

# Reinvestigating Import And Economic Growth Nexus In India: A Cointegration And Causality Test Analysis

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**Abstract :** The present study aims at investigating the long run cointegration and causal relationship between imports and economic growth in India over the period 1980-2012. The variables which are used are import as a percentage share of GDP (LIMP) and real GDP at factor cost (LGDP). By applying the econometric tests including stability tests, ADF Unit Root Test, Johansen (1991) cointegration test, VECM and Block Exogeneity Wald Test, the study has found the evidence of the existence of long run relationship between import and economic growth and import led growth strategy is applicable in India over the long run. However the study does not find any short run causality between the two and this is not surprising at all since import may not be the source of growth in the short run because imported technology in the form of capital goods takes time to increase the productive capacity of the country and growth does not always be the source of imports. Sometimes, imports may be financed through the borrowing either internal or external or through emigrant remittances etc.

**Index terms:** Import, Economic Growth, Causality, Cointegration, India

## 1. INTRODUCTION

Theoretically, import is very important source of economic growth of a country as it provides most needed inputs of production most specifically to developing countries. Import provides inputs of production to a country which is mostly needed in the production of its export sector also. Secondly, technology transfer through import is another source of growth. Transfer of technology and knowledge is possible in the form of imported goods (Grossman and Helpman, 1991, Rivera-Batiz and Romer, 1991), which is an important source of productivity growth. Therefore, one can say that import in the form of technology transfer is an important factor which promotes growth as explained by endogenous growth theory. Besides this, import also promotes competition between domestic and foreign firms. This enhances domestic firms to innovate new ideas. This prevents duplication of ideas (Grossman and Helpman, 1991, Rivera-Batiz and Romer, 1991). However, Grossman and Helpman (1990b) also mentions that although knowledge spillover takes place in the form of imported goods, but it may loss the economy if it does not able to appropriate all the benefits from its own investment because of import. A large number of empirical literatures are found who have investigated the relationship between export and economic growth (Bhat, 1995; Mallick, 1996; Dhawan and Biswal, 1999; Chandra, 2003; Sharma and Panagiotidis, 2005; Kaushik et al, 2006; Pandey, 2006; Dash, 2009 etc.). Many studies have used export alone as the indicator of trade. But this is not fair as trade consists of both export and import. So exclusion of import on trade-growth nexus may lead to misspecification bias. The empirical literature on the relationship between imports and economic growth is limited comparatively to the literature on the export-economic growth nexus. In the review section, a brief review of empirical literature on import-growth nexus is presented with the help of tabular presentation. The present paper empirically examines the import-growth relationship in case of India over the study period 1980-2012. Most specifically, the aim of the paper is to investigate whether

## 2. EMPIRICAL REVIEW OF LITERATURE

**Table-1:** Empirical Studies Related to Imports and Economic Growth

Authors	Sample Country	Method	Findings
Awokuse (2008)	Argentina, Peru, Colombia	Granger Causality, Impulse Response Functions	Import led Growth and Export led Growth
Shahbaz and Rehman (2012)	Pakistan	VECM	Import led Growth
Ramkrishna (1995)	India	Multiple Ranks F Test	Import led Growth and Export led Growth
Pistoresi and Rinaldi (2012)	Italy	Cointegration Analysis	Import led Growth
Sachin N. Mehta (2015)	India	Cointegration Analysis, VECM, Granger Causality	Growth led Export, Growth does not lead to Import, Export led Import
Achchuthan (2013)	Sri Lanka	Regression	Export led Growth
Ajmi, et.al.(2015)	South Africa	VAR	Import does not lead to Growth
Salih et.al. (2007)	India	Granger Causality	Income led Export, Income led Import, Export led Import

Different studies are there that have investigated the relationship between import and economic growth by using different methods, different sample period and on different sample countries. Table 1 above briefly reviews some of the empirical literature.

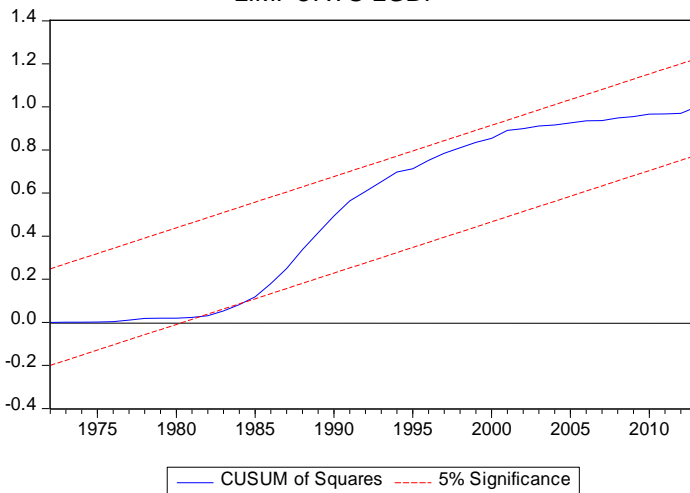
### 3. DATA AND METHODOLOGY

In order to investigate the import-growth nexus in case of India, secondary time series data have been used on different indicators over the study period 1980-2012. For imports and economic growth two indicators namely imports as a percentage share of GDP (LIMP) and real GDP at factor cost (LGDP) have been used. All the data are converted into their natural logarithm form to get the stationarity more easily and to reduce heteroscedasticity problem. The data for these variables are collected from various sources including Central Statistical Organisation (CSO), Official Website of Reserve Bank of India (RBI), World Development Indicators (WDI), World Bank. The empirical investigation of the present study mainly consists of long run cointegration between imports and GDP and long run causal relationship between the two. The econometrics tests that have been used are – Stability tests, ADF Unit Root Test, Lag Order Selection Criteria, Johansen Cointegration Test, Vector Error Correction Model (VECM) and Block Exogeneity Wald Test or Granger Causality Test with VECM framework.

### 4. EMPIRICAL RESULTS AND ANALYSIS :

At first it is useful to check structural break of the import-GDP model with the help of stability tests.

**Fig 1: CUSUM of Square test on the regression of LIMPORTS-LGDP**



The CUSUM squares graph shows that although the model is almost stable but a structural break is present in 1983 where the plot of the graph just crosses the critical lines at 5

percent significance level. The Chow breakpoint test is conducted in order to see whether the structural break is significant or not.

**Table 2**

Chow Breakpoint test :1983			
Null Hypothesis : No breaks at Specified breakpoint			
F- Statistic	21.31925	Probability	0.0000
Log likelihood ratio	31.92623	Probability	0.0000

The Chow test results of the regression of import and GDP are shown in table (2), where it is found that 1983 is a significant structural breakpoint at 1% level. The new era of import liberalization in India was started only after 1977-1978 and this process was carried forward in 1980s. Following this, the import intensity of the country increased very significantly almost by 25 percent starting from 1983-1984 to 1986-1987. From 1980-1989, the economy also grew at an annual rate of 5.5 percent. This may be the reason of finding structural break in this specified model.

Unit Root Test:

**Table 3**

Results of ADF Unit Root Test in Level				
Variables	t-Statistic	Critical 5%	Prob	Inference
LGDP	-1.984654	-3.518090	0.5929	Non-Stationary
LIMPORTS	-1.871507	-3.518090	0.6518	Non-Stationary
Results of ADF Unit Root Test at First Difference				
Variables	t-Statistic	Critical 5%	Prob	Inference
LGDP	-7.482609	-3.520787	0.0000	Stationary
LIMPORTS	-5.361635	-3.520787	0.0004	Stationary

**ADF Unit Root Test Results**

Now, from the ADF unit root test in table (3), both the series LIMPORTS and LGDP are found to be integrated of order one or I (1) and therefore can proceed for cointegration test. The optimum lag length '1' for Johansen Cointegration test is selected according to the LR, FPE, AIC, SC, HQ criterion by conducting the lag length selection criteria as reported in the table (4).

Table 4  
Results of Lag Length Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	15.93 997	NA	0.00840 7	0.89699 8	0.98144 2	0.92753 1
1	132.7 530	275.08 20*	6.07e- 06*	6.33765 0*	6.08431 8*	6.24605 3*
2	135.9 623	5.6162 49	6.32e- 06	6.29811 4	5.87589 4	6.14545 3
3	136.1 408	0.2944 81	7.69e- 06	6.10703 8	5.51593 0	5.69331 2
4	137.2 524	1.7230 38	8.96e- 06	5.96262 0	5.20262 4	5.68782 9

\*indicates lag order selected by the criterion

#### Cointegration test:

Now, cointegration test is conducted by taking selected lag '1' in order to explore the long run relationship between imports as a percentage share of GDP (LIMPORTS) and real GDP (LGDP). The results of the cointegration test are revealed in the following table (5). In the table (5), trace test indicates 2 co integrating equations between imports and growth but max-Eigen test indicates no cointegration between the two. Since, both the test reveals contradictory results, in such circumstances it is reasonable to follow the results of trace test. Because as recommended by Johansen and Juselius (1990), when trace test and maximum Eigen Value test provide contradictory results, trace test results should be used. Another view in support of the trace test results is given by Kasa, 1992 and Serletis and King, 1997 according to whom trace statistic considers all the smallest Eigen values. So, trace statistic is more powerful than the statistic of maximum Eigen Value.

Table 5: Results of Johansen Cointegration Test

Trace Test					
Hypothesized No of CE(s)	Eigen Value	Trace Statistic	Critical Value at 0.05	at	Prob
None	0.242067	16.91489	15.49471		0.0304
At most 1	0.118011	5.274171	3.841466		0.0216
Max Eigen Value Test					
Hypothesized No of CE(s)	Eigen Value	Max-Eigen Statistic	Critical Value at 0.05	at	Prob
None	0.242067	11.64072	14.26460		0.1249
At most 1	0.118011	5.274171	3.841466		0.0216

By taking in to consideration of these views, the study accepts the results of the trace test where null hypothesis of no cointegration is rejected because the critical value is less than the trace statistic at 5 % level of significance providing support for the existence of long run relationship between imports and growth in case of India.

Normalized co integrating equation obtained from Johansen Cointegration test is (standard error in parenthesis)-

$$LGDP = 1.000000 + 1.864747 LIMPORTS \\ (0.22543)$$

Thus, according to the normalized co integrating equation which is normalized for LGDP, imports have positive relationship with economic growth in India where 1 percent increase in imports leads to approximately 1.86 percent increase in economic growth in the long run. Moreover, the coefficient (1.864747) is statistically significant at 1% level of significance. So, there is positive and significant long run relationship exists between imports and economic growth as per the equation.

#### Vector Error Correction Model (VECM):

After applying VAR (Vector Auto Regression) model developed by Johansen (1991) and Johansen and Juselius (1990), in order to examine the co integrating relationship between imports and growth, the study finds cointegration or long run relationship between imports and economic growth and thus justifies the use of Vector Error Correction Model (VECM). VECM adds error correction features to a VAR model. The coefficient of the error correction term provides information about whether previous period's deviation from the long run equilibrium is corrected in the current periods or not. The coefficient of the error correction model shows the speed of adjustment of the whole system towards the equilibrium in the long run. The coefficient term must be negative and significant in order to adjust to the short term shocks and to obtain the long run equilibrium. Positive coefficient of the error correction term implies that the process is not converging to in the long run rather it implies that the model is moving further and further away from equilibrium. Negative and significant error correction term shows the speed of adjustment or at what speed the system moves to equilibrium. In other words, negative and significant error correction term (which is less than 1) implies positive move to balance situation or equilibrium. The result of the VECM is reported in the table (6).

Table 6  
Estimation of Error Correction Model

Error Correction	D(LGDP)	D(LIMPORTS)
Co-int Eq(1)	-0.031791 [-2.86873] (0.0067)	0.065878 [1.70929] (0.0956)
D(LGDP(-1))	-0.120636 [-0.76498] (0.4490)	0.173384 [0.31614] (0.7536)
D(LIMPORTS(-1))	0.014872 [0.31370] (0.7555)	0.192369 [1.16669] (0.2506)
C	0.059614 [6.01975] (0.0000)	0.027728 [0.80510] (0.4258)

t-Statistic in [] and probability value in ()

As seen in the above table (6), the coefficient of the error correction term for economic growth that measures the speed of adjustment of short run imbalance in relation to balance is negative equal to -0.031791 and significant at 1 % level of significance. The value of -0.031791 implies that the previous periods deviation from the long run equilibrium is corrected as an adjustment speed of 3.17 percent approximately in the current period and deviation from the long run equilibrium is reduced. But, the adjustment coefficient for imports is found to be positive and

insignificant at 5 percent level of significance. This implies that the model will unstable in the long run due to some disturbances in the system. From the negative and significant error correction term, the study confirms the existence of long run relationship between imports and economic growth and also unidirectional causality running from imports to growth. However, the study does not find any short run causal relationship between the two from the VECM results because all the coefficients of one period lag of the first difference of the variables in both equations are found to be insignificant.

#### Causality test with VECM :

The study also applies Granger causality test with VECM framework which is known as Block Exogeneity Wald Test for confirmation of short run causal relationship that are not found in VECM results. Table (7) explains the findings of Granger Causality test with VECM (or findings of Block-Exogeneity Wald Test).

**Table (7)**  
Results of Block –Exogeneity Wald Test

Dependent Variable : D(LGDP)			
Excluded	Chi Sq	df	Prob
D(LIMPORTS)	0.098405	1	0.7538
All	0.098405	1	0.7538
Dependent Variable: D(LIMPORTS)			
Excluded	Chi Sq	df	Prob
D(LIMPORTS)	0.099945	1	0.7519
All	0.099945	1	0.7519

From the above table (7), it is seen that no causal relationship exist between imports growth and economic growth. Although in the long run imports have positive and significant relationship with growth performance of the economy, but in the short run, neither imports granger cause economic growth nor economic growth granger causes imports. This finding of long run relationship between imports and economic growth and no causal relationship between them in the short run is similar to the findings of Mehta (2015) in particular case of India. Ram (1990), Mishra, P.K (2012) also find existence of long run relationship between imports and real GDP in India.

## 5. CONCLUSION

The findings of the existence of long run relationship between imports and real economic growth is very significant for India. This may be due to the increasing competitive pressures in the domestic markets arising from the imports of consumer goods and transfers of technological goods in the form of imported capital goods from the developed countries. However, the present study does not find any short run causal link between imports and growth. Imports may not be the source of growth in the short run because imported technology in the form of capital goods takes time to increase the productive capacity of the country .This is not seems to be surprising. Moreover, the study does not find causality from growth to imports. Again this is not surprising because growth does

not always be the source of imports. Sometimes, imports may be financed through the borrowing either internal or external or through emigrant remittances etc.

## REFERENCES

- [1] Grossman, G.M. and Helpman, E. (1990a). "Innovation and Economic Growth in the Global Economy", Cambridge, M.A: MIT Press.
- [2] Grossman, G.M. and Helpman. E. (1990b). "Trade, Innovation and Growth", American Economic Review, Vol.80 (2), p.p.86-91.
- [3] Johansen, S. (1991). "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", Econometrica, Vol. 59(6), p.p.1551-1580.
- [4] Johansen, S. and Juselius, K. (1990). "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money", Oxford Bulletin of Economics and Statistics, Vol. 52(2), p.p.169-210.
- [5] Kalita, A.(2018). "A Study on Trade Openness, Economic Growth and Income Inequality in India (1970- 2013)", Unpublished M.Phil Dissertation
- [6] McGraw-Hill Companies, Fourth Edition, West Point, USA.
- [7] Rivera Batiz, L-A and Romer, P.M. (1991). "International Trade with Endogenous Technological Change", European Economic Review, Vol.35, p.p.971-1001.
- [8] Romer, Paul M. (1990). "Endogenous Technological Change", Journal of Political Economy, Vol. 98(5), p.p. 71-102.
- [9] Young, A. (1991). "Learning by Doing and Dynamic Effects of International Trade", Quarterly Journal of Economics, Vol. 106(2), p.p.369-405