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Exports, imports and economic growth in India: Evidence from cointegration and causality analysis

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Abstract. *The relationship between exports, imports and economic growth in India has been analysed by a large number of empirical studies in the recent past. However, this paper examines the relationship between exports, imports and economic growth in an unexplored way. The study uses monthly dataset for the first time. Johansen's Co-integration and Granger causality tests were employed in the empirical analysis, using Augmented Dickey Fuller (ADF) and Dickey Fuller (DF) tests. The present study covers data of 12 years' period from April 2005 to March 2017. The variables used for the study are of I (1) i.e. first order of difference means that they are stationary at first order difference. The Johansen and Juselius Cointegration test was used to determine the presence of a cointegration vector in the variables. Both the 'Trace and Max-Eigen' values specified cointegration at 5 percent level of significance, specifying that the variables have a long run relationship. The results of the Granger causality test show that there is bidirectional causality running between exports and economic growth (IIP) as well as imports and economic growth. Therefore, the study confirms that there is bidirectional causality has been found between exports and economic growth which support export-led growth and growth-led export hypothesis. However, this study finally suggests that both growth as well as export promotion strategy are to be pursued consistently with an emphasis on sustainable and inclusive growth.*

Keywords: exports, imports, economic growth, cointegration, causality and India.

JEL Classification: C32; F43; O11.

1. Introduction

The relationship between exports, imports and economic growth occupies the center stage in development literature when economists try to analyse the different levels of economic growth of an economy (Shihab et al., 2014). Exports play an important role in the economic development of any country and are considered as a major stimulus for domestic production by making the best use of natural, human and other resources. Over the past several decades, there has been a great debate among the scholars and academicians between two hypotheses in the trade and development literature, i.e., Exports-led Growth (ELG) and Growth-leg Exports (GLE) hypothesis. Most of the empirical studies point out that the growth of exports has a positive effect on economic growth (ELG hypothesis) for instance (Michaely, 1977; Balassa, 1978; Feder, 1982; Helpman and Krugman 1985; Krueger 1985; Al-Yousif, 1997; Vohra, 2001; SAbual-Foul, 2004; Abou-Stait, 2005; Tang et al., 2015).

On the other hand, several studies have supported the bidirectional causal relationship between exports and economic growth (Ghartey, 1993; Edwards, 1998; Werenheimer, 2000; Ramos, 2001; Hatemi-J, 2002; Awokuse, 2007; Balcilar and Ozdemir, 2013). In distinction to the Export-led Growth hypothesis, studies such as Bhagwati (1988) have pointed that an increase in gross domestic product (GDP) normally leads to a corresponding growth of trade, unless the trends of growth-induced supply as well as corresponding demand forms an anti-trade bias. Moreover, few empirical studies note that the economic growth can affect positively exports (GLE hypothesis) (Oxley, 1993; Sharma and Dhakal, 1994; Ghatak and Price, 1997; Shan and Tian 1998).

In the case of India, the different empirical evidences have been put forth such as (Ghatak and Price, 1997; Agrawal, 2014; Dhawan and Biswal, 1999; Marjit and Raychaudhari, 1997; Sharma and Panagiotidis, 2005; Kaushik and Klein, 2008). In the conclusion, the empirical literature on exports, imports and economic growth has presented mixed evidence of the long-run relationship as well as the direction of the causal relationship. However, it depends on the sample of the study period, frequency of data and methodology which is applied. Export-led growth (ELG) hypothesis examined by various studies in India give relatively more weight of economic growth to exports. This study examines whether increasing share of exports, exports growth as well as imports growth leads to economic prosperity in India or not. However, the main aim of the present study is to explore the long-run relationship between the variables and to investigate the direction of the causality between exports, imports and economic growth in India in a new dimension.

This paper contributes to the prevailing literature and tries to fill the following gaps arrived. First, the studies which examined the relationship between exports, imports and economic growth have mainly focused on the annual data. This limitation will not give a clear picture hence we examine the monthly data so as to bring out a clear picture. Second, most studies that explore the export, import and growth nexus for India, do not tend to cover the recent time period. Hence, the present study investigates a robust data set for a period of 12-years recent time period (April 2005 to March 2017). It is, therefore, a more up-to-date empirical investigation for India. Therefore, this study will provide policy for the long-run economic growth of India. The rest of the study is

organized as follows: Section 2 presents the review of the literature. Section 3 briefly describes the data and methodology. Section 4 presents the empirical results and interpretation of the results. The final section provides conclusion and policy implication.

2. Review of literature

There is an extensive literature focusing on the causal relationship between imports, exports and economic growth. This literature emphasizes on the benefits of external oriented trade policy of export promotion over the shortcomings of inward-oriented trade policy of import substitution. However, some empirical studies found the evidence in support of the ELG hypothesis others found evidence in support of the GLE hypothesis whereas several empirical evidences demonstrate a bidirectional causal relationship. There is the celebrated argument about the greater success of export-oriented industrial development (Bhagwati, 1982; Srinivasan, 1985), as compared to import-substituting industrialisation (Myrdal, 1957; Frank, 1969). The contrasting views on trade as an "engine" of growth (Lewis, 1980) or a "handmaiden" of growth (Kravis, 1970), are also well-known. There have been various studies that have found some relationship between exports or export growth and economic growth (GDP). In the case of emerging countries, analytical work formerly focused on association between exports and income (Emery, 1967; Kravis, 1970), moving on to investigations with insufficient samples (Balassa, 1978), followed by studies aiming on aggregate production functions, that comprised exports as an independent variable (Feder, 1983). Hence, it is highly appropriate to provide a brief review of the empirical studies done in this field and also it is helpful to identify the areas which need further research.

Jung and Marshall (1985) have examined causality between exports and economic growth for 37 emerging countries. The study found evidence in support for Export-led Growth hypothesis only for Ecuador, Indonesia, Costa Rica, and Egypt for the period of 1950 to 1981. Chow (1987) investigated the causality between exports of industrial goods and industrial output growth in eight Newly Industrialized Countries (NIC) using Sim's causality test in a bi-variate model. He found robust bidirectional causality between these variables for the majority of the NIC's for the period of 1960 to 1980. Berg and Schmidt (1994) have examined the Export-led growth hypothesis for 17 Latin American countries and also found the co-integration relationship for 11 nations. Similarly, this study found a positive as well as significant effect of export on economic growth in Peru and Colombia whereas no significant effect was found in the case of Argentina. Afzal (2006) found a stable as well as strong relationship between economic growth and exports there exists bi-directional causality between industrial exports and economic progress for Pakistan economy.

Moreover, several empirical studies are found in the Indian context. Dhawan and Biswal (1999) examined the ELG hypothesis by investigating the association between real exports, terms of trade and real GDP for India for the period of 1961-1993 using vector autoregressive (VAR) model. They employed a multivariate approach using Johansen's Co-integration technique. They found the long-run relationship between these variables,

and the causal association flows from the terms of trade to the growth in exports and growth in GDP. However, they concluded that the causal relationship between GDP and exports seems to be a short run phenomenon. Dash and Kumar (2007) empirically confirmed that the ELG hypothesis for five 'South Asian' nations including India, using panel data for the period of 1991 to 2005. The study found that there exists a long-run balance relationship between GDP and other independent variables and causality has running from exports growth to GDP, supporting ELG hypothesis. Moreover, this study supported the view that an export is the 'engine of growth' under liberalized trade period. Sinha (1996) has examined the relationship between the openness of trade and economic growth in India and found the bi-directional causality between these variables. This indicates that both exports and imports contribute to economic growth in the long run. Ghatak and Price (1997) point out that real export growth Granger-caused by non-export real GDP for the period of 1960 to 1992 in India.

From the above literature review, it is very clear that the results of these empirical studies are diverse but it advocates in general that the level of progress is an essential factor in determining the export-growth association. Moreover, the results of different studies are noticeably sensitive to the variables comprised in a relationship, the theoretical approach used and even on the time period taken and statistical and econometric (empirical) methods employed.

3. Data and methodology

3.1. Data source and variables

The present study explores the relationship between exports, imports and economic growth for India during April 2005 to March 2017 based on monthly time series data. Exports are the aggregate of oil and non-oil exports of India and Imports are the aggregate of oil and non-oil imports by India and, economic growth is proxied by Index of Industrial Production (IIP). Data has been collected from the Handbook of Indian economy and statistics, RBI. All the variables of the study are converted into a natural logarithm. Since the study is based on monthly time series data, the monthly data of GDP is not available. Hence we take the Index of Industrial Production (IIP) as the proxy for economic growth. The selection of IIP as a proxy for economic growth is for two reasons. First, IIP is significantly correlated with real GDP (0.97 with a significance level of 0.01) and with the real output of the services and therefore, is a strong proxy for economic growth. Second, IIP is found to be a reliable important indicator of business cycles in India (Mazumdar, 2005). The present study makes use of the variety of econometric models to carry out the empirical analysis and those models explained in the following section.

In the present empirical study, the log-linear specifications of the variables are employed and the following estimation equation is used as a model:

$$lnG_t = \alpha_0 + \beta_1 lnX_t + \beta_2 lnM_t + \varepsilon_t$$

where G_t, X_t, and M_t represents economic growth (IIP), exports and imports respectively. The parameter α_0 is the intercept term. β1 and β2 contribute for the elasticity of the explanatory variables.

3.2. Unit root test

Prior to estimating for co-integration and causal relationship between the time series variables, the first and foremost step is to test their stationarity in order to evade any spurious or misleading relationship between them. A series of data is said to be stationarity if its mean and variance are time invariant. Hence, this study applied the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) test to examine the same. The null hypothesis of non-stationarity rejects when negative and significant test statistics. The DF test assumed that the error term (u) is uncorrelated but in the case of ADF test (developed by Dickey and Fuller known as the ADF) they are correlated. The formula of this test is as follows:

$$Y_t = \rho Y_{t-1} + u_t \quad (1)$$

$$-1 \leq \rho \leq 1$$

where, Y_t is a variable of interest and u_t is white noise error term. This test follows the calculation of t-statistics which is tested under the null hypothesis: Ho: $\rho = 1$ (that is we have a unit root or time series under consideration is non-stationary) against an alternative hypothesis: Ha: $\rho \neq 1$. Subtract Yt-1 from the both side of equation-1.

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t$$

$$\Delta Y_t = (\rho - 1) Y_{t-1} + u_t$$

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad (2)$$

where $\delta = (\rho-1)$ and Δ is the first difference operator. In practice, therefore instead of estimating equation-1, we estimate equation-2 and test the null hypothesis that $\delta=0$. (If $\delta=0$, then $\rho=1$). Null hypothesis Ho: $\delta = 0$. Alternative hypothesis Ha: $\delta \neq 0$. Though if u_t are correlated the DF test is to be modified by adding, as an additional lagged value of the dependent variable (ΔYt-1) which then it becomes ADF, which is as follows:

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} + \alpha i \sum \Delta Y_{t-1} + \varepsilon i \quad (3)$$

where 't' is time trend, εi is white noise error term and $\beta 1$, $\beta 2$, δ and αi are the parameters, which are to be estimated. In this case still the null hypothesis is same as in DF test and ADF test follows the same asymptotic distribution as the DF statistic. Technically if the computed value of the tau-statistics exceeds the (Mackinnon) critical tau-values, the null hypothesis must be rejected and vice-versa. It is an important question in time series data analysis whether each variable is stationary in levels or stationary after the first differencing. If the time series in levels are found to be non-stationary and stationary only after its first differencing, it means they are integrated to an order of 1, i.e. I (1). Thus, if the data series are stationary after the first differencing then it can be essential to test for co-integration.

3.3. Test of cointegration

Before going to check the long run relationship among the variables it is crucial to check the stationarity test of the variables in order to avoid spurious as well as bias result. After confirming the stationarity of the data series we then proceed to the cointegration analysis

in order to examine the long-run relationship between the variables considered. Once the order of integration is defined it is helpful to check the long run relationship among the variables. To study the relationship between the economic variables cointegration test is extensively used in the empirical literature. Since the variables under study are found to be I (1), the cointegration method is suitable to estimate the long-run relationship between the exports, imports and economic growth. The model of cointegration is that non-stationary time series are cointegrated if a linear combination of these variables is stationary. The present study used the Johansen and Juselius (1990) test to check the cointegration among the variables. The details of the test are shown below. Johansen suggests two test statistics to test the null hypothesis that numbers of characteristics roots are insignificantly different from unity.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} ln\,(1 - \widehat{\lambda}\, i)$$

$$\lambda_{max}(r, r+1) = -T\, ln\,(1 - \hat{\lambda}\, i + 1)$$

where λi estimated characteristic and T is the number of usable observations. The $\lambda trace$ test the null hypothesis is $r = 0$ against the alternative of $r > 0$ and λmax test the null hypothesis is $r = 0$ against the alternative of $r = 1$. The null hypothesis for this test is that there are r cointegrating vectors in.

3.4. Test of Granger causality

In order to examine the causal relationship between exports, imports and economic growth the study have used Granger causality technique proposed by C.W.J. Granger (1969). Granger causality method regresses a variable y on a lagged value of itself and other variable x. If x is considered to be statistically significant, it explains some of the variance of y which is not defined by lagged values of y. This shows that x is causally preceding to y and said to dynamically cause y. The present study employed the following model specification of Granger causality.

$$Y_t = \sum_{i=1}^{n} \delta_i\ y_{t-i} + \sum_{i=1}^{n} \gamma_i\ x_{t-i} + u_t$$

The null hypothesis (Ho) in each case is that the variable under consideration does not Granger cause the other variable. Then null hypothesis tested against the alternative hypothesis and we apply the F-test which follows the F-distribution. If the computed F-value exceeds the critical F-value at the chosen level of significance, the null hypothesis will be rejected and vice versa. The Granger causality test depends critically on the number of lagged terms introduced in the model.

4. Empirical results and discussion

4.1. Unit root tests

In order to achieve the aim of the present study, we employ 'Johansen's Cointegration as well as Granger Causality test' for Exports Imports and Economic growth (IIP). But before examining these tests it is essential that the data are examined for stationary or non-stationary

(testing the time series properties of monthly data). For this purpose, we used ADF (Augmented Dickey-Fuller) and DF (Dickey-Fuller) tests. Table 1 displays the results of these tests. The tests are based on the null hypothesis that a unit root exists in the variable.

Table 1. *Results of unit root tests*

Variable	Statistics	At level			At First Difference			Inference
		I	I&T	None	I	I&T	None	
IIP (Y)	ADF	-1.7686	-3.0028	1.6587	-7.0033*	-6.9934*	-6.7937*	I (1)
	DF	0.7895	-1.8826	-------	-4.4667*	-4.9830*	------	I (1)
Export (X)	ADF	-1.4183	-2.1298	1.1128	-12.0525*	-12.0259*	-6.5731*	I (1)
	DF	0.4040	-1.9993	-------	-6.3306*	-5.7911*	------	I (1)
Import (M)	ADF	-1.6883	-1.9257	0.4632	-16.9935*	-16.9547*	-16.9576*	I (1)
	DF	-0.2092	-1.7629	-------	-4.4755	-15.1937	-------	I (1)

Note: IIP-Index of Industrial Production, DF-Dickey-Fuller test and ADF-Augmented Dickey-Fuller test. I-Intercept, T-Trend.

The stationarity test is very much helpful to avoid spurious and bias result, which may lead to false conclusions. To avoid this problem, the study conducted the unit root tests for all the variables. The above table shows that exports (X), imports (M) and IIP (Y) are non-stationary at level. But, the null hypothesis of a unit root test is rejected in the first difference at the appropriate significant level. Therefore, all variables which we have taken for the present study are following the first order of integration I (1). That means all the variables of the study have achieved stationarity after first difference.

4.2. Cointegration test

In the above Table 1 we have reported that the data series of exports, imports and economic growth are stationary after first difference. So, the study has employed cointegration test to confirm the existence of long-run relationship between exports, imports and economic growth (IIP). For this purpose, we used Johansen's cointegration procedure to find the long-run relationship between variables. The cointegration test results are presented in Table 2.

Table 2. *Johansen's cointegration estimation results*

Unrestricted	Cointegration Rank Test	(Trace)		
Rank	Eigenvalues	Statistic	0.05 Critical values	p-value**
0	0.268292	63.54081*	29.79707	0.0000
1	0.101998	18.87129*	15.49471	0.0149
2	0.024089	3.486860	3.841466	0.0619
Unrestricted	Cointegration Rank Test	(Maximum Eigenvalue)		
Rank	Eigenvalues	Statistic	0.05 Critical values	p-value**
0	0.268292	44.66952*	21.13162	0.0000
1	0.101998	15.38443*	14.26460	0.0331
2	0.024089	3.486860	3.841466	0.0619

Note: Both Trace and Max-eigenvalue tests indicate that 2 cointegrating equations at the 0.05 level. (*) denotes rejection of the hypothesis at the 0.05 level and (**) Mackinnon-Haug-Michelis (1999) p-values.

The above result of the Johansen's cointegration test shows that null hypothesis of Trace statistics and Maximum eigenvalue statistics value is less than the 5 % conventional significance level and reject null and accept the alternative hypothesis with concludes two cointegrating equations exist between the exports, imports and economic growth. This shows that there is a long-run relationship between exports, exports and economic growth in India.

4.3. Granger causality test

After testing the cointegration (long-run relationship) between variables, we assume that at least unidirectional causality among the variables. The results of the Granger causality test are presented in Table 3. The evidence in this section provides support for the causality relationship between exports, imports and economic growth (IIP). There is a strong evidence suggesting that the direction of causality runs from imports as well as exports to economic growth and from economic prosperity to exports and imports in the case of India. These results show that we reject the null hypothesis in all the cases. Therefore, we found that there is bidirectional causality between Exports, Imports and economic growth in India.

Table 3. *Granger causality test results*

Null Hypothesis:	F-Statistic	Probability	Inference
EXPORTS does not Granger Cause IIP	3.27564	0.0135**	Reject
IIP does not Granger Cause EXPORTS	5.15708	0.0007***	Reject
IMPORTS does not Granger Cause IIP	4.52846	0.0019***	Reject
IIP does not Granger Cause IMPORTS	4.19110	0.0032***	Reject
IMPORTS does not Granger Cause EXPORTS	2.12961	0.0807	Accept
EXPORTS does not Granger Cause IMPORTS	5.29413	0.0006***	Reject

Note: ***, ** indicates significance at 1%, 5% level respectively.

The results of the study show that bidirectional causality running between exports and economic growth (IIP) as well as imports and economic growth at 1% level of significance. This results indicate that the growth-led exports (GLE hypothesis) and export-led growth (ELG hypothesis) are found with the empirical evidence in India. Hence, growth-led exports and export-led growth hypothesis are valid for India. The growth-led exports hypothesis is possible for any country when development in domestic skilled labour, technology and innovation (Bhagwati, 1988). Conclusively, our results confirm bidirectional causality between exports and economic growth. Therefore, in India on one side where the economic growth surges by increasing export on the other side there is a positive impact of exports on economic growth.

5. Summary and conclusion

The relationship between exports, imports and economic growth has long been a subject of great concern in the development literature. The theoretical consent on export-led growth emerged in the 1980s, after the prosperous performance of the East-Asian Economies. However, many empirical studies have found that exports prompting economic growth and vice-versa in different nations and regions. This study examines the relationship between exports, imports and economic growth in India over the period April 2005–March 2017. To fulfill this, first, it is found that all the variables viz. export, imports and economic growth (IIP) are stationary after the first difference form by using ADF and DF test. The Johansen and Juselius Cointegration test shows the existence of long-run relationship between variables of the study. We conclude our study that it is more clear the existence of bi-directional causality between exports and economic growth which leads to the supporting of export-led growth and growth-led exports hypothesis. We now take a clear stand with the possible large extent of the dataset in support to validate our results. Similarly, we found that there is bidirectional causality between

imports and economic growth. Conclusively, a long-term relationship was found to exist among the variables used in this study. Moreover, our results confirm bidirectional causality running between exports and economic growth. Therefore, in India on one side where the economic growth surges by increasing export on the other side there is a positive impact of exports on economic growth. The study finally suggests that both growth as well as export promotion strategy is pursued consistently with an emphasis on sustainable and inclusive growth.

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