

Paper Title

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

ABSTRACT

This study examines the association between India's foreign direct investments, exports, imports, and Inflation on Economic Growth in India. The autoregressive distributed lag (ARDL), bounds testing technique to co-integration over the long run, is used to investigate these connections. The error correction model (ECM) is also utilized to investigate the short-run dynamics. The findings support a long-term connection between FDI, exports, imports and Inflation on Economic Growth. Furthermore, FDI inflows, exports and Inflation in India proved to have a positive and insignificant on Economic Growth. However, imports looked to have a negative and insignificant impact. Finally, the research recommends that a more favorable government policy toward FDI might make the Indian economy more dynamic.

Keywords: Foreign direct investment; inflation; ARDL; ECM.

1. INTRODUCTION

Since the advent of economic liberalization measures in the early 1990s, India has been one of the world's fastest-growing economies in the world from 1992 and 2010. India's economy grew

at a pace of 7% every year. Meanwhile, foreign direct investment (FDI) inflow into India accelerated. "Between 2001 and 2010, average annual FDI inflows into India reached \$18.5 billion, more than six times the amount for the 1995-2000 period, allowing India to become one

of the fastest-growing FDI recipients (in terms of annual FDI inflows) among developing countries between 2001 and 2010" [1]. As a result, it is a fascinating research issue about India's economy sure to arise: what influence does the entry of FDI have on Economic Growth in India?

The association between FDI inflows and developing nations' economic growth has been extensively researched [2-5]. Wang and Swain [6], Borensztein, Eduardo and Lee [7], are a few examples (2007) [8].

"They report a favourable impact of FDI on economic growth. However, despite rises in flows of FDI, especially in recent years, the FDI-growth nexus in India has not yet been intensively searched. However, after performing an extensive review of the literature, it has been evident that only a handful of studies to date have been conducted, such as Pradhan [9], have attempted to tackle the issue and have provided a mixed response. Pradhan [9] employs a production function analysis to analyse the effect of inward FDI on Economic Growth in India". The present paper is organised into six sections: Section II reviews the relevant research literature; Section III outlines the data and the methodology used; Section IV presents research findings along with its analysis, and Section V draws conclusions and makes suggestions concerning policy implications.

2. REVIEW OF LITERATURE

FDI inflows are one of the most critical determinants of a country's development and economic progress. Several articles empirically examine the influence of FDI and Exports on Economic Growth. The influence of each variable, namely FDI, exports, and imports, on economic development has been researched in multiple countries over various periods and using various econometric models, methodologies, and methods. The concept that FDI supports economic growth developed with the emergence of neoclassical growth theory. According to Harrod [10], Domar [11], and Solow's [12]'s "neoclassical growth theory, FDI promotes economic development in the same way as domestic investments do in the short run". According to the endogenous growth hypothesis proposed by Lucas [13], "FDI promotes

3.2 Variables Identified and their Meanings

•GDP (Gross Domestic Product)_____Dependent variable

economic growth by integrating new technology and knowledge spillovers". According to studies by Borensztein and Lee [7] and Lim and Maisom [14,15], "FDI accompanied by management practices, human capital, exports, and technology transfer, aids in generating growth momentum". According to Lipsey and Weiss [16,17], "there is a positive association between trade flows and industry FDI". Alexiou and Tsaliki [18] investigate "the link between FDI and GDP in Greece from 1945 to 2003, demonstrating that FDI-led growth strikes in the long run". Miankhet et al. [19] investigate "the link between FDI and GDP in six rising economies (Chile, India, Mexico, Malaysia, Pakistan, and Thailand). The outcome demonstrates the long-run causation of GDP to the other factors under consideration". Katircioglu [20] studies "the long-run and short-run links between FDI inflows and economic development in Turkey from 1970 to 2005 using the ARDL-Bounds test. The analytical results suggest a link between FDI and real GDP". Belloumi [21] investigates "the relationship between FDI, trade openness, and economic development in Tunisia from 1970 to 2008 using the ARDL Bounds test). The analysis's findings reveal the factors working together in the long term". Sunde [22] discovered "unidirectional causation between economic growth and foreign direct investment using the VECM Granger causality test, confirming the FDI-led growth theory for South Africa. With this in mind, this article explores the dynamic link between FDI inflows, exports, imports, and GDP in India from 1991 to 2018 using the Autoregressive Distributed Lag technique (ARDL-Bounds test)".

3. OUTLINES THE DATA AND THE METHODOLOGY

3.1 Data Sources and Data Types

The study was based on secondary data and collected from various public resources i.e., the World Development Indicator, World Bank, the Indian Economic Survey, and the Handbook of Statistics. The sampling period for the study was 30 years, from 1991 to 2020. These methods were utilized in a similar way in agricultural growth [23] and determinants of agricultural growth in Uttar Pradesh [24]. Growth Performance of Major Food-Grain (Wheat, Rice and Gram) In Uttar Pradesh, [25].

- INF (Inflation Rate) _____ Independent variable
- FDI (Foreign Direct Investment) _____ Independent variable
- EXP (Export) _____ Independent variable
- IMP (Import) _____ Independent variable

3.3 Gross Domestic Product (GDP)

The country produced all the goods and services in a particular year. "GDP stands for Gross Domestic Product. To reflect economic Growth, GDP was used as the dependent variable. If GDP rises, so will economic growth.

FDI, Net Inflows (% of GDP), The value of inner direct investment made by non-resident investors in the reporting economy, including reinvested earnings and intra-company loans, net of capital repatriation, and loan repayment, is referred to as FDI net inflows.

3.4 Inflation, Consumer Prices (Annual %)

Inflation is the rate at which prices of goods and services rise. Inflation reduces the buying power of currencies. Therefore, it has a significant influence on the country's economy and population. The consumer price index also measures Inflation.

Export of Goods and Services (% of GDP) transport or convey (anything, such as a commodity) to another location (such as another country).

Import of Goods and Services (% of GDP) bring (something, such as products) from another country into an area or country.

3.5 Formulation of Hypotheses

H0 = Agriculture productivity in India has no positive association with economic growth.

H1: Agriculture productivity has a favorable association with India's economic growth.

3.6 Econometric Model

This study's econometric model is as follows:

$$GDP = \beta_0 + \beta_1 (INF) + \beta_2 (EXP) + \beta_3 (IMP) + \mu \quad (1)$$

Where,

GDP stands for Gross Domestic Product.

INF stands for Inflation.

EXP stand for Export

IMP stand for Import

β_0 = Interception

Slope Coefficient = $\beta_1, \beta_2, \beta_3$,

Error Term = μ

4. RESEARCH FINDING

4.1 Descriptive Statistics

Table 1. Dependent and independent variable

	GDP	FDI	EXP	IMP	INF
Mean	5.81	1.29	16.83	19.23	7.24
Median	6.59	1.18	18.54	20.28	6.50
Maximum	8.84	3.62	25.43	31.26	13.87
Minimum	-7.25	0.03	8.49	8.49	3.33
Std. Dev.	3.11	0.84	5.43	7.04	3.24
Skewness	-2.59	0.61	-0.07	0.09	0.51
Kurtosis	11.36	3.08	1.61	1.72	1.96
Jarque-Bera	121.13	1.87	2.43	2.10	2.63
Probability	0.00	0.39	0.30	0.35	0.27

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Sources; World Bank

4.2 Statistical Evaluation

Table 1 reveals that the average GDP growth rate is 5.81 percent, with a standard deviation of 3.11 percent. The average inflation rate (INF) is 7.23, with a standard deviation of 3.23. The mean or average value of Foreign Direct Investment (FDI) is 1.29, with a standard deviation of 0.84. The mean value of Export is 16.83, with a standard deviation of 5.43. The mean total Import value is 19.22, with a standard deviation of 7.04. Other variables are favorably skewed except for GDP & Export, which are negatively skewed, including Inflation, FDI, and IMP. The variables' kurtosis statistics show that EXP, IMP and INF are platykurtic (lower peak or short-tailed) since their values are smaller than 3. GDP & FDI is leptokurtic (long tailed or high peak) since its value is greater than three. The results show that the Jarque-Bera P (probability) value of GDP is 0.00, less than 10%; hence, we reject the null hypothesis, indicating that the data is not normally distributed. Because the Jarque-Bera P-value of Inflation is 0.26, greater than 10%, we accept the null hypothesis because it indicates that the data is normally distributed. As a result, because the Jarque-Bera P-value of all the other variables is greater than 10%, therefore null hypothesis is accepted because the data is normally distributed.

All the variables are significantly correlated with GDP except FDI and INFLATION. The variable gross domestic product (GDP) is negatively correlated with FDI and INF. EXP and IMPORT positively correlate with the gross domestic product (GDP). The same variables FDI and FDI, EXP and EXP, IMP and IMP and INF are entirely dependent on each other. The association

between GDP and Inflation is negative -0.07 because $r > |0.30|$. The degree of association between FDI, EXP, and IMP force is 0.79, 0.78, and the correlation is moderate because $|0.30| < r < |0.70|$. The degree of association between GDP and INF is -0.07, which shows a weak correlation.

Table 3 shows the stationary and non-stationary characteristics of the variables. Time series data must be stationary to avoid erroneous regression analysis since obtaining excellent findings and forecasts with a non-stationary series is impossible. The augmented Dickey-Fuller test revealed that certain variables are stationary at the level, and others are stationary at the first difference. This means that GDP is integrated at the first difference, and the t-statistic value is -4.37 with a probability value of 0.002. Inflation is likewise stationary at the level with a t-statistic of -5.99 and a probability of 0.00. The Foreign Direct Investment (FDI) is integrated at the first difference with the t-statistic value of -5.82, with a probability value of 0.00. The EXP is stagnant at a t-statistic of -1.53 and a probability of 0.50. The IMP is stationary at the first difference, with a t-statistic of -4.07 and a probability of 0.00. Time series analysis reveals that all variables are integrated into distinct orders, implying no co-integration among variables. Therefore, the ARDL model may be used. However, in other words, above Table 3, we can see that When the ADF and PP tests are used to determine whether variables are stationary, we find that logarithms of gross domestic product (LnGDP) and logarithms of Foreign Direct Investment (LnFDI) are both stationary at the 1 percent level of significance.

Table 2. Results of the correlation matrix

	GDP	FDI	EXP	IMP	INF
GDP	1.00	-0.12	0.10	0.14	-0.07
FDI	-0.12	1.00	0.79	0.78	-0.131
EXP	0.10	0.79	1.00	0.98	-0.133
IMP	0.14	0.78	0.98	1.00	-0.07
INF	-0.07	-0.13	-0.133	-0.07	1.00

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Table 3. ADF Test

Variable	DF/ADF Unit root Tests		DF/PP	
	Level	First Difference	Level	First Difference
LGDP	-2.10(0.24)	-4.37**(0.00)	-2.10 (0.24)	-4.37**(0.00)
LFDI	-1.823(0.36)	-5.82** (0.00)	1.75 (0.39)	-6.20** (0.00)
LEXP	-1.53 (.50)	-5.477**(0.00)	-1.53(0.50)	-5.48**(0.00)
LIMP	-1.56 (0.48)	-4.073**(0.00)	-1.57(0.00)	-4.07**(0.00)
LINF	-5.99*(0.00)	-6.78**(0.00)	-3.10**(0.03)	-6.86**(0.00)

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In contrast, logarithms of exports (LnEXP), logarithms of imports (LnIMP) and logarithms of Inflation (LnINF) are both stationary at the 5 percent level of significance. The right lag order is also one of the ARDL method's requirements. The information criterion for picking the laglengths is Akaike's information criterion (AIC), and the findings show that the best lag length of the variables is 4.

4.3 Autoregressive Distributed Lag Model

The ARDL technique examines India's Foreign direct investment, Export, Import, Inflation, and economic growth. The ARDL bounds testing technique established by Pesaran and Shin [26], and many researcher used this technique such as Ansari, et. al. [24], Khan et. al. [27]. and is elastic, requiring that variables in the model specification be integrated at order 0 or 1, that is, I (0) or I (1). (1). Even with tiny samples, this estimate methodology produces effective results. In the model, variables can be assigned varying leg lengths. The following is the ARDL equation [28]:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \dots + \beta_q Y_{t-p} + \alpha_0 X_t + \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \dots + \alpha_k X_{t-k} + \epsilon_t \quad (2)$$

The unconstrained vector error model, on the other hand, is shown below

$$\Delta GDP_t = Y_0 + \sum_{i=1}^p Y_1 GDP_{t-1} + \sum_{i=1}^p Y_2 FDI_{t-1} + \sum_{i=1}^p Y_3 EXP_{t-1} + \sum_{i=1}^p Y_4 IMP_{t-1} + \sum_{i=1}^p Y_5 INFL_{t-1} + \epsilon_t \quad (3)$$

The ARDL model, shown in Equation (3), demonstrates the long-run and short-run connection between the dependent and independent variables. The intercept term is 0. The short-run coefficients of variables are Y0, Y1 Y2, Y3, Y4, explanatory variables. In contrast, the

long run coefficients of variables, and t is the stochastic error, which includes all missing variables in the Equation.

The bound test for co-integration demonstrates the long-run relationship between the variables. Table 4 displays the results.

Table 3 shows that the F-statistic value (4.01) is greater than the lower and upper bounds at the 5% significance level. As a result, there is a long-run link between LnGDP, LnFDI, LnEXP, LnIMP and LnINF. The model meets the model's normalcy, autoregressive conditional Heteroscedasticity (ARCH), functional forms, and serial correlation assumptions. Because the co-integration link is determined in this manner, the procedure for estimating the Autoregressive Distributive Lag (ARDL) model began to look for long and short-term associations. After establishing co-integration, the long-run model may be calculated using equation 2. Table 5 summarizes the outcomes of estimating equation 2.

Table 5 indicates the results of the ARDL model, which indicate that the co-efficient value of FDI, in the long run, is significant. It reflects a Positive association with GDP annual growth rate, meaning if the one-unit increase in the GPD rate, the FDI annual growth rate will likely rise by 17 percent. The co-efficient import (EXP) value is statistically insignificant and negatively related to GDP annual growth in the long run. In the long run, the reason for the insignificant and negative relationships is the lack of investment due to the electricity shortage [29,30,9]. Therefore, there is a negative effect of imports on GDP. The co-efficient inflation value is positive and statistically insignificant in the long run.

Table 4. F-Bounds test

Test Statistic	Value	Significance.	I(0)	I(1)
F-statistic	4.01	10%	2.2	3.09
k	4	5%	2.56	3.49

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Table 5. Long run coefficient

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	17.91	22.62	0.79	0.47
EXP01	13.69	13.35	1.02	0.36
IMP	-12.14	12.36	-0.98	0.38
INF	2.049	2.02	1.01	0.36
C	-28.02	29.82	-0.93	0.40
EC = GDP - (17.9164*FDI + 13.6941*EXP01 -12.1452*IMP + 2.0496*INF -28.0211)				

Author's Calculation Eview-10

Table 6. Error correction model: Short run relationship

ECM Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI)	-4.02	0.40	-9.89	0.000
D(EXP01)	-3.68	0.53	-6.93	0.002
D(IMP)	2.10	0.34	6.06	0.003
D(INF)	0.76	0.10	6.98	0.002
CointEq(-1)*	0.77718	0.105	7.35	0.001
R-squared		0.97686	Mean dependent var	-0.53
Adjusted R-squared		0.93573	S.D. dependent var	3.18
S.E. of regression		0.80811	Akaike info criterion	2.65
Sum squared resid		5.87739	Schwarz criterion	3.48
Log likelihood		-17.562	Hannan-Quinn criter.	2.89
Durbin-Watson stat		1.66166		

Author's Calculation Eview-10

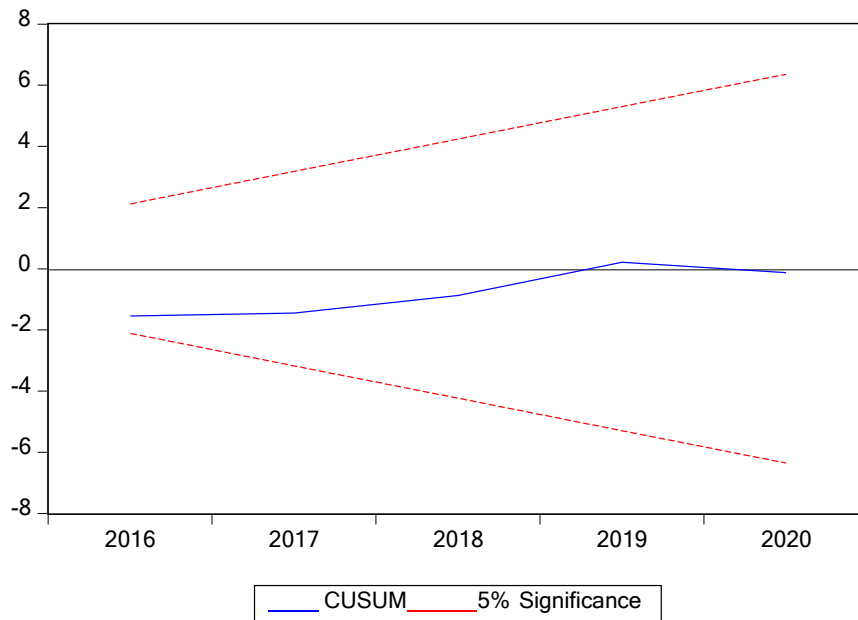


Fig. 1. Graph showing Cumulative sum of recursive residuals (CUSUM)

The above table 6 shows that economic growth in a variable is the most important in the long and short run. The value of the ECM co-efficient is 0.77, which is positive and significant. The positive and significant coefficient of error correction model indicates the presence of a long-run causal relationship. The value of ECM indicates the speed of adjustment from disequilibrium to equilibrium. The adjusted R² is 0.97, which reveals a 97% variation in GDP (Dependent variable) due to the change in independent variables. The probability of F-statistic is also statistically significant at 5% significance, which justifies that the model is a goodness of fit.

Stability of the Model: Cumulative sum of recursive residuals (CUSUM) talks about the stability of the model concerning short-run and long-run relationships between variables. The graph of the cumulative sum of recursive residuals is provided below.

CUSUM Test takes the time series on the horizontal axis and residual along the vertical axis to check the stability of the model. Fig. 1 shows that CUSUM is within 5% critical lines range. The graph does not cross this critical boundary. So, it is concluded that the model is stable, and no significant gap exists. This correct specification model accepts the null hypothesis at the 5% significance level.

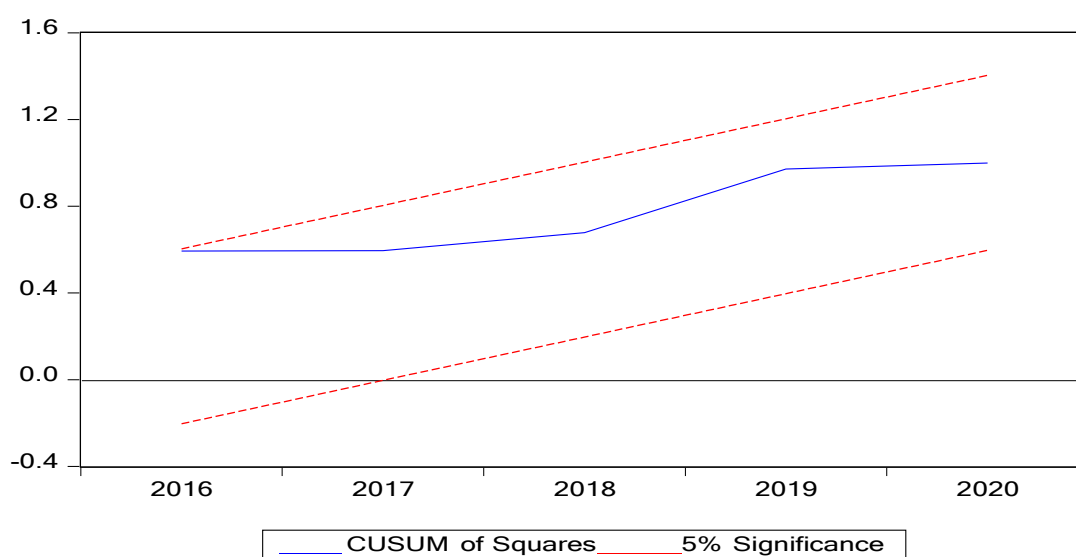


Fig. 2. The plot of CUSUM and CUSUM statistics

The findings show that the coefficients are not unstable, as seen by the plot of CUSUM, and The CUSUM statistic is within the crucial bands of the 5% confidence range for parameter stability.

4.4 Findings of the Study

The following are the study's key findings: - First, the study explores explanatory factors' influence on economic growth, often known as GDP. The findings of the ARDL model demonstrate that all of the independent variables, including FDI, EXP, IMP, and INF, are insignificant in the long run but significant in the short run. The second good aspect of India's economic growth is the absence of imports, which negatively impacts economic growth in the long run. The value of R-square in the study indicates that the independent variable has a considerable influence on the dependent variable, and the model of the study is of excellent fit. This study looked at the influence of foreign direct investment inflows, exports, imports, and Inflation on India's economic growth from 1991 to 2020. FDI, long run and short run, in India Foreign direct investment has a positive impact on economic growth. which was a component of the same stream that Harrod [10], Domar [11], Solow's [12], and Ikram et.al., [31].

The study applied ARDL bound testing technique to investigate the long-run and short-run relationships between the variables, namely GDP, FDI inflows, exports, imports, and Inflation.

The co-integration analysis results show a positive and negligible association between

GDP, FDI, and exports of goods and services and a negative association between GDP and imports.

However, in a broader context, it can be stated that FDI inflows and exports are the driving forces behind India's economic growth. Export prospects should be promoted so FDI inflows can also enhance into other areas of the economy [32-34].

5. CONCLUSION AND POLICY RECOMMENDATIONS

The findings can significantly impact Indian policymakers, recommending a concentration on FDI and export-led growth. Furthermore, this study suggests that additional structural policies be used to implement changes with explicit aims and pledges. Despite the recent increase in foreign FDI into India, empirical research on the FDI spillover effects is few and has shown varied results. This conclusion has a clear implication: because FDI is proven to be an engine of economic Growth in India, implementing a more active and open strategy to encourage FDI inflows in chosen sectors is likely to boost knowledge. FDI-induced productivity growth and exports in host countries generally go hand in hand. Government policy directed at undertaking industry transfer to advance industrial structure (e.g., high-tech industries) in India can positively affect both FDI and exports, thereby boosting economic growth. Finally, while we hypothesize that additional disaggregated data, such as sector and industry data, might provide more

robust results, this paper cannot investigate industrial/sector heterogeneity. Future studies should look at this topic.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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