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Causation Among Exports, Imports and Economic Growth in South Asian Countries: A Vector Error-correction Modeling Approach

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Abstract *This research attempts to examine the causal relationships among exports, imports and economic growth for the seven economies of South Asia, namely Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka using annual time series data from 1972 to 2010. We apply multivariate time series econometric tools to investigate the relationship. For checking nonstationarity for all the variables we have used techniques of Augmented Dickey-Fuller and Phillips-Perron tests. We implement the technique of Johansen's cointegration estimation procedure using a vector autoregressive (VAR) model to examine the causal relationships among the variables. In order to show the direction of the short-run and long-run causal relationships among exports, imports and economic growth, we apply the method of Granger causality based on vector error correction model (VECM). While controlling for imports the results of these methods indicate bidirectional causality between exports and output growth in Bhutan, India, Maldives and Nepal in the short-run. There is also a short-run unidirectional causality from exports to economic growth in Pakistan and Sri Lanka, from economic growth to exports in Bangladesh. This study finds long-run equilibrium relationships among exports, imports and economic growth for Bangladesh, Bhutan, India, Maldives, Nepal and Pakistan. Results, therefore, reveal the export-led growth hypothesis to be a long-run phenomenon for all countries in the region.*

Keywords: *Augmented Dickey Fuller test, Phillips-Perron test, Johansen Cointegra- tion Approach, Granger Causality*

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1. Introduction

The relationship between exports and economic growth has been explored in the literature. A growing body of trade and development literature has emphasized exports as a vehicle to accelerate GDP growth or economic growth. It is widely common postulate that export expansion is one of the main determinants of economic growth. It is argued that exports can help the process of economic growth through a variety of channels including, for example, efficient allocation of resources, economies of scale, comparative advantage, enhanced capacity utilization, improved productivity, and diffusion of technological knowledge and innovation, exchange of new ideas and production process. On the other hand, exports can be affected by output (Kaldor, 1967, Lancaster, 1980, and Krugman, 1984). Many growth related literatures argue that output growth has a positive impact on productivity growth and improved productivity or reduced unit cost is expected to facilitate exports. It could be interesting, from a policy making point of view, to study the causal nexus of exports and output in South Asian Countries.

However, imports and economic growth are closely related in many countries, as many developing countries are bound to import some commodities from industrially developed countries. Imports may have either positive or negative impact on economic growth depending upon the types of imports. If the import bundles consist of necessary food items, luxurious commodities and other unproductive ones, it may negatively affect economic growth because of pressures created on balance of payments. But if import bundles consist of industrial machinery, low cost production process, latest production system, new technology etc., it will positively affect economic growth in the long-run, although it may slower economic growth in the short-run. Imports can also help to get comparative advantage and specialization. If there is a difference between internal relative process on autarky and those that can be obtained internationally, then a country can improve its well-being by specializing in and producing the relatively less expensive domestic goods and importing goods that are relatively more expensive.

The nexus between exports and economic growth is analyzed by Rahmaddi and Ichihashi (2011) in Indonesia during the period 1771 to 2008. This paper shows that exports and economic growth exhibit bidirectional causal relationship (Taban and Aktar, 2007; Shirazi and Manap, 2005; Ismail and Harjito, 2003; Lee and Huang, 2002). Safdari et al. (2011) analyze the causal relationship between exports and economic growth for a panel of thirteen Asian developing countries over the period 1988 to 2008. Empirical analyses presented a unidirectional causality from economic growth to export (Srivastava and Kapoor, 2007).

Al-Mamun and Nath (2007) examine the link between exports and economic growth in Bangladesh using quarterly data for a period from 1976 to 2003. They find that there is a long-run unidirectional causality from exports to growth in Bangladesh.

Shirazi and Manap (2004) reinvestigate export-led growth hypothesis for Pakistan. The empirical results strongly support a long-run relationship among imports, exports and output growth. The paper finds feedback effect between import and output growth, and unidirectional causality from export to output growth. Nevertheless, this paper does not find any significant causality between import and export growth. Asafu-Adjaye and Chakraborty (1999) also find that the causality runs indirectly from exports to imports and then real output.

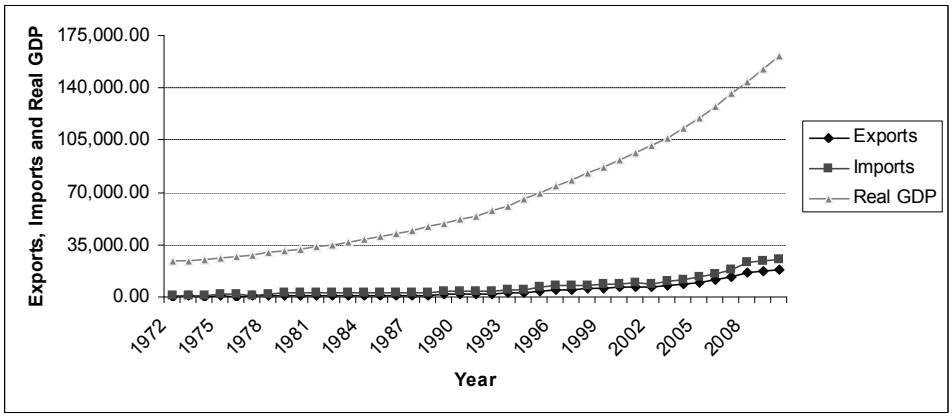
Awokuse (2008) found evidence supporting the import-led growth effect in some South American countries. Similar findings are to be found in Thangavelu and Rajaguru (2004) for India, Indonesia, Malaysia, Philippines, Singapore and Taiwan and in Awokuse (2007) for Poland. On the other hand, in Awokuse (2007) the causality is found to run in the opposite direction for the Czech Republic. Finally, and to the best of our knowledge, there is apparently no empirical evidence on the role played by imports on economic growth in China.

Humpage (2000) studies whether imports hinder or help economic growth in U.S.A. The results show that imports do not reduce or slow economic growth. By fostering specialization and the transfer of technology, they lead directly to faster economic growth and improved standards of living. Unfortunately, the benefits of specialization and technological progress do not accrue equally to everyone, and may worsen the economic lot of some people. No one, however, seriously scorns economic advancements (Li, et al. 2003; Kotan and Sayg?l?, 1999).

2. An Overview of Exports, Imports and Real GDP in South Asian Countries

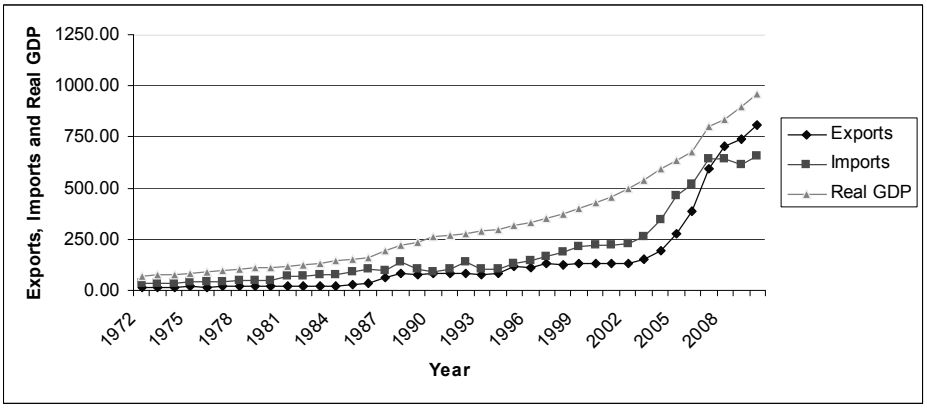
Exports and imports are major components of international trade. An overview of exports, imports and GDP is discussed in this section for South Asian countries and these are depicted in Figure 1-7. Foreign trade is of vital importance to the economic growth of Bangladesh. The country's import needs are large and in order to finance those imports, the government, since liberation, has been trying to enhance foreign exchange earnings through planned and increased exports. At present, Bangladesh's major export items are ready-made garments, raw jute, jute goods, tea, leather and frozen fish. The main import items of Bangladesh are machinery and transport equipment, petroleum and petroleum products, textile yarns fabrics and made up articles and related products, chemicals, iron and steel, and fertilizer.

Figure 1: Trend of Exports, Imports and Real GDP in Bangladesh (million US$)



Bhutan's economy is based on agriculture, forestry, tourism and the sale of hydroelectric power to India. The nation's biggest partners are India and Bangladesh, and to an extent, Italy. Export commodities of Bhutan are electricity (to India), ferrosilicon, cement, calcium carbide, copper wire, manganese, vegetable oil. After 2000, Bhutan's total volume and value of import increased somewhat faster than in the previous decades.

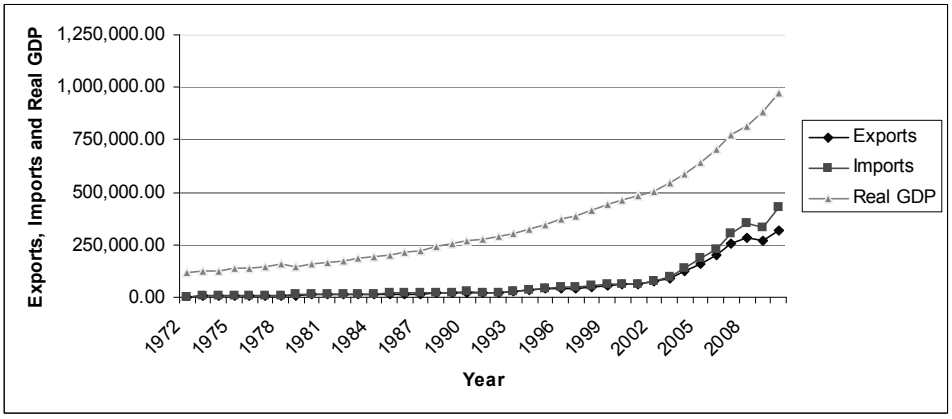
Figure 2: Trend of Exports, Imports and Real GDP in Bhutan (million US$)



India is one of the growing economies of the world. India is now aggressively pushing for a more liberal global trade regime, especially in services. Some of India's main export items are computer software, car, cotton, textiles, jute goods, tea, coffee, cocoa products, rice, wheat, pickles, mango pulp, juices, jams, preserved vegetables and RMGs. Import items of India include crude oil, precious stones, machinery, fertilizer, iron and steel, and chemicals. Although India has

steadily opened up its economy, its tariffs continue to be high when compared with other countries and its investment norms are still restrictive. This leads us to see India as a "rapid globalizer" while at the same time as a "highly protectionist" economy.

Figure 3: Trend of Exports, Imports and Real GDP in India (million US$)



In recent times, Maldives has experienced economic fluctuations. For Maldives' trade, tourism is the primary industry, accounting for close to 30% of the country's GDP. After tourism, fish is still an important industry for Maldives. After fishing, agriculture and manufacturing industries play a very important role in the economy of Maldives. The share of industry in Maldives is some 18% of the GDP. The main export bundle of Maldives includes agricultural food and beverage, arts, crafts and gifts, building and electrical, business products, business services, chemicals and plastics, clothing and fashion, health and beauty, home products, industrial products, metals and minerals, electronics, sports, toys and games, and transportation. Imports involve a variety of commodities such as ships, foods, petroleum products, clothing, textiles, capital goods, and intermediate goods.

Nepal is one of the world's poorest countries. Agriculture remains a major source of livelihood, and tourism is also important. The growing divergence between export and import caused trade deficit to increase. In 2005, the trade deficit was US$ 1211 million and in 2009 it increased to US $2720 million; in 2010 the trade deficit was around US $3000 million. Nepal's main export bundle includes carpets, clothing, leather goods, jute goods, grain, herbs and tea.

Foreign trade is important to the economy of Pakistan because of the country's need to import a variety of products. In the early 1980s, incentives were provided to industrialists to increase manufactured exports. The major export items of

Figure 4: Exports, Imports and Real GDP in Maldives (million US$)

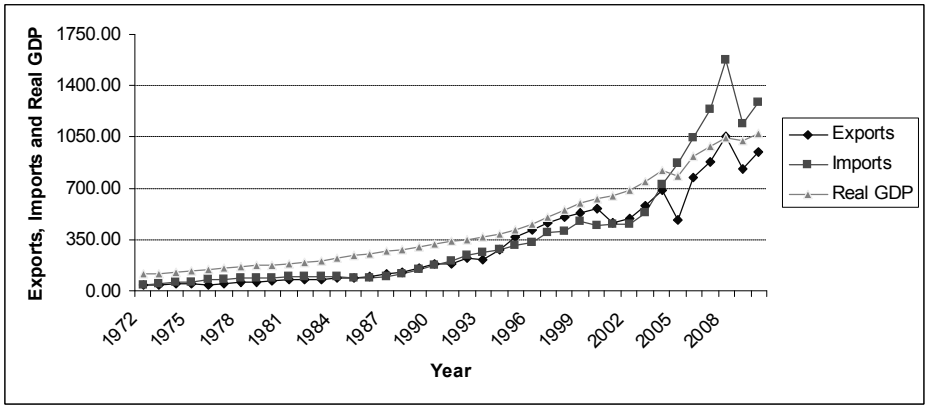
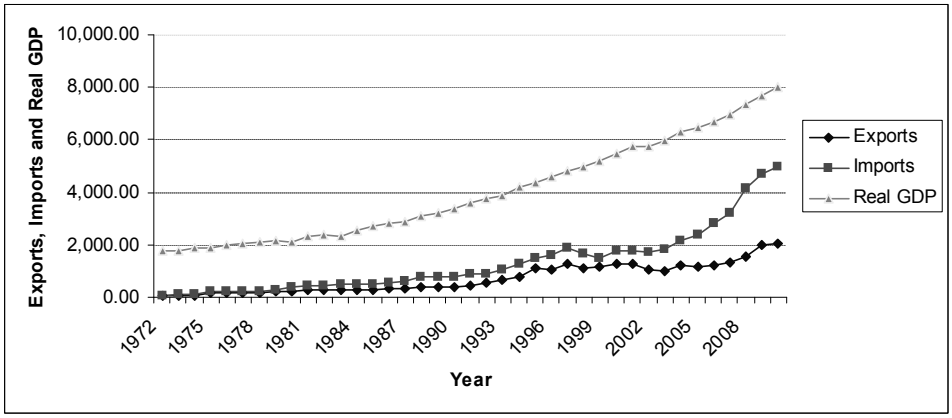


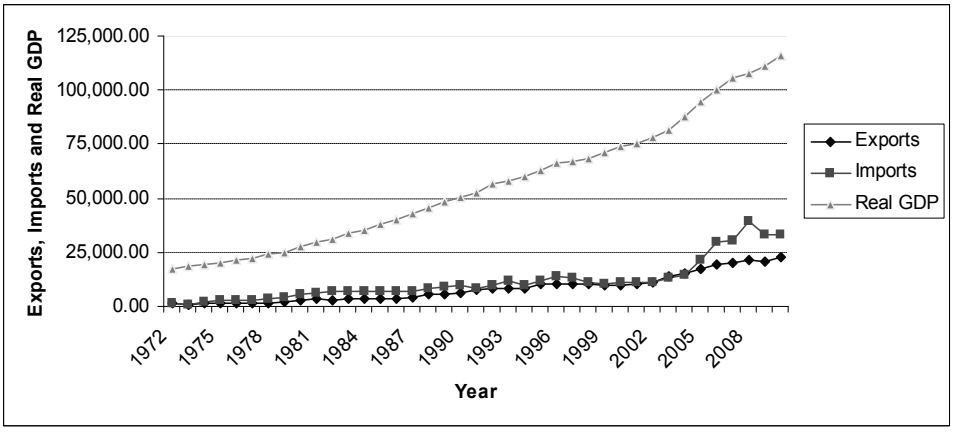
Figure 5: Exports, Imports and Real GDP in Nepal (million US$)



Pakistan are textile goods (garments, bed linen, cotton cloths, and yarn), rice, leather goods, sports goods, chemicals, manufactures, carpets and rugs. Import items of Pakistan include petroleum, petroleum products, machinery, plastics, transportation equipment, edible oils, paper and paperboard, iron and steel and tea.

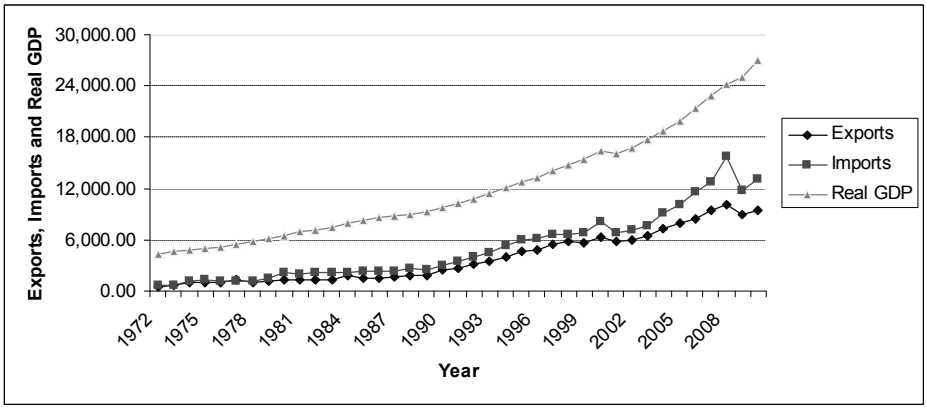
Sri Lanka is a lower-middle income developing nation. The main economic sectors of Sri Lanka are tourism, tea export, apparel, textile, rice production and other agricultural products. In addition to these economic sectors, overseas employment contributes highly in foreign exchange. The major export items of Sri Lanka are textiles and apparel, tea and spices, diamonds, emeralds, rubies, coconut products, rubber manufactures and fish. The main import items of Sri Lanka are textile, fabrics, mineral products, foodstuffs, machinery and

Figure 6: Exports, Imports and Real GDP in Pakistan (million US$)



transportation equipment, petroleum products, motor vehicles, synthetic yarn, fabrics, wheat, fertilizer, chemicals, and building materials.

Figure 7: Exports, Imports and Real GDP in Sri Lanka (million US$)



From the trend of exports and imports one understand the nature of the change in the foreign trade for the seven economies of South Asia. The export earnings of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka were, respectively, US$ 356.84, US$ 13.32, US$2,899.02, US$ 35.21, US$ 57.97, US$ 1096.08, US$ 570.18 million in 1972. In 1980 the export earnings increased to US$ 995.27, US$ 18.51, US$ 11415.8, US$ 65.20, US$ 224.58, US$ 2958.19, US$ 1296.67 million, respectively. In 2000 the export earnings of these countries were US$ 6588.07, US$ 130.47, US$ 60879.8, US$ 558.12, US$ 1279.28, US$ 9940.17, US$ 6371.58 million, respectively. The total export earnings of these

countries in 2010 stood at US$ 18546.46, US$ 810.63, US$ 319288.2, US$ 948.50, US$ 2021.32, US$ 22552.97 and US$ 9370.01 million, respectively.

The total import payments of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka were US$ 863.53, US$ 369.02, US$ 2669.7, US$ 41.01, US$ 81.08, US$ 1580.91, US$ 610.38 million, respectively, in 1972. In 1980 import payments stood at US$ 3239.43, US$ 51.14, US$ 17190.10, US$ 87.10, US$ 364.50, US$ 5709.19, US$ 2205.44 million, respectively. In 2000 these amounted to US$ 9060.86, US$ 219.59, US$ 65125.73, US$ 447.13, US$ 1781.59, US$ 10862.33, US$ 8103.47 million, respectively. The import payments of these countries were US$ 24944.61, US$ 653.53, US$ 429748.9, US$ 1284.31, US$ 4997.23, US$ 33171.28, US$ 13129.1 million, respectively, in 2010.

In 1972, the GDPs of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka were US$ 23788.67, US$ 66.32, US$ 118449.32, US$ 114.63, US$ 1763.70, US$ 17510.44, US$ 4272.87 million, respectively. In 2000, the GDPs of the above countries were US$ 91988.98, US$ 427.81, US$ 460182.03, US$ 624.34, US$ 5494.25, US$ 73952.37, US$ 16330.81 million, respectively. In 2010, the GDPs of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka stood at US$ 161619.75, US$ 961.37, US$ 971486.07, US$ 1072.37, US$ 8036.78, US$ 116334.73, US$ 27029.19 million, respectively.

3. Methodology

The empirical methodology of this paper consists of three steps, checking the time series properties of the variables, that is, testing for a unit root, testing for the long-run cointegration relationship among the variables and estimating Granger causality based on vector error-correction model (VECM) in a multivariate framework. These steps are briefly explained below.

3.1 Unit Root Test

Checking of stationarity properties of the variables is the first step of the methodology. If the variables are nonstationary, stationarity can be achieved by differencing them. The number of differencing required to make the variables stationary is called order of integration. We use the Augmented Dickey Fuller (ADF) and Phillips-Perron test to examine whether the variables are stationary or not. The ADF test is estimated by the following regression:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \Sigma \alpha_t \Delta Y_{t-1} + u_t \qquad (1)$$

where $\Delta\mathbf{Y}$ is the first difference of Y series, β_1 is a constant term, t is a trend variable, m is the number of lags which are included to allow for serial correlation in the residuals and u_t is the residual term. A test for nonstationarity of the series, Y_t, amounts to a t-test of $\delta=0$. The alternative hypothesis of stationary requires that *?* be significantly negative.

If the absolute value of the computed t-statistics for δ exceeds the absolute critical value, then the null hypothesis, that the Y_t series is not stationary, must be rejected against its alternative hypothesis. If, on the other hand, it is less than the critical value, it is concluded that the Y_t series is nonstationary.

Phillips-Perron (1988) test (PP) is also applied to test nonstationarity. The ADF test take cares of possible serial correlation in the error terms by adding the lagged difference terms of the regressand. Phillips and Perron (PP) use nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms. The test detects the presence of a unit root in a series, say Y_t, by estimating the regression as follows:

$$\Delta Y_t=\alpha+\rho Y_{t-1}+u_t \tag{2}$$

$$\Delta Y_t=\alpha+\beta t+\rho Y_{t-1}+u_t \tag{3}$$

where the second equation includes a trend variable. The PP test is the t value associated with the estimated coefficient of ρ. The series is stationary if ρ is negative and significant. The test is performed for all the variables where both the original series and the differences of the series are tested for stationarity.

3.2 Johansen's multivariate Cointegration Approach

The second step is to test for long-run relationship among the variables. We apply the Johansen's multivariate cointegration procedure to assess the long-run relationship. We formulate the Vector Autoregressive (VAR) model following Johansen as follows:

$$y_t = \mu + \sum_{k=1}^{p} \Pi_k y_{t-k} + \varepsilon_t \tag{4}$$

where y_t is an *(n x 1)* column vector of *n I(1)* variables, Π_k is a coefficient matrix, μ presents a *(n x 1)* vector of constants, p denotes the lag length, and ε_t is a disturbance term independently and identically distributed with zero mean and constant variance. Equation (4) can also be expressed in first difference form as:

$$\Delta y_t = \mu + \eta y_{t-1} + \sum_{k=1}^{p-1} \Gamma_k y_{t-k} + \varepsilon_t \tag{5}$$

where Δ is the first difference operator and I is a n × n identity matrix, $\eta = \sum_{k=1}^{p} \Pi_k - I$

$\Gamma_k = -\sum_{j=k+1}^{p} \Pi_j$ and The rank of matrix Π determines the number of cointegration vectors which is equal to the number of independent number of cointegrations. If the rank of Π equals r and $r < n$, then there exists r cointegrating relationships in the model. The number of cointegrating relations can be tested with two statistics, namely trace and maximum eigenvalue. The trace test statistic for the null hypothesis that there are at most r distinct cointegrating vectors is:

$$\lambda_{trace} = T \sum_{i=r+1}^{p} \ln(1 - \lambda_i) \tag{6}$$

where $\lambda_{r+1} \ldots . \lambda_p$ are p-r smallest estimated eigenvalues. The likelihood ratio test statistic for the null hypothesis of r cointegrating vectors against the alternative of $r+1$ cointegrating vectors is the maximum eigenvalue test and is given by:

$$\lambda_{max} = T \ln(1\text{-}\lambda_{r+1}) \tag{7}$$

2.3 Granger Causality

The notion of cointegration provides the basis for modeling both the short-run and the long-run relationships simultaneously. If it is found that the variables are cointegrated, then according to Granger representation theorem (Engle and Granger 1987), the relationship among exports, imports, remittances and economic growth can be expressed as the vector error correction mechanism in a multivariate framework. This is given below:

$$\Delta y = \alpha_{11} + \alpha_y v_{t-i} + \sum_{i=1}^{k} \delta_{11,i} \Delta y_{t-i} + \sum_{i=i}^{k} \delta_{12,i} x_{t-i} + \sum_{i=1}^{k} \delta_{13,i} m_{t-i} + \varepsilon_1 \tag{8}$$

$$\Delta x = \alpha_{21} + \alpha_x v_{t-i} + \sum_{i=1}^{k} \delta_{21,i} \Delta y_{t-i} + \sum_{i=i}^{k} \delta_{22,i} x_{t-i} + \sum_{i=1}^{k} \delta_{23,i} m_{t-i} + \varepsilon_2 \tag{9}$$

$$\Delta m = \alpha_{31} + \alpha_m v_{t-i} + \sum_{i=1}^{k} \delta_{31,i} \Delta y_{t-i} + \sum_{i=i}^{k} \delta_{32,i} x_{t-i} + \sum_{i=1}^{k} \delta_{33,i} m_{t-i} + \varepsilon_3 \tag{10}$$

This equation system constitutes VAR in first differences, which have included error correction terms and allows examining the short-run dynamics of the long-run relationship among the variables. The coefficient of the error correction term must be seen as correcting towards equilibrium subspace, i.e., how adjustment is taking place in the short-run to maintain stable equilibrium long-run relationship among the variables. The coefficients of the lagged values of the variables show whether the independent variables cause the corresponding dependent variable (Ramos, 2001).

2.4. Data

This study is completely based on secondary data. Annual data on real GDP, exports and imports are used for this study. These data are collected from World Bank's website and converted into million US$. We also consult publications like SAARC Statistical Year Book, Economic Trend, International Financial Statistics, and World Development Report.

3. Discussion of Econometric Results

3.1. Results of Unit Root

In order to investigate the stationarity properties of the variables (real GDP, exports and imports) we run the regression analysis with an intercept term with time trend for testing the presence of a unit root. Table 1 shows the results of unit root based on Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Results show that most of the series are nonstationary at level forms with trend, but stationary at first difference. For Bangladesh, GDP is stationary at level with trend at 1% level of significance, which is again stationary at first difference form.

For India, the export and GDP series are stationary but import series are nonstationary at level form, these reject the null hypothesis of nonstationarity at their first differences in case of ADF test. Output, on the other side, is also stationary at level form and also is stationary at first difference form in case of PP test. For Sri Lanka, all but GDP are nonstationary at their level forms and stationary at first differences in both case of ADF and PP test at 10% level of significance. Besides these variables, all the variables are nonstationary at level forms but stationary at first difference forms.

3.2 Results of Johansen Multivariate Cointegration

If time series turn out to be nonstationary in their levels, it is possible that stochastic trends are common across series leading to stationary combinations of the levels. This is known as cointegration. Johansen's multivariate cointegration procedure based on Vector Autoregression (VAR) provides maximum eigenvalue and trace statistics which indicate the cointegration status among the variables and the number of cointegration vector.

According to Table 2, both Trace and Maximum Eigenvalue test indicate the rejection of the null hypothesis that there is no cointegrating relationship at 1 percent level of significance for Bangladesh. This indicates the existence of one cointegrating relationships among the variables in the series for Bangladesh. In case of Bhutan, Nepal and Sri Lanka, both Trace and Maximum Eigenvalue test

Table 1: Results of Augmented Dickey-Fuller and Phillips-Perron Test for Unit Roots

	Variables	Augmented Dickey-Fuller		Phillips-Perron	
		Level	**First Difference**	**Level**	**First Difference**
Bangladesh	Exports	2.597572	-4.297700***	2.353297	-4.388177***
	Imports	1.467019	-4.945741***	1.417691	-4.951845***
	GDP	3.005879	-3.838737**	6.843553***	-3.612408**
Bhutan	Exports	-0.635766	-4.705500***	1.507172	-3.770073**
	Imports	-0.141624	-4.681240***	-0.323282	-4.678837***
	GDP	2.789996	-5.124672***	3.080215	-5.322788***
India	Exports	4.356569***	-4.125978**	1.795635	-4.171081***
	Imports	2.023144	-4.093323**	3.075343	-4.947042***
	GDP	6.497876***	-3.607269*	11.50398***	-3.335839*
Maldives	Exports	-0.624536	-3.717374**	-2.149649	-21.83577***
	Imports	1.741096	-3.536144**	-1.104810	-7.497945***
	GDP	2.493392	-5.723223***	0.258889	-17.05983***
Nepal	Exports	-1.324590	-6.315240***	-1.353560	-6.314111***
	Imports	2.375991	-3.863295**	1.993950	-3.831065**
	GDP	-0.278975	-6.352615***	0.030065	-7.564137***
Pakistan	Exports	-0.606835	-4.700288***	-0.859152	-4.702840***
	Imports	-4.304877***	-6.021180***	-1.395937	-6.037723***
	GDP	-0.496785	-3.946255**	-0.061256	-3.909090**
Sri Lanka	Exports	-2.439818	-6.418868***	-1.618349	-6.418868***
	Imports	-0.518811	-3.822445**	-1.906713	-9.255132***
	GDP	3.244631*	-4.022574**	3.382008*	-4.184752**
Significance Levels		**Critical Values**	**Critical Values**	**Critical Values**	**Critical values**
1 Percent		-4.219126	-4.226815	-4.219126	-4.226815
5 Percent		-3.533083	-3.536601	-3.533083	-3.536601
10 Percent		-3.198312	-3.200320	-3.198312	-3.200320

Note: ***, ** and * denote rejection of null hypothesis of unit root at 1%, 5% and 10% level of significance. Here we consider the variables with a trend both in level and first difference form. A variable is said to be stationary, if the absolute value of the statistics is larger than the MacKinnon asymptotic critical values.

Table 2: Results of Johansen's Cointegration Test

Countries	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
Bangladesh	None **	0.5489	39.979	29.68	35.65	None **	29.4542	20.97	25.52
	At most 1	0.2473	10.524	15.41	20.04	At most 1	10.5123	14.07	18.63
	At most 2	0.0003	0.01212	3.76	6.65	At most 2	0.01212	3.76	6.65
Bhutan	None **	0.6827	54.1799	29.68	35.65	None **	42.4775	20.97	25.52
	At most 1	0.2335	11.7024	15.41	20.04	At most 1	9.84027	14.07	18.63
	At most 2	0.0491	1.8621	3.76	6.65	At most 2	1.8621	3.76	6.65
India	None **	0.7818	90.8959	29.68	35.65	None **	56.3319	20.97	25.52
	At most 1**	0.4994	34.5639	15.41	20.04	At most 1**	25.6026	14.07	18.63
	At most 2**	0.2151	8.96135	3.76	6.65	At most 2	8.96135	3.76	6.65
Maldives	None *	0.3817	30.1083	29.68	35.65	None *	17.7884	20.97	25.52
	At most 1	0.2381	12.3199	15.41	20.04	At most 1	10.0599	14.07	18.63
	At most 2	0.0593	2.2600	3.76	6.65	At most 2	2.2600	3.76	6.65
Nepal	None **	0.6444	51.6329	29.68	35.65	None **	38.2589	20.97	25.52
	At most 1	0.2753	13.3741	15.41	20.04	At most 1	11.9160	14.07	18.63
	At most 2	0.0386	1.4580	3.76	6.65	At most 2	1.4580	3.76	6.65
Pakistan	None *	0.4888	31.8470	29.68	35.65	None *	24.8295	20.97	25.52
	At most 1	0.1119	7.0175	15.41	20.04	At most 1	4.3931	14.07	18.63
	At most 2	0.0685	2.6244	3.76	6.65	At most 2	2.6244	3.76	6.65
Sri Lanka	None **	0.5446	38.0503	29.68	35.65	None **	29.1018	20.97	25.52
	At most 1	0.1925	8.9485	15.41	20.04	At most 1	7.9109	14.07	18.63
	At most 2	0.0278	1.0376	3.76	6.65	At most 2	1.0376	3.76	6.65

Note: * (**) denotes rejection of the hypothesis at the 5% (1%) level.

indicate one cointegrating relationship, that is, the value of both Trace and Maximum Eigenvalue test statistics cannot reject the null hypothesis of at most one cointegrating relationship. For India, the value of Trace statistic rejects all the null hypothesis of cointegrating relationships, indicating three cointegrating relationships. But Maximum Eigenvalue test statistic rejects all but at most one cointegrating relationships at 1 percent level of significance. Both statistics indicate the existence of one cointegrating relationship at 5 percent level of significance for Maldives and at 1 percent level of significance for Pakistan.

3.3 Results of Granger Causality

Granger causality is used to find the direction of causality when we have cointegrating relationship among the variables. Table 3 reports the results of Granger causality.

In Table 3, for example, the common factor 1.11062 of column 4 and row 2 presents the value of F statistic of either acceptance or rejection of the null hypothesis that export does not Granger cause GDP for Bangladesh. If this value is significant, the null hypothesis is rejected meaning that export Granger causes GDP.. In case of Table 3, this value is not significant, that is, the null hypothesis cannot be rejected. Table 3 shows, for Bangladesh, that a unidirectional causality runs from GDP to exports and imports, from exports and imports. For Bhutan, there is a unidirectional causality from GDP and imports to exports, from exports to imports. In case of India, there is a unidirectional causality from economic growth to exports and imports, from imports to exports.

There is a bidirectional causality between exports and economic growth and unidirectional causality from economic growth to imports for Maldives. For Nepal, there is a unidirectional causality from economic growth, imports to exports and from exports to imports. In case of Pakistan, a bidirectional causality runs between exports and economic growth, a unidirectional causality from economic growth and exports to imports. For Sri Lanka, a bidirectional causality exists between imports and economic growth, from exports to economic growth and from imports to exports.

3.4 Results of Granger Causality Based on VECM

Granger causality tests based on VECM can show both the short-run and long-run causality among the variables and results are provided in Table 4. Columns 2, 3, 4 and 5 of Table 4 report the χ^2-statistic for the joint significance of the lagged independent variables while Column 6 provides the *t*-statistics for the error-correction terms.

The statistical significance of the χ^2-statistic and F statistics, respectively, would indicate the presence of short-run and long-run causality.

Table 4 reports the results of Granger causality tests based on vector error correction mechanism (VECM) to represent both short-run and long-run causality among the variables. Columns 3, 4 and 5 report the χ^2-statistic for the joint significance of the lagged independent variables while Column 6 provides the *t*-statistics for the error-correction terms. The statistical significance of the error-

Table 3: Results of Granger Causality Test

Countries	Dependent Variables	GDP	Exports	Imports
Bangladesh	GDP		1.11062	0.91413
			(0.34172)	(0.41108)
	Exports	4.44159*		0.84858
		(0.01985)		(0.43743)
	Imports	4.72067*	5.03113*	
		(0.01598)	(0.01259)	
Bhutan	GDP		1.72410	0.71996
			(0.19449)	(0.49449)
	Exports	4.44157*		9.24401**
		(0.01985)		(0.00068)
	Imports	2.71001	4.93712*	
		(0.08180)	(0.01353)	
India	GDP		0.30379	1.28063
			(1.23691)	(0.29172)
	Exports	19.7574**		10.7860**
		(2.6E-06)		(0.00026)
	Imports	18.0382**	0.00059	
		(5.7E-06)	(9.45643)	
Maldives	GDP		4.53246*	1.82507
			(0.01849)	(0.17759)
	Exports	5.29520*		0.24141
		(0.01031)		(0.78694)
	Imports	4.11094*	0.46468	
		(0.02576)	(0.63251)	
Nepal	GDP		0.67435	0.57679
			(0.51658)	(0.56743)
	Exports	5.31485*		7.81763**
		(0.01016)		(0.00172)
	Imports	0.84998	3.55571*	
		(0.43685)	(0.04032)	
Pakistan	GDP		3.90496*	0.55792
			(0.03038)	(0.57786)
	Exports	3.77858*		2.62701
		(0.03364)		(0.08783)
	Imports	33.0586**	6.55660**	
		(1.6E-08)	(0.00411)	
Sri Lanka	GDP		4.31325*	6.42173**
			(0.02195)	(0.00452)
	Exports	0.99907		3.47357*
		(0.37942)		(0.04313)
	Imports	10.4317**	6.19344**	
		(0.00033)	(0.00533)	

Note: * (**) denotes rejection of the hypothesis at the 5% (1%) level. Causality tests are based on Granger causality. Figures in parentheses are p-values of the F-statistic for the joint significance of variables.

correction term and the χ^2-statistic respectively would indicate the presence of long-run and short-run causality. In Table 4, X and M stands for exports and imports, respectively. For Bangladesh, the error correction term is significant for GDP and import equations, indicating a long-run causality from exports and imports to economic growth and economic growth and exports to imports. At the same time the error correction term is insignificant for export equation. There is, however, evidence of short-run unidirectional causality from economic growth to exports and imports.

For Bhutan, the error correction terms are significant for all three equations, namely, GDP, export and import equations, indicating the presence of long-run causality among them. In the short-run, however, there is evidence of bidirectional causality between exports and economic growth, while there is an evidence of unidirectional causality from imports to economic growth and exports. For India, the error correction term is insignificant for the import equation. There is also an evidence of short-run bidirectional causality between exports and imports and between imports and economic growth, while there is a unidirectional causality from economic growth to exports.

In the case of Maldives, the error correction term is insignificant but the export and import equations are significant. There is also a short-run bidirectional causality between exports and economic growth, while unidirectional causal pattern from output to imports is found. For Nepal, there is an evidence of long-run causality among the variables as error correction terms of all the three equations are significant. There is also a short-run bidirectional causality between exports and economic growth and between imports and economic growth. The error correction term is significant in import equation for Pakistan. Short-run causal patterns have been identified from economic growth to imports. In case of Sri Lanka, error correction terms are significant for export and import equations. There is, however, short-run causality from economic growth to exports and imports. Strictly speaking, one may argue that there is an evidence of export-led growth in all South Asian countries.

4. Summary and Conclusion

This paper studies the relationships existing among exports, imports and economic growth and the potential impacts of the sixth five year plan on these relationships using annual time series data from 1972 to 2010. After checking nonstationarity of the variables, Johansen's approach of cointegration is applied to investigate the number of cointegrating relationships. Then we apply Granger causality test based on vector error correction model (VECM) to investigate the

Table 4: Results of Granger Causality Based on Vector Error Correction Model

Countries	Variables	Lagged GDP	Lagged X	Lagged M	EC term
Bangladesh	GDP		0.949761	1.621792	-0.603403*
			(0.6220)	(0.4445)	[-2.08051]
	X	5.445700*		1.450911	0.170765
		(0.0457)		(0.4841)	[0.66751]
	M	11.55701**	1.378277		1.171561*
		(0.0031)	(0.5020)		[2.56307]
Bhutan	GDP		12.78554**	24.65486**	-0.465000*
			(0.0017)	(0.0000)	[-6.18191]
	X	23.76722**		7.647665*	-0.750672*
		(0.0000)		(0.0218)	[-5.91452]
	M	1.146644	0.278861		-0.530213*
		(0.5636)	(0.8699)		[-2.62287]
India	GDP		5.967100	9.142509*	-0.487650
			(0.0506)	(0.0103)	[-1.01669]
	X	72.05732**		23.39744**	0.521441
		(0.0000)		(0.0000)	[1.79050]
	M	84.85437**	14.17582**		1.672485*
		(0.0000)	(0.0008)		[4.00168]
Maldives	GDP		11.20191**	2.259766	-0.091768
			(0.0037)	(0.3231)	[-1.01317]
	X	8.756290*		5.439756	-0.745147*
		(0.0125)		(0.0659)	[-2.85721]
	M	62.71286**	2.870314		-1.527966*
		(0.0000)	(0.2381)		[-6.94630]
Nepal	GDP		32.08813**	37.77856**	-0.483095*
			(0.0000)	(0.0000)	[-8.01747]
	X	12.53594**		3.909847	-0.228511*
		(0.0019)		(0.1416)	[-2.35923]
	M	7.018189*	1.787860		-0.517324*
		(0.0299)	(0.4090)		[-3.52629]
Pakistan	GDP		8.721879*	0.174997	-0.608403
			(0.0128)	(0.9162)	[-1.87626]
	X	3.551997		0.586309	-0.349155
		(0.1693)		(0.7459)	[-1.80458]
	M	32.54348**	1.702508		1.614783*
		(0.0000)	(0.4269)		[3.83552]
Sri Lanka	GDP		3.867184	5.143207	-0.030229
			(0.1446)	(0.0764)	[-0.40238]
	X	10.86431**		0.038073	0.301150*
		(0.0044)		(0.9811)	[2.81238]
	M	22.08958**	0.075200		0.931952*
		(0.0000)	(0.9631)		[4.54605]

Note: * (**) denotes rejection of the hypothesis at the 5% (1%) level. Causality tests are based on Granger causality. Figures in parentheses are p-values of the F-statistic for the joint significance of variables.

direction of short-run and long-run causality among the variables.

Our findings suggest that exports, imports and GDP are cointegrated for the countries concerned, implying a long-run relationship amongst all these variables. However, the direction of short-run and long-run causality is not unidirectional. To summarize, however, the study confirms that export growth has been instrumental in accelerating economic growth in all the South Asian economies. The evidence of both short-run and long-run causality between export growth and economic growth and between import and economic growth points out that there are several ways in which exports can have a positive effect on economic growth. For example, exports can boost output growth in the short-run by allowing the utilization of excess capacity in cases where domestic demand is less than full capacity production. Imports may also have a long-run positive effect on economic growth but this depends on the types of imports. If the import bundles consist of daily necessaries, it will negatively affect the economic growth, while the imports of industrial machinery, technology, and the latest method of production can contribute to economic growth in the longer time perspective.

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