



The Impact of Export and FDI on the Economic Growth Rate in India: An ARDL Bound Testing Approach

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

The development of exports is a crucial factor in driving the growth of the Indian economy. India has often experienced turbulence in its economic growth and development throughout its history. The study has demonstrated the disruptions that have taken place in the nation's development and export patterns by analysing data from 1970. Flow stability has only been found in FDI for the whole coverage period. Hence, attaining export stability and expansion are the two most crucial criteria for the Indian economy. The article demonstrates the existence of a long-term relationship between exports, foreign direct investment (FDI), and GDP growth. Hence, the development of export and foreign direct investment (FDI) policies is crucial for a nation to attain economic stability. Furthermore, as the study investigates, there is a necessity to enhance the exportation in diverse industries for a comprehensive analysis. Enhancing foreign direct investment (FDI) inflows into the economy can further bolster export promotion. The administration may prioritize the relaxation of limitations on foreign direct investment (FDI) in industries that have not received much attention previously. With the rise in foreign direct investment (FDI) inflows, these industries have the potential to enhance their production and export strategies, therefore making a significant

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contribution to India's long-term economic growth. It is feasible to do thorough study on the particular industries that should be given priority in order to improve export promotion and attract foreign direct investment (FDI) in the Indian economy.

Keywords: Export; FDI; economic growth; ARDL; India.

1. INTRODUCTION

Most countries highly focus on FDI after implementation of economic reforms. From 2002 to 2006 the share of the stock market of FDI GDP has risen around 60%. (Carril-Caccia and Pavlova, 2018) Consumer products have occupied a dominant role in the economy, and it leads to creating demand in other countries also. As one of the largest economies in the world, India had entered extensive world trade agreements, and investment, export linkages with the rest of the world. Due to economic reforms since 1990's world financial market development has played very crucial role.

Foreign exporters have to raise the quality of products to increase the global market share and acquire brand image to their company. Financial risk pushes the company's quality products. After economic reforms in India all FMCG goods were highly demanded and exported. The first three year had a moderate increase of exports and continued till 1998, but in 1998 declined due to political instability and the Malaysian crisis, thereafter exports were continuously rising. The growth of imports also raise in the last 40 years, huge trade deficits also registered due to political decisions and global issues also. the situation worsened in 1997 to 2002, the imports are more than exports. in 2003/04 to 2006/07 during tenth plan imports increased three times than earlier. FDI direct impact on economic growth on the fixed capital formation and stock market also, FDI to compliment domestic investments to supplement investment shortages, by fostering technological development. (Romer (1986:1990), Grossmann and Helpman (1991). The economic growth rate fallen down in 1970's but slowly raised, because of technology based policies. The availability of cheap and skilled labour is one the main reason to sustain the economic activities. Liberalization, privatization, globalization and systematic trade policies leads to innovations in transportation and communication issues. FDI Policy has more impact on the economic activities, it provides basic infrastructure to register rapid growth in financial activities.

Earlier there was no study conducted on the same topic, particularly on exports, and FDI Lot of economic literature has highlighted the benefits from FDI [1] (Markusen, 1984; Clare, 1996; Borensztein et al., 1998; Markusen and Venables, 1999; Javorcik, 2004; Haskel et al., 2007; Arnold et al., 2011; Poole, 2013).

The overall purpose of the study is to measure impact of export and FDI on the economic growth in India: an ARDL bound testing approach.

The paper has organized three areas, section two provides a theoretical basis of the study and empirical literature review. section three presents the methods which are considered for this study. section four discusses the results and analysis of data. section five concludes and recommends further studies.

2. LITERATURE REVIEW

Researches have been carried out not only to analyze the relationship between exports and economic growth but have been extended to find out the variables that effect foreign trade of countries. Kersan-Škabić (2021) analysed of "the influence of Information and Communication Technology (ICT) infrastructure, usage and skills on the export and import of goods and services in the region of South-East Europe (SEE). Applying the gravity models to bilateral trade flows through the panel data analysis, the research revealed that GDP per capita and Internet usage have a significant positive impact on import, and in addition, the digital infrastructure and digital skills have a positive, but small impact on export. Distance has a negative impact on trade". Similarly Fedorenko, Yakhneeva, Zaychikova, & Lipinsky [2] analyzed "the impact of socio-economic factors on export and import indicators in five Russian port areas and ten regions from 2010 to 2019. Using the methods of correlation and regression analysis, panel data analysis (fixed-effect models) and nonlinear models, the research revealed dependency patterns for the regions of the Arctic, Baltic, Far Eastern, Azov-Black Sea and Caspian basins. The research further indicated that investments in the development of seaports stimulate foreign trade growth in port areas and

neighboring regions, which, in turn, shows the level of a region's integration into the global economic cooperation system".

While majority of the studies have been conducted for a whole range of products that comprise the foreign trade of a country, certain studies have also been conducted to a limited sphere of single product or a group of products. Gizaw, Abafita, & Merra [3], employed the extended generalized Cobb Douglas production function, Johansen co-integration test, Vector Error Correction Model (VECM) and Granger causality test to examine the impact of coffee exports on economic growth in Ethiopia from 1980 to 2017. While the research confirmed cointegration of all variables, it showed that coffee exports had an insignificant short-run impact on economic growth. The Impulse Response Function used in the study further revealed that besides coffee exports, labor force, capital formation, non-coffee exports and real effective exchange rates (REER) had positive and significant impact in long run.

Similar to this Siaw, Jiang, Pickson, & Dunya [4] examined "the correlation between a basket of agricultural exports and economic growth. They applied disaggregate level using the Autoregressive Distributed Lag (ARDL) model with yearly time series data spanning from 1990 to 2011 to advise policy makers on the dynamics of growth. Both the long-run and the short-run results revealed that, cocoa export had a positive and significant impact on economic growth whilst the export of pineapple and banana had negative effect on economic growth even though pineapple export was not significant in both long run and short run. In addition, the study further established unidirectional causality running from banana to economic growth, a bi-directional causal relationship between cocoa export and economic growth and no causality between economic development and pineapple export in Ghana".

Sofla [5] employed "the panel data econometric approach to investigate the impact of foreign trade on the economic development of selected developing countries with emphasis on crops. Carrying out his research in a group of 10 countries from 2010 to 2019, the author concluded that for selected developing countries the effect of real GDP, real effective exchange rate, and the net inflow of foreign direct investment on the export of crops and economic development has been positive and significant".

It is well known that foreign trade is an important catalyst in a country's development. Various studies have been carried out to decipher the relationship between various factors that leads to a nation's development. These studies have been carried out for various regions belonging to a specific country or a country as a whole and as well as for consortium of countries. While studying the effects of foreign trade (economic openness) on South African economic growth, Tah, Czerniak, Levine, Wiggin, & Osundu [6] indicated that "foreign trade is a significant catalyst of growth in both the short- and long-run period. The research employed the co-integration test, Gonzalo-Granger common long-memory test, and the error-correction model and indicated that human and physical capital are significant catalysts of growth in the long-run. The authors suggested that South Africa should have policies that encourage foreign trade in order to boost both short and long-run economic growth". The results obtained in this research were similar to Sunde [7] who discovered "unidirectional causality between economic growth and foreign direct investment running from foreign direct investment to economic growth, unidirectional causality between foreign direct investment and exports running from foreign direct investment to exports and bidirectional causality between economic growth and export".

Applying the joint integration test using the Autoregressive Distributed Lag (ARDL) model foreign trade in Algeria from 1991 to 2017, Bouklia [8] investigated the relationship between GDP, exports, imports, and economic openness. While confirming long and short parameters, this research indicated existence of a positive relationship between exports and economic growth. The research further concluded that domination of oil and natural gas in Algeria's exports has led to an imbalance in the commodity structure of Algerian exports and makes the economy vulnerable to fluctuations also.

Analytical studies have been conducted to not only for a country but also for a group of countries. Kalirajan, Miankhel, & Thangavelu [9] examined the dynamic relationship between export, FDI and GDP for six emerging countries using a time series framework of the Vector Error Correction Models (VECM) for six countries namely: Chile, India, Mexico, Malaysia, Pakistan and Thailand. Their results indicated that countries have experienced export led growth, however differences existed for various countries

in the long and short run. in the long run. It was identified that GDP growth is the common factor that drives growth in other variables such as exports in the case of Pakistan and FDI in the case of India. The Latin American countries of Mexico and Chile show a different of relationship in the short run but in the long run, exports affect the growth of FDI and output. In the case of East Asian countries, bidirectional causality between GDP and FDI was found in Thailand, while no relationship between these variables in case of Malaysia were evident. Erum, Hussain, & Yousaf [10] explored the impact of the FDI on economic growth of South Asian Association of Regional Cooperation(SAARC) countries by using the pooled data for the period 1990-2014. Along with neo-classical production function and Taylor series approximation, Fixed Effects Model was used to investigate the impact of FDI, domestic capital, labour and government expenditures on economic growth. The results underlined the positive effect of both domestic investment and FDI on economic growth, however the contribution of domestic private investment was more trustworthy than the contribution of FDI. The labour has positive and significant association with GDP. The effect of government expenditure is negligible on economic growth. The findings further suggested that growth strategy cannot yield the long term benefits if it neglects investments on human capital. Iqbal, Tang, & Rasool [11] investigated the effects of carbon emissions, renewable energy consumption, FDI, and exports on economic growth in BRICS countries from 2000 to 2018 using several econometric techniques like ARDL, pool mean group (PMG), mean group (MG), and the Dumitrescu Hurlin panel causality tests. The estimation of the PMG model indicated that carbon emissions, renewable energy consumption, exports, FDI, and savings have a significant positive long-run impact on economic growth, while interest rates and trade openness affect economic growth negatively. A bi-directional causal relationship between carbon emissions and economic growth and between economic growth and foreign direct investment was indicated by the Dumitrescu Hurlin panel causality results along with one-way causality from exports and labor force to economic growth. The overall results implied that an increase in carbon emissions and FDI have led to an increase in economic growth in the countries of Brazil, Russia, India, China and South Africa. Applying similar analytical techniques Bhujabal, Sethi, & Padhan [12] suggested that ICT and FDI affect the carbon emissions or environmental

pollution negatively, implying significant decrease in environmental pollution with the rise in ICT infrastructure and FDI inflows. The results further suggested the existence of bidirectional causality among ICT and FDI implying an increase in ICT infrastructure due to increase in foreign investment and an increase in ICT infrastructure leading to an increase in foreign investment in the Asia Pacific countries.

Do, Song, Do, Tran, & Nguyen [13], analyzed the impact of foreign direct investment (FDI) and domestic investment (DI) on Vietnam's exports between 1985 to 2020. The Johansen co-integration test proved that FDI and domestic investment had a long-term positive impact on Vietnam's export growth while the result of the variance decomposition study demonstrated that the FDI sector has a bigger impact on Vietnam's export growth than the DI sector. Further to this the application of Granger causality test revealed that there is a one-way relationship between FDI and export in the near term, but no such relationship exists between DI and export. Though the export activities are vulnerable to FDI sector shocks, FDI has been regarded as the most important factor of export growth in Vietnam.

Similar methods used by Verter & Bečvářová [14] in Nigeria deciphered that there is a positive relationship between agricultural exports and economic growth but an inverse relationship between agricultural degree of openness and economic growth. Bidirectional causality running from agricultural export to economic growth was confirmed along with feedback causality from REER to economic growth. The study further revealed unidirectional causality between REER and agricultural degree as well as agricultural exports to REER of openness in the country.

Recently a few studies have also been conducted to identify the impact of FDI originating from a single or limited source on the country's growth. Ahmad, et al., [1] used the ARDL approach to ascertain the impact of Chinese FDI on economic growth in Pakistan. This study documents the exploration of the determinants of economic growth in Pakistan by emphasizing the significant role played by Chinese FDI and investments in renewable energy in particular. Employing time series data analysis to examine the relationship between GDP and Chinese FDI, inflation, trade openness, exchange rates, interest rates, remittances, and renewable energy consumption from 1990 to 2019, this determined that the dependent and

independent variables are linked in the long term and Chinese FDI has a substantial favorable effect on Pakistan's economic growth. It was further acknowledged that renewable energy usage has a long-term favorable and significant association with Pakistan's economic growth.

Autoregressive Distributed Lag Model has been used sparingly for understanding the relationship between the economic growth, FDI and exports. While Pahlavani, Wilson, & Worthington [15] used this model to understand the trade and GDP nexus in Iran, Islam, Saif, & AlShammari [16] export – growth nexus in Kingdom of Saudi Arabia. This technique has been employed in researches that involve issues related to financial markets that explore relationship between oil prices, exchange rate, and stock prices [17], exchange rates and stock prices [18] and long run demand for money [19]. Of late this approach has also been used in researches involving CO₂ emissions [20], renewable energy consumption [21], climate change [22] and sustainability assessment [23,24].

The previous studies mostly focus on the empowerment of an economy through various variables. A specific focus on the choice of the variables needs to be considered. Also, a detailed analysis of country specific analysis needs to be classified. In that respect, the current study focusses on highlighting the export, FDI and economic growth variable analysis with respect to Indian economy.

2.1 Objectives

1. To find out long run cointegration among export, FDI and economic growth in India.
2. To find out long run impact of export and FDI on economic growth in India.
4. To find out short run granger causality between export, FDI and economic growth in India.

2.2 Hypothesis

1. H₀₁: There is no long run cointegration among export, FDI and economic growth in India.
2. H_{02a}: There is no long run impact of export on economic growth in India.
3. H_{02b}: There is no long run impact of FDI on economic growth in India.
4. H_{03a}: Export does not granger cause FDI
5. H_{03b} : FDI does not granger cause export.
6. H_{03c}: Export does not granger cause economic growth.

7. H_{03d}: Economic growth does not granger cause export.

8. H_{03e}: FDI does not granger cause economic growth.

9. H_{03f}: Economic growth does not granger cause FDI.

10. H₀₄: There exists no serial correlation in the data.

11. H₀₅: The series is homoscedastic in nature.

2.3 Data Description

The data for analysis have been considered based on its logarithmic form. The growth rate of GDP has been considered as per capita GDP measured in local currency unit. This per capita income is measured by aggregate GDP divided by midyear population. GDP has been considered as gross value added to taxes and deducted to subsidies. Also, per capita GDP is considered without depreciation in calculation.

The growth rate of export is based on local currency unit. Exports are considered as production of all goods and services for rest of the countries in the world. Products, freight, insurance, transportation (including travel), royalties and licence fees; and other services such as financial, informational, personal and government services are included in the value of goods. Employee remuneration, investment income (formerly referred to as factor services), and transfer payments are not included. It's a term used to describe investments that are made to acquire a significant stake in a company operating in a different economy than the investor's own. Equity capital, reinvestment earnings, other long-term capital and short-term investment are all included in the balance of payment. As a percentage of GDP, this figure illustrates net inflows from foreign investors (new investment inflows minus disinvestment).

Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors and is divided by GDP.

The justification of the consideration of the variables is explained as follows:

For a developing country, the export remains at its highest priority to foster economic growth. Also, the growth can happen through augmentation of foreign investment. As there are lot of alternatives that influence foreign investment, a specific way of foreign investment needs to be considered. In this case, the article specifies foreign direct investment as it is the broadest version of foreign aid a country can receive.

A simple infinite lag-distributed model is called an ARDL (Autoregressive-distributed lag). The word "autoregressive" indicates that y_t is explained by its own lag in addition to being explained by x_t .

It is difficult to estimate the infinite number of parameters in the infinite lag model. The problem of defining a certain lag duration is resolved by this paradigm. Quite the other; it necessitates making the model non-linear to impose a structure on the lag durations. The Geometric model also functions as an infinite lag-distributed model. The subsequent lag weights in this model are set to decrease geometrically. The ARDL model, on the other hand, considers the lags of additional independent variables in addition to the dependent variable's lag to address the problem of collinearity. Also, it analyses the short run and long run aspects of a time series. It divides long run cointegration and short run error correction term to be important while describing the dataset.

2.4 Data Analysis

The descriptive statistics of the dataset are presented in Table 1 examining the

summary of the data considered for the analysis.

Table 1 analyses summary of the statistical data. The descriptive statistics explains that FDI has maximum value of its mean (0.194544) and median (0.140584). The export has its maximum value (1.586112) and growth rate of GDP has its minimum value (-0.213321). The scatteredness in the dataset is found by standard deviation. It has its minimum value (0.197042) for FDI and maximum value (0.354388) for export. The value of skewness is highest for FDI (0.582881) and lowest for GDP growth rate (-4.548150). The value of kurtosis is maximum for GDP growth rate (27.53928) and lowest for FDI (1.976003). The Jarque Bera value explains that the FDI time series is following normal distribution in the dataset. Finally, fifty years of data have been accumulated to calculate the data analysis. Hence, total number of observations counts to fifty.

In the next stage, the data are tested through the unit root tests for finding the order of integration. For finding the roots. The article has considered Augmented Dicky Fuller (ADF) and Phillips Perron (PP) to find out the roots in the time series. The results of ADF and PP are summarised in Table 2 and Table 3.

The data in the study are checked with integration in different orders. Hence, it passes through unit root test considered by Augmented Dicky Fuller (ADF) and Phillips Perron (PP). The result of the test is summarised in Table 2.

Table 1. Summary of statistics

Statistics	ln (GDPGR)	ln (EXP)	ln (FDI)
Mean	1.034106	1.122334	0.194544
Median	1.072393	1.176094	0.140584
Maximum	1.184675	1.586112	0.664691
Minimum	(0.213321)	(0.164253)	(0.013086)
Std. Dev.	0.207266	0.354388	0.197042
Skewness	(4.548150)	(1.654923)	0.582881
Kurtosis	27.53928	6.050270	1.976003
Jarque-Bera	1426.914	42.20672	5.015775
Probability	0.000000	0.000000	0.081440
Sum	51.70529	56.11671	9.727192
Sum Sq. Dev.	2.104999	6.153954	1.902455
Observations	50	50	50

Table 2. Summary of ADF and PP at level

Variable Name	ADF		PP	
	t-Statistic	Prob	t-Statistic	Prob
ln (GDPGR)	(6.606129) **	0.00	(6.642458)**	0.00
ln (EXP)	(6.740600) **	0.00	(6.740600)**	0.00
ln (FDI)	(0.879738)	0.7864	(0.656385)	0.8479

** denotes the value as significant at five percent level

Table 3. Summary of unit root test by ADF and PP at first difference

Variable Name	ADF		PP	
	t-Statistic	Prob	t-Statistic	Prob
ln (GDPGR)	(11.88882) **	0.00	(33.14779) **	0.00
ln (EXP)	(11.88219) **	0.00	(27.85241) **	0.00
ln (FDI)	(7.406414) **	0.00	(7.835232) **	0.00

** denotes the value as significant at five percent level

Table 4. Conditional error correction model

Variable	Value of the Coefficients	t-Statistic	Probability
ln (GDPGR_1)	(0.489812) **	(3.555679)	0.0009
ln (EXP_1)	0.382864	3.285814	0.0020
Δ ln (EXP)	0.145036	1.431283	0.1593
ln (FDI)	0.263118	1.277214	0.2081

** denotes the value as significant at five percent level

The article's primary goal is to determine the relationship between India's economic development explained as economic growth, exports, and foreign direct investment (FDI). As specified by Nkoro and Uko (2016), ARDL model is a single equation model, the current study considers growth rate of India as dependent variable and export and FDI as the independent variables. Table 4 simplifies the practical rationale for incorporation of ARDL model for the variables. It shows the significant probabilistic value for export to augment the growth rate of Indian economy.

The conditional error correction model exemplifies validation of applying ARDL model in the article. The result shows that lagged export and lagged GDP growth rate are significant in contributing their roles of determining rate of growth of GDP IN India.

2.5 Long Run Analysis

The principal step of analysing long run association is to find out cointegration between the datasets. The article, in the next step, finds out the long run relationship among GDP growth rate, export and FDI by applying ARDL model. The result of cointegration is summarised in Table 5.

Table 5 explains the result of cointegration. It explains the cointegration value as 6.321942, that signifies a positive cointegration among the variables. It proves that all the three variables move together in the long run. The cointegration result exceeds both the tabular values of I (0) and I (1), where I (0) signifies the situation of no cointegration, and I (1) signifies the situation of positive cointegration. As the calculated value is more than both the tabular values, the result is significant. If it would have fallen in between I (0) and I (1), the result would have been ambiguous and would bear insignificance in the model. Thus, we accept H11 stating that there exists long run cointegration among the variables taken under consideration. The study also finds the long run coefficient in the model by presenting Table 6.

Table 6 finds out the long run coefficient of the model. After specifying the cointegration result, the article emphasises extracting the long run coefficient concentrating on the impact of export on GDP growth rate. The long run coefficient is positive (0.781656) and proves that growth rate of exports increases GDP growth rate in long run in India. The study finds out the importance of export promotion in long run to implement sustainable growth in Indian economy. Even though we failed to accept H_{12b}, we accept H_{12a} and explain that there exists a long run impact of export on economic growth in India.

Table 5. Result of cointegration

Variable Specification		F- Statistic	I (0)	I (1)	
Dependent Variable	ln (GDPGR)		5%	3.15	4.11
Independent Variables	ln (EXP) and ln (FDI)	6.321942 **	10%	2.44	3.28

** explains the value is significant at five percent level

Table 6. Long run coefficient of ARDL

Variable Name	Coefficient	t-Statistic	Probability
ln (EXP)	0.781656 **	8.412873	0.00

** explains the value is significant at five percent level

Table 7. Result of error correction model

Variable Name	Coefficient	t-Statistic	Probability
Δln (EXP)	0.145036	1.478858	0.1461
ln (FDI)	0.263118	1.680658	0.0998
ECT (1)	(0.489812) **	(3.595116)	0.0008

** explains the value is significant at five percent level

Table 8. Result of granger causality test

Null Hypothesis Statement	F- Statistic	Probability
ln (FDI) granger causes ln (EXP)	1.84820	0.1698
ln (EXP) granger causes ln (FDI)	2.89093*	0.0664
ln (GDPGR) granger causes ln (EXP)	0.27269	0.7626
ln (EXP) granger causes ln (GDPGR)	0.68073	0.5116
ln (GDPGR) granger causes ln (FDI)	1.06814	0.3526
ln (FDI) granger causes ln (GDPGR)	3.23058**	0.0493

* explains the value is significant at ten percent level

** explains the value is significant at five percent level

Table 9. Correlation matrix

	ln (EXP)	ln (FDI)	ln (GDPGR)
ln (EXP)	1	-0.058826	-0.067253
ln (FDI)_	-0.058826	1	0.331771
ln (GDPGR)	-0.067253	0.331771	1

2.6 Short Run Analysis

The short run ARDL model is justified by the short run coefficients and the Error Correction Term (ECT) embedded in the model. The respective values are depicted in Table 7.

Table 7 presents the short run coefficients of the model. The result proves that in short run, there remains no causality between the variables. But the ECT value is negative (0.489812) and significant (probability- 0.0008. this proves the long run unidirectional causality from growth rate of export to GDP growth rate.

2.7 Long Run Causality

The ECT value proves that export growth will positively increase growth rate of GDP in the long run. Hence, any shocks in the economy will be unconcerned while moving towards long run stability in India. The chances are 48.98 percent to recover itself from short run disturbances in any economic condition.

2.8 Short Run Causality

The short run directional causality is checked through Granger Causality test. the result of the test is given in Table 8.

Table 8 explains the short run causation among the variables. The causality is proved through Granger causality method. The study confirms export growth will granger cause foreign direct investment in India, that ultimately granger cause economic growth in the country. Hence, the unidirectional causality from export growth to GDP growth via FDI emphasizes the requirement of export promotion in the country. The extensive export valuation will ultimately augment the condition of the economy to its next level. It confirms the acceptance of H_{13a} and H_{13e} . All the other null hypotheses (H_{03b} , H_{03c} , H_{03d} and H_{03f}) get their acceptance of confirming the absence of granger causation among the respective variables.

The need of correlation analysis arises here as the variables are considered under time series data. The correlation matrix is presented in Table 9.

The correlation table shows there remains positive correlation among GDP growth rate and FDI. It proves the need of enhanced FDI inflows in the economy to improve the growth rate of the country.

The importance of confirming the absence of autocorrelation arises in the analysis. Hence, the study performs Breusch-Godfrey Serial Correlation LM Test to test the autocorrelation among the datasets. The result of the autocorrelation is presented in Table 10.

The variables can be correlated with their own lag values of the past. Hence, the need of

autocorrelation analysis comes here. The Breusch-Godfrey Serial Correlation LM Test measures the value of F-statistic (1.971785) along with its probability (0.0677). It signifies that the study is free from autocorrelation. Thus, we accept H_{04} .

The next stage is to prove homoskedasticity in the dataset. The need of the test arises as the variables with different variances may result with biased analysis. The presence of constant variance thus is required for unbiased estimate of the results. The Breusch-Pagan-Godfrey test of homoskedasticity is presented in Table 11.

The Table 11 signifies that the model is free from heteroskedasticity and all the sample values in the model carries uniform variance in the time series data set. This proves to accept H_{05} .

The problem of multicollinearity is addressed here, and the results are shown in Table 12.

Table 12 explains the values in Variance Inflation Factor (VIF) matrix. Except GDPGR, all the variables are free from multicollinearity problem in the dataset. The respective values of VIF column prove the absence of multicollinearity as all the values are less than 10 here.

The stability of the model is judged through Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMQ) test. The results of the tests are presented in Fig. 1a and Fig. b.

Both Fig. 1a and Fig. b show the proof of stability in the model.

Table 10. Breusch-godfrey serial correlation LM test

Null Hypothesis Statement	F- Statistic	Probability
There remains no autocorrelation in the model	1.971785	0.0677

*** explains the value is significant at five percent level*

Table 11. Breusch-pagan-godfrey heteroskedasticity test

Null Hypothesis Statement	F- Statistic	Probability
There remains no heteroskedasticity in the model	1.172115	0.3361

Table 12. Result of multicollinearity

Name of the Variable	Coefficient of Variance	Variance Inflation Factor (VIF)
ln (GDPGR)	0.018976	14.95980
ln (EXP)	0.010268	9.896897
ln (EXP) ⁽¹⁾	0.008559	8.520894
ln (FDI)	0.042440	2.329459

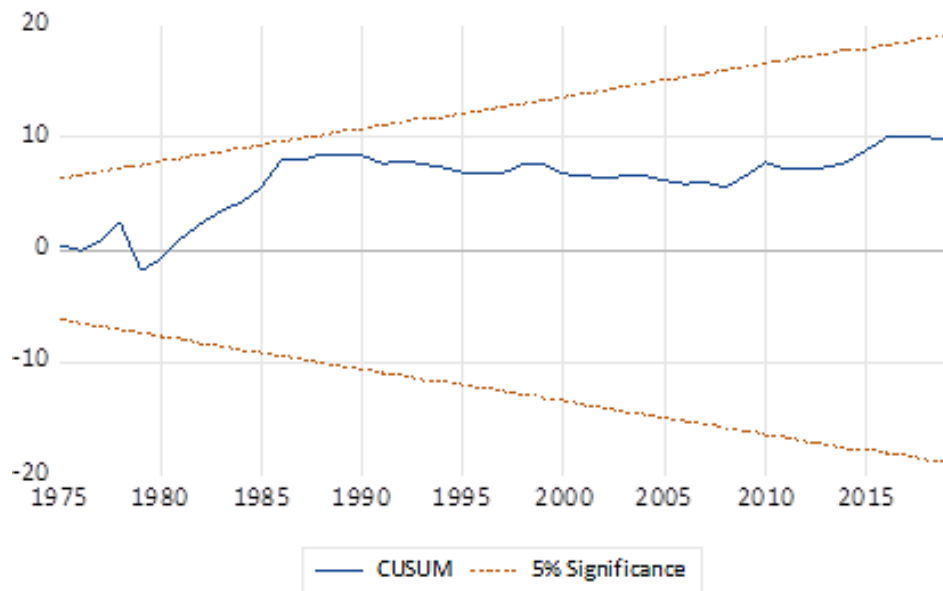


Fig. 1a. Result of CUSUM Test

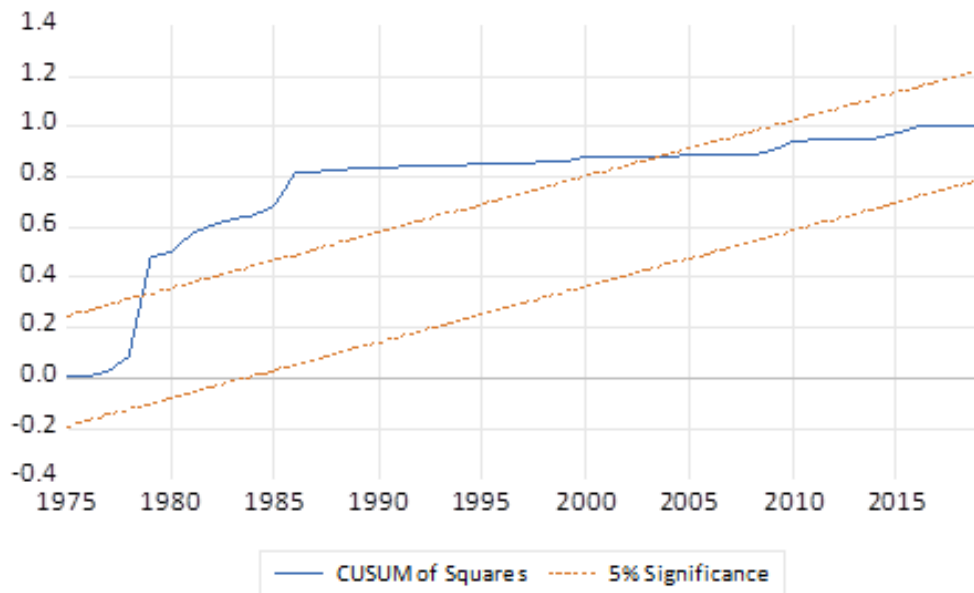


Fig. 1b. Result of CUSUMQ Test

3. DISCUSSION

Exports and foreign direct investment (FDI) have a complementing effect, but this effect depends on the host nation's level of development. FDI is applied and promoted in the developing economy to boost exports for developing nations and least well for lower-income countries.

The result of the study finds that there exists a keen relationship between export, FDI and growth rate of Indian economy over time. The

cointegration among the three variables proves the long-term association. Also, in the short run error correction result, it is proved that the shock adjustment mechanism is significant by 48.9812 percent. The economic turbulence in the short run will be corrected with 48.9812 percent probability and eventually the economy will move towards its long run stability. The result of ECM signifies that the causality in the long run from export to economic growth is significant. Finally, the short run granger causality proves that the export in the country will augment FDI inflows in

the economy, which, eventually will bring economic growth in India. The model shows that the data under the time series are free from autocorrelation and heteroskedasticity. It also signifies the stability of the model by CUSUM and CUSUMQ test. Finally, the multicollinearity in the data is tested through Variance Inflation Factor (VIF). The long run association the variables proves its importance to define the economic policies the way which provides utmost weightage to export promotion in the country. The need of percentage increase in the import substitution is doubtful though in the present analysis of the study. The policies in FDI need to be reformulated based on the current policies framed on different sectors of the economy. The correct policy in export promotion and FDI inflows will lead to positive per capita growth rate in India. Finally, the concentration of the short run steady economic growth needs to be focussed more to achieve subsequent long run stable economic growth in Indian economy.

India has a comparative advantage over other countries due to their expertise in technical advancement and high-quality exports. Therefore, a developing country aiming to maintain economic growth must prioritize enhancing the level of technology, innovation, and commerce. Hence, the findings of the research significantly enhance the process of internationalization in India. Additionally, it could offer valuable insights to policymakers and academia regarding the impact of commerce, technology, and the movement of knowledge and skills on the process of internationalization. Therefore, it is imperative to make efforts to stimulate investment policy and attract foreign direct investment, which will improve exports and transition towards technology-intensive industries, ultimately leading to increased economic productivity and growth. Moreover, the study reveals that technology enhances the efficiency, export capabilities, and economic expansion of the economies. Hence, it is imperative for Indian government to formulate a compelling strategy pertaining to technological advancement and to attract foreign investments to encourage productivity, investments, technology transfer, and trade. This will enhance the competitiveness of the economy by improving the quality of exports on the global market. Overall, exports and technology are currently and will continue to significantly contribute to the economic success of India. At the end, the study can be extended to check for

the other Asian economies that has not been a part of the current analysis.

4. CONCLUSION

The study ensures providing importance on export promotion in the country from the long run analysis of the data. Though the short run results are insignificant ensuring less urgency on short run economic policies, the long run ensures the weightage towards enhancement of export expansion and inflows of FDI in the country. The economic growth in India has always been unstable and facing instability in the path of its progress. As the study considers data from 1970, it has demonstrated the upheavals in the flow of exports and growth in the country. The stability in the flow has only been found in the FDI for the coverage period. Hence, the requirement of bringing stability in export and growth is utmost necessary for India. As the study found long run cointegration among export, FDI and GDP growth, the policy formation is necessary in export and FDI to receive economic stability in the country. As the study analyses in discussion, the requirement to boost export promotion in different sectors that have not yet been concentrated in detail. Another way to increase export promotion can be with the help of enhanced FDI inflows in the economy. The government may concentrate on relaxing the FDI inflows in the sectors which have not been given much importance yet. With the increased FDI inflows, these sectors may concentrate producing more and exporting in greater way to bring ultimate long run economic growth in India. The specific sectors to be focused to increase FDI as well as export promotion can be an extended for further research with respect to Indian economy.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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