Export-led Growth (ELG) Hypothesis in BCIM Countries: A Panel Econometric Analysis

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Abstract

The study explores the stability and causality of export-led growth (ELG) hypothesis for Bangladesh, China, India and Myanmar commonly known as BCIM countries. ADF and KPSS unit root tests are employed to check the stationarity of time series data and ARDL approach for long-run co-integration among the variables. MWALD Granger causality test is also used to determine the direction of causality among the variables. It is found that both export-led growth (ELG) and growth-led export (GLE) hypotheses are stable in Bangladesh and India; only ELG theorem is relevant to China; and GLE hypothesis is valid in case of Myanmar. In this study, unidirectional and bidirectional causal associations between the variables determine the relevance to ELG and GLE hypotheses in the context of BCIM countries. It is mentionable that any joint step of BCIM countries is critical to promote exports by penetrating new destinations with diversification of exports of goods and services. The study findings also suggest that the potential for utilizing unused resources of these countries to promote exports in order to reach spectacular growth path.

Keywords: Export-led growth, growth-led exports, economic growth, panel econometric analysis, BCIM countries.

JEL Code: C22, F10, F43, O11

1.0 Introduction

The export-led growth (ELG) hypothesis has been used for investigation the underlying relationship between international trade and economic growth. The relationship between international trade and economic growth has become an important area of empirical research as exports are considered as one of the main drivers of economic growth. Export-led growth(ELG) is defined when causality running from exports to economic growth (Tang, Lai, & Ozturk, 2015). The growth of exports accelerates economic growth through economies of scale achieved by specialization in production and spill over of technical knowledge (Helpman and Krugman, 1985). The study of Easterly (2007) posits that exports boost up economic efficiency through proper allocation of resources for stimulating economic growth in the long run. Apart from ELG hypothesis, growth-led export (GLE) theorem is

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supported by Bhagwati (1988) in line with neoclassical trade theory. Bhagwati (1988) opined that economic growth spurs both demand and supply sides of an economy. Thus, economic growth improves the formation of skills and technological progress. A study on Bangladesh (Nasrin and Koli, 2018) finds that export, import, and economic growth have a long run relationship and the results validate the export-led growth hypothesis. A study on the export-led growth hypothesis for Argentina, Brazil, and Mexico suggests that the causal relationship is either bi-directional or unidirectional from export to GDP reflecting the relevance of ELG hypothesis (Per-Ola Maneschiold, 2008).

The study of Shan and Sun (1998) examines the export-led growth hypothesis in case of China by estimating an augmented growth equation based on times series data. The Granger causality procedure developed by Toda and Yamamoto (1995) is applied to test the causality link between exports and economic growth in a VAR system. The results show a bidirectional causality between exports and real industrial output in China over the period 1987-1996. Therefore the export-led growth hypothesis is rejected in this study despite the positive contribution of exports on China's economic growth.

Economic growth enhances the labor productivity by improving their skills. From this point, labor productivity is considered the one of the significant determining factors of whether to export or not (Arnold & Hussinger, 2005; Melitz & Ghironi, 2007). Jung (2017) expressed that international trade literatures highlight domestic political instability to be a fundamental source of uncertainty for the trade agreements. There are two-fold effects of trade policy uncertainty. Firstly, trade policy uncertainty emanated from political instability deject effective dealing with partner countries and their buyers (Mölders, 2016). There might have the possibility of terminating the trade agreements signed between those forces due to political instability. Secondly, the uncertainty hampers the access of potential exporters to new markets (Handley, 2014). Even, political instability makes the industries of export-produced commodities dysfunctional as labors become unwilling to work amid the unstable situation within a country. Any obstacle in production ultimately contributes to the lower growth in economy. So, ELG hypothesis cannot work properly in an unstable or bad governance situation.

For decades, economies dependent on exports, such as Malaysia, South Korea, Thailand, Vietnam, Hong Kong etc. have achieved a remarkable success in improving their economic growth (Tang et al., 2015). BCIM forum (Bangladesh, China, India and Myanmar) follows the same way to generate impressive economic growth. This forum was in 1999 aiming to build a Regional Economic Development

Area (REDA) in order to harness economic growth by utilizing the region's unused resources (ESCAP, 2002). Based on both regional cooperation and inner mechanisms, China and India have already achieved their rapid economic growth through expanding their trade mostly by exports (Stiglitz, 2007). Bangladesh has been the 54th largest export economy in the world (ECI, 2019), aiming to materialize its vision to be a developed economy by 2041. Myanmar is also the 75th largest export economy in the world (ECI, 2019). This economy also intends to achieve impressive economic growth by promoting its exports.

With this backdrop the study attempts to check the stability of ELG hypothesis in BCIM countries by incorporating exchange rates, total labor and political uncertainty issue as control variables. ARDL bound testing approach to co-integration and MWALD Granger causality test developed by Toda & Yamamoto (1995) are employed here. Studies that examined the relationship between exports and economic growth are almost non-existence in case of BCIM countries.

The remainder of this study is organized as follows. Section 2 deals with the objectives, Section 3 deals with the scenarios of GDP and exports in BCIM countries and Section 4 with the review some existing literatures. Section 5 represents the data and econometric techniques. Section 6 portrays the empirical results while conclusion and policy recommendations of this study are placed in Section 7.

2.0 Objectives of the Study

The broad of objective of this study is to examine the stability and long-run co-integration between economic growth and exports in BICM countries. The specific objects are as follows:

(i) To examine the evidence of export-led growth hypothesis in BICM countries;
(ii) To check the panel stationary of the variables;
(iii) To check to causality between economic growth and exports in BICM countries.

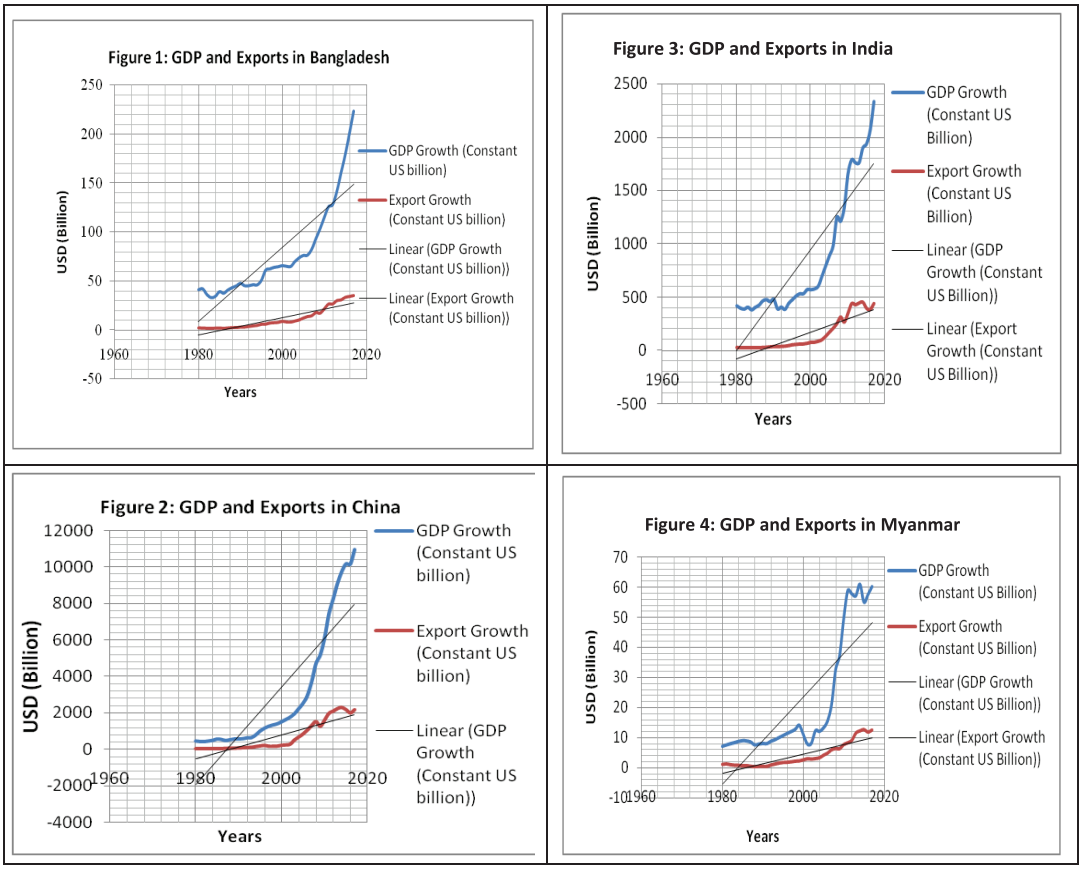
3.0 Export-Growth Scenario in BCIM Countries

The BCIM Economic Corridor is a modern form of the ancient Silk Road, and a review of the 1999 Track II Kunming initiative among Bangladesh, China, India and Myanmar. The total geographical area of the BCIM forum is about 9% of the world with a population constituting about 40 percent of the world. The BCIM concept drew its motivation from the concept of 'Growth Zones', which blends resources of the neighboring countries to expedite economic growth of the member countries. Using the idea of 'Growth Zones', these countries aimed to achieve the

opportunities, which are connectivity and infrastructure, energy resources, agriculture, trade and investment etc. (Rahman, Rahman, & Shadat, 2007).

The outcome of regional economic integration (REI) is significantly noticeable regarding their contribution to the regional as well as world economy. Now, the GDP of these four integral countries is about 15 percent of the total GDP of the world (World Bank, 2014). In 2013, the BCIM trade comprises 14 percent of the international trade and joint shares of exports and imports of this forum in international market are calculated at 14 percent and 13 percent (N. I. Islam, Matin, & Hossan, 2015).

The GDP and exports scenario of BICM countries are depicted in the following figures:



Source: WDI, World Bank, 2018

The above figures show the positive trends of both GDP and exports for BICM countries. The linearity of the curves indicates positive association between GDP and exports.

4.0 Review of Literatures

A number of studies used cross-country data and rank correlation method to examine the validity of export-led growth (ELG) hypothesis (Maizels,1963, Kravis,1970, Heller and Porter,1978, Tyler, 1981, Rana, 1986). Emery (1967); Jay and Michalopoulos (1973), Voivodas, (1973); Williamson (1978); Salvatore (1983); Balassa (1985); Ram (1985); Tyler (1981); Singer and Gray (1988); Mbaku (1989); Fosu (1996); Otani and Villanueva (1990); Alam (1991); Dodaro (1991); De Gregorio (1992); Sheehey (1992); Weaver (1993); Coppin (1994); Amirkhalkhali and Dar (1995); Yaghmaian and Ghorashi (1995); and McNab and Moore (1998) employed cross-country data by using different regression methods such as OLS, 2SLS, 3SLS Models; and panel data method. A cluster of studies used the autoregressive distributive lag (ARDL) model to investigate the export-growth nexus. Shan and Sun (1998) examined the ELG hypothesis in case of China employing monthly data and explored bidirectional causal relationship between export growth and economic growth. Mah (2005) employed the same model and discovered a long-run relationship with bidirectional causality existed between export growth and real GDP growth. There are also a number of literatures that supported the ELG hypothesis, including Parikh and Stirbu (2004); Al Mamun and Nath (2005); Maneschiöld (2008); and Herrerias and Orts (2011).

A study of Das and Kumar (2007) empirically verifies the ELG hypothesis for five South Asian countries using panel data over the period 1991-2005 using panel unit root test, heterogeneous panel co-integration and error correction models. The study supports the view that export is the engine of growth under liberalized trade regime. Hye, Wizarat and Lau (2013) examined trade-growth nexus using ARDL approach using data from six Asian countries e.g. Bangladesh, India, Pakistan, Sri Lanka, Nepal and Bhutan over different time periods. Using the modified Granger Causality test, the study found ELG hypothesis relevant to all the countries except Pakistan while import-led growth model is appropriate to this country. Tang, Lai and Ozturk (2015) re-investigated the ELG hypothesis for Asia's Four Little Dragons using co-integration and rolling causality analyses. Using both bivariate (exports and GDP) and trivariate (exports, GDP and exchange rate) models, The study found that exports and GDP are co-integrated for all the four economies, indicating that there exists a long run relationship between the variables, but the rolling regression-based MWALD test discovered that ELG hypothesis is not stable in each of the four economies over their respective period of analysis.

The Study of Mamun et al (2019) finds the existence of export-led growth (ELG) hypothesis for Bangladesh. Their study highlights the strong relationship between the growth and export of Bangladesh following the inception of trade liberalization

and export promotion in the late 1970s through 2010s. The study examines both the short-run causality and long-run dynamics between export and economic growth in order to confirm whether the ELG hypothesis works for Bangladesh drawing data for the period from 1974 to 2015. The long-run dynamics between export and output growth based on ARDL Bounds testing approach suggest that ELG is evident for Bangladesh. Toda-Yamamoto approach confirms a unidirectional causality that runs from exports to output growth. A unidirectional causal relationship from export to output growth is necessary for the validity of the ELG hypothesis. However, bidirectional causality between export and output implies that growth in exports reinvigorates output growth which, in turn, reinforces export expansion and thereby further underlines the validity of the ELG hypothesis.

The study of Herrerias and Orts (2010) employs an empirical framework of the co-integrated vector autoregressive model on the economy of China. They find that the empirical results show that both investment (in physical capital and R&D) and exports, as well as the exchange rate policy, are relevant factors in explaining China's long-run economic growth over the past 4 decades. The study of Sannassee et al (2014) focuses on the previous studies which show that exports help in achieving robust economic growth. A recent study of Kim et al (2020) examines the causality between export expansion and economic growth in Myanmar using annual time series data for the period from 1981 to 2015. Johansen co-integration test and the Toda-Yamamoto Granger causality test are employed to test the export-led growth hypothesis in Myanmar. The study results show that there is a uni-directional causality running from export expansion to economic growth in Myanmar. The results support the export-led growth hypothesis in Myanmar. They conclude that the Myanmar government should actively promote an export expansion strategy to stimulate economic growth by improving trade liberalization and trade facilitation while reducing tariffs and eliminating non-tariff barriers.

Based on aforesaid review of literature, there are a good number of empirical evidences that examined both the co-integration and causal relations between exports and economic growth in the context of different countries. The individual examination of ELG hypothesis on BCIM economies by incorporating exchange rate, labor productivity and political uncertainty as control variables is scarce in econometric literature. Thus, this study can add value in the development literature by investigating ELG theorem into BCIM countries.

5.0 Models, Data and Econometric Techniques

5.1. Models and Data Source

The data of GDP, exports are sourced from the World Bank Development Indicators (WDI), and exchange rates and gross government consumption expenditure and investment data from FAOSTAT Data and Penn World Table. The nominal data of GDP, exports and gross government consumption expenditure and investment for Bangladesh, China, India and Myanmar (BCIM) have been transformed into real data by using US GDP deflator. The study period ranges from 1980 to 2017 for all the economies. In the study, dependent variable is real GDP and independent variables are real exports, real exchange rate and real gross government consumption expenditure and investment. Based on the availability of data, we use the bivariate, trivariate and multivariate models, which are specified as follows:

Bivariate model: $lnY_{it} = \beta_{i1} + \beta_{i2} lnEX_{it} + \mu_{i1t}$ Here i=1…….3 (1)

Trivariate model: $lnY_{it} = \beta_{i1} + \beta_{i2} lnEX_{it} + \beta_{i3} lnEXCH_{it} + \mu_{2it}$ Here i=1……..4 (2)

Multivariate model: $\ln Y_{it} = \beta_{i1} + \beta_{i2} lnEX_{it} + \beta_{i3} lnEXCH_{it} + \beta_{i4} lnGCEI_{it} + \mu_{3it}$ Here i=1……..4 (3)

Where, Y_t represents the real GDP, EX_t is the real exports, $EXCH_t$ is the real exchange rate and $GCEI_t$ is the real gross government consumption expenditure and investment. The variables are demonstrated in logarithmic form. The residuals ($\mu_{1t}, \mu_{2t}, \mu_{3it}$) are assumed to be distributed normally as white noises with mean and standard deviation are 0 and 1 respectively. This study uses annual data of real gross domestic product (GDP), real exports, US GDP deflator (base year: 2010), real exchange rate and real gross government consumption expenditure and investment. For reliable and consistent results, all these data are transformed into natural logarithm form (Shahbaz, Loganathan, Muzaffar, Ahmed, & Jabran, 2016).

Before implementing time series data properties, stationarity test is mandatory to know about the nature of the data (Ewing, Sari, & Soytas, 2007). Then we check the stationary status of all the variables by using the Dickey & Fuller (1979)and the Kwiatkowski, Phillips, Schmidt, & Shin, (1992) tests. Since some variables are I(0) and residual variables are I(1), this stationarity results direct us to run ARDL bounds approach to cointegration (M. Hashem Pesaran, Shin, & Smith, 2001; M Hashem Pesaran & Shin, 1998). The ARDL model encompasses a good number of advantages over conventional cointegration testing techniques. First of all, this method can be applicable whether the variables are of mixed orders of integration e.g. I(0) and I(1). Secondly, it is possible to estimate both the short run and long run relationship among the variables simultaneously by using ARDL procedure. Besides,

endogeneity issue is checked by ARDL model including lags of dependent and independent variables in the model.

Time series data usually have the chance to be non-stationary that causes spurious result in detecting relationship among the variables in a study. The stationarity test of Levin, Lin and Chu (2002) used in the study is advantageous because it suggests a panel based on ADF test to detect the existence of the homogeneity in the variables of the autoregressive coefficients for all panel units with cross-sectional independence. Besides, the test developed by Im, Pesaran and Shin, (2003) is also free from restriction afar from LLC test as it allows the heterogeneous coefficients. In the study, we take individual Levin, Lin and Chu (2002), Im, Pesaran and Shin, (2003), ADF- Fisher Chi-square and PP-Fisher Chi-square test unit root techniques for checking the stationarity of the variables.

5.2 Hausman's Random Effect Test

The justification of the use of random effects is that the deviation among entities is presumed to be random and uncorrelated to the independent variables or predictors. The random effect is used while there appear significant differences across entities, having some influence on dependent variable. Besides, the significant advantage of random effects model is that time invariant variables are included. Random effects assume that the error term of the entities is not associated with the predictors that allows for time-invariant variables to play a role as explanatory variables.

5.3 Panel Co-Integration Test

Co-integration test is mainly conducted whether there is a long-run relationship among the variables. The existence of a co-integrated relationship among the data properties demonstrates a significant long-run relationship among the variables. If the variables in the study are found to be the mixed order of integration i.e. I(0) and I(1), panel co-integration test especially the Pooled Mean Group (henceforth PMG) is appropriate to examine the long-run equilibrium among non- stationary variables. According to Pesaran, Shin and Smith (1999), the PMG estimator is better than other co-integration tests as it includes both pooling and averaging. In this regard, the study uses the PMG panel co-integration approach to examine the existence of a long run relationship between GDP, exports, exchange rate, and gross government consumption expenditure and investment in BCIM countries. This estimator allows the intercepts, short-run coefficients, and error variances to differ freely across groups, but restrains the long-run coefficients to be the similar. Besides, the estimation technique can be run although the integration order of data becomes I(0) or I(1) or mixed.

5.4 Panel Causality Test

Measuring short-run and long-run relationship between variables without any information about the causality between them offers several policy implications (Shahbaz, Azim, & Ahmad, 2011). Dealing with the big data variables, a technique is developed by Dumitrescu and Hurlin, (2012) in order to test Granger causality in panel data properties. Therefore, the current study uses the DH panel causality test, which has two advantages over the traditional Granger (1969) causality test. In addition to considering fixed coefficients like the Granger causality test, the DH test considers two dimensions of heterogeneity: the heterogeneity of the regression model used to test the Granger causality, and the heterogeneity of the causal relationship.

6.0 Empirical Results

In this section, we represent the empirical results for the stationarity tests; the PMG panel co- integration test, and the DH panel causality test.

6.1 Stationarity Test Results

In order to avoid spurious result in regression, firstly the stationarity of the variables must be identified (Granger and Newbold, 1973; Phillips, 1986). This study employed Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), ADF-Fisher Chi-square and PP-Fisher Chi-square) unit root technique for checking the stationarity of the variables in the study. Following Table-1 shows the panel stationarity test results:

Table-1: Panel Stationarity Test Results

Variable	Levin, Lin & Chu t*		Im, Pesaran and Shin W-stat		ADF-Fisher Chi square		PP-Fisher Chi-square	
	intercept	intercept and trend	intercept	intercept and trend	intercept	intercept and trend	Intercept	intercept and trend
Levels								
*ln*Y	2.79139 (0.9974)	-0.63179 (0.2638)	5.19187 (1.0000)	0.92224 (0.8218)	0.20504 (1.0000)	3.17826 (0.9227)	0.08749 (1.0000)	3.31192 (0.9133)
*ln*EX	1.16419 (0.8778)	-1.23166 (0.1090)	3.49020 (0.9998)	-1.80192** (0.0358)	0.42015 (0.9999)	16.0111 (0.0422)	0.28894 (1.0000)	14.9728** * (0.0597)
*ln*EXCH	-3.56551* (0.0002)	-0.51997 (0.3015)	-1.69234** (0.0453)	0.93859 (0.8260)	14.9696*** (0.0597)	6.86105 (0.5517)	28.4571* (0.0004)	9.25033 (0.3216)
*ln*GCEI	2.49941 (0.9938)	0.76968 (0.7793)	4.72095 (1.0000)	0.98419 (0.8375)	0.24298 (1.0000)	4.17240 (0.8412)	0.08323 (1.0000)	11.7622 (0.1621)
First Difference								
Δ (*ln*Y)	-5.98924* (0.0000)	-6.28726* (0.0000)	-4.58568* (0.0000)	-4.20513* (0.0000)	36.1847* (0.0000)	31.5749* (0.0001)	49.1110* (0.0000)	44.6362* (0.0000)
Δ (*ln*EX)	-2.10620* (0.0176	-1.30475*** (0.0960)	-4.72019* (0.0000)	-3.35042* (0.0004)	37.5557* (0.0000)	25.0296* (0.0015)	67.0848* (0.0000)	54.0017* (0.0000)
Δ (*ln*EXCH)	-5.14254* (0.0000)	-5.34071* (0.0000)	-4.39586* (0.0000)	-4.74871* (0.0000)	36.0692* (0.0000)	37.4174* (0.0000)	44.7910* (0.0000)	44.1918* (0.0000)
Δ (*ln*GCEI)	-4.81466* (0.0000)	-4.66068* (0.0000)	-5.08617* (0.0000)	-4.39763* (0.0000)	41.3490* (0.0000)	33.4209* (0.0001)	60.3631* (0.0000)	47.5089* (0.0000)

Note: Δ denotes the first difference operator. (*), (**) and (***) represent the statistical significance at 1%, 5% and 10% level respectively. Probabilities are shown in parentheses.

Above results depict that the variables of the study are integrated at the order of both I(0) and I(1), implying that variables are stationary at both the level and first difference. With confirmation of the different orders of integration for all variables, we then advance with the PMG panel co-integration test to check whether there is a long-run relationship among the variables under analysis.

6.2 Hausman's Random Effects Test Result

Random-effects specify the individual characteristics of variables that may or may not influence the predictor variables. Random effects allow generalizing the inferences beyond the sample used in the model. Table-2 shows the random effects result by using Hausman test:

Table-2: Result of Correlated Random Effects – Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	**11.261749**	**3**	**0.0104**

Above table depicts those random effects probability is significant at 5% level, implying that there appears random effect in the data properties of BCIM economies. It rejects the null hypothesis that there is no random effect of the macroeconomic dynamics to stimulate growth in BCIM economies.

6.3 Co-integration Test Results

Since the variables are traced to be the order of integration at both I(0) and I(1), the study employs Johansen co-integration test (Fisher), and Kao test (Kao, 1999) following Engle- Granger method in panel unit roots in order to inspect the probable presence of one or more co- integrated association among the variables. The results of the panel co-integration tests are shown below:

Table-3: Results of Panel Co-integration Test

Fisher (combined Johansen)	**Kao Test (ADF)**
Trace statistic	-3.046613*
89.48*[r=0], 34.57* [r>=1], 22.80* [r>=2], 21.50*[r>=3]	
Maximum eigenvalues	
66.87*[r>=0], 19.52** [r>=1], 16.16**[r>=2], 21.50*[r>3]	

Note: (*) and (*) denote the 1% and 5% level of significance respectively.

Source: Author's Own Estimates

From the above results, it is shown that the null hypothesis of no co-integration between variables is rejected at 1% and 5% level of significance respectively according to the used co- integration tests while r represents the number of co-integrating equations with linear trend. It is evident that six co-integrating vectors exist at the 1% significance level and two vectors are co- integrated at 5% significance level by employing Fisher test (Johansen, 1992; Maddala and Wu, 1999). Besides, Kao test also shows that there appears co-integration among the variables at 1% level of significance.

6.4 PMG-Based Regression Results

To apply the PMG panel co-integration test, we adopt the optimal lag structure for the ARDL approach. In the study, we use the AIC statistics to select the best possible lag structure for the ARDL system. The PMG co-integration tests for the bivariate, trivariate and multivariate models are depicted below in Table-4, 5 and 6 respectively:

Table-4: Long-run and short-run relationship between variables in bivariate model

Long-run Equation

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.**
***ln*EX**	**0.902259**	**0.224487**	**4.019200**	**0.0001**
	Short Run Equation			
COINTEQ01	**-0.101202**	**0.028004**	**-3.613819**	**0.0004**
C	**0.477488**	**0.136556**	**3.496654**	**0.0006**

Source: Author's Own Estimates

For the bivariate model (GDP and exports), exports of BCIM countries have highly positive impact on GDP growth in the long run, showing 1% level of significance. As the coefficient of C is larger (47%), it requires including other variables under trivariate models with regard to the robustness of the model.

Table-5: Long-run and short-run relationship between variables in trivariate model

Long Run Equation				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.**
***ln*EX**	**0.450972**	**0.124390**	**3.625461**	**0.0004**
***ln*EXCH**	**-0.439749**	**0.101206**	**-4.345094**	**0.0000**
Short Run Equation				
COINTEQ01	**-0.203075**	**0.054064**	**-3.756179**	**0.0003**
C	**3.176245**	**0.754987**	**4.207019**	**0.0000**

Source: Author's Own Estimates

For the trivariate model (GDP, exports and exchange rate), exports of these economies have substantially positive effect on the GDP growth in the long-run at 1% significance level while we regress these variables within the purview of exchange rate in order to investigate their relationship. Inclusion of exchange rate as a variable in the model is appropriate considering that if the depreciation in currency exists in export-based economies, exports promotion becomes high. Under this situation, the buyers of the external countries import goods from export-based economies in a relatively lower price. Although there is a significance of exchange rates in export-led growth of an economy, it is relevant to advance to the multivariate models due to higher coefficient of C portrayed in the short-run equation.

Table-6: Long-run and Short-run Relationship Among Variables in Multivariate Model

Long Run Equation				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.**
***ln*EX**	**0.639978**	**0.105758**	**6.051347**	**0.0000**
***ln*EXCH**	**-0.099438**	**0.062365**	**-1.594460**	**0.1134**
***ln*GCEI**	**0.645500**	**0.277755**	**2.323989**	**0.0217**
Short Run Equation				
COINTEQ01	**-0.127242**	**0.061389**	**-2.072710**	**0.0403**
C	**0.324878**	**0.147031**	**2.209580**	**0.0290**

Source: Author's Own Estimates

For the multivariate model (GDP, exports, exchange rate and gross government consumption expenditure and investment), exports of these economies also impact GDP growth at 1% significant level in the long-run while we check this relationship within the purview of exchange rates and gross government consumption expenditure and investment. As in the bivariate model, the intercept is high (47%); it requires the addition to relevant variable in the model. From this point of view, gross government consumption expenditure and investment is added to the model that contributes to lower the value of intercept (32%) in the multivariate model. So, employing multivariate model in these economies is suitable to examine the exports-GDP nexus as well as establish export-led growth theorem.

In addition, the ECT coefficient in all models shows the negative sign at the 1% and 5% significance levels, implying that the statistics rejects the null hypothesis of no co-integration between exports and GDP for BCIM countries (Table-4, 5 and 6). Besides, the estimate of negative error correction term in ECM explains the extent of disequilibrium that can be eliminated at each period. In other words, on the basis of the size of the estimate of error correction term, [Sign is expected to be negative] the responsiveness of the changes in variables to the previous deviations of actual values of variables from the long run equilibrium can be understood. How quickly disequilibrium can be corrected [eliminated] depends on the size and statistical significance of constant estimate of error correction term. If the size is larger, the proportion of error correction will be slower. It may also be interpreted as the coefficient of speed of adjustment between short run dynamics and long run equilibrium values. As the error term is very low (12%) in multivariate models in the study, we can say that speed of adjustment is quicker from any short-run disequilibrium to long-run equilibrium.

6.5 Pairwise Dumitrescu-Hurlin (DH) Panel Causality Test Results

Table-2 reports the DH panel causality results, showing that there exists bidirectional causal relationship between exports and GDP at 1% and 5% level of significance, causality running from exports to GDP and from GDP to exports respectively in BCIM countries. It implies that export led growth hypothesis is stable in the context of all BCIM economies.

Table-5: Result of Panel Causality Test

Alternative Hypothesis		W-Stat.	Zbar-Stat.	Prob.	Remark
*ln*EX	*ln*Y	6.84788	4.11200	4.E-05	Bidirectional
*ln*Y	*ln*EX	4.68926	2.22743	0.0259	Bidirectional
*ln*EXCH	*ln*Y	9.24816	6.20756	5.E-10	Bidirectional
*ln*Y	*ln*EXCH	4.03723	1.65818	0.0973	Bidirectional
*ln*GCEI	*ln*Y	5.21395	2.68551	0.0072	Bidirectional
*ln*Y	*ln*GCEI	5.44316	2.88562	0.0039	Bidirectional
*ln*EXCH	*ln*EX	10.2153	7.05196	2.E-12	Bidirectional
*ln*EX	*ln*EXCH	5.41798	2.86364	0.0042	Bidirectional
*ln*GCEI	*ln*EX	5.92389	3.30532	0.0009	Bidirectional
*ln*EX	*ln*GCEI	6.44525	3.76049	0.0002	Bidirectional
*ln*GCEI	*ln*EXCH	2.12758	-0.00903	0.9928	Not Significant
*ln*EXCH	*ln*GCEI	5.51935	2.95213	0.0032	Bidirectional

Besides, exchange rate and GDP have bidirectional causal relationship at 1% and 10% significance level; gross government consumption expenditure and investment and GDP; and exchange rates and exports; gross government consumption expenditure and investment and exports are also found to have a bidirectional causal link at 1% significance level respectively. And there exists unidirectional causal link, running from exchange rates to gross government consumption expenditure and investment.

6.7 Diagnostic Tests

The diagnostic statistics of ARDL models for all four BCIM countries are presented in Table-7. Ramsey RESET test results depicts that the models are free from any misspecification problem. Lagrange multiplier (LM) tests reveal that there is no serial correlation at 5% level of significance. JB test results depicts that all residuals in the models are distributed normally. Further, ARCH test confirms that there is no heteroskedasticity issue in the models.

Table-7: Diagnostic test

Countries	LM Test	JB Test	ARCH Test
Bangladesh	2.44 (0.17)	1.96 (0.37)	1.57 (0.22)
China	1.00 (0.39)	1.96 (0.37)	1.91 (0.17)
India	2.21 (0.10)	1.43 (0.48)	0.12 (0.72)
Myanmar	1.78 (0.22)	0.15 (0.92)	1.73 (0.19)

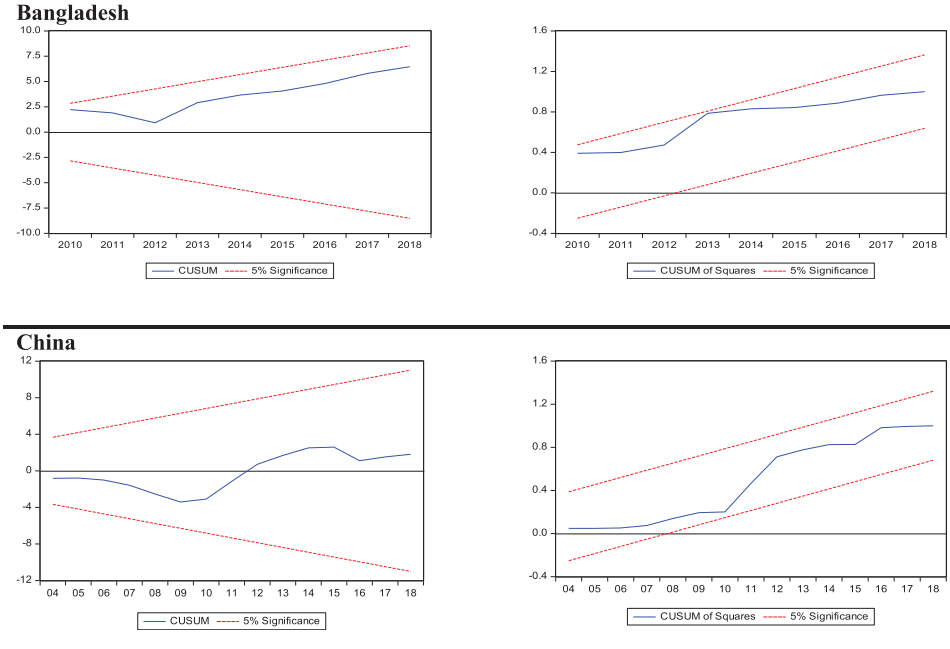
Notes: The values show F-Statistics; the value in parenthesis is p-values; LM test is to check serial correlation; JB means Jarque-Bera used for normality test; and ARCH is Heteroskedasticity test.

Source: Author's Own Estimates

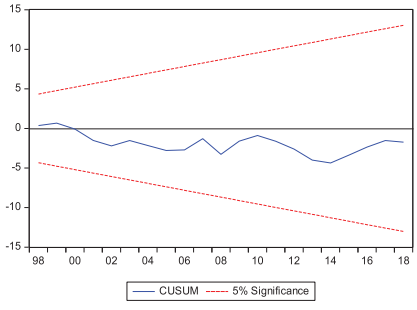
6.8 Stability of the Model

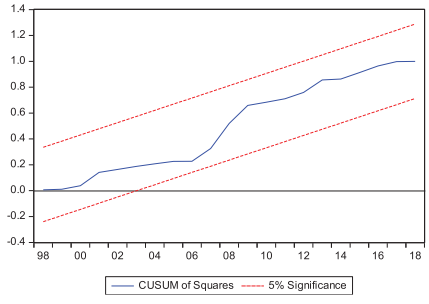
The structural stability test of the parameter on the axis cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals squares (CUSUMSQ) procedures coined by H. M. Pesaran & Pesaran (1997) are employed to determine the models' robustness. The CUSUM and CUSUMSQ tests in the form of graphical representation are depicted in Fig. 5 As per precondition, if the plots stay within the 5% level of critical bound, it indicates that the parameters of the models are stable and consistent. The plots of our models reveal that the CUSUM and CUSUMSQ are within the boundaries for all BCIM countries over the period.

Figure 5: CUSUM and CUSUM of square tests

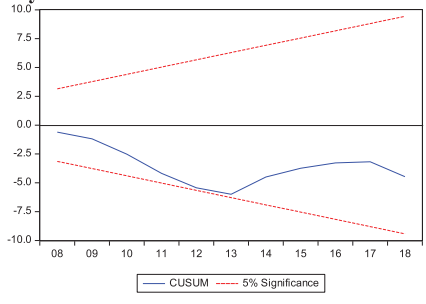


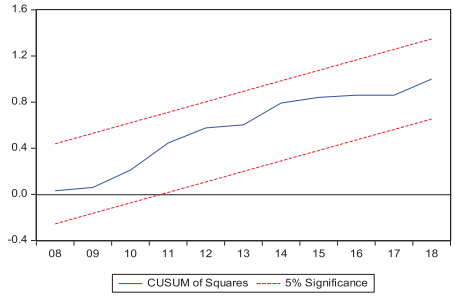
India





Myanmar





6.9 MWALD Causality Test Result

Granger theorem depicts that there will be at least a unidirectional causal relationship among the variables if they are co-integrated. We then advance to measure the augmented VAR system to check the causality between exports and GDP for BCIM countries.

Table-8: Modified Wald (MWALD) Causality

Countries	**Null hypothesis: Exports do not Granger-cause GDP**	
	Lag (k)	MWALD statistics
Bangladesh	5	9.60*** (0.001)
China	3	3.43* (0.063)
India	3	3.03* (0.0813)
Myanmar	3	0.98 (0.32)
	Null hypothesis: GDP does not Granger-cause exports	
	Lag (k)	MWALD statistics
Bangladesh	11	4.77** (0.028)
China	9	0.07 (0.777)
India	8	4.12** (0.042)
Myanmar	8	20.64*** (0.000)

Note: *** and ** represent statistical significance at 1% and 5% levels respectively. The order of the optimal lag (k) is determined by AIC.

Table-8 shows the results of causal association between exports and GDP in BCIM countries utilizing Toda-Yamamoto technique. The MWALD test statistics reveal that the null hypothesis at 1% significant level for Bangladesh and at 10% for both China and India is rejected respectively, implying that exports Granger-cause GDP for these three countries in BCIM forum. Besides, Table 6 also represents the testing result of null hypothesis that GDP does not Granger-cause exports. Here the null of hypothesis of no cointegration for both Bangladesh and India is rejected at 5% and for Myanmar 1% level of significance.

It shows that bidirectional causality between exports and GDP is found in both Bangladesh and India; and unidirectional causal relationship from exports to GDP is explored in the context of China. Finally, in case of Myanmar, there exists unidirectional causality running from GDP to exports. According to MWALD Granger causality results, we conclude that both export-led growth (ELG) and growth-led (GLE) hypotheses are stable in Bangladesh and India; only ELG is valid for China; and GLE is relevant for Myanmar.

7.0 Conclusion and Policy Recommendations

Using the PMG panel co-integration technique and DH causality tests, the study empirically investigates the export-led growth hypothesis for BCIM economies by employing the bivariate, trivariate and multivariate models over the period from 1980 to 2017. The PMG panel co- integration tests show the GDP and exports under bivariate model, GDP, exports and exchange rates under trivariate model and GDP, exports, exchange rates and gross government consumption expenditure and investment under multivariate models are co-integrated in BCIM economies. It implies that exports and GDP in these economies are moving together in retaining their long-run relationship although nonconformity from the steady state can take place in the short run in the bivariate, trivariate and multivariate models. Besides, the DH tests show that there is a bilateral causality between exports and GDP for these economies. Above all, the finding of the study is that the export-led growth hypothesis for these four economies is stable and significantly existed in the growth trail of all BCIM economies.

Given these results and considering the nature of the export markets remain strong; it is the time for all four BCIM economies to extend their growth strategies to be dependent on exports to developed and unexplored markets. However, these four economies should make their export- oriented policies convenient to the importers of developed economies. Now, new policy strategies must aim to diversify both the export items and markets through intensifying the regional integration among these economies. Further addition of some countries to their integration process can also

be supported for more export promotion to faster economic growth in order to materialize their dream of being mammoth economic force in the international market. More importantly, decision makers should create inner stimulants of exports in these economies by enhancing government consumption expenditure with regard to domestic demand. And increasing public investment is core to stimulate private investment by building infrastructures, taking capacity building programs for human resources, raising productive public capitals such as utilizing unused resources for these economies etc. Above all, policy makers of these countries should design proper macroeconomic policies in order to promote exports, which, in turn, accelerate the pace of economic growth.

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