The Dynamics of Relationship between exports and economic growth in India

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Abstract

In this era of open economy, nations are concerned with increasing the quality of life of their citizens. And, the quality of life mainly comes from the macro-economic prosperity. Thus, fast growth of gross domestic Product has become the most important objective of any economy. There are various approaches to achieve this target of which one strategy is to promote exports of the country. At this juncture, an important issue immediately breaks the minds of economists and researchers, that is, whether export promotion leads to higher economic growth or economic growth promotes exports. Thus, this paper is an attempt to reinvestigate the dynamics of the relationship between exports and economic growth for India over the period 1970 to 2009. Applying popular time series econometric techniques of cointegration and vector error correction estimation, the study provides the evidence of stationarity of time series variables, existence of long-run equilibrium relation between them, and finally, the rejection of export-led growth hypothesis for India by the Granger causality test based on vector error correction model estimation.

Keywords: Export-led Growth Hypothesis, India, GDP, Granger Causality, Error Correction Model

JEL Classification Code: C22, C32, F43

1. Introduction

In this era of open economy, nations are concerned with increasing the quality of life of their citizens. And, the quality of life mainly comes from the macro-economic prosperity. Thus, increasing Gross domestic Product is the most important objective of any economy. There are different approaches to achieve this target of which one possibility is to promote exports. At this juncture, an important issue immediately cracks the minds of economists and researchers, that is, whether export promotion leads to higher economic growth or economic growth promotes exports growth. Thus, economists came up with different views at different times and the literature puts forward a debate for researchers and policy

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makers since the last few decades. One school of thought argues in favour of export-led growth hypothesis while the other school advocates for growth-driven export hypothesis. In addition, the existing literature also provides the evidence that export promotion leads to economic growth and economic growth leads to export promotion, i.e., the bi-directional causality between exports and economic growth.

The Export-led growth hypothesis generally reflects the relationship between exports and economic growth. The proponents of such hypothesis argue that export promotion through policies such as export subsidies or exchange rate depreciation will increase economic growth. The substance of the neo-classical arguments underlying the export-led growth hypothesis is that competition in international markets promotes economies of scale and increases efficiency by concentrating resources in sectors in which the country has a comparative advantage. These positive externalities promote economic growth (Bhagwati, 1978; Balassa, 1978; Krueger, 1978; Feder, 1982; Krueger, 1990; Vohra, 2001; Ullah et al., 2009). On the contrary, the argument that economic growth promotes export growth stands on the idea that gains in productivity give rise to comparative advantages in certain sectors that lead naturally to export growth. Also, countries with high growth rates and relatively low absorption rates must necessarily export the excess output (Arnade and Vasavada, 1995; Fosu, 1996; Thornton, 1996; Henriques and Sadorsky, 1996; Sharma and Panagiotidis, 2005). In addition, some studies demonstrate that there exists a bi-directional relationship between these variables such that export causes economic growth and economic growth causes export (Dutt and Ghosh, 1994; Thornton, 1997; Shan and Sun, 1998a; Shan and Sun, 1998b; Khalafalla and Webb, 2001).

It is due to such contradicting evidences about the dynamic relation between exports and economic growth that many developing countries are still in dilemma whether to open up their economies to promote international trade or whether they should concentrate on economic activities that will promote international trade. Today, there has been much worldwide debate about Doha Development Agenda, Trade for Aid discussion, etc. and a good number of researchers and policy makers believe that developing countries can achieve economic growth through free market while others believe that developing countries should protect their industries from imported goods and promote their economic activities which will lead to the economic growth.

Now, it is believed that the rapid growth of China and India is mainly due to the expansion of their exports. "The success of China and India largely caused by both the export-led growth and access to technology through globalization" (Stiglitz, 2007). Exports imply access to the global market and permit increased production while trade encourages efficient allocation of resources, and trade contributes to economic growth by generating long-run gains (Easterly, 2007). Thus, India can be an interesting case study of the export and economic growth relationship.

It is against this backdrop that the paper attempts to revisit the issue of the relationship between growth of exports and economic growth in case of India for the period 1970 to 2009. The rest of the paper is organised as follows: Section 2 reviews the theoretical as well as empirical literature; Section 3 discusses the data and methodology; Section 4 makes the empirical analysis; and section 5 concludes.

2. Literature Review

The argument concerning the role of exports as one of the main deterministic factors of economic growth is not new. It goes back to the classical economic theories by Adam Smith and David Ricardo, who argued that international trade plays an important role in economic growth and that there are economic gains from specialisation.

The argument of the neo-classical economists is that competition in international market promotes economies of scale and increases efficiency by concentrating resources in sectors in which the country has a comparative advantage. These positive externalities promote economic growth.

These theoretical arguments regarding exports-economic growth nexus have been empirically verified by economists and researchers at different times. A number of studies including Jung and Marshall (1985), Chow (1987), Darrat (1987), Hsiao (1987), Bahmani-Oskooee et al (1991), Kugler (1991), Dodaro (1993), Van den Berg and Schmidt (1994), Greenaway and Sapsford (1994), and Islam (1998) have had adopted time series analysis for exploring the causal liaison between exports growth and output growth. Using the Granger (1969), Sims (1972) and Hsiao (1987) causality procedures, these studies failed to provide an unvarying conclusion about the export-led growth hypothesis. However, these time series studies were not free from disparagement. Although standard Granger or Sims tests are only valid if the original time series are not cointegrated, none of these studies checked the cointegrating properties of the time-series variables involved. When two or more time series variables are cointegrated, inferences based on traditional time-series modelling techniques will be misleading, as pointed out by Granger (1988), this is because traditional causality tests would miss some of the "forecastability", hence, reach incorrect conclusions about causality. Moreover, all the studies reviewed above used growth of Gross Domestic Product (GDP) and that of exports which are akin to first differencing and filter out long-run information. In order to alleviate such occurrences, cointegration and error-correction models have been recommended to combine the short-term as well as long-run information. Bahmani-Oskooee and Alse (1993) took all these issues into account and employed quarterly instead of annual data for the nine countries studied. The study found strong empirical support for two-way causality between exports growth and GDP growth in eight out of nine countries.

Darrat (1986) worked on four Asian countries, (Hong Kong, South Korea, Singapore, and Taiwan) and found no evidence of unidirectional causality from exports to economic growth in all the four economies. In the case of Taiwan, however, the study detected unidirectional causality from economic growth to export growth.

Kim (1993) has examined the major trends of key macroeconomic variables in South Korea and Chile and correlated them to export performance. Kim identified exports as a major source of economic growth and provided the evidence of the validity of the claim that an open and trade-oriented economy is not only the best guarantee for long-term economic growth, but it lightens the initial impacts of external shocks. Kim, further, mentioned that there are factors other than trade which increase economic growth.

Erfani (1999) examined the causal relationship between economic performance and exports over the period of 1965 to 1995 for several developing countries in Asia and Latin America. The results showed the significant positive relationship between exports and economic growth. This study provides the evidence of export-led growth hypothesis.

Vohra (2001) showed the relationship between the exports and economic growth in India, Pakistan, Philippines, Malaysia, and Thailand for the period 1973 to 1993. The empirical results indicated that when a country has achieved some level of economic development then the exports have a positive and significant impact on economic growth. The study also showed the importance of liberal market policies by pursuing export expansion strategies, and by attracting foreign investments.

Subasat (2002) investigated the empirical linkages between exports and economic growth. The study suggested that the more export-oriented countries like middle-income countries grow faster than the relatively less export-oriented countries. The study further showed that export promotion does not have any significant impact on economic growth for low and high income countries.

Amavilah (2003) determined the role of exports in economic growth by analyzing Namibia's data from 1968 to 1992. Results explained the general importance of exports, but the study finds no discernible sign of accelerated growth due to exports.

Lin (2003) stated that 10 per cent increase in exports cause 1 per cent increase in GDP in the 1990s in China on the basis of new proposed estimation method, when both direct and indirect contributions are considered.

Shirazi et al (2004) studied the short-run and long-run relationship among real exports, real imports, and economic growth on the basis of co-integration and multivariate Granger causality test as developed by Toda and Yamamoto (1995) for the period 1960 to 2003.This study showed a long-run relationship among imports, exports, and economic growth and found unidirectional causality from exports to output. But, it did not find any significant causality between imports and exports.

Thurayia (2004) studied the relationship between exports and economic growth experience in Saudi Arabia and Sudan. Results showed that the growth rate in total exports in Saudi Arabia had an active role in achieving economic growth while it had a weak influence in Sudan. The results of cointegration and error correction models showed a positive effect of exports on GDP in the short- and long- run, which confirms the validity of the hypothesis of export-led growth in Saudi Arabia, and Sudan.

Mah (2005) studied the long-run causality between exports and economic growth for China with the help of the significance of error correction term, EC_{t-1} . This study indicates that export expansion is insufficient to explain the patterns of real economic growth.

Tang (2006) stated that there is no long-run relationship among exports, real Gross Domestic product, and imports. This study further shows no short- and long-run causality between export expansion and economic growth in China on the basis of Granger causality test while economic growth does Granger-cause imports in the short-run.

Jordaan (2007) analyzed the causality between exports and GDP of Namibia for the period 1970 to 2005. The export-led growth hypothesis is tested through Granger causality

and cointegration models. It tests whether there is unidirectional or bi-directional causality between exports and GDP. The results revealed that exports Granger-cause GDP and GDP per capita, and suggested that the export-led growth strategy through various incentives has a positive influence on growth.

Rangasamy (2008) examined the exports and economic growth relationship for South Africa, and provides the evidence that the unidirectional Granger causality runs from exports to economic growth.

Pazim (2009) tested the validity of export-led growth hypothesis in three countries by using panel data analysis. And, it is concluded that there exists no significant relationship between the size on national income and amount of exports for these countries on the basis of one-way random effect model. The panel unit root test shows that the process for both GDP and exports at first glance is not stationary, while the panel co-integration test indicates that there is no co-integration relationship between the exports and economic growth for these countries.

Ullah et al (2009) re-investigated the export-led growth hypothesis using time series econometric techniques over the period of 1970 to 2008 for Pakistan. The results reveal that export expansion leads to economic growth.

Elbeydi, Hamuda and Gazda (2010) investigated the relationship between exports and economic growth for Libya for the period 1980 to 2007. The findings indicate that there exists a long-run bi-directional causality between exports and income growth, and thus, the export promotion policy contributes to the economic growth of Libya.

The study of the dynamics of the relation between growth of exports and economic growth has been addressed by a number of researches in the context of India. Nandi and Biswas (1991) found the evidence of unidirectional causality from growth of exports to economic growth. This study does not test for stationarity and conduct Sims causality test on the levels of the income and export variables. Given that the levels of the income and export variables are usually non-stationary, the results are unreliable.

Sharma and Dhakal (1994) offer some evidence of the export-led growth hypothesis for India, but the empirical evidence offered by it is unreliable. The study concludes that the income and export series for India are non-stationary using the Phillip-Perron test. It tests for causality, but does not test for cointegration. However, the correct application of Granger tests requires the identification of a possible cointegrating relationship.

Bhat (1995) re-examines the exports-economic growth nexus for India, and finds evidence of bi-directional causality between growth of exports and economic growth. Xu (1996) confirms rejection of the export-led growth hypothesis for India. Ghatak and Price (1997) conclude that growth of exports is caused by output growth in India. Dhawan and Biswal (1999) examine the same issue for the period 1961 to 1993, and find that growth in GDP causes growth in exports while causality from exports to GDP appears to be a short-run phenomenon.

Nidugala (2000) finds that exports had a crucial role in influencing GDP growth in the 1980s. Anwar and Sampath (2000) examine the export-led growth hypothesis for 97 countries (including India, Pakistan and Sri Lanka) for the period 1960 to 1992. They

found the evidence of unidirectional causality in the case of Pakistan and Sri Lanka, and no causality in the case of India. However, Kemal et al (2002) finds a positive association between exports and economic growth for India as well as for other economies of South Asia.

In case of India, Chandra (2000; 2002) found bi-directional causal relationship between growth of exports and GDP growth which is a short-run causal relation, as cointegration between growth of exports and GDP growth was not found.

Sharma and Panagiotidis (2004) test the export-led growth hypothesis in the context of India, and the results strengthen the arguments against the export-led growth hypothesis for the case of India.

Raju and Kurien (2005) analyzed the relationship between exports and economic growth in India over the pre-liberalization period 1960-1992, and found strong support for unidirectional causality from exports to economic growth using Granger causality regressions based on stationary variables, with and without an error-correction term.

Dash (2009) analyzes the causal relationship between growth of exports and economic growth in India for the post-liberalization period 1992-2007, and the results indicate that there exists a long-run relationship between output and exports, and it is unidirectional, running from growth of exports to output growth.

It is, therefore, clear from the above literature review that the evidence regarding exports-economic growth nexus is rather ambiguous and mixed. A number of studies support the export-led economic growth while others do not. Furthermore, studies on this issue in the context of India are only a few, and again provide mixed evidences. Also, the literature lacks studies including the period of recent global financial crisis. Therefore, this paper is an attempt to re-investigate the exports-economic growth nexus for India considering the period of recent global financial downsizing. This study shall provide the useful information helpful to policy makers. It can serve as a reference to subsequent research works on the issue 'exports-economic growth nexus' in the context of India.

3. Data and Methodology

The objective of this paper is to investigate the dynamics of the relationship between exports and economic growth in India using the annual data for the period 1970 to 2009. In this study, the variables are Total Exports by India (EX) and Economic Growth (EG). Total Exports by India is the sum of oil, and non-oil exports expressed in crores of rupees. And, the real Gross Domestic Product (GDP) is used as the proxy for economic growth in India. All necessary data for the sample period are obtained from the Handbook of Statistics on Indian Economy published by Reserve Bank of India[1]. All the variables are taken in their natural logarithms to avoid the problems of heteroscedasticity.

The estimation methodology employed in this study is the cointegration and error

[1] See, the web data at: http://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook of Statistics on Indian Economy

correction modeling technique. The entire estimation procedure consists of three steps: first, unit root test; second, cointegration test; third, the error correction model estimation.

3.1 Unit Root Test

The econometric methodology first examines the stationarity properties of each time series of consideration. The present study uses Augmented Dickey-Fuller (ADF) unit root test to examine the stationarity of the data series. It consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms and optionally, a constant and a time trend. This can be expressed as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta Y_{t-j} + \varepsilon_t \ . \qquad (1)$$

The additional lagged terms are included to ensure that the errors are uncorrelated. In this ADF procedure, the test for a unit root is conducted on the coefficient of Y_{t-1} in the regression. If the coefficient is significantly different from zero, then the hypothesis that Y_t contains a unit root is rejected. Rejection of the null hypothesis implies stationarity. Precisely, the null hypothesis is that the variable Y_t is a non-stationary series ($H_0 : \alpha_2 = 0$) and is rejected when α_2 is significantly negative ($H_a : \alpha_2 < 0$). If the calculated value of ADF statistic is higher than McKinnon's critical values, then the null hypothesis (H_0) is not rejected and the series is non-stationary or not integrated of order zero, I(0). Alternatively, rejection of the null hypothesis implies stationarity. Failure to reject the null hypothesis leads to conducting the test on the difference of the series, so further differencing is conducted until stationarity is reached and the null hypothesis is rejected. If the time series (variables) are non-stationary in their levels, they can be integrated with I(1), when their first differences are stationary.

3.2 Cointegration Test

Once the unit roots are confirmed for data series, the next step is to examine whether there exists a long-run equilibrium relationship among the variables. This calls for cointegration analysis which is significant so as to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a Vector Auto-Regression (VAR) model in the first difference is mis-specified due to the effects of a common trend. If cointegration relationship is identified, the model should include residuals from the vectors (lagged one period) in the dynamic VECM system. In this stage, Johansen's cointegration test is used to identify cointegrating relationship among the variables. The Johansen method applies the maximum likelihood procedure to determine the presence of cointegrated vectors in non-stationary time series. The testing hypothesis is the null of non-cointegration against the alternative of existence of cointegration using the Johansen maximum likelihood procedure.

In the Johansen framework, the first step is the estimation of an unrestricted, closed

p^{th} order VAR in k variables. The VAR model as considered in this study is:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_p Y_{t-p} + BX_t + \varepsilon_t \quad (2)$$

Where Y_t is a k -vector of non-stationary I(1) endogenous variables, X_t is a d -vector of exogenous deterministic variables, A_1, ..., A_p *and* B are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Since most economic time series are non-stationary, the above stated VAR model is generally estimated in its first-difference form as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + BX_t + \varepsilon_t \quad (3)$$

$$\text{Where, } \Pi = \sum_{i=1}^{p} A_i - I, \quad \textit{and} \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r < k$, then there exist $k \times r$ matrices α *and* β each with rank r such that $\Pi = \alpha\beta'$ *and* $\beta' Y_t$ is I(0). r is the number of co-integrating relations (the *co-integrating rank*) and each column of β is the co-integrating vector. α is the matrix of error correction parameters that measure the speed of adjustments in ΔY_t.

The Johansen approach to cointegration test is based on two test statistics, viz., the trace test statistic, and the maximum eigenvalue test statistic.

3.2.1 Trace Test Statistic

The trace test statistic can be specified as: $\tau_{trace} = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i)$, where λ_i is the ith largest eigenvalue of matrix Π and T is the number of observations. In the trace test, the null hypothesis is that the number of distinct cointegrating vector(s) is less than or equal to the number of cointegration relations (r).

3.2.2 Maximum Eigenvalue Test

The maximum eigenvalue test examines the null hypothesis of exactly r cointegrating relations against the alternative of r + 1 cointegrating relations with the test statistic: $\tau_{\max} = -T \log(1 - \lambda_{r+1})$, where λ_{r+1} is the $(r+1)^{th}$ largest squared eigenvalue. In the trace test, the null hypothesis of $r = 0$ is tested against the alternative of r + 1 cointegrating vectors.

It is well known that Johansen's cointegration test is very sensitive to the choice of lag length. So, at first a VAR model is fitted to the time series data in order to find an appropriate lag structure. The Akaie Information Criterion (AIC), Schwarz Criterion (SC)

and the Likelihood Ratio (LR) test are used to select the number of lags required in the cointegration test.

3.3 Vector Error Correction Model (VECM)

Once the cointegration is confirmed to exist between variables, then the third step entails the construction of error correction mechanism to model dynamic relationship. The purpose of the error correction model is to indicate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state.

A Vector Error Correction Model (VECM) is a restricted VAR designed for use with non-stationary series that are known to be cointegrated. Once the equilibrium conditions are imposed, the VECM describes how the examined model is adjusting in each time period towards its long-run equilibrium state. Since the variables are supposed to be cointegrated, then in the short-run, deviations from this long-run equilibrium will feedback on the changes in the dependent variables in order to force their movements towards the long-run equilibrium state. Hence, the cointegrated vectors from which the error correction terms are derived are each indicating an independent direction where a stable meaningful long-run equilibrium state exists.

The VECM has cointegration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge on their cointegrating relationship while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The dynamic specification of the VECM allows the deletion of the insignificant variables, while the error correction term is retained. The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state.

In this study the error correction model as suggested by Hendry (1995) has been used. The general form of the VECM is as follows:

$$\Delta X_t = \alpha_0 + \lambda_1 EC^1{}_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta X_{t-i} + \sum_{j=1}^{n} \alpha_j \Delta \mathrm{Y}_{t-j} + \varepsilon_{1t} \tag{4}$$

$$\Delta \mathrm{Y}_t = \beta_0 + \lambda_2 EC^2{}_{t-1} + \sum_{i=1}^{m} \beta_i \Delta \mathrm{Y}_{t-i} + \sum_{j=1}^{n} \beta_j \Delta X_{t-j} + \varepsilon_{2t} \tag{5}$$

Where Δ is the first difference operator; EC_{t-1} is the error correction term lagged one period; λ is the short-run coefficient of the error correction term ($-1 < \lambda < 0$); and ε is the white noise. The error correction coefficient (λ) is very important in this error correction estimation as the greater co-efficient indicates higher speed of adjustment of the model from the short-run to the long-run.

The error correction term represents the long-run relationship. A negative and significant coefficient of the error correction term indicates the presence of long-run causal relationship. If both the coefficients of error correction terms in both the equations

are significant, this will suggest the bi-directional causality. If only λ_1 is negative and significant, this will suggest a unidirectional causality from Y to X, implying that Y drives X towards long-run equilibrium, but not the other way around. Similarly, if λ_2 is negative and significant, this will suggest a unidirectional causality from X to Y, implying that X drives Y towards long-run equilibrium but not the other way around.

On the other hand, the lagged terms of ΔX_t and ΔY_t appeared as explanatory variables, indicating a short-run cause and effect relationship between the two variables. Thus, if the lagged coefficients of ΔX_t appear to be significant in the regression of ΔY_t, this will mean that X causes Y. Similarly, if the lagged coefficients of ΔY_t appear to be significant in the regression of ΔX_t, this will mean that Y causes X.

4. Empirical Analysis

At the outset, the Pearson's correlation coefficient between exports and real GDP is calculated over the sample period, and its significance is tested by the t-test. The value of Pearson's correlation coefficient (r) between these two time series over the sample period is 0.99. It shows that exports and real GDP are positively related in India and that a very high degree of correlation is evident between them. To test whether this value of 'r' shows a significant relationship between the two time series, student's t-test is used. The null hypothesis of the test is $r = 0$ against the alternative of $r \neq 0$. Since the t-statistic at 37 degrees of freedom is 42.68, and the critical t-value at 5 per cent level of significance is less than it, the null hypothesis is rejected. So, it can be said that the correlation between exports and real GDP is statistically significant. Correlation, however, does not say anything about long-run relationship, and thus, leaves unsettled the debate concerning the long-run relationship between exports and real economic growth measured by real gross domestic product.

Now, it is required to determine the order of integration for each of the two variables used in the analysis along with their stationarity tests. The Augmented Dickey-Fuller unit root test has been used for this purpose and, the results of such test are reported in Table 1.

Table 1: Results of Augmented Dickey-Fuller Unit Root Test

Variables in their First Differences with intercept	ADF Statistic	Critical Values	Decision
LEX_t	**-4.94**	**At 1% : -4.22 At 5% : -3.53 At 10% : -3.20**	**Reject Null hypothesis of no unit root**
$LGDP_t$	**-4.51**	**At 1% : -4.22 At 5% : -3.53 At 10% : -3.20**	**Reject Null hypothesis of no unit root**

Source: Author's own Calculation

It is clear from Table 1 that the null hypothesis of no unit roots for both the time series are rejected at their first differences since the ADF test statistic values are less than the critical values at 10, 5 and 1 per cent levels of significances. Thus, the variables are stationary and integrated into the same order, i.e., I(1).

In the next step, the cointegration between the stationary variables has been tested by the Johansen's Trace and Maximum Eigenvalue tests. The results of these tests are shown in Table 2.

Table 2: Results of Johansen's Cointegration Test

Hypothesized Number of Cointegrating Equations	Eigen Value	Trace Statistics	Critical Value at 5% (p-value)	Maximum Eigen statistics	Critical Value at 5% (p-value)
None*	0.432	26.465	20.261(0.006)	20.421	15.892(0.009)
At Most 1	0.154	6.044	9.164(0.187)	6.044	9.164(0.187)

Source: Author's own Calculation

* denotes rejection of the hypothesis at the 0.05 level

The Trace test indicates the existence of two cointegrating equations at 5 per cent level of significance. And, the maximum eigenvalue test makes the confirmation of this result. Thus, the two variables of the study have long-run equilibrium relationship between them. But in the short-run there may be deviations from this equilibrium, and it is required to verify whether such disequilibrium converges on the long-run equilibrium or not. Thus, Vector Error Correction Model is used to generate such short-run dynamics. Error correction mechanism provides a means whereby a proportion of the disequilibrium is corrected in the next period. So, error correction mechanism is a means to reconcile the short-run and long-run behaviour.

The estimation of a Vector Error Correction Model (VECM) requires selection of an appropriate lag length. The number of lags in the model is determined according to the Schwarz Information Criterion (SIC). The lag length that minimizes the SIC is 1. Then, an error correction model with the computed t-values of the regression coefficients is estimated and the results are reported in Table 3.

The estimated coefficient of error-correction term (EC^{1}_{t-1}) in the LEX equation is statistically significant and has a negative sign, which confirms that there is not only any problem in the long-run equilibrium relation between the independent and dependent variables at 5 per cent level of significance, but its relative value (-0.167) for India shows the rate of convergence to the equilibrium state per year. Precisely, the speed of adjustment of any disequilibrium towards a long-run equilibrium is that about 16.7 per cent of the disequilibrium in exports is corrected each year. Furthermore, the negative and statistically significant value of error correction coefficient indicates the existence of a long-run causality between the variables of the study. And, this causality is unidirectional in our

model being running from the real GDP to exports. In other words, the changes in exports can be explained by real GDP.

Table 3: Estimates for VECM Regression

$$\Delta LEX_t = 0.081 - 0.167EC^1_{t-1} + 0.205\Delta LEX_{t-1} + 0.411\Delta LGNP_{t-1}$$
$$\Delta LGDP_t = 0.082 - 0.0143EC^2_{t-1} + 0.103\Delta LEX_{t-1} + 0.216\Delta LGDP_{t-1}$$

Independent Variable	ΔLEX_t	$\Delta LGDP_t$
Constant **[t-statistic]** **(p-value)**	**0.081** **[**1.591**]** **(0.120)**	**0.082** **[**4.014**]** **(0.00027)**
EC_{t-1} **[t-statistic]** **(p-value)**	EC^1_{t-1} **= -0.167** **[**-1.836**]** **(0.074)**	EC^2_{t-1} **= 0.0143** **[**-0.393**]** **(0.696)**
ΔLEX_{t-1} **[t-statistic]** **(p-value)**	**0.205** **[**1.242**]** **(0.222)**	**0.103** **[**1.557**]** **(0.127)**
$\Delta LGDP_{t-1}$ **[t-statistic]** **(p-value)**	**0.411** **[**1.010**]** **(0.319)**	**0.216** **[**1.325**]** **(0.193)**

Source: Author's own Calculation

The existence of Cointegration implies the existence of Granger causality at least in one direction (Granger, 1988). The long-run causality test from the VECM indicates that causality runs from real GDP to exports, since the coefficient of the error term in LEX equation is statistically significant and negatively based on standard t-test which means that the error term (EC^1_{t-1}) contributes to explain the changes in exports. However, the coefficient of the error correction term in the GDP equation is negative, but statistically insignificant which means that the error correction term (EC^2_{t-1}) does not contribute to explain the changes in real GDP. Therefore, there is unidirectional causality running from real GDP to exports.

The coefficients of the first difference of LEX and LGDP lagged one period in LEX equation in Table 3 are statistically insignificant which indicate the absence of short-run causality from real GDP to exports based on VECM estimates. In order to confirm the result of the short-run causality between the ΔLEX and the ΔLGDP based on VECM estimates, a standard Granger causality test is also performed based on the F-value.

Table 4: Results of Granger Causality Test

Null Hypothesis	F-Statistic	Probability	Decision
ΔLEX does not Granger Cause ΔLGDP	**2.522**	**0.096**	**Accept**
ΔLGDP does not Granger Cause ΔLEX	**1.324**	**0.280**	**Accept**

Source: Author's own Calculation
(Number of lags = 2)

The results in Table 4 indicate that real GDP does not Granger-cause the exports at 5 per cent level of significance. This result supports the previous result obtained from VECM that there is no short-run causality at 5 per cent level of significance. Based on this causality tests, changes in the real GDP cause changes in exports in the long-run, but not in the short-run.

5. Summary and Conclusion

In this paper, the relationship between exports and economic growth in a developing country like India has been investigated using popular time series methodologies. The data properties are analyzed to determine the stationarity of time series using the Augmented Dickey-Fuller unit root test which indicates that the two series are I(1). The results of the Cointegration test based on Johansen's procedure indicate the existence of the Cointegration between exports and real GDP. Therefore, the two variables of the study have a long-run equilibrium relationship between them, although they may be in disequilibrium in the short-run. The vector error correction model based on VAR indicates that about 16.7 per cent of disequilibrium is corrected every year. In addition, the negative and significant error correction term in LEX equation supports the existence of a long-run equilibrium relationship between real GDP and exports. Furthermore, the estimates of the VECM indicate the existence of a unidirectional causality running from real GDP to exports. The Granger causality test indicates that there is a causal relationship running from GDP to exports in the long-run, but not in the short-run.

The results of the empirical analysis lead to the conclusion that both exports and economic growth are related to past deviations (error correction terms) from the empirical long-run relationship. It implies that all variables in the system have a tendency to quickly revert back to their equilibrium relationship. This means that any increase in real GDP would have a positive impact on the growth of exports in the long-run. In other words, India provides the evidence of growth-driven exports over the sample period. This finding, thus, rejects the export-led growth hypothesis in India and corroborates the studies of Xu (1996), Ghatak and Price (1997), and Dhawan and Biswal (1999). Moreover, this study finds just the opposite result of Dash (2009); that it is exports that have promoted growth in India in the period 1992 to 2007, not the reverse. Thus, leaving the issue unsettled may be due to the inclusion of a relatively small time horizon in Dash (2009) and about a quite long sample period (about 40 years) in this study.

The fact is that India's economy is mostly dependent on its large domestic market with external trade accounting for only 20 per cent of the country's GDP[2]. In 2008, India accounted for 1.45 per cent of global merchandise trade and 2.8 per cent of global commercial services export. This supports the finding that the trend in India is not exports-led growth but rather growth-led exports.

In 2008-09, global financial meltdown and economic recession in developed economies were the major contributors in India's economic slowdown. Due to this, India's exports declined by 29.2 per cent in June 2009[3]. This steep decline was because countries were hit the hardest by the global recession, such as the United States and members of the European Union, account for more than 60 per cent of Indian exports. The later part of 2009 to April 2010, there has been a remarkable surge in India's exports. In April 2010, exports by India reported an increase by 36.2 per cent higher than the level in April 2009. Recently it is further reported that India's export increased by 23 per cent year-on-year basis in September 2010[4]. All these support the empirical evidence that the long-term trend may not be exports-led growth in India. The policy implication of such empirical evidence may be that the Government of India and other policy-planning bodies should devise prudential norms and policies to make the macro-economic fundamentals of the country strong enough to absorb the external shocks thereby achieving a fast growth of real economic variables to ensure a noticeable surge in the country's exports. In this direction, increasing domestic and foreign investments in key areas and ensuring price, interest rate, forex and political stabilities would go a long way.

However, further investigations are required to resolve such moot point using relatively longer time series, and incorporating in the study more number of macro-economic variables that governs the growth of exports by the country as well as the economic growth of the country.

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