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Does Democracy Lead to More Growth in Exports? A Case Study on Bangladesh

Md. Deen Islam[1] and Afsara Tasnim[2]

[1]*Department of Economics, University of Dhaka. E-mail:* mdeenislam@du.ac.bd
[2]*Department of Economics, University of Dhaka*

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Abstract: This paper examines the impact of the transition to democracy on the structural change in exports in Bangladesh. The study finds that the introduction of democracy has led to a significant increase in growth in exports compared to the previous non-democratic period. Using an econometric model involving a dummy variable, we analyze the relationships between export earnings and various demand determinants, including US GDP, World GDP, and exchange rates. The results indicate that the export function is significantly different between pre and post-democratic transition periods, providing evidence that democracy has had a positive impact on the growth of exports in Bangladesh. Overall, the study highlights the importance of democratic governance in fostering economic growth and development.

Keywords: Exports, Structural Change, Democracy, Growth

1. Introduction

Bangladesh, a country with a rich history and diverse culture, has undergone significant political, social, and economic changes since its independence from Pakistan in 1971. Among the most significant of these changes was the transition to democracy in 1990, which replaced decades of military rule with a parliamentary system of governance. The democratic transition was a pivotal moment in Bangladesh's history, and its impact on the country's economic development has been widely debated. Bangladesh continued its policy of industrialization through import substitution and maintained a fixed exchange rate system up until 1990. With the advent of democratic transition after 1990, the country adopted an export-led growth plan associated with a trade liberalization policy and a managed flexible exchange rate system. The goal of this policy is to increase export competitiveness and lessen the anti-export bias present in trade restrictions. Export is a major component of national income accounting and is expected to bring growth in the total output or GDP of a

country. In developing countries like Bangladesh, export-led growth contributes to raising income per capita and reducing poverty incidence.

Democratic transitions have long been linked to economic growth, development, and increased trade activity. The literature on the relationship between democratic transitions and economic outcomes has grown significantly over the past few decades, and the question of how political changes can impact economic performance remains a pressing issue for policymakers, scholars, and practitioners alike. Democracy promotes growth by boosting investment, encouraging economic reforms, improving the quality of education and healthcare, and lowering social discontent. Also, democracy brings political and economic stability, which creates a better image for the country to the rest of the world. Foreigners will show their interest in trade and investment in the country. Thus, exports to the rest of the world will rise. In this paper, we focus on the case of Bangladesh, a country that underwent a democratic transition in 1990 and has experienced significant changes in its economic landscape.

The transition to democracy in Bangladesh in 1990, after years of authoritarian rule under military regimes, marked a significant turning point for the country, as it allowed for more open and inclusive political processes and led to the emergence of a more vibrant civil society. The democratic transition was accompanied by a series of economic reforms aimed at liberalizing trade and opening up the economy to foreign investment. These reforms aimed to increase export competitiveness and expand Bangladesh's export base. Since the democratic transition, Bangladesh has experienced impressive economic growth, with an average annual GDP growth rate of over 6% in the last two decades. The country has also made significant strides in poverty reduction, with the poverty rate declining from over 40% in 1990 to around 20% in 2018. In recent years, Bangladesh has emerged as a major player in the global textile and apparel industry.

However, the relationship between the democratic transition and Bangladesh's export performance remains understudied. The existing literature has focused primarily on the impact of trade liberalization and sector-specific policies on export performance, with little attention paid to the role of political changes. This paper aims to fill this gap by exploring the relationship between the democratic transition of 1990 and Bangladesh's export performance. The primary research question that guides this study is: To what extent did the democratic transition of 1990 impact Bangladesh's export performance? We approach this question by examining the changes in Bangladesh's trade policy and trade outcomes before and after the democratic transition. We also consider

the broader institutional changes that accompanied the transition, including changes in political stability, civil society participation, and the regulatory environment.

To address the research question of whether the democratic transition in Bangladesh in 1990 had an impact on its export performance, a rigorous analytical approach was taken. The study employed a combination of structural break analysis and co-integration techniques to investigate the changes in export earnings following the political shift. The first step in the analysis involved showing data stationarity to ensure the reliability of the results. Next, A dummy variable regression analysis was performed to estimate the impact of the democratic transition on export earnings. The results of the regression showed that export earnings had grown at a significantly higher rate after the democratic transition.

To validate these findings, the study then proceeded to estimate a co-integration regression model of Bangladesh's export earnings, the USA's income, the rest of the world's income, and the exchange rate. By including these demand-side factors in the analysis, the study sought to rule out their potential influence on the observed changes in export earnings. The results of the co-integration regression showed that the changes in Bangladesh's export earnings after the democratic transition were not significantly correlated with demand-side factors. This finding supported the conclusion that the higher export earnings after the 1990 transition could largely be attributed to the democratic transition and the ensuing policy changes.

Thus, this study provides a robust analysis of the impact of the democratic transition in Bangladesh on its export performance. By providing evidence that the democratic transition and policy changes were the driving force behind the increased export earnings, this study contributes to a better understanding of the relationship between political stability and economic growth. The findings of this study will contribute to the literature on the relationship between democratic transitions and economic outcomes, as well as provide valuable insights for policymakers in Bangladesh and other developing countries. The study will also contribute to the literature on the political economy of trade, which has gained increasing attention in recent years as scholars seek to understand the complex interactions between political and economic factors in shaping trade policy and outcomes.

The rest of the paper is organized as follows: Section 2 provides a review of related literature. Data description and methodology of the analysis are presented in section 3. Sections 4 and 5 present the findings of the study and conclusion, respectively.

2. Literature Review

There is a massive literature on the effect of trade liberalization and democratic transition on economic growth and export performance. In this section, we only discuss the studies that investigate this relationship for Bangladesh. Hence, the objective of this literature review is to analyze various empirical studies that examine the relationship between trade liberalization and democratization in Bangladesh and their impact on the country's economic growth and export performance.

2.1. Trade Liberalization and Economic Growth

(Hossain and Alauddin 2005) examined how trade liberalization affected the growth and structure of export, import, GDP, and other macroeconomic indicators, with an emphasis on exports. Using the ARDL model and cointegration, the study found that trade liberalization had a positive impact on total exports. The results showed that both anti-action bias reduction and imports had a positive relationship with total exports. (Majumder and Rana 2016) conducted an empirical case of the effect of trade liberalization on the economic growth of Bangladesh between the period of 1990 to 2010. Their results revealed that the government's policy of trade and exchange rate liberalization had a positive relationship with economic growth, with a 1 unit change in the exchange rate associated with a 34.86% change in exports. (Manni and Afzal 2012) also showed that greater openness increases exports, which leads to a favorable impact on economic growth and development. The estimated regression results of their study revealed a significant positive relationship between openness and growth, with a rising pattern of exports observed during the period of trade liberalization.

2.2. Democratization and Economic Growth

(Dasgupta, Bhattacharya and Neethi 2013) investigated the effect of democratic transition in Bangladesh by utilizing a cointegrated vector autoregressive modeling. Their findings implied that the democratic system did not seem to have a significant positive effect on economic growth in Bangladesh, as the coefficient for democratic quality was found to be statistically insignificant. (Thacker 2007) examined the connection between democracy and economic openness by evaluating the theories that longer periods of democratic rule encourage more openness in trade and foreign direct investment. The study revealed that greater levels of integration with the global economy were related to both a nation's current degree of democracy and its democratic past. If everything else is equal, nations with more democratic systems typically have more open economies.

2.3. Export Performance after Trade Liberalization

(Mohiuddin and Hasan 2005) analyzed the qualitative performance of exports after trade liberalization in the early 1990s. The study found a significant increase in the average growth of exports of 14.5% in 1990 compared to 7.4% in 1980. However, the analysis of structural change revealed that export items were highly concentrated towards a single item (e.g., RMG). (Moniruzzaman and Rana 2010) discussed the implications of trade liberalization on the export of agricultural products in Bangladesh. The study found that the country had a comparative advantage in agricultural products and that trade liberalization had a significant impact on the export performance of agricultural products, particularly vegetables and fruits. (Manni and Afzal 2012) showed achievements of the various economic indicators including exports after the trade liberalization. They applied the OLS technique and analyzed empirical findings based on this. They outlined that greater openness increases exports which leads to a favorable impact on economic growth and development. The estimated regression results showed a significant positive relationship between openness and growth. A rising pattern of export is seen with the period of trade liberalization.

(Dawson 2006) uses the cointegration model to assess the impact of trade liberalization on the export income relationship. Annual data for the period 1973-2003 is used for analysis. He finds that trade liberalization increased export growth, but it has no effect on the structure of the long-run export income relationship. The break in 1990 turned out to be insignificant here. (Hoque and Yosop 2012) examined an empirical investigation of trade liberalization on the export performance of Bangladesh. ARDL bound test is applied with annual time series data from the period 1972-1973 to 2004-2005. According to test results, trade liberalization has a statistically significant but little impact on total export. This analysis shows that exports are primarily influenced by GDP expansion. (Ahmed 2000) examined a cointegration analysis of export response to real exchange rate-based trade liberalization during the period 1974-1995. Empirical results are obtained from the cointegration price and export-weighted real effective exchange rate. The econometric estimation of the aggregate export supply function reveals a high negative export earning to export weighted REER implying an increase in export competitiveness.

These empirical studies indicate that the adoption of trade liberalization policies has had a positive impact on Bangladesh's economic growth and export performance. However, the impact of democratization on economic growth is less clear, with some studies finding that democratic systems have no significant impact on economic growth. Nevertheless, nations with more democratic systems

typically have more open economies, indicating that democratization may be essential for the growth of trade and foreign direct investment. Further research is needed to examine the long-term effects of trade liberalization and democratization on the economy of Bangladesh. We contribute to bridging this gap the in literature by investigating the effect of Bangladesh's democratic transition on its export performance.

3. Data and Methodology

3.1. Data Source

As the objective of this study is to examine whether there exists any structural change in export earnings following the democratic transition, we included foreign incomes of trading partners (US GDP), the official exchange rate of Bangladesh (taka/dollar), and world GDP, along with the export earnings of Bangladesh. In our cointegration regression, Export is the dependent variable and US GDP, exchange rate, and world GDP are independent variables. These are annual time series data for the period ranging from 1972-2021 and all the data except the exchange rate are measured in constant 2015 USD. All the data are collected from the World Development Indicators (WDI) published by the World Bank (WB).

3.2. Description of Data

The data retrieved from the above-mentioned secondary source has been methodically arranged for ease of use in our econometric modeling. In total, we have gathered 50 observations for all variables, including exports of goods and services in Bangladesh, the gross domestic product of the United States, the official exchange rate of Bangladesh, and the gross domestic product of the world. With the exception of exchange rates, all the data has been measured in constant 2015 USD. The actual data for exports, US GDP, and world GDP have been converted into million USD to avoid measuring larger units. The dataset is complete with no missing values. To display structural changes in the data, we

Table 1: Description of the Relevant Variables

Variable	*Description*
Exports	Exports of goods and services (Constant 2015 USD)
US GDP	Gross Domestic Product of the United States (Constant 2015 USD)
Exchange Rate	Official Exchange Rate (LCU per USD, period average)
World GDP	Gross Domestic Products of the World (Constant 2015 USD)

Source: World Development Indicators (World Bank)

have divided our sample into two periods and implemented a categorical variable (dummy variable), which is defined in the following section. The table below provides a description of the variables used in the model.

Multiple factors influence a country's exports, such as currency exchange rates, global demand, inflation, trade agreements, domestic and foreign income, the relative price of exports, as well as political and economic factors. Our model considers exports as the dependent variable, while exchange rates (taka/dollar), world GDP, and US GDP are independent variables. The United States holds significant bilateral economic relations with Bangladesh and is the country's most important trade partner. Export demand is directly impacted by the foreign income of trading partners, and as one of Bangladesh's largest export destinations, an increase in US GDP could lead to a rise in Bangladesh's exports to the US. Therefore, the US GDP is included as an independent variable in our model. Additionally, world GDP is controlled to reflect the changes in export destinations in the rest of the world. Trade theory dictates that the exchange rate is a crucial determinant of international trade, So, we also include the USD-BDT exchange rates (BDT per USD) in our regression.

3.3. Descriptive Statistics

Descriptive statistics of all variables are provided in table A1 in the appendix. It shows various measures of central tendency. They provide fundamental details about variables in a dataset. The average value of exports, US GDP, exchange rate, and world GDP is 11614.675, 12304181, 46.949, and 47061646, respectively and all except the exchange rate are in million USD. These data series are plotted in figure 1 with the best linear fit. From figure 1, we can compare the situation before and after the period 1990. We observe different slope and intercept for the pre-democratic period (before 1990) and the post-democratic period (after 1990) implying the presence of structural change which led to more growth in exports.

3.4. Methodology

Since the data is time series in nature, we first check the stationarity for each variable. The details of stationarity checks are provided in the appendix. Generally, Chow test is used to test the structural stability of the regression, which gives results on the basis of the F-test. The traditional chow test can identify whether there is any structural break in certain point in time by showing the difference in the regression model between the two time periods. But it doesn't tell the source of the differences, i.e., whether the difference is due to change in

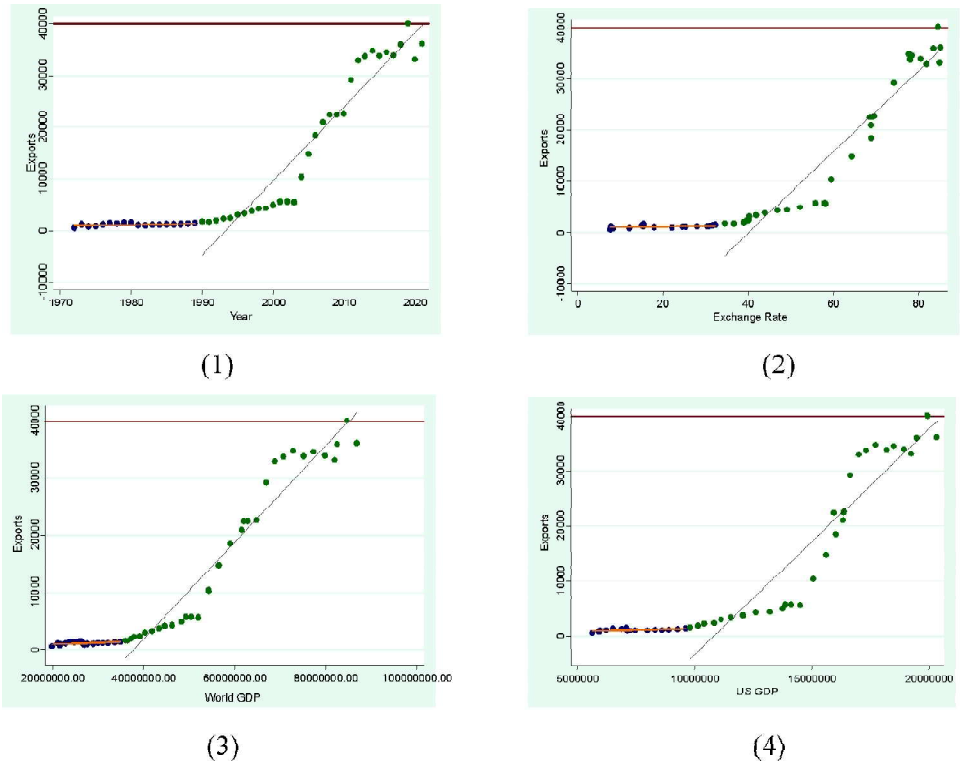

Figure 1: Data Visualization through Graphical Representation

other omitted factors (the intercept of the regression) or it is because of the change in the nature of a data series (slope of the regression). Dummy variable regression is an alternative approach to test for structural break. Besides examining the structural change, it also finds out what causes the differences in the model. This approach is appropriate for testing our hypothesis and we do not need to estimate multiple regressions as the chow test does.

A dummy variable indicates the presence or absence of a quality or an attribute. Here, 1 may indicate the presence of that attribute, and 0 indicating the absence of it (Gujarati and Porter 2008). Dummy variables are also known as qualitative or categorical variables. We can easily incorporate qualitative data into our model using dummy variables. Since we are interested to show the structural change of exports of Bangladesh due to the democratic transition after 1990, we can easily subgroups of the sample by using a dummy variable. Hence, we split our sample data (1972-2021) into two time periods: 1972 to 1989 (the period before the democratic transition) and 1990 to 2021 (the period after the democratic transition). The econometric model that we are going to estimate is,

$$E_t = \alpha_0 + \alpha_1 D + \alpha_2 t + \alpha_3 (D \times t) + u_t \quad (1)$$

where t is the index for the year, E denotes exports, D is a dummy variable taking a value 0 if year < 1990 and 1 if year ≥ 1990. Here parameter α_1 is the differential intercept coefficient, showing the level effect of democratic transition on export earnings, and α_3 is the differential slope coefficient indicating how much the slope coefficient of the second period's export function differs from the first period. If α_1 and α_3 are found to be statistically significant then we reject the null hypothesis of parameter stability. We can prove this by observing the following two model,

$$(1972\text{-}1989): E(E_t | D = 0, t) = \alpha_0 + \alpha_2 t$$

$$(1990\text{-}2021): E(E_t | D = 1, t) = \alpha_0 + \alpha_1 + (\alpha_2 + \alpha_3)_t$$

We see different intercept and slope coefficients for the two time periods, which allows us to reject the null hypothesis of no structural change. Since exports from Bangladesh could also be affected by the demand factors, such as the income of major trading partners of Bangladesh, we estimate the following cointegration regression to rule out the possibility that structural changes in Bangladesh's exports is due to the changes in demand conditions.

$$E_t = \beta_0 + \beta_1 D + \beta_2 x_t + \Sigma\gamma_i x_{it} + \Sigma\delta_i (D \times x_{it}) + e_t \quad (2)$$

where $x_i \in \{USGDP, \frac{BDT}{USD} exchange\ rate, and\ world\ GDP\}$

The coefficient attached to the dummy variable is the differential intercept coefficient used to describe the difference between the mean exports of democratic and non-democratic periods. And the coefficient attached to the interactive dummy (D multiplied by a variable) is the differential slope coefficient or slope drifter. If one of the differential slope or intercept coefficients is found to be statistically significant then we can say that the above-mentioned relationships have undergone a structural change in Bangladesh during the period of democratic transition and vice-versa.

4. Findings

The results of regression equation (1) are shown in table 2. Column (1) in table 2 shows the results of a simple regression with only dummy variable. The coefficient of D in column (1) shows the average value of exports in the pre-democratic period which is about $1128.705 million. Compared with this, the average exports for the post-democratic period are higher by about $16384.328 million, for an actual average export of $17513.035 million (1128.705+16384.328).

The differential intercept coefficient is statistically significant at 1% level. So, we can conclude that every year exports, on average, are increasing by about $16384.328 million compared to the pre-democratic period. The mean exports in these two periods are not the same suggesting the presence of structural change.

Table 2: Structural Change in Exports Due to Democratic Transition

Variable	*Dependent Variable: Exports*	
D	*(1)*	*(2)*
	16384.328***	-2823652***
	(3321.417)	(317611.6)
t		18.796
		(147.499)
D×t		1415.889***
		(160.06)
Constant	1128.705	36096.77
	(2657.133)	(292123.2)
Adj. R^2	0.3226	0.9438
F test	24.33	275.37
Observations	50	50

Note: Standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1
Source: World Development Indicators (World Bank).

Column (2) shows the results of the full specification in equation (1). The coefficient of D is the difference in intercept and the coefficient of D×t is the difference in slope coefficient in the export functions in the pre-and post-democratic period. Here both coefficients are highly statistically significant indicating the structural change in the export earnings of Bangladesh in the pre-and post-democratic period. On average, every year exports are increasing by about $1415.889 million compared to the pre-democratic period**.** Therefore, it is evident that structural instability is present in the parameters of different periods. The structural change occurred due to the differences in the intercept term and the slope coefficient. The results of the regression model (2) are provided in table 3.

Since the democratic transition took place after 1990, we considered 1990 as the breakpoint. The relationship between variables does not remain constant across the entire period because of this break. When we introduce each of the three demand factors separately (column 1, 2, 3), both the differential slope and intercept coefficients are statistically significant, which strongly suggests that the relationship between exports-US GDP, exports-ex.rate, and exports-world GDP have undergone a structural change over the periods. On average, exports

Table 3: Structural Change in Exports

Variable	*Dependent Variable: Exports*			
	(1)	*(2)*	*(3)*	*(4)*
D	-44616.4***	-32902.9***	-32389.25 ***	-10323.06
	(6709.585)	(3001.938)	(4454.337)	(6979.163)
US GDP	0.0000867			-0.0003005
	(0.0007797)			(0.0038715)
Ex.Rate		9.631511		-43.5923
		(92.94791)		(195.9119)
World GDP			0.0000246	0.0001881
			(0.0001498)	(0.001147)
D×US GDP	0.003994 ***			-0.0060349
	(0.0008101)			(0.0039473)
D×Ex.Rate		785.4887***		800.4238***
		(99.25685)		(226.5199)
D×World GDP			0.00082***	0.001132
			(0.0001529)	(0.0011535)
Constant	493.357	938.1146	472.69	-827.038
	(5787.976)	(1995.047)	(4048.302)	(6377.334)
F-test	180.80	269.67	389.44	422.28
Adj.R^2	0.9167	0.9427	0.9596	0.9837
		Total Obs.=50		

Source: World Development Indicators (World Bank)
Note: Standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

in Bangladesh is rising in each of the three cases after 1990. Democracy is leading to higher growth in exports. However, when we included all the variables jointly (column 4) and found that only one of the differential slope coefficients attached to the interactive dummy (D multiplied Ex.rate) is significant which is enough to reject the null hypothesis of parameter stability (no structural change). But the other two differential slope coefficients attached to the interactive dummies involving US GDP and world GDP are insignificant. US GDP and world GDP are highly correlated (0.99) which gives us spurious regression. The magnitude of the interactive dummy involving US GDP is negative (column 4). US GDP and world GDP do not affect exports of Bangladesh due to the transition event. Thus, we can conclude that the structural change in the export earnings of Bangladesh after the democratic transition is not due to changes in the demand-side conditions, but rather because of supply-side forces. From the results, we can draw our conclusion that the democratic transition led to more growth in exports for Bangladesh. We performed a number of diagnostic checks for our regression results, which are reported in the appendix.

Autocorrelation

The Durbin-Watson d test is found to be 0.3449683, which implies a positive serial correlation in the residuals. The closer the value of d is to zero, the stronger the proof of positive serial correlations. After the first differencing of the regression model d test is found to be 2 which removes our problems of autocorrelations.

5. Conclusion

The study presented discusses the relationship between democracy and export performance in Bangladesh. We found that democracy tends to induce more growth in exports, as it leads to easier access to the international market and greater foreign direct investment (FDI). We attribute this to the greater openness that is promoted by democracy, as well as the popular support for democratization that has developed along with calls for broader market economies and a growing middle class. We showed that exports on average grow more due to the democratic transition through regression results. We compared the value of exports between the pre-democratic and post-democratic periods and found that there were differences in both the intercept terms and the slope coefficients. From our analysis of Bangladesh's export earnings, we can say that the more democratize the country becomes, the better will be the country's export conditions.

Declarations of interest: none

References

Ahmed, Nasiruddin. 2000. "Export response to trade liberalization in Bangladesh: a cointegration analysis." *Applied Economics* 32 (8): 1077-1084. https://doi.org/10.1080/000368400322138.

Dasgupta, Shouro, Debapriya Bhattacharya , and Dwitiya Jawher Neethi. 2013. "Does Democracy Impact Economic Growth? Exploring the Case of Bangladesh – A Cointegrated VAR Approach." https://econpapers.repec.org/RePEc:pra:mprapa:56621.

Dawson, Philip J. 2006. "The export–income relationship and trade liberalisation in Bangladesh." *Journal of Policy Modeling* 28 (8): 889-896. https://doi.org/10.1016/j.jpolmod.2006.04.005.

Gujarati, D N, and D C Porter. 2008. *Basic Econometrics.* 5th. McGraw-Hill Education Education.

Hoque, Mohammad Monjurul, and Zulkornain Yosop. 2012. "Impacts of Trade Liberalization on Export Performance in Bangladesh: An Empirical Investigation." *South Asia Economic Journal* 13 (2): 207-239. https://doi.org/10.1177/1391561412457235.

Hossain, Mohammad A, and Mohammad Alauddin. 2005. "Trade liberalization in Bangladesh: the process and its impact on macro variables particularly export expansion." *The Journal of Developing Areas* 39 (1): 127-150. https://www.jstor.org/stable/4192993.

Majumder, Shapan Chandra, and Md Masud Rana. 2016. "Trade liberalization and its effects on the economic growth of Bangladesh: an empirical analysis." *American Journal of Trade and Policy* 3 (1): 7-16. doi:http://dx.doi.org/10.18034/ajtp.v3i2.402.

Manni, Umme Humayara, and Munshi Naser Ibne Afzal. 2012. "Effect of Trade Liberalization on Economic Growth of Developing Countries: A Case of Bangladesh Economy." *Journal of Business Economics and Finance* 1 (2): 37-44. https://dergipark.org.tr/en/pub/jbef/issue/32420/360521.

Mohiuddin, K.M.G, and M.D. Hasan. 2005. "Trade Liberalization and Export performance of Bangladesh." *The Cost and Management* XXXIII: 44-46. https://www.researchgate.net/publication/303696623.

Moniruzzaman, Md., and SM Sohel Rana. 2010. "Long Run Relationship between Export and Import of Bangladesh: Growth Trend, Cointegration and Causality Analysis." *The Journal of Development Studies* 39 (1): 140-164. https://www.researchgate.net/publication/282847568.

Thacker, Strom C. 2007. "Does Democracy Promote Economic Openness?" Department of International Relations, Boston University.

Appendix

Table A1: Descriptive Statistics of Relevant Variables

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Exports	50	11614.675	13696.901	599.698	40121.542
USGDP	50	12304181	4619803.1	5639408.1	20529460
Exchange rate	50	46.949	25.095	7.7	85.084
World GDP	50	47061646	20244306	19926486	86852662

Source: World Development Indicators (World Bank)

Table A2: OLS Regression Result of Model 3

	Model 3 Dependent Variable: Exports
US GDP	-0.0082243*** (0.000448)
Exchange Rate	406.4115 *** (66.25451)
World GDP	0.0019933*** (0.0001375)
Adj.R square	0.9741
F-test	628.45
Observations	50

Note: Standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

Source: World Development Indicators (World Bank)

Stationarity Tests

As we have taken time series data of 50 observations, this is a stochastic process. Our data follow a random walk which means they are non-stationary. The value of time series is a particular realization of time or an event. If those events change then we will get different values. Values of time series must be random and independent of time otherwise variables will be nonstationary. We will face autocorrelation problem (violation of CLRM) and cannot apply OLS if all the series are non-stationary.

Unit Root Test

Suppose we run a regression of last year's export on the current year's export,

$$Y_t = \rho Y_{t-1} + U_t \qquad -1 \leq \rho \leq +1$$

U_t is the error term. If the value of the coefficient of Y_{t-1} is less than 1 then the value of the above series will converge towards the mean over time. If $\rho = 1$ then the above equation has a unit root, which is a non-stationary stochastic process.

We manipulate the above equation by subtracting Y_{t-1} from both sides,

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + U_t$$
$$= (\rho - 1)\, Y_{t-1} + U_t$$
$$\text{So, } \Delta Y_t = \delta Y_{t-1} + U_t$$

Here $\delta = \rho - 1$ and, Δ is the first difference operator.

Hypothesis test : (Dickey-Fuller test)

$$H_0: \delta = 0$$
$$H_1: \delta < 0$$

For stationary δ must be less than zero meaning that $\rho - 1 < 0$, hence $\rho < 1$. If $\delta = 0$ then $\rho = 1$, we will have a unit root which implies that our time series is non-stationary.

First Difference Stationary

If variables are non-stationary at level then taking their first difference will eliminate the nonstationary terms from the variable. If variables become stationary at first difference it is called integrated of order one [I(1)]. The Dickey-Fuller test is one-sided and it is assumed that U_t are correlated. But there might be cases where U_t are uncorrelated. We will conduct the Augmented Dickey-Fuller (ADF) test instead of the *DF* test. A random walk process may or may not have drift or it may have both deterministic and stochastic trends. To allow for the various possibilities, *DF* test is estimated in different ways, under three different null hypotheses,

$\Delta Y_t = \delta Y_{t-1} + U_t$ (Y_t is a random walk)

$\Delta Y_t = \beta_1 + \delta Y Y_{t-1} + U_t$ (Y_t is a random walk with drift)

$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + U_t$ (Y_t is a random walk with drift around a deterministic trend)

ADF test augments the above three equations by adding the lagged values of the dependent variable ΔY_t. Suppose we consider the third equation and the ADF test estimates the following equation,

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t$$

ε_t is a pure white noise error. The idea of including enough lag terms is to show that the error term in the above equation is serially uncorrelated and we obtain an unbiased estimate of δ. We will perform the ADF test of stationarity using EViews-12 software. We test the same null hypothesis under the ADF test as the DF test. If the test statistic is less than the ADF critical values we reject the null hypothesis of non-stationary of the series (Gujarati and Porter 2008).

Result of Stationary Checking

The following table shows the Augmented Dickey-Fuller unit root test results of the stationarity of the variables.

Table A3: Augmented Dickey-Fuller Unit Root Test for Stationarity

Variables	*Level/1st Difference*	*ADF Statistics*	*Critical Values*			*Remarks*
			1% Level	*5% Level*	*10% Level*	
Exports	Level	0.847 (0.9924)	-3.587	-2.933	-2.601	I(1)
	1st Difference	-6.259*** (0.000)	-3.594	-2.936	-2.602	
US GDP	Level	1.231 (0.9962)	-3.587	-2.933	-2.601	I(1)
	1st Difference	-6.338*** (0.000)	-3.594	-2.936	-2.602	
World GDP	Level	2.985 (1.0000)	-3.587	-2.933	-2.601	I(1)
	1st Difference	-6.475*** (0.0000)	-3.594	-2.936	-2.602	
Official Exchange Rate	Level	-0.395 (0.9190)	-3.587	-2.933	-2.601	I(1)
	1st Difference	-5.754*** (0.0000)	-3.594	-2.936	-2.602	

Note: p values in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

The null hypothesis is,

H_0:Variable has a unit root (non-stationary)

Decision rule: Reject the null hypothesis if the test statistic is lower than the critical values at 1%, 5%, and 10% level.

The table shows that all the series or variables are non-stationary at the level form, I(0). But the variables become stationary after taking their first difference implying that they are integrated of order one, I(1).

Diagnostic checks

Multicollinearity

Multicollinearity mostly arises in the case of time series analysis where the number of independent variables is more than one. One of our CLRM (Classical Linear Regression Model) assumptions is that there should not be any kind of relationship among the independent variables in the model. But in most cases variables might be correlated with each other, and it is very common. There are no formal tests for multicollinearity. We always try to measure the extent or degree of the problem. We are likely to face multicollinearity problem as more than one independent variable is present in the model. Let's try to find out whether our model suffers multicollinearity problem or not. There are various methods to detect multicollinearity problems. One of the methods is mentioned below.

A high R^2 but few significant t-ratios

The following table provides the estimated result of the regression involving all the independent variables jointly. From the table, we can see that R square, the determinant of the goodness of fit, is much high in excess of 0.8 and also the value of F is significant (F value is high). This information leads us to reject the hypothesis that the partial slope coefficients are jointly equal to zero. But on the basis of t-statistics, one or more of the partial slope coefficients are individually statistically insignificant. This is a signal of multicollinearity. The regression results of our the model including all the variables jointly are given below.

Table A4: Estimated Regression Result Including all the Variables Jointly

Dependent Variable = Exports				
	Coefficient	*St. Error*	*t-test*	*Prob.*
D	-10323.06	6979.163	-1.48	0.147
US GDP	-0.0003005	0.0038715	-0.08	0.938
Exchange Rate	-43.5923	195.9119	-0.22	0.825

Dependent Variable = Exports				
	Coefficient	*St. Error*	*t-test*	*Prob.*
World GDP	0.0001881	0.001147	0.16	0.870
D×US GDP	-0.0060349	.0039473	-1.53	0.134
D× Ex.Rate	800.4238***	226.5199	3.53	0.001
D×WGDP	0.001132	0.0011535	0.98	0.332
Constant	-827.038	6377.334	-0.13	0.897
Adj.R^2	0.9837			
F test	422.28			
Obs.	50			

Note: *** p<0.01, ** p<0.05, * p<0.1
Source: World Development Indicators (World Bank)

We notice a high R^2 but few significant t ratios. We do not always need to fix the problem of multicollinearity. As we have assumed to satisfy all the CLRM assumptions and maintain the objective of the study, we will do nothing to solve it. Although multicollinearity problems exist, our estimators are still linear, unbiased, and consistent with minimum variance.

Comments on Cointegration Analysis

When variables are integrated of same the order i.e. I(1) and residuals are found to be stationary at level, I(0), then our variables will be cointegrated in the long run. The idea of unit root and cointegration makes a significant contribution by compelling us to determine if the regression residuals are stationary.

Engle-Granger Approach

Step 1: Estimating the following equation applying OLS,

$$E_t = \alpha_0 + \alpha_1 \, USGDP + \alpha_2 \, EX.Rate + \alpha_3 \, WorldGDP + U_t \qquad (3)$$

Table A2 provides the result summary of the estimated equation 3. The results showed that although the slope coefficients are statistically significant, the adjusted R square is very high (0.9741). The variables are highly correlated with each other which results in spurious regression. Now we need to estimate the residuals of the model.

Step 2: Checking the stationarity of the error term or residual: performing unit root test on residual the null hypothesis,

H_0: Residual has a unit root (non-stationary)

If we reject the null hypothesis of non-stationarity of residual if ADF test statistics is lower than critical values at 1%,5%, and 10% level.

Table A5: Augmented-Dickey Fuller Unit Root Test for Stationarity

Variable	*Level/1st Difference*	*ADF Statistics*	*Critical Values*		
			1% Level	*5% Level*	*10% Level*
Residuals	Level	-2.471 (0.1226)	-3.587	-2.933	-2.601
	1st Difference	-6.996*** (0.0000)	-3.594	-2.936	-2.602

Note: p values in parentheses; *** p<0.01, ** p<0.05, * p<0.1 ;

According to the ADF test, residuals are not stationary at level form. we cannot reject our null hypothesis of non-stationary residuals. So, variables are not cointegrated in the long run. From this statement, we can say that the exports of Bangladesh are not affected by the increase or decrease in the GDP of the US, the World GDP, or the exchange rate. First, talking about the relationship with the exchange rate, which is controlled centrally by Bangladesh Bank. We don't observe enough variations in the exchange rate and hence we could not detect any long-run relationship between the exchange rate and the export data of Bangladesh. Now coming to the relationship of export demand with foreign incomes (GDP of US and world GDP). Being an LDC the country enjoys preferential market access, GSP facilities, and DFQF market access facilities. Our exports are mostly driven by quota facilities, and trade preferences in the European market, Canadian market, and Japanese market. If world GDP or US GDP rises, Bangladesh's exports are not going to be affected to that extent. Bangladesh's exports are highly concentrated towards a few items i.e. RMG which covers more than 85% of total export earnings. Moreover, as a least developed country, Bangladesh mostly exports low value-added cheap products the demand for which is not so high for foreigners. So, we do not notice any long-term relationship between the export demand of Bangladesh and foreign incomes.

Autocorrelation

The Durbin-Watson d test is found to be 0.3402491, which implies a positive serial correlation in the residuals. The closer the value of d is to zero, the stronger the proof of positive serial correlations. After the first differencing of the regression model d test is found to be 2 which removes our problems of autocorrelations.