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Long Run Relationship between Export and Import of Bangladesh: Growth Trend, Cointegration and Causality Analysis

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Abstract: *Agriculture plays crucial role in the economy of Bangladesh in terms of food security, employment generation, poverty reduction and supplying raw materials for key manufacturing units. As agriculture is still one of the top priority sectors in Bangladesh economy, formal financial institutions have been providing huge amount of credit for sustainable development of the sector. The specialized banks, state-owned commercial banks and private commercial banks played key roles in providing of agriculture credit in Bangladesh. In the recent times, agricultural credit has been increased several times. Given this background, the paper reviews the recent trends of agricultural credit provided by the banking industry in Bangladesh. The paper would also provide suggestions for ensuring adequate supply of agricultural credit so as to address problems of agricultural output and maintaining food security, employment generation and poverty reduction in Bangladesh.*

Key Word: Agricultural credit

1. Introduction

The main objective of pursuing a liberal trade policy instead of import substitution strategy since late 1980s is to achieve a competitive trade balance. The foreign exchange gap (Export minus Import) is also another concern of Bangladesh economy for development efforts. The import capacity also depends on export receipts. Though Bangladesh has been experiencing negative foreign exchange gap since independence but the gap has been fluctuating over the years. Therefore it is important to examine the long run relationship between export and import for designing appropriate policy option in the external sector. Husted(2001) explored the long run relationship between exports and imports of the USA using Engle-

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Granger methodology. Bahmani-Oskooee (1994) studied the long run relationship between export and import of Australia. Dipendra Singha (1999) explored the long run relationship between export and import of Pakistan with the annual data by applying Cointegration methodology. Naqvi and Morimune (2005) studied the long run convergence of export and import for Pakistan using Johanson method of Cointegration. C.C. Keong et al. (2004) investigated the long run relationship between export and import of Malaysia by applying multivariate cointegration technique. The main findings of most these studies reveal that trade gap is a short run phenomenon and it is convergent in the long run.

Trade liberalization is emerged as one of the major macroeconomic policy concerns in many developing countries including Bangladesh for economic growth and development in the recent years. Trade is considered as the 'Engine of Growth' because of its role that facilitates a country to specialize in the production of goods and services following the theory of comparative advantage or revealed comparative advantage. On the other hand a country can import of goods and services at affordable and lower cost from abroad as compared the cost of producing the same in home country. Foreign trade, mainly meant by export and import, has significantly contributed to the process of industrialization in many developing countries.

Liberalization removes restrictions and barriers to trade and increases the openness in terms of mobility of goods and services, capital and technological knowledge. Therefore, a country can utilise the opportunity of specialization for the goods and services in which it has comparative advantages. Economic theory suggests that free and liberalized trade regime can perform better than the restricted trade. It is assumed that trade liberalization has positive impacts on trade performance of developing countries. It is also argued that trade liberalization augments the export led growth strategy and the productive capacity based on competitive and comparative advantage. The failure of Import Substitution Strategy (ISS) for industrialisation in many countries is an important reason for switching over to Export-led Growth Strategy (EGS). The commitment to WTO for maintaining liberal and open trade regime is also another important reason for the member countries to undertake liberalization measures.

Trade Liberalisation has been one of the major policy reforms in Bangladesh. Bangladesh, as one of the founding member countries of WTO, started a wide range of trade liberalization programs in the early 1990s. The components of SAP such as Structural Adjustment Facility (SAF) and Enhanced Structural Adjustment Facility (ESAF) facilitated the country to undertake various policy reforms which include trade policy, industrial policy, fiscal and monetary policy, exchange rate policy etc. A substantial change has been occurred in the trade regime of Bangladesh during the last three decades. The early 1990s is marked as the break point in the structural change through a shift from inward looking policy to outward look-

ing policy with higher integration in the global economy. The liberalization programs include various measures such removal of major non-tariff barriers, reduction of tariffs at both major Harmonised System (HS) group and sub-HS group, rationalization of tariff structure, tariff escalation ctc., incentives for exports, duty drawback system, simplification of custom procedures etc.

Since 1992, Bangladesh has continued to liberalize its trade regime, by, inter alia, greatly reducing tariffs and eliminating some quantitative restrictions on imports. It has also considerably increased the transparency of its trade regime. Nonetheless, the regime is still characterized by a certain lack of transparency as regards the application of certain trade and trade-related measures such as customs administration, tariff concessions, advance income taxes on imports and exports, import surcharges, subsidies and other assistance, competition policy, and the regulatory framework. This provides considerable scope for administrative discretion, and even corruption, which in turn increases the uncertainty and costs of trading with and doing business in Bangladesh. At the same time, lack of transparency distorts market signals that are necessary to ensure an efficient allocation of resources, preventing Bangladesh from reaping the full benefits from trade liberalization and what would appear to be one of the most liberal FDI regimes in South Asia.

Foreign trade plays very important and crucial role in economic development of a country. Economic theories suggest that it reduces the dependence of foreign aid, augments the base of industrialization, increases foreign exchange earnings, creates employment opportunities, helps in transformation of the economic structure etc. Empirical evidences support that there exist positive correlation and strong causality between foreign trade and economic growth and development of many countries. Since independence Bangladesh has been facing with chronic deficit in the balance of trade. The main reasons have been identified as increasingly large dependence on import of capital goods and machineries, industrial raw materials, fuel, food grain and a wide variety of consumer items on import side and low volume of few traditional export items, low valued products, high concentration on traditional markets, and low level of product diversification on the export front.

Therefore, it is important to examine the dynamics of export, import and their long run relationship in the context Trade Liberalization in Bangladesh. The organization of this paper is as follows; Section I is the introduction, section II deals with the objectives and methodology, section IV deals with Cointegration test and Engale-Granger Causality relationship and explains the VAR relationship and section V is the conclusion of the study.

2. Review of Literature

The existing literatures, related to this study, are briefly reviewed in this section.

Reza analyses the chronic trade deficit of Bangladesh arguing that the export base and export earnings are persistently very low over a long span of time. He finds out

the performance of export sub-sector is very poor because of heavy concentration on few traditional items like raw jute, jute goods, tea, fish, leathers etc. Analyzing the trade figures from 1950 to 1978 he tries to show the problems and prospect of this sub-sector. He also focuses the employment potential and income distribution implications of export oriented strategy of development. He also suggests for export-led growth strategy instead of import substitution growth strategy as a policy option.

A. R. Bhuyan examines the prospect of non-traditional exports focusing on the imports of machinery and industrial raw materials. He shows that the demands for non-traditional items have been growing and there remains scope for modernization and expansion of this sub-sector. He does not give details about the transformation and diversification of non-traditional exports. The policy reforms for improvement of exports have not been focused in this study.

Kabir, in his study, tries to estimate the aggregate import and export demand functions of Bangladesh using time series data for a sample period from 1973 to 1983. In his study he chooses domestic price, foreign price, foreign exchange reserve, exchange rate as explanatory variables. He estimates the price elasticity and income elasticity of our exports and imports but he does not analyse the growth of export and imports. The trade policy or reforms and its impact on the export performance have been ignored in this study.

Mahmood explains the possibilities of the export led growth in Bangladesh. He argues that a country like Bangladesh can achieve high standards of living only through industrialization and expansion of trade in manufacturing. Citing examples of South Korea, Taiwan, Singapore, Hong Kong he mentions that Bangladesh should avoid import substitution industries and move to manufactured export because the demand for manufactured exports are more stable compared to traditional products. He argues that traditional exports suffer from supply inelasticity in the world market. His study does not include the trade reforms and its impact on trade performance.

Talukdar analyses the diversification of export with reference to Ready Made Garments(RMG). He points out that Bangladesh has comparative advantage in RMG because of cheap labour. He opines that export earnings could be enhanced through promotion of RMG. This study places more weights only one export items. But other developing countries have been enjoying comparative advantage in RMG. So, in order to face global challenges Bangladesh should diversify export base.

Roy analyses the determinants of export performance of Bangladesh using an econometric analysis. He examines the causal relationship of the determining factors and export performance for Bangladesh. His study finds that the export performance of Bangladesh is associated with greater commodity diversification

of exports. He shows that commodity exports have been diversified more over the years. Liberalization of trade and industrial polices has important consequences for the composition of exports as well as growth and stability. But this study does not specifically cover the relationship between impact of trade liberalization and trade performance.

Raihan (2007) analyzed the dynamics of trade liberalization in Bangladesh in the context of policies and practices by using modern tools of economic analysis. He reviewed theoretical evidences between Trade Liberalisation and economic growth, Trade Liberalisation policies and programmes in Bangladesh. He conducted a time-series evaluation of Bangladesh's Trade Liberalisation in a changing perspective and in a global prospective, a dynamic panel econometric study on Bangladesh manufacturing industries, Short-run vs. Long-run Macro impacts of Trade Liberalisation: an inter-temporal computable general equilibrium(CGE) model of Bangladesh.

Ahmed analyzes the trends and impact of trade liberalization in Bangladesh. He examines the impact of trade liberalization on import demand, export supply, industrial growth of Bangladesh using modern time series method of co-integration and error correction modeling. In analyzing Bangladesh experience with trade liberalization he addresses a number of key issues such as nature and policy instruments of trade liberalization, the degree of trade liberalization, impact of trade liberalization on import demand, export supply, industrial growth and government revenue, and external constraints faced by Bangladesh. He finds that both at aggregate and commodity level the import is generally less sensitive to import price changes whereas export both at aggregate and commodity level are sensitive to real exchange rate and relative prices. Bangladesh export supply is found as price inelastic at both levels. Using ECM he finds that trade liberalization it has significant role in improving the trade performance of Bangladesh.

Santos-Paulino and Thirlwall have used panel data and times series/cross section analysis to estimate the effect of trade liberalization on export growth, import growth, the balance of trade and the balance of payments for a sample of 22 developing countries that have adopted trade liberalization policies since the mid-1970s. They found that liberalization stimulated export growth but raised import growth by more, leading to a worsening of the balance of trade and payments.

3. Objective and Methodology

3.1 Objective

The broad objective of the study is set to empirically analyze the long run relationship between export and import of Bangladesh. The specific objectives of the study are as follows:

i. To examine the growth trend of export and import of Bangladesh;

ii. To identify the structural changes and stability of export and import of Bangladesh;

iii. To find out causal relationship between trade liberalization and export, import;

iv. To estimate the export-import model of Bangladesh.

3.2 Methodology

The study follows time series econometric techniques and tools for testing different models and hypotheses to conform the long run relationship between export and import of Bangladesh. The approach and methodology used in the present study are different to some extent from those adopted in the works cited in the literature review.

Data Sources and Methods of Data Collection:

Annual Time Series Data for the period from 1972-73 to 2008-2009 for the relevant variables is collected from the various publications of the government of Bangladesh, World Tables of World Bank, International Financial Statistics of IMF etc. The collected data from secondary sources are processed in an orderly manner so that it could be used for econometric modeling.

Trend Growth Functions and Compound Growth Rates

Compound Growth Rate CGR) is computed by taking the form of mathematical equation as $X_t = X_0(1+r)^t$, where X is the concerned variable, t represents time periods. The procedure is as follows:

1. Taking natural logarithm on both sides of the equation $X_t = X_0(1+r)^t$
2. $\ln X_t = \ln X_0 + T \ln (1+r)$, let $\beta_0 = \ln X_0$ and $\beta_1 = \ln (1+r)$ the original equation can be written as $\ln X_t = \beta_0 + \beta_1 T$
3. Adding disturbance error term the econometric specification takes the form as $\ln X_t = \beta_0 + \beta_1 T + u_t$
4. The model specified above takes the form of a linear regression model in the sense that coefficients β_0 and β_1 are in linear form. The model becomes a semilog or log-lin form. Here X_0 is the regressand and t is repressor. β_1 gives instantaneous growth rate(at a point in time).
5. Using OLS method of linear regression we get the estimate of β_1 which are the coefficients of time variable. Once β_1 are estimated then we take anti-log of β_1. Then 1 is subtracted from the anti-log of β1 and the results are multiplied by 100 to get the compound growth rate.
6. The formula for Trend Growth Rate (TGR) takes the following form:

   CGR = [Anti-log of estimated β_1 – 1] X 100.

A. The Export Trend Function:

$$\mathbf{Log\ X = \beta_0 + \beta_1 T + \varepsilon_t}$$

[Log X = Exports in logarithm, T = Year, ε_t = Error Term, β_1 = Coefficient]

B. The Import Trend Function:

$$\mathbf{Log\ M = \beta_0 + \beta_1\ T + \varepsilon_t}$$

[Log M = Imports in logarithm, T = Year, ε_t = Error Term, β_1 = Coefficient]

Compound Annual Growth Rate (CAGR)

The compound annual growth rate is calculated by taking the nth root of the total percentage growth rate, where n is the number of years in the period being considered. This can be written as follows:

$$CAGR = [V_1/ V_0]^{1/N} - 1$$

Where V_1 = Ending Value, V_0 = Beginning Value, N= Years

CAGR essentially smoothes out the progress of exports and imports over a period of time, providing a clearer picture of change.

Structural Breakpoint Test

The structural changes in trade pattern before labialization and after liberalization is tested by using 'Chow Breakpoint Test'. It is very important for long-run time series to identify parameter stability over the period of investigation. Two types of diagnostic test are generally used for structural breakpoint – Chow Test is used when the possible break point in the data series can be identified a 'priory' and CUSUM test is used when the breakpoint in the data is not known as a 'priory'. In this study the study period is broken by two sub-periods such as pre-liberalization from 19972-1973 to 1989-1090 and post-liberalization from 1990-91 to 2009-2010. Therefore Chow Test is applied to test the parameter stability. The structural change can be measured by the two intercepts or two slopes of the models in pre-liberalization and post-liberalization periods. The procedure for Chow test is as follows:

1. Estimate the model by OLS using the whole or unbroken series to generate the Residual Sum of Squares (RSS).
2. Estimate the model by OLS for sub-period n1 observations to generate RSS1 for the period before the break.
3. Estimate the model by OLS for sub-period n2 observations to generate RSS2 for the period after the break.
4. Variance of the error term of the models should be remained unchanged, when variance is not constant then Chow is applied.

5. If RSS of the entire period is equal to the sum of RSS1 and RSS2 then there s no structural break. F test is used to find out the structural change.

The Chow Test is simply the F-test which can be formulated by the following formula:

$$F = \frac{(R\,S\,S \quad (R\,S\,S + R\,S\,S)/k}{(R\,S\,S + R\,S\,S)/(n \quad + n \quad - 2k}$$

Where,

RSS = RSS of the combined regression model of n_1 and n_2 observations with $(n_1 + n_2 – k)$ degree of freedom(df)

RSS_1 = RSS of the trend regression model of n_1 observations with df = $(n_1 – k)$

RSS_2 = RSS of the trend regression model of n_2 observations with df = $(n_2 – k)$

n_1 = observations of the periods before trade liberalization

n_2 = Observations of the periods after trade liberalization

k= number of parameter to be estimated

Hypotheses

$H_0 : b_1 = a_1; b_2 = a_2$

$H_1 : H_0$ is not true.

H_0 : There is no change of trade between pre and post liberalization

H_1 : There is significant change of trade between pre and post liberalization

Decision Rule: if the value of computed F statistic is greater than the critical F value then we reject the null hypothesis of structural stability.

Instability Index

The pattern of stability of exports and imports during both pre-liberalized and post-liberalized periods as well as overall study period is measured by the Coppock's Instability Index. The instability index is measured by the following steps:

1. Taking the logarithmic of the values of exports and imports
2. Subtracting the logarithm value in year t1 from the same of year to in order to get the first difference of the logarithmic values.
3. Taking the arithmetic mean of logarithm first differences
4. Subtracting the mean of logarithm first differences from each logarithm first differences in order to obtain the logarithm differences between the actual and the average logarithmic differences.

5. The logarithmic differences are squared and summed up and divided by N-1 years to get the log variance of the concerned series.
6. Taking the square root of the log variance and obtaining antilog of the square rot value. The antilog of square root value is subtracted from 1 and multiplying by 100, the Instability Index is constructed.

Instability Index formula: II = [antilog (√Log V – 1)] x 100.

Econometric Modeling:

The study applies time series econometric techniques such as Cointegration and Engale-Granger Casuality modeling strategy. These techniques are chosen because they provide a formal framework for investigating the existence of both long-run and short-run relationship among variables, each of which may individually be non-stationary. The economic interpretation is that even though the variables contain stochastic trend meaning non-stationary they are linked to form a long run equilibrium. This framework helps identify the long-run relationship as well as the short-run dynamics between external sector variables and other macroeconomic variables for trade policy modeling. Time series properties of all concerned variables in the models used in this study have been identified by Augmented Dickey-Fuller (ADF 1981) and Philips-Perron (PP 1988) tests respectively. In unit root test if the variables are found to be on-stationary at their respective levels then we proceed to Cointegration tests developed by Engle and Granger(1987). The Co-integration test is performed by either Johansen (1988) or Johansen and Juselius (1990) multivariate Cointegration approach.

1 Unit Root Testing:

In most cases, the macroeconomic time series are found non-stationary, rather stationary with a deterministic trend. This creates a problem because the non-stationary of data breaks down the normal properties of test statistics (t, F, DW etc) and R^2 and running a regression with such data produces questionable, invalid or spurious results. So it is important to check stationary of data before proceeding with estimates (Gujrati, D. N., 1995). Hence a stationary variable is integrated of order (I(0)), a variable which must be differentiated once to become stationary is to be I(1) co-integrated of order one. In applied work co-integration possess a formal framework for activating long run equilibrium relationships. When a set of I (1) variables are co- integrated then regressing one on the others should produce residuals that are I (0).

The Augmented-Dicky Fuller test (ADF) is superior than Dickey Fuller (DF) test as it can remove the serial autocorrelation successfully. So, in this study Augmented Dickey Fuller (ADF) statistics will be used to trace out whether the time series has a unit root or not. Philips-Perron Unit root test (PP test) is another technique to identify whether there is a unit or not. To test for stationarity, both

ADF and PP test can be conducted. If there arise any contradiction, ADF results are preferred over Phillips-Perron test (Campbell and Perron 1991)

Co-integration Analysis

The concept of co-integration was developed by Engle and Granger in 1987. As we have mentioned earlier that stationarity in time series data is necessary to have a valid t statistics and F statistics. But it has been identified that two or more time series data can be cointegrated although each of which is individually non-stationary or random walk. Cointegration tells us about the presence of long run relation among two or more variables. When we go for running cointegration analysis, we assume that all variables are non-stationary. Secondly they are all integrated of the same order. Even, if the variables are not integrated in the same order, we still can continue with cointegration analysis. We call this situation 'Multicointegration' There are indeed two tools to identify whether there exists a long run relation among variables. They are:

1. Engel-Granger's Residual based test
2. Johansen-Juselius (JJ) test.

Since Engel-Granger's Test suffers from some shortcomings, Johansen-Juselius (JJ) test is preferred for cointegration analysis. While doing Johansen-Juselius Test, if there comes up a different result between trace statistic and maximum eigenvalue test, maximum eigenvalue result is preferred (Banerjee et al 1993).

Pairwise Granger Causality Tests.

Pairwise Granger causality tests are conducted to examine whether an endogenous variable can be treated as exogenous. For each equation in the VAR, the output displays (Wald) statistics for the joint significance of each of the other lagged endogenous variables in that equation. The statistic in the last row is the statistic for joint significance of all other lagged endogenous variables in the equation[16]. When we estimate a VEC, the lagged variables that are tested for exclusion are only those that are first differenced. The lagged level terms in the cointegrating equations (the error correction terms) are not tested.

The following econometric models are specified to examine the long run relationship between export and import using annual time series data.

Model 1: $Mt = \alpha + \beta Xt + ut$; log specification: $LMt = \alpha + \beta LXt + ut$

Model 2: $Xt = \alpha + \beta Mt + ut$; log specification: $LXt = \alpha + \beta LMt + ut$

where Mt represents import at time t, Xt stands for export at time t, α stands for intercept, β for slope coefficient and ut is the error term at time t. LMt represents import in log form at time t, Xt stands for export in log at time t.

4.0 Findings of the Study

4.1 Growth Trend of Exports

The compound growth rate and compound annual growth rate of exports are estimated separately for the pre-liberalized and post-liberalized regimes as well for the entire study period from 1972-1973 to 2009-2010. It is observed that the compound growth rate of exports in the pre-libealized regime i.e. 1972-1973 to 1989-1990 is 8.81 per cent while the same is 11.90 per cent in the post-liberalized period i.e. 1990-1991 to 2009-2010. The CGR for the whole study period i.e. 1972-1973 to 2009-2010 is estimated as 11.56 per cent. It indicates that the growth rates of exports are higher in the post-liberalization period. On the other hand it is observed that the compound annual growth rate of exports in the pre-libealized regime i.e. 1972-1973 to 1989-1990 is 8.54 while the same is 11.88% in the post-liberalized period i.e. 1990-1991 to 2009-2010. The CAGR for the whole study period i.e. 1972-1973 to 2009-2010 is estimated as 10.63%. It can be concluded that trade reforms or trade liberalization in Bangladesh has positive impact on exports in Bangladesh.

Table 8 Compound Growth Rates and Compound Annual Growth Rates for Exports

Period	Estimated Trend Regression	CGR[1] (%)	CAGR[2](%)
Pre-liberalised 1972-1973 to 1989-1990	LogX= 5.71 + 0.084T	8.81	8.54
Post-liberalized 1990-1991 to 2009-2010	LogX= 5.45 + 0.112T	11.90	11.88
Overall 1972-73 to 2009-2010	LogX= 5.50 + 0.109T	11.56	10.63

Note:

1. **CGR = [Anti-log of estimated b – 1] X 100, log means natural logarithm**
2. **CAGR = [Ending Value/Beginning Value]$^{1/N}$ – 1**

Source: Author's own calculation.

4.1.1 Test of Hypothesis:

Using t-test the following hypothesis is tested whether trade liberalization has positive impact on export growth in Bangladesh.

H_0 : There is no change in export growth between pre and post trade liberalization regime.

H_1 : There is significant positive change in export growth between pre and post trade liberalization regime.

The t-test is performed on the basis of trend regression of the pre-liberalization and

post-liberalization periods.

$$t_{37df} = (b1 - b_2)/\sqrt{(seb_1)^2 + (seb_2)^2}$$

Here, b1 = slope coefficient of time variable in the pre-liberalization period, b2 = slope coefficient of time variable in the post-liberalization period, se = standard error of slope coefficient. Now the putting the values in the formula t-statistic is computed as:

$$t_{37df} = (0.037 - 0.049)/\sqrt{(0.002)^2 + (0.002)^2}$$
$$= -4.26$$

Decision: The table value of t-statistic at 37 degree of freedom is 1.65 and the absolute value of calculated t-statistic is 4.26. Since the calculated value is higher than the critical t-value so the null hypothesis H0 is rejected and the alternative hypothesis H1 is accepted at 5 per cent significance level implying that the export is significantly increased in the post-liberalization regime.

4.1.2 Chow Breakpoint Test

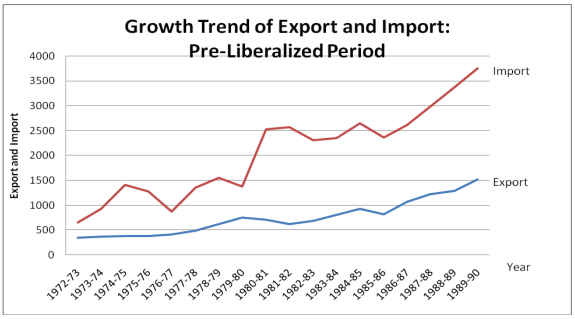
The structural change in export of Bangladesh to the liberalization of trade is tested by Chow Test using the F-test which can be formulated as :

$$F = \frac{(R\,S\,S \quad (R\,S\,S + R\,S\,S)/k}{(R\,S\,S + R\,S\,S)/(n \quad + n \quad - 2k}$$

Chow Breakpoint Test: 1989

F-statistic	14.85506	Prob. F(2,34)	0.000023
Log likelihood ratio	23.86335	Prob. Chi-Square(2)	0.000007

Chow Breakpoint test is conducted based on 1989-90 and it is found that F-statistic is greater than F critical value at 2, 34 degree of freedom and the p-value 0,0000 indicates that the null hypothesis H_0 of structural stability is rejected.



4.1.3 Instability of Exports

The instability is measured separately by using Coppock's Instability Index(CII) for pre-liberalized period and post-liberalized period. The CII is also measured for

the overall study period. The estimate results are shown in the following table and the detail procedure for calculating the index is analyzed in methodology chapter. It is evident from the value of CII that the exports of Bangladesh in pre-liberalized period is more instable as compared to post-liberalized period as expected. The CII is computed as 11.56% for the pre-liberalized period and 7.76% for the post-liberalized period. The overall CII is 10.00% for the study period.

Table 9: Instability of Exports

Period	Coppock Instability Index (%)
Pre-liberalised 1972-1973 to 1989-1990	11.56
Post-liberalized 1990-1991 to 2009-2010	7.76
Overall 1972-73 to 2009-10	10.00

Note: CII = [Anti-log √ log variance – 1] X 100.
Source: Author's own calculation.

4.2 Growth Trend of Bangladesh's Import

4.2.1 Compound Growth Rates of Imports

The compound growth rates of imports are estimated for the entire study period from 1972-1973 to 2009-2010 as well as for the two sub-periods i.e. pre-liberalized period from 1972-1973 to 1989-90 and post-liberalized period from 1990-1991 to 2009-2010. The results are shown below:

Table 10: Compound Growth Rates (CGR) for Imports

Period	Estimated Trend Equation	CGR (%)	Level of significance
Pre-liberalised 1972-1973 to 1989-1990	logM = 6.69 + 0.087T	9.08	0.000
Post-liberalized 1990-1991 to 2009-2010	logM = 6.25 + 0.099T	10.41	0.000
Overall 1972-1973 to 2009-2010	logM = 6.68 + 0.086T	8.98	0.000

Note:
1. CGR = [Anti-log of estimated b – 1] X 100
2. log means natural logarithm
3. M stands for Imports

Source: Author's own calculation.

It is observed from the above table that the compound growth rate of imports in the pre-liberalized regime i.e. 1972-1973 to 1989-1990 is estimated as 9.08 per cent while the same is 10.41 per cent in the post liberalized regime i.e. 1990-1991 to 2009-2010 and 8.98 per cent in the overall study period i.e. 1972-1973 to 2009-2010. It indicates that the growth rates of imports are fluctuating and it becomes

higher in the post liberalized regime. The overall compound growth rate of imports for the period 1972-1973 to 2009-2010 is estimated as 8.98 per cent whereas the compound growth rate of export for the same period is found as 11.56 per cent. It indicates that our export sector has performed well compared to that of import sector during the study period.

4.2.2 Structural Change in the Aggregate Imports

To measure the structural change in the aggregate imports of Bangladesh Chow test is conducted. The test result confirms that there exists no structural breakpoint in 1989 in the series of imports from Bangladesh during the study period. Since the F-statistic is 2.529 which is lower than the F-critical value and it is also confirmed by the p-value equals to 0.094 which is higher than any level of significance (α). The Chow test result is shown below in table 11.

Table: 11 Structural Breakpoint Test

Chow Breakpoint Test: 1989			
F-statistic	2.529	Prob. F(2,34)	0.094
Log likelihood ratio	5.270	Prob. Chi-Square(2)	0.071

Source: Source: Author's own calculation.

4.2.2 Instability of Imports of Bangladesh

The instability of import trade of Bangladesh is checked by using Coppock Instability Index. Details procedures of the Coppock Instability Index is mentioned in Methodology chapter.

Table 12 : Instability of Imports

Period	Coppock Instability Index (%)
Pre-liberalised 1972-1973 to 1989-1990	14.56
Post-liberalized 1990-1991 to 2009-2010	9.25
Overall 1972-73 to 2009-10	12.30

Note: CII = [Anti-log √ log variance – 1] X 100.
Source: Author's own calculation.

The higher value of the Coppock Instability Index indicates the higher degree of instability. It is observed that the CII is 14.56 percent during the pre-liberalized regime and 9.25 percent during the post-liberalized regime. So it is a clear indication that the instability in import is higher during pre-liberalised period than post-liberalized period. Even the CII of post-liberalization period is lower that that of during the overall study period (12.30 percent).

4.2.3 Test of Stationarity of the Variables of Export-Import Model

The coingration method implies that if two or more series are linked to form equilibrium relationship over long run even though they are nonstationary and the first difference of the series is stationary. The first step is to test the order of integration of the variables. To check the Stationarity of the variables, expect the liberalization dummy, standard Augmented Dickey-Fuller (ADF) and Phillips-Perron(PP) tests have been conducted both at levels and at the first difference of each variable.

The test results are summarized below:

Table 13: Augmented Dickey-Fuller Unit Root Test

Null Hypothesis: H0 ; The concerned variable has a unit root

Variables	Level / First Difference	Intercept	Intercept and Trend	Conclusion
LM	Level	-0.81 (0.803)	-4.06 (0.015)	I(1) and I(0) Inconclusive
	First Difference	-6.87 (0.000)	-6.76 (0.000)	I(0) Stationary
LX	Level	-0.49 (0.984)	-0.25 (0.292)	I(1) Nonstationary
	First Difference	-5.60 (0.000)	-5.59 (0.000)	I(0) Stationary

Note:

a) ADF test Critical Values for model with intercept: -3.62 for 1% level of significance, -2.94 for 5% level of significance and -2.61 for 10% level of significance.

b) ADF test Critical Values for model with intercept and trend: -4.23 for 1% level of significance, -3.54 for 5% level of significance and -3.20 for 10% level of significance.

c) Unit Root Tests are performed by E-Views 5.0.

It is observed from the above ADF test that most of the variables are non-stationary at the level for model with intercept and intercept and trend. But it is interesting to note that all the variables are I(0) i.e. stationary at the first difference for model with intercept and intercept and trend. The similar test result is found in case of Phillips-Perron test.

Table 14: Phillips-Perron Unit Root Test

Null Hypothesis: H0 ; The concerned variable has a unit root

Variables	Level / First Difference	Intercept	Intercept and Trend	Conclusion
LM	Level	-0.81 (0.803)	-4.06 (0.015)	I(1) and I(0) Inconclusive
	First Difference	-6.87 (0.000)	-6.76 (0.000)	I(0) Stationary
LX	Level	-0.49 (0.984)	-0.25 (0.292)	I(1) Nonstationary
	First Difference	-5.60 (0.000)	-5.59 (0.000)	I(0) Stationary

Note:

a) PP test Critical Values for model with intercept: -3.62 for 1% level of significance, -2.94 for 5% level of significance and -2.61 for 10% level of significance.

b) P test Critical Values for model with intercept and trend: -4.23 for 1% level of significance, -3.54 for 5% level of significance and -3.20 for 10% level of significance.

c) Unit Root Tests are performed by E-Views 5.0.

It is observed from the above PP unit root test that most of the variables are non-stationary at the level for model with intercept and intercept and trend. But it is interesting to note that all the variables are I(0) i.e. stationary at the first difference for model with intercept and intercept and trend.

4.2.4 Co-integration Test

Co-integration test is conducted to examine whether there are any long run relationship among the variables of the model. Johansen and Juselius co-integration test is applied here. Two tests i.e. the trace test and the maximal eigenvalue test are used to determine the number of cointegrating vectors. Te cointegration test results are shown in the following table:

Table 15: Johansen Co-integration Test Based on Eigenvalue Test

Trend assumption: Linear deterministic trend

Hypothesis		Max-Eigen Statistics	0.05% Critical Value	p-value**
Null	Alternative			
r* = 0	r = 1	15.57	14.07	18.63
r ≤ 1	r = 2	0.139	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
*(**) denotes rejection of the hypothesis at the 5%(1%) level
**MacKinnon-Haug-Michelis (1999) p-values

Table 16: Johansen Co-integration Test Based on Trace Test

Trend assumption: Linear deterministic trend

Hypothesis		Trace Statistics	0.05% Critical Value	p-value**
Null	Alternative			
r* = 0	r = 1	15.71	15.41	20.04
r ≤ 1	r = 2	0.139	3.76	6.65

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* *(**) denotes rejection of the hypothesis at the 5%(1%) level
**MacKinnon-Haug-Michelis (1999) p-values

Johansen and Juselius co-integration test shows that at laet one cointegrating vector in both the trace test and the maximal eigenvalue test.

Table 15: Normalized Cointegrating Coefficients

LM	LX
1.000	-0.76 (0.029)

4.2.5 Pair wise Granger Causality Test

Table 16: Pair wise Granger Casuality Test based on Model-1

Null Hypothesis: H_0	F-Statistic	Probability	Conclusion
LOG(EXPORT) does not Granger Cause LOG(IMPORT)	9.62*	0.000	H_0 is rejected meaning Export granger cause to import
LOG(IMPORT) does not Granger Cause LOG(EXPORT)	1.49	0.241	H_0 is not rejected meaning import has no granger cause to export

**Significant at 1% level*

Table17 : Pair wise Granger Casuality Test based on Model-2

Null Hypothesis: H_0	F-Statistic	Probability	Conclusion
LOG(IMPORT) does not Granger Cause LOG(EXPORT)	1.48996	0.24108	H_0 is not rejected meaning import has no granger cause to export
LOG(EXPORT) does not Granger Cause LOG(IMPORT)	10.1616	0.00040	H_0 is rejected meaning export has granger cause to import

*Significant at 1% level

4.2.6 Estimation of Export-Import Models

5.2.6.1 Estimation of Export-Import Model-1

Dependent Variable: LOG(EXPORT)

Estimated Equation: LX= -2.79 + 1.22 LM

Table 10: Results of OLS Estimation of Model-1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.794974	0.333735	-8.374829	0.0000
LOG(IMPORT)	1.250727	0.039737	31.47498	0.0000
Test Statistics				
S.E. of regression	0.232505	Akaike info criterion		-0.028612
Sum squared resid	1.946112	Schwarz criterion		0.057576
R-squared	0.964935	F-statistic		990.6743
Adjusted R-squared	0.963961	Prob(F-statistic)		0.000000
Log likelihood	2.543637	Durbin-Watson stat		0.997258

4.2.6.1 Estimation of Export-Import Model-2

Dependent Variable: LOG(IMPORT)

Estimated Equation: LM= 2.42 + 0.77 LX

Table 9: Results of OLS Estimation of Model-2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.42	0.191	12.64	0.000
LOG(EXPORT)	0.77	0.025	31.36	0.000
Test Statistics				
S.E. of regression	0.184	Akaike info criterion		-0.494
Sum squared resid	1.222	Schwarz criterion		-0.407
R-squared	0.964	F-statistic		983.66
Adjusted R-squared	0.963	Prob(F-statistic)		0.000
Log likelihood	11.379	Durbin-Watson stat		1.005

5. Policy Recommendations and Conclusion:

We can conclude that trade reforms or trade liberalization in Bangladesh has positive impact on exports in Bangladesh. The compound growth rate of exports in the pre-libealized regime i.e. 1972-1973 to 1989-1990 is 8.81 per cent while the same is 11.90 per cent in the post-liberalized period i.e. 1990-1991 to 2009-2010. The CGR for the whole study period i.e. 1972-1973 to 2009-2010 is estimated as 11.56 per cent. It indicates that the growth rates of exports are higher in the post-liberalization period.

It is observed that the compound growth rate of imports in the pre-liberalized regime i.e. 1972-1973 to 1989-1990 is estimated as 9.08 per cent while the same is 10.41 per cent in the post liberalized regime i.e. 1990-1991 to 2009-2010 and 8.98 per cent in the overall study period i.e. 1972-1973 to 2009-2010. It indicates that the growth rates of imports are fluctuating and it becomes higher in the post liberalized regime. The overall compound growth rate of imports for the period 1972-1973 to 2009-2010 is estimated as 8.98 per cent whereas the compound growth rate of export for the same period is found as 11.56 per cent. It indicates that our export sector has performed well compared to that of import sector during the study period.

There is a clear indication that the instability in import is higher during pre-liberalised period than post-liberalized period. Even the CII of post-liberalization period is lower than that of during the overall study period (12.30 percent). It is observed from unit root test that most of the variables are non-stationary at the level for model with intercept and intercept and trend. But it is interesting to note that all the variables are I(0) i.e. stationary at the first difference for model with intercept and intercept and trend. The null hypothesis H0 is rejected meaning export has granger cause to import. Therefore, the policy makers should pay more attention to the promotion of export in formulating an appropriate foreign trade policy of Bangladesh.

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