

---

# Trade Liberalization and De Novo Hypothesis in the context of Bangladesh: An Empirical analysis

Abdul Hannan Chowdhury

&

Raisul Islam

North-South University, Bangladesh

---

## Key words:

Trade Liberalization, Cointegration, Vector Error Correction Model, De-Novo hypothesis

## Abstract

*This paper attempts to investigate whether the government of Bangladesh is promoting industrial exports and investigates the effects of industrial export on growth; with a notion, if de novo hypothesis holds. The paper attempts to check the effects of trade liberalization on growth applying methods of cointegration, and vector error correction model. The study concludes that trade openness is needed to be contained in a controllable level and suggests policymakers to regulate trade openness to gradually diminish the import trend.*

---

## Introduction

The general idea of *free trade and growth* was developed in advocacy of free trade based on *neoclassical trade theory* and from recent *endogenous growth theory* (Romer, 1990). The support for free trade is drawn from Ricardian principles of comparative advantage (Viner, 1937). Similar idea is drawn from the notion of perfect competition and the believe of neoclassical economists who argues on the importance of efficient capital allocation due to free trade (Krugman, 1986; Corden, 1974).

The phenomenon of free trade came under severe scrutiny in the face of *Great Depression*. Hence, theoretical foundations of '*optimum tariff*' were developed in support of protection (Johnson, 1950; Kaldor, 1940). Johnson advocated trade protection in three groups of classical exposition is the economic arguments, non-economic arguments and non-arguments. Economic arguments raise infant industry argument, optimal tariff argument and correction of domestic market distortions, while non-economic arguments emphasize on self-sufficiency development for domestic economy. Non-arguments attempt to resolve *balance of payment distortions* through trade protection. Johnson concluded that '*optimal tariff*' protection is the only valid argument, while in other cases such arguments will only inflict distortions.

The neoclassical economists refute the notion of protection as an alternative, as this would result in intra-industry effects. The increased barrier to entry would make domestic traders to engage in monopolistic competition, while small enterprises will be left inefficient. *Intra-industry effects* are the source to welfare loss (Tybout, 1991). Bhagwati (1988) points up the theory of *directly unproductive and profit seeking activities*, which will cause waste to national resources. Further, the *Solow-growth model* embodies technology as an endogenous factor (Agion, 1992; Romer, 1989), defining that international trade ensures faster diffusion of technology, embodied into better intermediate goods resulting in higher productivity and growth for domestic economy (Grossman, 1991). This will result in *learning by doing* effect and *technological know-how* is surpassed. In addition, management is more efficient and all will combine in high growth (Krugman, 1987; Young, 1991; Lucas, 1988).

Numerous studies have been conducted on export-led growth, trade openness, manufacturing exports as a new engine of growth, particularly in the last decade, on different economies, ranging from developed to poor countries, drawing interesting conclusions. The present study seeks to investigate the effects of export, openness on growth in the context of Bangladesh that represents many other countries in growing Asian Economy. The study will therefore illuminate the phases of trade liberalization in Bangladesh and then will illustrate the effect of changes in the phase, applying co-integration.

## Trade openness and Export-growth Process in Bangladesh

Bangladesh has gone through three phases of policy changes, towards deregulation and openness to trade, after independence in 1971. The first phase was marked by severe controls on exports and

imports (1972-1975), putting the country in a socialist framework. Banking and trade infrastructure was nationalized as an inward-looking, import substitution (IS) approach was adopted. Agricultural inputs and outputs were controlled. Empirical literature suggests that this was appropriate approach for the suggested timeframe (Ahmed 2000). The second phase of denationalization, deregulation and trade liberalization (1976-1990) lacked a good direction to work out the process. Nationalized trade barriers were reduced and a 'free trade' approach was undertaken. Privatization of industries and banking sector was allowed and price controls over nationalized firms were lifted. Abolishment of state trading was initiated. The third phase of policy shift (1991-2002) was significant as 'trade barriers' have been removed as a flexible exchange rate regime is adopted. To encourage further reduction of anti-export bias, export processing zones have been established, to co-operate manufacturing exports. These recent policies shifts have moved towards complete privatization of banks, infrastructure and agricultural sector. During this phase, Bangladesh continued to experience rapid trade liberalization that is indicated into the import-export trend ever since.

When the country adopts rigorous trade policy towards openness and promoting exports, large scale capital owners and labor unions are in oppose to liberalization. The cause of opposition may lie in the fact that, increased competition, effect the workers in protected public and private sector, who fail to adjust to the exposed economy with increased productivity. The politicians tend to protect large scale owners, who severely discourage competition and create bias towards exports (Sattar, 2004). The following are literatures in both pros and cons of export promotion, growth and trade liberalization.

## Literature Review

The theoretical literature argues that export expansion increases the investment and capital accumulation in a country. The two-gap model explains that growing export reduces the constraints that prevail in foreign exchange. Such reduction of constraints lead to better accumulation of productive resources, capital goods and intermediate goods (McKinnon, 1964; Bacha, 1984; Cheneray, 1966). Export expansion also increases investement opportunity of a country. Contemporary economists suggest that deposits into domestic and banking system, government cutback and foreign exchange reserve cannot only induce investment. Investment opportunities determine investment rather than savings. The export growth will provide investment opportunities to home country (Sandrum, 1994).

Economic growth may increase export for a country and theories suggest that the relationship of export and economic growth is bi-directional. The effect of better learning and technological development give rise to output. The output growth ensures that domestic demand is met and export will expand. However, this technological process development or learning process development is not directly related to the export promoting policies (Jung, 1985). As the home country realizes economies of scale, expansion of export takes place (Grossman, 1991). Therefore, the bi-directional theory suggests that GDP is a function of investment that enhances export performance and export increases investment opportunities.

In the designing process of development economics, entailed was dominant export pessimistic theories, rather than export promoting views. After world war II, IS strategies were followed by many countries. However, the initial phase of implementing IS strategies seemed ideal during that period, but the results were not favorable for all economies. Export pessimistic views were not justified for many economies that have reached a certain level of development, and industrialization. On the other hand, the import substitution trade policies laid undesirable effects on balance of payment. As a result, the growing economies did not accept import substitution strategies, rather accept export promoting views (Adelman, 1984).

Bhagwati (1988) suggested growth led export hypothesis is dominant when supply and demand is induced by growth. In such cases, anti-trade bias is turned down. The possibility of bi-directional causality prevails in many major theoritical literture (Grossman, 1991; Bhagwati, 1988).

Adelman (1984) argues that export-led growth is not the only open development strategy for a least developed country. The open development strategy that ensures the allocation of agriculturally driven resources may prove superior than the capital allocation strategy for investment resources. An alternative to the import substituion strategy, for a closed development approach is an agricultural-demand-led-industrialization strategy (ADLI). It is important to identify the phase of closed development ideology, which is dominant after the era of pro-agricultural strategy is over. An arfargument is that ADLI

as a balanced-growth-approach, can only be a mean, to attain the goal for developing countries need for higher growth, and growing industrialization by expanding the demand for domestically produced consumer and intermediate goods. The linkage effect to agriculture with industrialization is also examined (Singer, 1979). Singer (1979) defines this target as lime target and ADLI is the solution. Adelman(1984) also puts out the constraints to ADLI strategy as it requires the improvement of infrastructure in agriculture which is difficult to attain in South Asian sub-continent. The capital needs to be perfectly infustructured for ADLI yield expected results. ADLI strategy is therefore a solution to allow time to the developing countries to bring about changes structurally, in 1980s to 1990s. This strategy cannot deny the importance of export-promoting strategies as an alternative for import substitution strategies at all (Adelman, 1984).

Alongside the theoretical literatures on export-led growth hypothesis, the numbers of empirical literature from the first of its kind by Maizels (1963) is numerous. Jung (1985) carried out empirical studies from 1967 to 1982, and found supportive relationships to export and growth. Greenaway (1994), conducted studies on the export-led growth hypothesis, and significant number of studies vividly shown relationships between export and growth. A cross country analysis was conducted from 1963 to 1999 of which only 4 countries failed to show significant relationships out of the 57 countries and only 10 out of the 102 time series analysis didn't show significant relationships between export and growth.

An important theoretical implication is increasing export also paves the way for imported capital goods to be entered into the country (Islam, 1998). As productivity is increased, investment along with profit grows and the economy enjoys higher growth (Edward, 1993; Levine, 1992). In last two decades, exports of newly industrialized countries grew by 20% and manufacturing exports entailed 70% of total exports. As a third factor, import of manufactured and productive capital goods increased. The demand for these capital goods indicates the increasing rate of growth. Therefore, the plethora of studies on export and growth make this issue important enough to review.

### **Cross-country Empirical Analyses and Controversial Theories**

Many empirical literature focused on particular countries or a category of countries to examine the export-led growth hypothesis. It is defined that if export growth coefficients and output growth coefficients are significantly positive, the country follows export promoting strategies. If output growth causes export growth than the country is labelled internally generated exports (IGE). On the other hand there is negative correlation, the country follows export reducing growth (ERG) strategy (Jung, 1985). Such countries are following inward-oriented strategies rather than outward-oriented policies. Inward-oriented countries may also follow IS trade policy.

Several studies on cross-country confirmed the existence of export-led growth for different countries, and in some countries otherwise results were found. Hatemi (2000) continued studies on Ireland, Portugal and Mexico, and found significant relationship but failed to confirm causal relationship for Greece and Turkey . Ghirmay (2001) found positive relationship of export and growth for a number of developing countries. Greenaway et al. (2002) conducted analysis on a number of developing countries and found that the growth rate dropped immediately after trade reform for a constant rate of export, but gained momentum following a J-curve response after the affect of trade reformation wires out.

Michaely (1976) analysing 41 developing countries for a large span of time concluded that Greece, Taiwan, Portugal, Spain, Israel, Yugoslavia and Korea had rapid growth with increasing export but Portugal did not show significant export growth, while GDP was growing in same pace. On the other hand, when Ethiopia increased its export performance considerably, but failed to increase its growth to the pace with other countries. On the basis of rank correlations, Michaely (1976) concluded that export performance will positively effect growth of a country, only when a country achieves development of a particular level. Countries below this level fails to exhibit good export-growth relationships. Balassa (1977) applied rank correlations on a sample of countries that established industrial base for a timeframe of 1960-73. Among these countries, Korea, Singapore and Taiwan adopted EP strategies at a very early stage and provided incentive to the exporting sector by subsidizing the sector in many ways. On the contrary, Israel and Yugoslavia promoted export during the same period, but their efforts seemed to dim in the later periods. Nevertheless, Argentina, Brazil, Columbia and Mexico continued the existing trade policy, supporting IS. During this period, Chile and India continued their inward-oriented policies and

was in the phase of weakly introducing EP policies. The result shows that while Korea and Taiwan had less growth with more export, Chile, India, Mexico, Brazil and other countries had higher level of growth with higher level of export. The countries that moved to opposite direction is due to the unfavorable internal conditions and policy constraints. Opposite direction of relationship is found (Islam, 1998) for Phillipines and Srilanka,. Due to the debt crisis and continued recession that prevailed during 1980s, after many countries adopted export promoting strategies, economists were dubious about export-led growth hypothesis. It became a necessity to re-examine the export promoting strategies (Bhagwati, 1988).

Current literatures focus more on successful Asian exporters, which maybe a mistake to be implemented as a general strategy for all economies. The sources of worry lies in the fact, if markets are shifted to EP, markets will fail to absorb all exports. The earlier wave of export pessimism was afflicted by this idea. Economists support the idea of intra-industry specialization which leads to adopting inward-oriented policies, and terms an economy as closed economy. The countries that adopts outward-oriented policies to a greater extent, or publicly promotes EP strategies, associates some level of government intervention. The government intervention makes sure that the exports are promoted, subsidized and invested into. The countries that are empirically supportive of export-led growth hypothesis, mostly follows government intervention. This practice is generalized except countries like Hong-Kong. However, these are exceptional cases and should not be generalized (Bhagwati, 1988).

Economists suggest that EP trade policies, make the domestic market less sheltered and susceptible to world economic condition, outside pressure, world competition as well as innovation. This view has also been criticized by Schumpeterian arguments (Bhagwati, 1984). The theory of *market imperfections* suggests that in presence of excessively high wages, countries may do poorly for instance, Jamaica. The *satisfaction theory of import substitution* suggests that the EP strategies are not suitable for many newly industrialized countries due to their lack of flexibility for movement of capital resources. Countries also lack the political capabilities to implement this flexibility. Adelman (1984) articulates ADLI strategy should be applied to allow a country enough time, for it to develop a structural base, before the country can successfully implement export promoting strategies. Export-led growth will follow if the country can achieve a minimum level of development. While in the face of rapid growth, many countries are doing well with EP trade policies, for instance, countries like Taiwan, Sri-Lanka, Phillipines, Jamaica, Brazil and Korea are not in the position to implement EP trade strategies and the desired export-led growth was not achieved.

As empirical evidence, causality tests between export and growth conducted by Jung and Marshall (1985) on 37 countries should be addressed. In this study, countries as many as South Africa, Korea, Pakistan, Israel, Bolivia and Peru did not show significantly positive relationship between export and growth. Rather these countries showed *export reducing growth(ERG)*, which is just the opposite. If these countries implements EP trade strategy, the countries will experience crippled economy and lower growth. Countries like Iran, Kenya and Thailand are in favor of internally generated growth, and in the process of successfully implement EP growth policy (Jung, 1985).

Based on the above results, countries should therefore, support IS as a pro-agricultural trade policy (Adelman, 1984). Countries are also advised to move towards ADLI strategy in this stage. It may not be favorable for countries to immediately implement EP trade strategies, hoping to yield benefits of export-led growth hypothesis. In the primary stage, countries require import substitution policies, to develop intra-industrial skills, economies of scale, and a trade base to a minimum level. The level in between is a complementary stage between IS and EP. Countries as India, Malaysia, Bangladesh in South East Asian region, followed IS moved towards outward-oriented policies and introduced trade openness, and enjoyed the benefits of export-led-growth. For many countries mentioned above, steps taken in an earlier phase, have backfired. Therefore, the controversies to export led growth is as prevalent as the support toward the hypothesis.

### **Empirics on Export Led-growth and Trade Liberalization in Bangladesh context**

This section of the paper will briefly review the studies conducted in the context of Bangladesh and the export-led growth hypothesis has been examined. Many structural adjustments were advised by World Bank(WB) and International Monetary Fund (IMF). The country went under further reforms in fiscal, monetary and industrial sectors, in the periods of 1985-86 and 1991-92; that helped to reduce its bias

against exports or convert to EP country from an IS country (Hossain, 2002; Rahman, 1995). Among the recently conducted researches, cointegration analyses, vector error correction models (VECM), explained many important variables such as manufacturing exports, investment capital to the total exports and growth. During this period the de-novo hypothesis states that manufacturing exports becoming a new engine of growth replacing total exports (Athukorala, 1998; Helleiner, 1995) were examined against Bangladesh in some empirical literatures (Hossain, 2002; Ahmed, 2000; Hossain, 2003). Hossain and Karunaratna (2004) conducts a study to examine whether manufacturing exports has replaced total exports as a new engine of growth for a period of 1974-1999. Significant relationships supporting export led growth is found, when the results weaken the de-novo claim and concludes that total exports is still a dominant factor to GDP growth. This is due to the fact that agricultural exports may dominate the manufacturing exports in total exports, as a pro-agricultural society, that follows the ideology subscribed by Adelman (1984). Karunaratna (2004) suggested that the policy reforms in Bangladesh have not been able to bring about significant structural changes instantly in the economy, applying cointegration on export and growth. However, the structural changes have brought about competition, that has fuelled the rigorous implementation of export promoting policies with significant government intervention, and export-led growth is therefore, supported (Hossain, 2004). Among the Asia's high power economy countries, evidence of cointegration between export and growth was found in Bangladesh, Sri Lanka, India, Nepal and Fiji; while other countries showed evidence for causality but no cointegration was found among the 15 countries surveyed (Islam, 1998).

### Significance of the study

The plethora of studies conducted to export-led growth phenomenon, may have applied methodology and range of data, that have been modified in recent times. Michaely (1976), Maizels (1963) applied rank coefficients to identify relationships between export and growth hypothesis, but did not apply statistical causation. Whereas studies by Balassa (1985) applied linear regression model without emphasizing on the time series data being unit root or not.

The literature have used a wide range of definitions of "economic growth" and "export" as export being a component of growth, many of these findings were spurious, and researches tried to circumvent these problems at a later stage. This has been defined as 'accounting identity' problem by taking export-GDP ratio (Michaely, 1976; Islam, 1998) or GDP net of exports (Heller, 1978; Islam, 1998). While trade policies in the world have changed, highly in the last few decades, it is indeed important to study the affect of export to growth for recent times.

Michealy (1976), Adelman (1984), Jung and Marshall (1985), Bhagwati (1988) contributed highly in the empirical literatures. However recent changes in the methods of estimation and global circumstances, may have rendered many of the important literatures insignificant, empirically. The major drawback for the studies carried out for Bangladesh which have applied econometric methods to draw conclusion to the export-led growth phenomenon is the time frame of study. In the last decade, the world economy has faced many obstacles, and Bangladeshi economy representing Asia's developing economies is affected by the fluctuations of world economy. In addition, the changes from inward-looking to outward-looking orientations may not bring consistency in the pattern of growth. It is important to analyse export-led growth hypothesis with significant emphasize on trade liberalization for recent years to see, whether the current indicators are consistent with the past, or there exists a necessity to bring changes to the adopted EP policies. The empirical analysis is conducted in the next phase.

### Methodology

Empirical study in past has utilized co-integration test, often in two-variable framework, neglecting the probability of misspecification. To avoid such errors, study should not exclude the variables that are assumed to have significant impact on growth. This study will therefore, include investment that is assumed to influence GDP. Hossain (2004) suggested two different multivariate models to find the impact of manufacturing export and real export on GDP in a cointegration framework. The direction and the level of impact is necessary to observe in a single multivariate framework, trade openness is added to suggest its impact along with other important variables. The presence of investment variable is important because, if export coefficient is significant, that implies an improvement in

efficiency. If increasing exports case capital accumulation or capital formation to increase, this will have significant effect on investment (Ghirmay, 2001). The more government spending increase, the more import of intermediary goods, and capital goods increases. This is proxied by capital formation and results in increased export and openness to trade is a good indicator of growth. The multivariate model that combines the growth, export, capital and trade variables. We have the following model:  $U_t(lgdpnet_t, lOP_t, lx_t, lcapital_t, lmanu_t)$  where lower case letters represent natural logarithms and  $t$  denotes the time subscripts.

This can be written as,  $lgdpnet_t = \alpha_0 + \alpha_1 lOP_t + \alpha_2 lx_t + \alpha_3 lcapital_t + \alpha_4 lmanu_t + \varepsilon_t$ .

Where,  $lgdpnet_t$  represents natural logarithm of real GDP net of exports;  $lOP_t$  is the natural logarithm of trade openness proxied by total GDP;  $lx_t$  is the natural logarithm of real exports;  $lcapital_t$  is the natural logarithm of real investment proxied by capital formation; and  $lmanu_t$  is the natural logarithm of real manufacturing exports.

Replacing  $lgdpnet_t$  by  $y_t$ , the estimation procedure of Engle and Granger (1987) transform to the following long run static equation

$$y_t = \alpha_0 + \alpha_1 lOP_t + \alpha_2 lx_t + \alpha_3 lcapital_t + \alpha_4 lmanu_t + \varepsilon_t \quad (1)$$

In equation (1) parameters are estimated using ordinary least square method and the short-run dynamic equation is established as

$$y_t = \alpha y_{t-1} + \beta_0 lOP_t + \beta_1 lOP_{t-1} + \gamma_0 lx_t + \gamma_1 lx_{t-1} + \vartheta_0 lcapital_t + \vartheta_1 lcapital_{t-1} + \theta_0 lmanu_t + \theta_1 lmanu_{t-1} + \varepsilon_t \quad (2)$$

And this equation can be rewritten as

$$y_t = \delta_1 \Delta y_t + \beta lOP_t + \delta_2 \Delta lOP_t + \gamma lx_t + \delta_3 \Delta lx_t + \vartheta lcapital_t + \delta_4 \Delta lcapital_t + \theta lmanu_t + \delta_5 \Delta lmanu_t + u_t \quad (3)$$

Estimating this model with short-run terms  $\Delta y_t$ ,  $\Delta lOP_t$ ,  $\Delta lx_t$ ,  $\Delta lcapital_t$  and  $\Delta lmanu_t$  is just equivalent to estimating the long run parameters of  $\beta$ ,  $\gamma$ ,  $\vartheta$  and  $\theta$ .

Then the issue of a good power property arise. In an Engle-Granger framework, the null of no-cointegration is tested. We assume the variables are integrated in their first differences having an order I(1) integration and there exists one cointegrating vector, the VECM model is thereby,

$$\Delta y_t = \delta_0 + \sum_{i=1}^n \delta_{1i} \Delta lOP_{t-1} + \sum_{i=1}^n \delta_{2i} \Delta lx_{t-1} + \sum_{i=1}^n \delta_{3i} \Delta lcapital_{t-1} + \sum_{i=1}^n \delta_{4i} \Delta lmanu_{t-1} + \delta_5 ECM_{t-1} + \varepsilon_t.$$

Here, ECM is the error correction term, or in other words, residuals from the first model. The error correction term or equilibrium correction term is therefore,

$$ECM_{t-1} = y_{t-1} - \beta lOP_{t-1} - \gamma lx_{t-1} - \vartheta lcapital_{t-1} - \theta lmanu_{t-1}$$

The long run ECM for this analysis this can be expressed as,

$$y_t = \delta_0 + \delta_1 lOP_t + \delta_2 lx_t + \delta_3 lcapital_t + \delta_4 lmanu_t + \delta_5 ECM_{t-1} + \varepsilon_t \quad (4)$$

The short-run dynamic ECM depends on the previous lags of the series and estimates the current value, accounting for only a few periods change, may fluctuate its behavior in the long run, but worth looking at is

$$\Delta y_t = \delta_0 + \delta_1 \Delta lOP_{t-1} + \delta_2 \Delta lx_{t-1} + \delta_3 \Delta lcapital_{t-1} + \delta_4 \Delta lmanu_{t-1} + \delta_5 ECM_{t-1} + \varepsilon_t \quad (5)$$

In estimating financial time series the natural logarithm is taken for the data available. As the non-linear data shows linearity by conversion, thus enabling the time series analyses to be applied on the appropriate series (Brooks, 2008).

One important consideration is the affect of a 'shock', the unexpected or unpredictable change in a variable, which is expected to gradually diminish, only if the series is a stationary one. The effect of a shock in time  $t$  will have smaller effect in time  $t+1$ , and a smaller effect in time  $t+2$ . However, for non-stationary series, the shocks will be infinite and in some instances will be increasing. Another consideration is the possibility of the existence of a 'spurious regression'. In addition, a non-stationary series will produce enormous large values if regression is run. Therefore, to conduct this study, stationary condition must exist in variables.

A series that is differenced  $d$ -times to be stationary is said to be integrated of order  $d$  and can be written as  $y_t \sim I(d)$ . In an autoregressive process, the  $y_t$  depends on its previous value, that is  $y_{t-1}$  and the error term  $u_t$ . The equation can be expressed as  $y_t = \phi y_{t-1} + u_t$ .

And with repeated substitutions, can be written as

$$y_t = \phi^{T+1} y_{t-1} + \phi u_{t-1} + \phi^2 u_{t-2} + \phi^3 u_{t-3} + \dots + \phi^T u_{t-T} + u_t.$$

With further substitutions,  $y_t = \phi^T y_0 + \sum_{j=0}^T \phi u_{t-j}$ .

From this equation, if  $\phi < 1$ , the shock in the system will gradually diminishes, and this is a stationary process. If  $\phi = 1$ , the shock in the system will persist and this is called a unit root process. To test for the existence of unit root, *Augmented Dickey-Fuller (ADF)*, *Phillips-Perron (PP)* and *Kwiatkowski-Phillips-Schmidt-Shin (KPSS)* tests were run. The data are in level and test regression includes intercept.

In the following ADF equation,  $y_t$  will represent  $lgdpnet_t, lOP_t, lx_t, lcapital_t, lmanu_t$ .

$\Delta y_t = \psi y_{t-1} + \sum_{i=1}^p \alpha_i \Delta y_{t-i} + \varepsilon_t$  where the  $H_0 = y_t \sim I(1)$ , unit root; against  $H_1 = y_t \sim I(0)$ , represents stationarity. The ADF test has been criticized for having low power, where the root of stationary process is very close to the non-stationary boundary. KPSS test was used on the variables to test the hypothesis that checks for stationarity directly.

KPSS (1992) is testing for non-stationary component if that is really zero. As  $y_t = \alpha + \beta_t + \mu_t$  is trend-stationary process, The KPSS test equation can be expressed as  $y_t = f(t) + x_t + \varepsilon_t$ .

where  $f(t) = \alpha + \beta_t$  and  $x_t = x_{t-1} + \vartheta_t$ . Here,  $\varepsilon_t$  is identically independently distributed (IID) and  $\vartheta_t$  is stationary. In KPSS test the  $H_0: \sigma^2 = 1$ , against  $H_1: \sigma^2 \neq 1$ .

## Data Description

Data has been used for periods of 27 years from 1980 to 2007. The primary reason is the post-war era experienced highly unstable political situations and conflicts of many level, that put the economic growth in a standstill. During this period, the infrastructure to export was being built as the country adopted an inward looking policy. However, in absence of significant infrastructure, there was no significant export data available, to be included in the observations. Furthermore, the inclusion of data from this period may cause arbitrariness in the entire group of sample. The infrastructure in favor of exports and imports were in the process of development, but became active from 1980s, and hence the sample data is collected from this period.

Mainly the data for the study is obtained from 'World development indicator, 2009' and the sources are located into Economics and Social data service ([www.esds.ac.uk](http://www.esds.ac.uk)). In addition supplementary data is collected from IMF, Balance of Payments data source. Some data has also been collected using Datastream. The following section consists brief description of important variables used in the study.

*GDP net of exports* is the indicator of growth variable used as the dependent variable and this variable is expressed in constant local currency unit, for the period of 1980 to 2007. The net value added is used rather than the gross value added output, representing growth. Gross value added output is better than gross output, as it entails the inclusion of raw materials as well as it accounts for differences (Salim, 1998). *GDP net of exports* is more appropriate than gross value added, as it provides superior structure of data allowing for better time series analyses.

*Total gross domestic product (TGDP)* is a proxy variable for trade openness or trade liberalization. The reason for inclusion of *TGDP* as proxying for liberalization is the fact that, the growth of total gross domestic product indicates the reduction of anti-trade bias for a country. The indicator *TGDP* is derived by taking the ratio of total *GDP* to the total of net imports and exports.

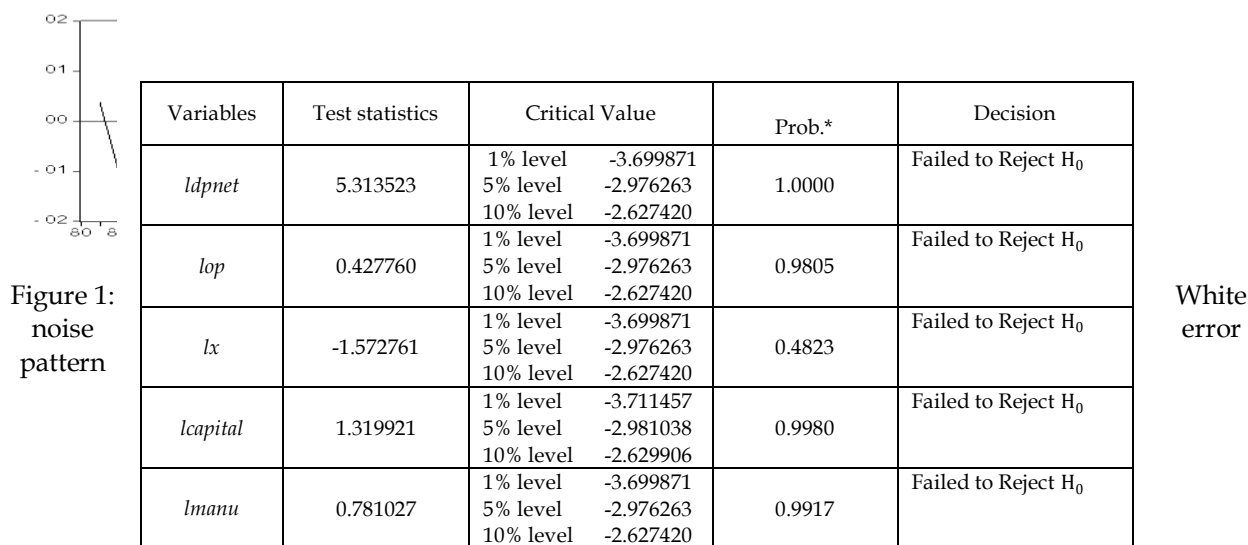
*Gross capital formation* is the variable that is representing investment as the increasing rate of capital growth indicates growth of efficiency, growth of productivity, production of more raw material and intermediary goods. The aggregate book value of land, buildings, machinery, transport, offices etc., which is estimated as gross fixed assets is representative of capital formation. In this analysis, data on *fixed capital assets* is used, which is expressed in constant local currency units.

*Real export* variable is indicating the *exports of goods and services* and are expressed in constant local currency units. Real export is indicative of the growing exports of the country, due to policy changes in favor of liberalization, particularly after 1984-85. Real export comprises agricultural output, industrial output as well as services.

*Manufacturing export* is the variable that represents, the total export of manufactured output or capital exports only. While the *de novo* claim establishes manufacturing exports as engine of growth, some empirical findings also suggest that is the new engine of growth for Bangladesh (Hossain, 2004). This discussion magnifies the importance of the inclusion of *real export* and *manufacturing export* variable together to observe the effect of manufacturing export on growth and real export on growth in a distinct manner.

### Analysis and Findings

The first step of data analysis is to check if the residuals are abiding by the condition of error term to be a white noise. Shown in the figure 1 that the residuals are white noise.



Considering  $H_0 = y_t \sim I(1)$ , unit root  
 $H_1 = y_t \sim I(0)$ , stationary.

\*MacKinnon (1996) one-sided p-values

Table 1: ADF Test on Level data

From the ADF test table 1, all the variables have been tested for stationarity at level. Unit root is found in log of GDP net of exports series at 1%, 5% and 10%, at level data, and it was founded that the series is a  $I(1)$  process and is stationary at first difference. However, the series is not  $I(2)$  and non-stationary at 2<sup>nd</sup> difference. The log of trade openness is stationary at first difference as unit root is found in level data as well, and the null of unit root is not rejected. Unit root is rejected convincingly in first difference and hence the series is stationary at second difference. Similarly, for log data of real exports, capital formation and manufacturing exports are all stationary at first difference, as unit root in level is found. However, a distinctive feature is that, among all the series, only real exports series show lower power. The rest of the series follows the trend of the former and are not stationary in their second difference.

From the KPSS test table shown in table 2, for all the variables, unit root at first differences are found. For all the variables, it is concluded that all the series are stationary at first difference.

Considering  $H_0 = y_t \sim I(0)$ , unit root  
 $H_1 = y_t \sim I(1)$ , stationary



Variables	LM Test statistics	Critical Value		Decision
<i>ldpnet</i>	0.674246	1% level	0.739000	Failed to Reject $H_0$
		5% level	0.463000	
		10% level	0.347000	
<i>lop</i>	0.592119	1% level	0.739000	Failed to Reject $H_0$
		5% level	0.463000	
		10% level	0.347000	
<i>lx</i>	0.530114	1% level	0.739000	Failed to Reject $H_0$
		5% level	0.463000	
		10% level	0.347000	

Table 2: KPSS Test on Level data

From the unit root tests it is seen that the series of data are stationary and fit to run the cointegration on the data, as the possibility of spurious regression has been removed and the series will provide desired results.

### Cointegration in Multivariate System - Johansen Approach

Johansen-Jesulius full rank cointegration method has been applied due to limitations in Engle-Granger two step method. The null hypothesis in this regard implies of no-cointegration, where as the alternative hypothesis implies the existence of cointegrating equation. The result is organized in table for cointegration rank test based on  $\lambda_{\text{trace}}$  test. Here,  $r$  denotes rank (number) of cointegration.

From both the trace test and maximum eigenvalue test, the null hypothesis of no cointegration is rejected once. Therefore, the rank of cointegration vector is 1 and there exists one cointegrating equation. The implication of this decision is that the model is integrated at order I(1) shown in table 3. In addition, there exists significant long run association among the variables.

$H_0$ hypothesis	$H_1$ hypothesis	$\lambda_{\text{trace}}$ Test statistics	95% Critical Value	Decision
$r = 0$	$r = 1$	81.61887	69.81889	Reject $H_0$ .
$r \leq 1$	$r = 2$	42.99245	47.85613	Failed to Reject $H_0$
$r \leq 2$	$r = 3$	17.06495	29.79707	Failed to Reject $H_0$
$r \leq 3$	$r = 4$	5.803932	15.49471	Failed to Reject $H_0$
$r \leq 4$	$r = 5$	0.296372	3.841466	Failed to Reject $H_0$

Table 3 : Cointegration rank test based on  $\lambda_{\text{trace}}$ 

### VECM Procedure

The acceptance of the VECM depends on the significance of the error correction term and the equilibrium correction term with the correct sign. Binding  $\beta_1 = 1$  restriction into the rank 1 cointegrated system, the derived error correction term is statistically significant, have the correct sign, with the value of -0.353633, showing a high speed of convergence to the equilibrium. The long run ECM which fits the model best experimenting the general form of equation (4) is,

$$y_t = 0.48 - 0.32 \ln OP_t + 0.53 \ln lx_t + 0.17 \ln capital_t + 0.49 \ln manu_{t-1} - 0.35 ECM_{t-1}. (6)$$

$H_0$ hypothesis	$H_1$ hypothesis	$\lambda_{\text{trace}}$ Test statistics	95% Critical Value	Decision
$r = 0$	$r = 1$	38.62642	33.87687	Reject $H_0$ .
$r \leq 1$	$r = 2$	25.92750	27.58434	Failed to Reject $H_0$ .
$r \leq 2$	$r = 3$	11.26101	21.13162	Failed to Reject $H_0$ .
$r \leq 3$	$r = 4$	5.507559	14.26460	Failed to Reject $H_0$ .

Table 4: Cointegration rank test based on  $\lambda_{\max}$ 

Where  $y_t$  denotes log of GDP net of exports. The desired long run relationship, of the model states that Bangladesh's real export, manufacturing export, investment is positively related to real GDP or growth, in the long run. From the fitted model it is concluded that real export, real manufacturing export, real capital formation have significantly positive relationship with growth, while trade openness has negative relationship with growth. For 1% change in real export, real manufacturing export and real capital formation or investment, GDP will grow consecutively by 0.53%, 0.49% and 0.17%, which are all statistically significant. In contrast, for 1% change in trade openness, real GDP will fall by 0.32%, which is also significant. The speed of adjustment coefficient determines that, it is expected for the model to converge into equilibrium within 3 quarters.

The short run ECM will look into the present term estimation of the model, which is run on the differential log of the variables. Satisfying the previously applied conditions of unit root, one cointegrating vector, and similar restrictions applied, the error correction model examines the general form of equation (5),

$$\Delta y_t = -0.14 - 1.23 \Delta IOP_{t-1} + 0.82 \Delta x_{t-1} + 0.62 \Delta \text{capital}_{t-1} + 1.62 \Delta \text{manu}_{t-1} - 0.143 ECM_{t-1} \quad (7)$$

The short-run ECM also have statistically significant variables. Notice that, for 1% change in manufacturing exports, GDP will increase by 1.62%, which is very high compared to real GDP that causes the GDP to grow by 0.82%. Manufacturing exports are therefore, showing a very good impact even in short run, as well as long run. On the contrary, 1% increase in trade openness, GDP will fall by 1.23%, which is also very significant. The error correction term has the correct sign, and a good speed of adjustment. In short run, the rate of convergence should be around one quarter period.

Akaike information criterion and Schwarz criterion has given significantly low values confirming the accuracy of the lag model selection. The Schwarz criterion with stricter penalty shows less deviation from Akaike.

## Conclusion

This paper investigates whether export-led growth hypothesis is applicable to Bangladesh, as well as if manufacturing exports becoming a new engine of growth. The study also seeks to identify the relationship between growth and trade openness. This would substantially suggest on the validity of the policy framework adopted and should be followed. To suggest on these, dynamic time-series econometric methods have been applied on the time frame from 1981-2007. Johansen's cointegration method has been applied and VECM was drawn utilized conditionally on the data sets being stationary. The statistical significance of both long-run and short-run model is checked and relationships drawn.

The results imply that for GDP net of exports, or growth indicator, trade openness indicator total GDP, real export, manufacturing export and real capital formation are all stationary in the long run. This would explain that Bangladesh had a stable growth, with distortions that are not highly significant, and converges into equilibrium in the long run. Therefore, the data are valid to be estimated and have drawn reliable conclusions. Growth has found to be positively associated with real export which would imply, increasing exports will yield higher productivity for the country. This association has proved that Bangladesh continues to follow, export-led growth hypothesis. Growth is significantly associated with manufacturing exports, which carries a higher coefficient. While growth is reliant on exports, the export sector is highly comprise of manufacturing exports, making growth to be affected highly by manufacturing exports only. This has verified that manufacturing exports are becoming the new engine of growth. Growth is negatively associated with trade openness indicator. This is justified by the fact that higher trade openness has caused Bangladesh to import more than export. As a result, the country is being reliant on imports. This association is significant as if the process gains a momentum, Bangladesh might experience a negative growth in the long run. However, higher imports are bringing in more capital goods which is increasing productivity, ensured by the association capital allocation and growth variable. The study has specified the duration to adjustment of distortions, which is very important prediction.

Findings of the study was found to be supportive of the study conducted by Ahmed (2002), that is Bangladesh follows export led growth significantly. As Asia's power house economy, among a few countries Bangladesh is in line to the theory (Ahmed, 2000). The study also supports the previous study

conducted by Hossain and Karunaratna (2002), explaining that manufacturing exports is becoming engine of growth following *de novo* hypotheses. It can be concluded that, *de novo* hypothesis is applicable in the case of Bangladesh. The analyses states that increased imports are affecting the balance of payment, and productivity negatively (Dornbusch, 1974).

In contrast to earlier studies, this study uses the current level of data, which has been updated in recent dates. The methods applied here is superior to many other studies and drawn conclusions are easily understood. The benefit of recent methods have given a contrasting fact implying, Bangladesh still needs to monitor its openness very closely, as the study finds a negative relationship, that is caused by increased imports; and if continued, may reduce productivity.

The study suggests that the government should continue to encourage exports. Increased imports are bringing in intermediate goods, and capital goods, which are desired, but after a specific structural formation, imports should be discouraged gradually, as this process is curbing growth. The data implies that policies seem to overlook this fact. It is high time, for this to be considered.

Future studies should continue to look into the associations, with different endogenous indicators, and look into specific elements of export sector, such as Garments and Knitwear for Bangladesh. Further studies should emphasis on agricultural sector and its association to growth. In conclusion, Bangladesh has emerged to be successfully implementing hypothesis, both in short-run and long-run policy implementation, and may emerge as a model nation for developing countries, which canbe compared to many different growth models and this pace should be maintained.

## Reference

- Adelman, I. (1984). Beyond Export-Led Growth. *World Development*, 12, 937-949.
- Ahmed, N. (2000). Exprt Response to Trade Liberalisation in Bangladesh: A Cointegration Analysis. *Journal of Economics*, 32.
- Athukorala, P. (1998). Export Response to Liberalization : the Sri-Lankan Experience. *Hitotsubashi Journal of Economics* , 39, 49-65.
- Balassa, B. (1971). *The Structure of Protection in Developing Countries*. Baltimore: John Hopkins University.
- Balassa, B. (1985). Exports, Policy Choices, and Economic Growth in Developing Countries After the 1973 Oil Shock. *Journal of Development Economics*, 18 (1), 23-35.
- Bacha, E. (1984). *Growth with Limited Supplies of Foreign Exchange: a Reappraisal of Two-gap Model*. New York: Academic Press.
- Bhagwati, J. (1988). Export Promoting Trade Strategies : Issues and Evidence. *The World Bank Research Observer*, 3, 27-57.
- Brooks, C. (2008). *Introductory Econometrics for Finance*. Cambridge: Cambridge University Press.
- Cheneray, H. (1966). Foreign Assistance and Economic Development. *American Economic Review*, 56 (4), 679-733.
- Corden, W. (1974). *Trade Policy and Economic Welfare*. Oxford: Clarendon Press,.
- Dornbusch, R. (1974). Tariffs and Nontraded Goods. *Journal of International Economics*, 28, 221-54.
- Edwards, S. (1993). Openness, trade liberalization and growth in developing countries. *Journal of Economic Literature* , 31, 1358-93.
- Engle, R. a. (1987). Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55, 251-276.
- Ghirmay, T. G. (2001). Exports, Investment, Efficiency and Economic Growth in LDC: An Empirical Investigation. *Applied Economics*, 33, 689-700.
- Granger, C. (1980). Testing for causality. *Journal of Economic Dynamic and Control* , 2, 329-52.
- Greenaway, D. M. (2002). Trade Liberalization and Growth in Developing Countries. *Journal of Development Economics*, 67, 229-244.
- Grenaway, D. (1994). What Does Liberalization Do for Exports and Growth? *Weltwirtschaftliches* , 130 (1), 152-174.
- Grossman, G. (1991). *Innovation and Growth in the Global Economy*. Cambridge, M.A.: The MIT Press.

- Hatemi-J.A. (2000). Time-Series Evidence for Balassa's Export-Led Growth Hypothesis. *Journal of International Trade and Economic Development*, 9 (3), 355-365.
- Helleiner, G. (1995). *Manufacturing for Exports in the Developing World: Problems and Possibilities*. London and New York: Routledge.
- Heller, P.(1978). Exports and Growth: An Empirical Re-Investigation. *Journal of Development Economics*, 5, 191-193.
- Hossain, M.(2002). *Export Response to the Reduction of Anti-Export Bias: Empirics from Bangladesh*. Brisbane: University of Queensland.
- Hossain, M.(2004). Exports and Economic Growth in Bangladesh : Has Manufacturing Exports become a New Engine of Exports-Led Growth? *The international trade journal*, 40 (3), 303-325.
- Hossain, M. (2003). *Trade Liberalization and Economic Performance: Analytics and Empirics from Bangladesh*. Brisbane: School of Economics, University of Queensland.
- Islam, M. (1998). Export Expansion and Economic Growth Testing for Cointegration and Causality. *Applied Economics*, 30, 415-425.
- Johansen, S.(1990). Maximum Likelihood Estimation and Inference on Cointegration-with Application to the demand of Money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210.
- Johnson, H. G. (1950). Factor Endowments, International Trade and Factor Prices. *Review of Economic Studies*, 1 (48), XIX.
- Jung, S.(1985). Exports, Growth and Causality in Developing Countries. *Journal of Development Economics*, 18, 1-12.
- Karunaratne, M.(2004). Exports and Economic Growth in Bangladesh: Has Manufacturing Exports Become a new Engine of Export-Led Growth. *The International Trade Journal* , 18 (4), 303-334.
- Kaldor, N. (1940). A Note on Tariffs and the Terms of Trade, *Econometrica*, 28, VII.
- Krugman, P. (1987). Is Trade Policy Passé? *Economic Perspectives*, 1, 131-44.
- Krugman, P. (1986). *New Thinking about Trade Policy*. In P. Krugman, *Strategic Trade Policy and the New International Economics* (1-22). Cambridge, MA: MIT Press.
- Levine, R.(1992). A sensitivity analysis of cross-country growth regressions. *The American Economic Review* , 82, 942-63.
- Lucas, R. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22, 30-42.
- Maizels, A. (1963). *Industrial Growth and World Trade*. Cambridge: Cambridge University Press.
- McKinnon, R. (1964). Foreign Exchange Constraints in Economic Development. *Economic Journal*, 74, 388-409.
- Michaely, M. (1976). Export and Economic Growth: An Empirical Investigation. *Journal of Development Economics*, 4, 49-53.
- Rahman, S. (1995). *Trade and Industrialization in Bangladesh: An Assessment*. (G. Helleiner, Ed.) *Manufacturing for Exports in the Developing World: Problems and Possibilities* .
- Romer, P. (1989). What determines the rate of growth and technology change? *World Bank Working Papers* , 279.
- Romer, P. (1990). Endogenous Technical Change. *Journal of Political Economy*, 98, 71-102.
- Sandrum, R. (1994). Exports and Economic Growth. *From Classical Economics to Development Economics* , 104-20.
- Salim, R.(1998). Sources of Output growth in Bangladesh Food Processing Industries: A Decomposition Analysis. *The development Economics* , XXXVII (3), 355-74.
- Sattar, S. A. (2004). *Trade Liberalization, Growth and Poverty Reduction; the case of Bangladesh*. Dhaka: The World Bank.
- Singer, H. (1979). Policy Implications of the Lime Target. *Industry and Development*, 3, 17-32.
- Tybout, J. D. (1991). The Effects of Trade Reforms on Scale and Technical Efficiency: New Evidence from Chile. *Journal of International Economics*, 31, 231-50.