The Impact of FDI and Exports on India's Economic Growth: A Multiple Regression Model

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Abstract

This study investigates the impact of Foreign Direct Investment (FDI) and exports on India's economic growth between 1990 and 2023 through a multiple regression model. The analysis reveals that FDI has a statistically significant positive effect on GDP growth, while the impact of exports on GDP growth is minimal. The Augmented Dickey-Fuller (ADF) test confirms that FDI and exports are not stationary at the level, requiring first differencing for stationarity, suggesting a dynamic relationship with economic growth. Regression results indicate a stronger relationship between FDI and GDP, emphasizing FDI as a crucial driver of economic development. The study also confirms the robustness of the model with no significant issues in misspecification, serial correlation, or multicollinearity. Based on these findings, policy recommendations emphasize the promotion of FDI, the diversification of export strategies, and the need for structural reforms to bolster India's long-term economic growth.

Keywords:

Foreign Direct Investment (FDI), Exports, Economic Growth, India, Multiple Regression Model.

1. Introduction

Foreign Direct Investment (FDI) and exports play a crucial role in driving economic growth across developed, developing, and emerging economies. FDI acts as a catalyst for technology transfer, knowledge spillover, and capital infusion, thereby enhancing productivity and economic development **(Dunning, 2001).** In developing economies, FDI contributes to infrastructure development, employment generation, and fosters integration into the global market **(Narula & Dunning, 2000).** Similarly, exports stimulate economic growth by increasing foreign exchange earnings, enhancing domestic industries' competitiveness, and expanding market access **(Krugman & Obstfeld, 2009).** Together, FDI and exports create a symbiotic relationship that drives both short-term and long-term growth in various economic contexts **(Balasubramanyam et al., 1996).**

Foreign Direct Investment (FDI) and exports play a pivotal role in driving economic growth, particularly in emerging economies like India. FDI brings in capital, technology, and managerial expertise, which enhances domestic productivity and industrial capabilities, thus fostering economic growth **(Borensztein et al., 1998).** Simultaneously, exports stimulate economic activity by expanding market access for domestic firms and promoting economies of scale, resulting in increased GDP growth **(Krugman, 1991).** For India, these two factors have been crucial in the post-liberalization era, contributing to its integration into the global economy **(Bajpai & Sachs, 2000).** Empirical studies have shown a positive relationship between FDI inflows and export performance, with both acting as key drivers for India's rapid economic development **(Athukorala & Kohpaiboon, 2010).** Additionally, it has been argued that the synergies between FDI and exports are central to improving technological capabilities and competitiveness in global markets (Harrison, 1994). Therefore, understanding the

interplay between these variables is critical for shaping policies that can further enhance India's economic trajectory **(Goldberg & Pavcnik, 2007).**

India's economic performance post-liberalization has been marked by significant growth, driven by market reforms initiated in 1991. The liberalization process led to increased foreign direct investment (FDI), a boost in exports, and enhanced integration with the global economy. These measures played a crucial role in transforming India's economic landscape, contributing to a consistent rise in GDP growth rates and poverty reduction **(Panagariya, 2008; Bery, 2009).** By opening up markets, reducing trade barriers, and fostering a more competitive environment, India experienced higher productivity, industrial growth, and expansion in the services sector **(Rangarajan, 2006).** Additionally, India's integration into global trade networks strengthened its macroeconomic stability and accelerated industrialization.

India's integration into international markets was largely facilitated by the increased flow of FDI and the expansion of exports, which contributed significantly to the country's economic growth. The liberalization of trade policies, coupled with a focus on improving infrastructure and human capital, allowed Indian firms to better compete in the global market. As a result, India became an important player in the global value chains, with external drivers such as international demand for Indian goods and services, global capital flows, and technological advancements driving economic performance. Exports, particularly in sectors like information technology, pharmaceuticals, and textiles, became pivotal to India's economic dynamism **(Balasubramanyam & Mahambare, 2010).**

Table 1.Current Outlook and Future predictions of Indian Economy

Indicator (Percent Y-O-Y growth)	**FY 2022-23**	**FY 2023-24**	**FY 2024-25**	**FY 2025-26**	**FY 2026-27**
Real GDP Growth (at constant market prices)	7.0	8.2	7.0	6.7	6.7
Private Consumption	6.8	4.0	5.7	6.0	6.1
Government Consumption	9.0	2.5	4.3	5.0	5.0
Gross Fixed Capital Formation	6.6	9.0	7.8	7.7	7.7
Exports, Goods and Services	13.4	2.6	7.2	7.2	7.9
Imports, Goods and Services	10.6	10.9	4.1	6.3	7.3
Agriculture	4.7	1.4	4.1	3.9	3.7
Industry	2.1	9.5	7.6	7.3	7.2
Services	10.0	7.6	7.4	7.1	7.1

Note: Indicators of FY 2023-24 are estimated while of FY2024-25 to FY 2026-27 is forecasted.
Source: CEIC and World Bank.

Table 1 presents the current outlook and future predictions of key indicators for the Indian economy from FY 2022-23 to FY 2026-27. It shows that India's real GDP growth is expected to moderate from 7.0% in FY 2022-23 to 6.7% by FY 2025-26 and FY 2026-27. Private consumption growth is projected to decline significantly in FY 2023-24, dropping to 4.0%, before recovering to 6.1% by FY 2026-27. Government consumption is expected to slow down after a high 9.0% growth in FY 2022-23, but maintain moderate growth of around 5.0% in the following years. Gross fixed capital formation and exports show positive momentum, with exports predicted to experience growth from 2.6% in FY 2023-24 to 7.9% by FY 2026-27. Imports are expected to stabilize after a sharp rise in FY 2023-24, with a steady growth rate across the forecast period. Sector-wise, agriculture growth is anticipated to decelerate, while industry and services are expected to maintain strong growth, with services

outpacing agriculture and industry in the coming years. Overall, the economy is expected to show moderate growth, with some variation across different sectors.

Foreign Direct Investment (FDI) and exports have long been considered essential drivers of economic growth for developing nations, including India. FDI brings not only capital but also technology, management expertise, and access to international markets, which can boost productivity and stimulate long-term economic development (Alfaro et al., 2004). Exports, on the other hand, expand market access for domestic firms, improve efficiency through competition, and help integrate the economy into global value chains (Razin & Rubinstein, 2006). While much has been written about the individual impact of FDI and exports on economic growth, few studies have explored the simultaneous and interactive effects of both these variables within a robust statistical framework. Understanding how FDI and exports jointly influence economic growth is critical for policymakers to design effective strategies that attract investment and promote international trade.

Despite the growing importance of FDI and exports in shaping economic trajectories, there exists a significant gap in the literature regarding their combined influence on India's growth, particularly in the context of emerging economies. Previous research has focused on either FDI **(Chakraborty & Nunnenkamp, 2008)** or exports **(Balassa, 1985)** in isolation, but there is limited empirical evidence that incorporates both factors in a single analytical model, especially using multiple regression techniques. This study seeks to address this gap by evaluating the joint impact of FDI and exports on India’s economic growth. Given the increasing significance of both these drivers in India’s globalized economy, this research is crucial for offering comprehensive insights into how foreign investments and international trade together contribute to economic expansion **(Kumar & Pradhan, 2017).**

2. Objectives of Research Study

The objectives of research study on "The Impact of FDI and Exports on India's Economic Growth: A Multiple Regression Model" to **construct a multiple regression model to assess the combined effect of FDI and exports on India's economic growth**. This objective seeks to develop and validate a multiple regression model that quantifies the joint impact of FDI and exports on GDP growth in India.This objectives will guide the research in understanding the individual and combined roles of FDI and exports in driving India's economic growth.

3. Review of Literature

Foreign Direct Investment (FDI) and exports have long been recognized as key drivers of economic growth, particularly in developing economies like India. As one of the largest emerging markets, India's economic growth trajectory has been significantly influenced by these two factors. Numerous studies have explored the relationship between FDI, exports, and economic growth, offering valuable insights into their interconnected roles in fostering development. While FDI provides capital, technology, and managerial expertise, exports serve as a key channel for markets, employment, and industrial growth. In India, the liberalization policies of the 1990s paved the way for increased FDI and export activities, triggering debates about their combined impact on the nation's economic expansion. This review of literature examines the empirical findings from various studies, shedding light on how FDI and exports contribute to India's GDP growth and the broader implications for policy and economic strategy.

3.1 The Relationship between Foreign Direct Investment (FDI) and Economic Growth

Foreign Direct Investment (FDI) has been widely considered a critical driver of economic growth, particularly in developing countries like India. Numerous studies have highlighted the positive relationship between FDI inflows and economic growth, suggesting that FDI brings not only capital but also technology, managerial expertise, and access to international markets. For instance, **Borensztein et al. (1998)** argue that FDI plays a pivotal role in accelerating economic growth by enhancing the technological capabilities of host countries. Their research shows that FDI inflows tend to lead to increased productivity, which, in turn, propels economic growth. In the Indian context, studies such as those by **Kumar (2002)** and **Banga (2003)** have confirmed that FDI has a significant positive effect on India's growth by fostering innovation and improving infrastructure, thus contributing to an increase in the country's GDP.

However, some studies caution that FDI does not automatically lead to economic growth. A number of researchers have highlighted that the relationship between FDI and economic growth can be contingent on the absorptive capacity of the host economy. In countries where the domestic market is not well developed or where the local workforce lacks the necessary skills, the potential benefits of FDI may not be fully realized. A study by **Aitken and Harrison (1999)** found that in some cases, FDI may lead to crowding out of domestic investment or contribute to an increase in income inequality, thus dampening its overall impact on economic growth. Similarly, research by **Alfaro et al. (2004)** argues that the benefits of FDI are contingent upon the host country's level of financial and human capital, suggesting that FDI might not always lead to higher economic growth if these factors are lacking.

In contrast, there are also studies that suggest a neutral or inconclusive relationship between FDI and economic growth. For instance, a study by **Carkovic and Levine (2002)** concluded that FDI might not significantly affect economic growth in some countries, especially if the economy is highly dependent on raw material exports or has low levels of industrial diversification. Furthermore, empirical analysis by **Blomström et al. (1994)** showed that while FDI can contribute to growth in specific industries, its effects might not be as pronounced across the entire economy, particularly in sectors that do not benefit from foreign investment. In India, the neutral impact of FDI on economic growth has been observed in sectors like agriculture, where foreign investments tend to be limited and the sector's growth is often driven by domestic factors.

Lastly, it is important to recognize that the impact of FDI on economic growth is not universally positive or negative but is deeply context-dependent. The interaction of various factors, such as government policies, the level of economic development, infrastructure quality, and the openness of the economy, can shape the nature of this relationship. A study by **Zhang (2001)** emphasizes that countries that adopt pro-FDI policies, such as tax incentives, improved infrastructure, and trade liberalization, are more likely to see the benefits of FDI in the form of economic growth. In India, recent reforms such as the introduction of the Goods and Services Tax (GST) and liberalized FDI norms have been instrumental in attracting foreign investments, which have, in turn, contributed to growth in several sectors, including technology and manufacturing.

3.2 The Relationship between Exports and Economic Growth

The relationship between exports and economic growth has been widely studied, and most research suggests a positive link between the two variables. The export-led growth hypothesis posits that an increase in exports can stimulate domestic economic growth by creating more jobs, enhancing productivity, and promoting innovation through exposure to international markets. According to **Krugman (1991),** export growth leads to higher levels of national income and economic growth because it allows countries to access larger markets and utilize economies

of scale. Similarly, **Chandra and Sharma (2015)** found that exports play a significant role in driving India's GDP growth by enhancing industrial output and boosting foreign exchange reserves. Moreover, **Balassa (1978)** emphasized that countries with higher export growth experience improvements in their overall economic performance as exports contribute to both short-term and long-term economic gains.

On the other hand, some studies argue that the relationship between exports and economic growth may not always be uniformly positive and can vary depending on various factors such as the type of goods being exported and the level of technological development. For instance, **Sarkar and Ahuja (2018)** suggested that while export growth positively impacts economies in the long run, the benefits for developing countries like India can be less pronounced in the short run if their exports are primarily low-value-added goods. Furthermore, some researchers have proposed a neutral or weak relationship between exports and economic growth. The findings of **Gupta and Khan (2012)** indicate that although exports have a positive effect on economic growth in the long term, in the short term, other factors such as domestic consumption and investment may have a more significant impact on economic expansion. Therefore, while the overall consensus tends to favor a positive link, the impact of exports on economic growth can be contingent upon specific conditions within a country's economic structure.

3.3 The Nexus between Foreign Direct Investment (FDI), Exports, and Economic Growth

The relationship between Foreign Direct Investment (FDI), exports, and economic growth has been a subject of considerable interest in the context of developing economies like India. Numerous studies have explored how these factors interact to stimulate economic development. FDI, as a source of capital, technology, and managerial expertise, is often viewed as a key driver of economic growth. According to **Basu and Guariglia (2007),** FDI inflows contribute to economic growth by providing access to advanced technologies and fostering efficiency in domestic industries. These benefits are often realized through the enhancement of exports, as FDI encourages firms to improve their productivity and expand their markets. In the Indian context, FDI has been found to significantly boost export performance, as it facilitates the transfer of knowledge and connects local industries to international markets **(Chakrabarti, 2001).**

Exports, on the other hand, have been identified as a critical determinant of growth, especially in an open economy. The relationship between exports and economic growth has been extensively documented in the literature, with many studies suggesting a bi-directional causality between the two. **Krugman (1994)** argues that exports are not only an engine of growth but also a crucial mechanism through which economies can access foreign markets and expand their production capacity. In India, the liberalization of trade policies and the expansion of export activities since the early 1990s have played a vital role in promoting economic growth **(Srinivasan & Bhagwati, 1999).** These exports are often driven by the presence of multinational companies that bring in capital, technology, and new management practices through FDI.

The interaction between FDI and exports has been shown to be particularly significant for emerging economies, where FDI acts as a conduit for greater access to international markets. In India, the dual forces of FDI and exports have worked synergistically to enhance economic performance. As noted by **Kumar (2001),** the integration of Indian firms into global value chains through FDI has not only increased export capacity but also accelerated economic growth by fostering competitiveness and improving industrial output. Moreover, studies by **Lipy and Afroz (2016)** suggest that FDI has a direct and indirect effect on export growth, with foreign-invested firms being more likely to export than purely domestic ones, due to their larger capital base and advanced technological capabilities.

In conclusion, the nexus between FDI, exports, and economic growth is complex and mutually reinforcing. FDI contributes to economic growth by improving domestic productivity, facilitating technology transfer, and increasing export capacity. At the same time, a robust export sector enhances economic growth and attracts more FDI, creating a positive feedback loop. The empirical evidence from India supports this interconnected relationship, with both FDI and exports playing complementary roles in driving the country's economic progress. These findings underscore the importance of policy measures that encourage both foreign investment and export promotion to sustain long-term economic growth **(Das, 2007; Singh & Kaur, 2014).**

4. Methodology and Data

The study used quantitative economic analysis based on the multiple linear regression model, and the annual growth of GDP in India appears as an endogenous variable. The respective external control variables were foreign direct investment as a percentage of GDP and exports of goods and services as a percentage of GDP dataset comprised on yearly basis in the study. The sample data used in this economic analysis included 33 observations obtained from World Development Indicators (WDIs) published annually between 1990 and 2023. The model adopted in this research is as follows.

$$GDP = \beta_0 + \beta_1 FDI + \beta_2 EXP\_ + \varepsilon_i$$

Wherein,
GDP =economic growth
FDI= foreign direct investment as a percentage of GDP
EXP_ = exports of goods and services as a percentage of GDP
ε =Unobserved random variables (error)

There have been tests statistics implemented to determine the appropriateness of data with respect to the defined model. First of all, we conducted input tests such as the Jarque-Bera and Dickey-Fuller (ADF) Augmented Test to evaluate normality and stationarity. Then the model will be interpreted on the basis of criteria such as statistical error levels, p-values, t-tests, F-statistics, R^2 and adjusted R^2-determination coefficients, heteroscedastic tests with White and Breusch-Pagan tests, collinear tests with variable inflation factors (VIFs) and autocorrelation tests with Breusch-Godfrey tests. The entire analysis will be performed with EViews 10 software.

5. Results and Discussion

Figure 1 highlights that the occurrence of non-stationarity and skewed right-handedness has been confirmed in the input statistics. It occurs because of structural breaks in time series. In this situation, GDP declined sharply during the first quarter of 2020-21 at the beginning of the COVID-19 pandemic.

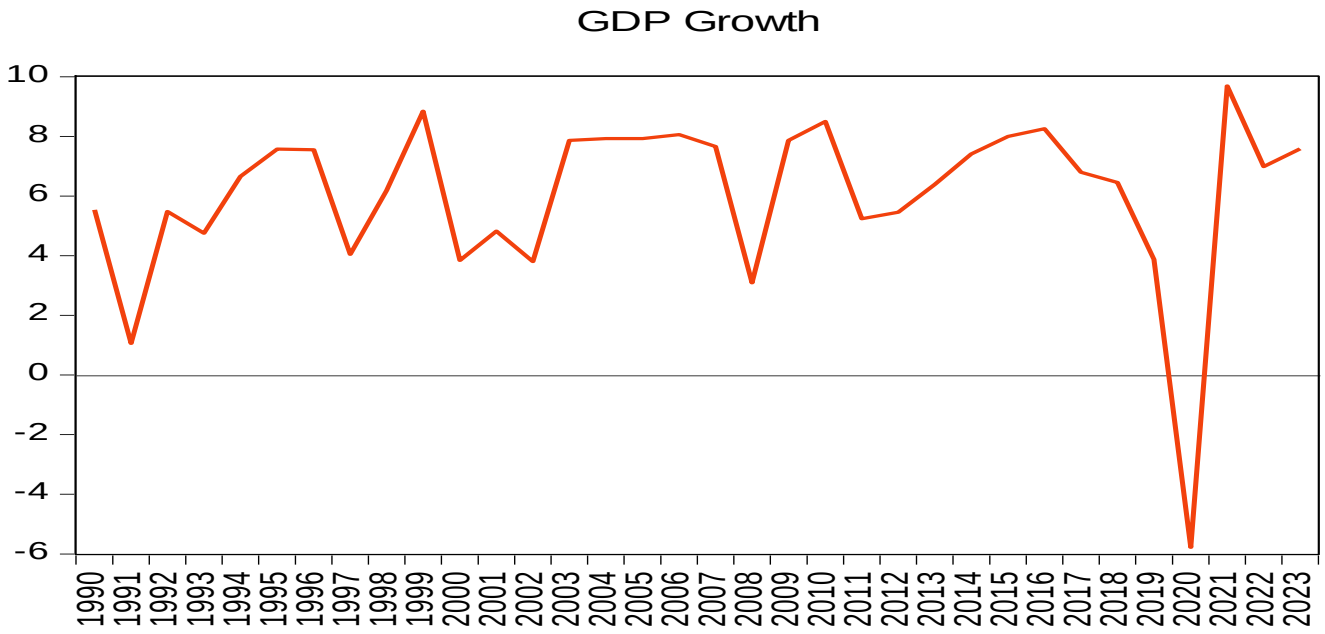

Figure 1.Graphical Presentation of GDP growth in India in the year 1990-2023.
Source: Drawn by the author using EViews 10.

The outbreak of COVID-19 undoubtedly slowed India's economic activity in March 2020 (Q1, 2020-21), with GDP falling by nearly 5.8% this year. The reopening of businesses and government stimulus measures supported the current recovery in 2021, with a record 9.69 per cent growth in GDP. Because of the sharp changes in the trend of time series on the graph, the problem of non-stationarity is considerably exacerbated. This problem requires the rescale of the time series data using logarithms and the differentiation of time series. Thus, the economic model was reformulated as follows:

$$LNGDP=\beta_0+\beta_1\ FDI\ 1+\beta_2\ LNEXP\_1+\varepsilon_i$$

Whereas,
LNGDP= Log 10 of economic growth
FDI 1=1st difference of foreign direct investment as a percentage of GDP
LNEXP_1=1st difference of log 10 of exports of goods and services as a percentage of GDP
ε= Unobserved random variables (error)

Optimum Lag Selection and Stationarity of Data

While analyzing the relationship between Foreign Direct Investment (FDI), exports, and India's economic growth, ensuring the accuracy and reliability of the econometric model is crucial. One of the fundamental steps in such analysis is determining the optimum lag length, which refers to selecting the appropriate number of past periods that should be considered to capture the dynamic effects of FDI and exports on economic growth. Additionally, stationarity of the data is vital, as non-stationary data can lead to misleading results and spurious relationships. This section discusses the significance of both optimum lag selection and data stationarity in constructing a valid multiple regression model for understanding the impact of FDI and exports on India's economic growth.

Table2.Vector autoregressive lag order selection based on Akaike information criterion

Variables	Lag	Log L	LR	FPE	AIC	SC	HQ
LNGDP	0	1.850937	NA*	0.055608*	-0.051572*	-0.006223*	-0.036313*
	1	1.862671	0.022046	0.059048	0.008323	0.099020	0.038840
FDI	0	-39.29913	NA	0.673352	2.442372	2.487721	2.457630
	1	-23.03365	30.55940*	0.266992*	1.517191*	1.607888*	1.547708*
LNEXP_	0	-11.36152	NA	0.123851	0.749183	0.794531	0.764441
	1	37.11743	91.08166*	0.006971*	-2.128329*	-2.037632*	-2.097812*

Source: Author's computation via EViews 10.

Table 2 shows the lag output of the selected variables of the model. Based on the available indicators, the AIC criteria are the best suitable to have the lowest value of all endogenous variables. The lowest value of FDI and LNEXP_ are 1-1, and the lowest value of LNGDP is zero. These are the optimum lag lengths of the individual variable series.

Table 3.Results of Augmented Dickey-Fuller Test (Stationarity)

Variables tested	Optimal lag(AIC)	Intercept		Trend and Intercept		Order of Integration	Decision
		t-statistic	p-value	t-statistic	p-value		
LNGDP	0	-5.715060	0.0000	-5.827171	0.0002	I(0)	stationary
FDI	1	-6.671907	0.0000	-6.702532	0.0000	I(1)	Stationary
LNEXP_	1	-3.075011	0.0390	-6.202326	0.0001	I(1)	stationary

Source: Author's computation via EViews 10.

Table 3 presents the results of the Augmented Dickey-Fuller (ADF) test for stationarity applied to the variables LNGDP (Logarithm of GDP), FDI (Foreign Direct Investment), and LNEXP (Logarithm of Exports). The ADF test evaluates the presence of a unit root in each time series, determining whether the variables are stationary or non-stationary. The optimal lag length, based on the Akaike Information Criterion (AIC), is specified for each variable. For LNGDP, the test results show that both the intercept and trend and intercept models yield significant negative t-statistics (-5.715060 and -5.827171) with p-values of 0.0000 and 0.0002, respectively, indicating that LNGDP is stationary at level (I(0)). In contrast, FDI and LNEXP are found to be stationary after first differencing, with t-statistics of -6.671907 and -3.075011 for the intercept and -6.702532 and -6.202326 for the trend and intercept models, all of which show p-values below 0.05, confirming that both FDI and LNEXP are I(1) variables. Thus, LNGDP is stationary at level, while FDI and LNEXP require first differencing to achieve stationarity, supporting the assumption of stationarity in the regression model for further analysis.

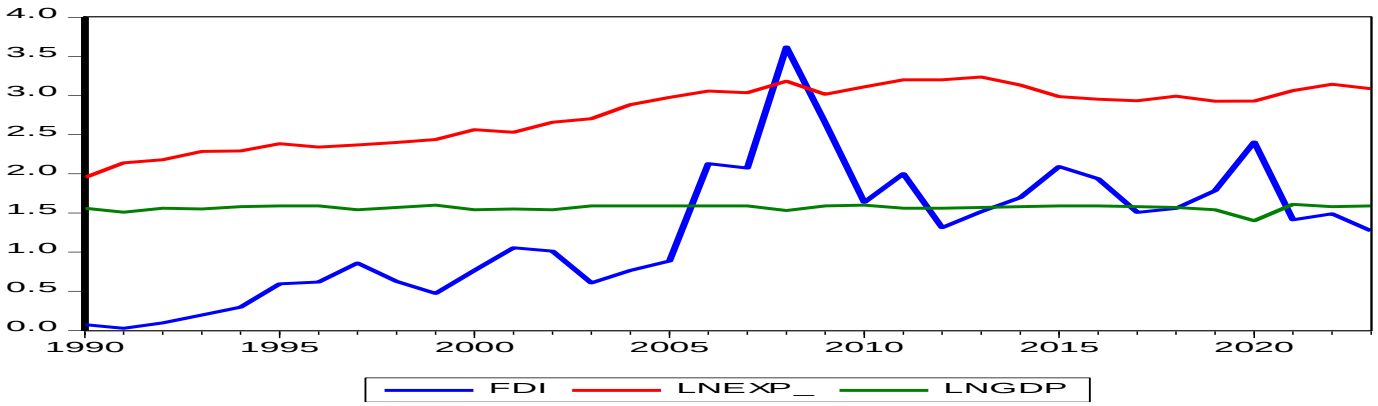

Figure 2.Graphical Presentation of the Data set at Level.

Notes: FDI=Foreign Direct Investment; LNEXP_= Logarithms 10 of Exports; LNGDP= Logarithms 10 of Gross Domestic Product.

Source: Drawn by the author using EViews 10.

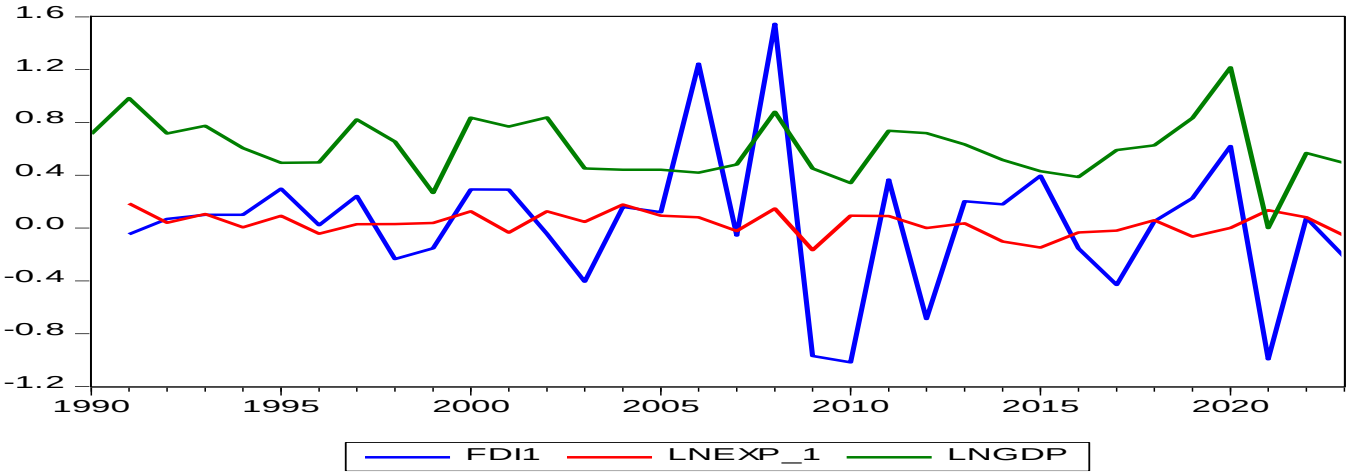

Figure 3.Graphical Presentation of the Data set at Stationarity

Notes: FDI 1=Foreign Direct Investment at first difference; LNEXP_1= Logarithms 10 of Exports at first difference; LNGDP= Logarithms 10 of Gross Domestic Product.

Source: Drawn by the author using EViews 10.

Table 4.Correlation Matrix Independent Variables and Controls

	LNGDP	FDI1	LNEXP_1
LNGDP	**1**	**0.45**	**0.12**
FDI1	**0.45**	**1**	**0.19**
LNEXP_1	**0.12**	**0.19**	**1**

Source: Author's computation via EViews 10.

Table 4 presents the correlation matrix of the independent variables and controls used in the study on the impact of Foreign Direct Investment (FDI) and exports on India's economic growth. The matrix shows that there is a moderate positive correlation of 0.45 between the logarithm of GDP (LNGDP) and FDI (FDI1), indicating a reasonable relationship between these two variables. The correlation between LNGDP and exports (LNEXP_1) is relatively weak at 0.12, suggesting a limited direct relationship between economic growth and exports in the dataset. Additionally, FDI and exports exhibit a weak correlation of 0.19, implying that the two variables are not strongly associated with each other. These findings suggest that while FDI appears to have a stronger link with economic growth, the relationship between exports and economic growth, as well as between FDI and exports, is relatively modest.

The Impact of the Volume of FDI and Exports on India's Economic Growth

Test of hypotheses:

Null hypothesis: Foreign direct investment does not affect GDP growth.

Alternative hypothesis: Foreign direct investment influences GDP growth.

Table 5. Results of Regression Analysis of the Impact of the Volume of FDI on India's Economic Growth

Model 1:Dependent Variable: LNGDP, Method: Least Squares, Sample (adjusted): 1991- 2023, Using observations: 33 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
C	0.592823	0.040038	14.80651	0.0000
FDI1	0.195528	0.072286	2.704920	0.0112
LNEXP_1	0.103228	0.440888	0.234138	0.8165
R-squared	0.207905	Mean dependent var		0.603455
Adjusted R-squared	0.155099	S.D. dependent var		0.232319
S.E. of regression	0.213545	Akaike info criterion		-0.163434
Sum squared resid.	1.368039	Schwarz criterion		-0.027388

Log likelihood	5.696664	Hannan-Quinn criter.	-0.117659
F-statistic	3.937131	Durbin-Watson stat	1.638090
Prob.(F-statistic)	0.030315		

Source: Author's computation via EViews 10.

Table 5 presents the results of a regression analysis investigating the impact of foreign direct investment (FDI) and exports on India's economic growth (LNGDP). The null hypothesis states that FDI does not affect GDP growth, while the alternative hypothesis suggests it does. The results show that the coefficient for FDI (0.195528) is statistically significant with a t-statistic of 2.704920 and a p-value of 0.0112, indicating a positive relationship between FDI and economic growth. In contrast, the coefficient for the first difference of log 10 exports (LNEXP_1) is not significant (p-value = 0.8165), suggesting that exports do not significantly influence GDP growth in this model. The overall model has an R-squared value of 0.2079, implying that approximately 20.79% of the variation in economic growth is explained by the included variables, with an F-statistic of 3.937131 and a p-value of 0.0303, which shows that the model is statistically significant. These results support the alternative hypothesis, indicating that FDI has a positive influence on India's economic growth.

The Ramsey RESET Test for General Misspecification

The Ramsey RESET (Regression Equation Specification Error Test) is a diagnostic tool used to detect general misspecification in a regression model, which may arise from omitted variables, incorrect functional form, or other specification errors. In the context of studying the impact of Foreign Direct Investment (FDI) and exports on India's economic growth, applying the Ramsey RESET test is crucial to ensure the validity of the multiple regression model. A common rule of thumb for the RESET test is that if the p-value is significantly low (typically less than 0.05), it suggests that the model may be misspecified, indicating that either key variables have been omitted or the model's functional form needs adjustment. This helps in refining the model to better capture the relationship between FDI, exports, and economic growth.

Null hypothesis: The model is properly specified.

Alternative hypothesis: The model is not properly specified or the model is not correctly specified.

Table 6. Ramsey RESET Test

Ramsey RESET Test, Specification: LNGDP C FDI1 LNEXP_1, Omitted Variables: Squares of fitted values			
	Value	**d. f.**	**Probability**
t-statistic	**1.237189**	**29**	**0.2259**
F-statistic	**1.530637**	**(1, 29)**	**0.2259**
Likelihood ratio	**1.697349**	**1**	**0.1926**

Source: Author's computation via EViews 10.

The Ramsey RESET test in Table 6 evaluates the specification of the regression model used to assess the impact of FDI and exports on India's economic growth. The null hypothesis posits that the model is correctly specified, while the alternative hypothesis suggests that the model may be misspecified. Based on the provided results, the t-statistic (1.237) and F-statistic (1.531) both yield high p-values (0.2259), well above the typical significance level of 0.05, indicating that there is insufficient evidence to reject the null hypothesis. The likelihood ratio test also supports this conclusion with a p-value of 0.1926. Therefore, the results suggest that the model is properly specified, and there is no indication of misspecification based on the conducted tests.

Residuals Diagnostic of the Model

In analyzing the impact of Foreign Direct Investment (FDI) and exports on India's economic growth using a multiple regression model, it is crucial to ensure the reliability and robustness of the model through various

diagnostic tests. These tests help identify potential issues that could affect the validity of the regression results. The **Breusch-Godfrey Serial Correlation LM Test** is used to detect autocorrelation in the residuals, which could lead to inefficient estimates. To check for heteroskedasticity, the **Breusch-Pagan-Godfrey** and **White heteroskedasticity tests** are employed to identify any non-constant variance in the residuals, which could distort standard errors and hypothesis testing. Finally, the **ARCH test** helps to assess the presence of autoregressive conditional heteroskedasticity, which is particularly relevant in financial time-series data. These tests collectively ensure that the assumptions underlying the regression model are met, improving the accuracy and interpretability of the analysis.

Table 7. Residuals Diagnostic Test Statistics of the Model

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	**0.313065**	**Prob. F(2,28)**	**0.7337**
Obs*R-squared	**0.721797**	**Prob. Chi-Square(2)**	**0.6970**
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	**0.924048**	**Prob. F(2,30)**	**0.4079**
Obs*R-squared	**1.914938**	**Prob. Chi-Square(2)**	**0.3839**
Scaled explained SS	**1.640049**	**Prob. Chi-Square(2)**	**0.4404**
Heteroskedasticity Test: White			
F-statistic	**1.901091**	**Prob. F(5,27)**	**0.1272**
Obs*R-squared	**8.592689**	**Prob. Chi-Square(5)**	**0.1265**
Scaled explained SS	**7.359211**	**Prob. Chi-Square(5)**	**0.1953**
Heteroskedasticity Test: ARCH			
F-statistic	**1.164666**	**Prob. F(1,30)**	**0.2891**
Obs*R-squared	**1.195883**	**Prob. Chi-Square(1)**	**0.2741**

Source: Author's computation via EViews 10.

Table 7 presents the residual diagnostic test statistics for a multiple regression model analyzing the impact of FDI and exports on India's economic growth. The results from various tests suggest that there are no significant issues with serial correlation or heteroskedasticity in the model. Specifically, the Breusch-Godfrey Serial Correlation LM Test shows no evidence of serial correlation with an F-statistic of 0.313 and a high p-value of 0.7337. Similarly, the Breusch-Pagan-Godfrey and White heteroskedasticity tests also show no significant heteroskedasticity, with p-values above 0.05 for all the relevant statistics (0.4079, 0.3839, and 0.1272). Additionally, the ARCH test does not indicate any autoregressive conditional heteroskedasticity, with a p-value of 0.2891. Overall, these diagnostic tests suggest that the model is well-specified, with no major residual issues impacting the regression results.

Normality of Residuals Distribution

Jarque-Bera is a test statistic that checks the normal distribution of the series. This test statistic measures the difference between the series' skew and kurtosis compared to the normal distribution. In **Figure 4,** the probability reported by the Jarque-Bera statistic exceeds a critical value of 5%. Therefore, we accept the null hypothesis. The data of the dependent variable is normally distributed. This figure is similar to the bell shape.

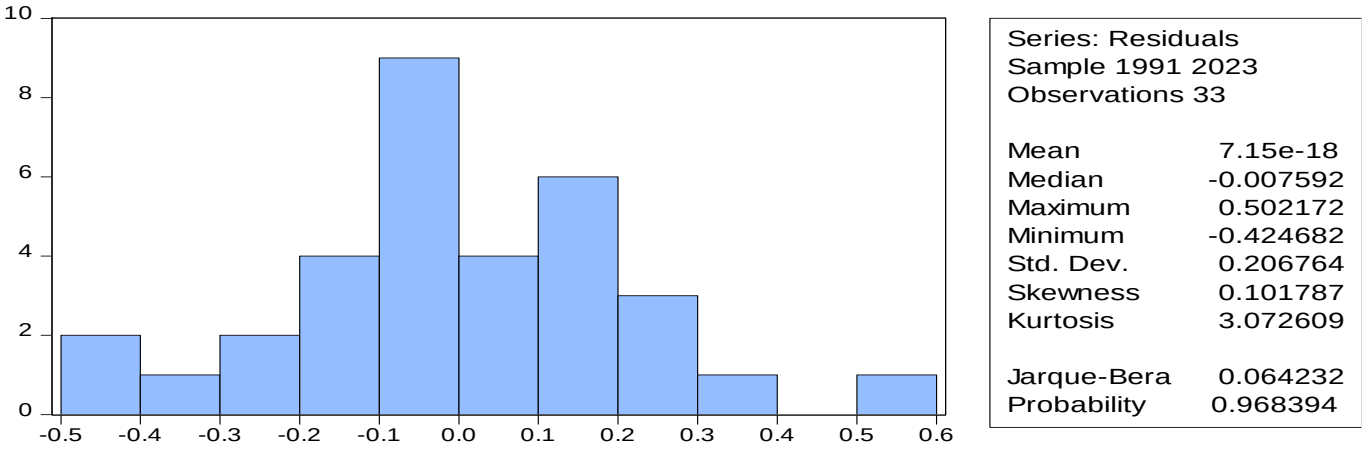

Figure 4. Normality of Residuals Distribution Test

Stability Diagnostic of the Model

Recursive Residuals, Recursive Estimation-CUSUM and CUSUM of Squares of GDP growth

The cumulative sum (CUSUM) test results for the stability of the estimated relationship between the dependent variable, GDP growth, and the independent variables (FDI and exports) over time. The CUSUM test is used to detect structural breaks or changes in the regression model's parameters, helping to assess if the relationship between GDP growth and the predictors has remained consistent throughout the sample period. A stable CUSUM line around the zero threshold indicates that the model's parameters are stable, while deviations from this line suggest potential structural changes or shifts in the impact of FDI and exports on economic growth in India. The interpretation of this figure 5 AND 6 would help in understanding whether the model's assumptions hold across the time period studied or if external factors have altered the economic dynamics.

Figures 5 and 6 show CUSUM and CUSUM squares, which are used to analyze the stability of dependent variables over time, especially during the period evaluated (1990-2023). The variable (GDP) explained in the study is stable because its evolution remains within the red-divisible confidence interval.

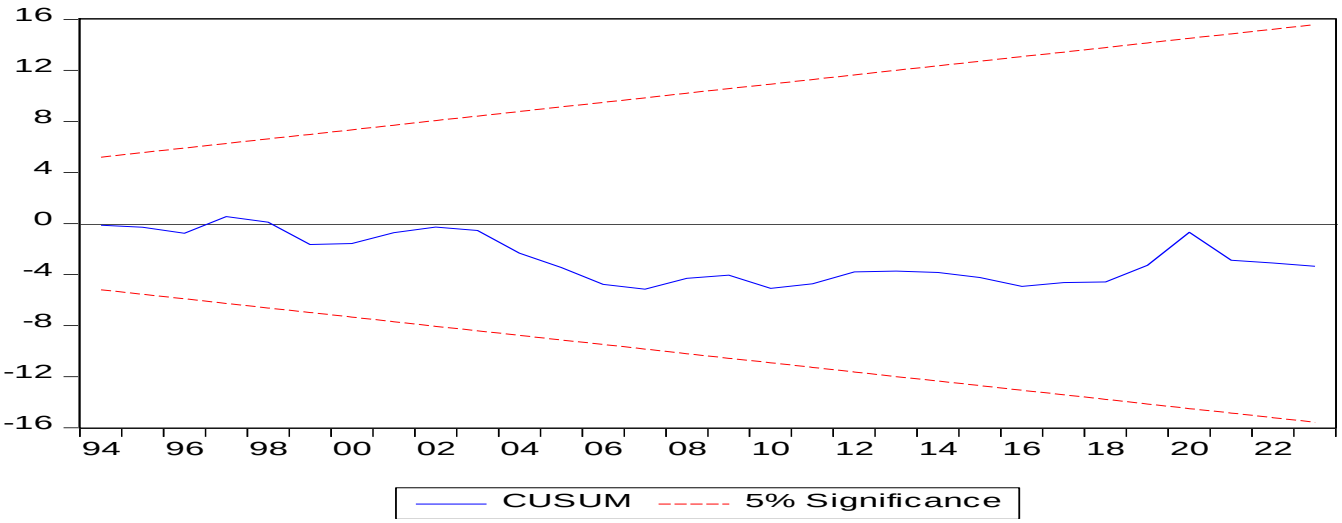

Figure5.Recursive Estimation-CUSUM of dependent variable (GDP growth)
Source: Author's computation via EViews 10.

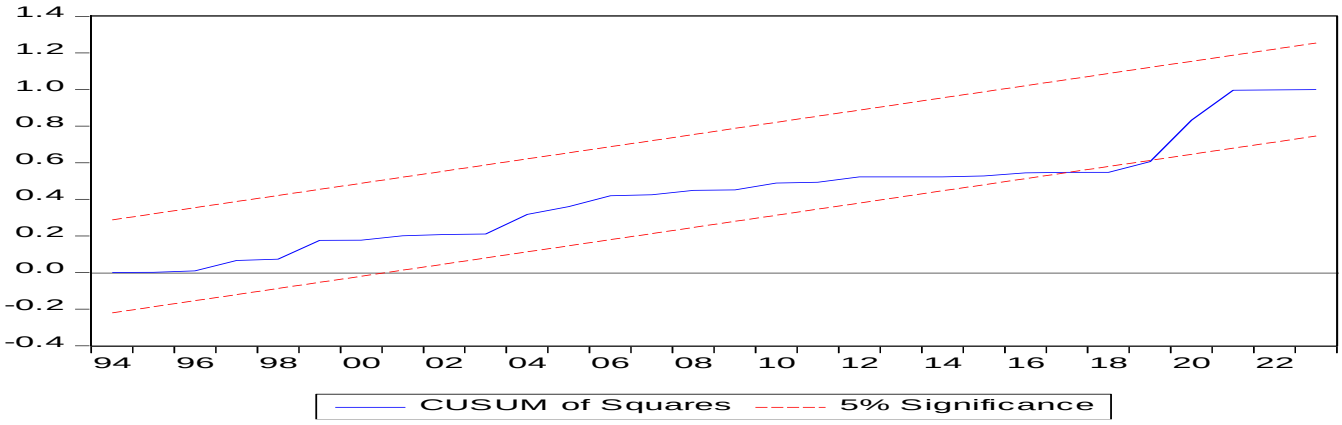

Figure6.Recursive Estimation-CUSUM of Squares of dependent variable (GDP growth)
Source: Author's computation via EViews 10.

Multicollinearity Diagnostic of the Model

In the context of this study, it is crucial to examine multicollinearity, as it can significantly affect the reliability of the regression results. Multicollinearity arises when two or more independent variables in a regression model are highly correlated, potentially distorting the estimates of their coefficients and leading to misleading conclusions. To diagnose multicollinearity, several diagnostic tools and rules of thumb can be applied. A common rule of thumb suggests that if the correlation between any two independent variables exceeds 0.8, there may be a concern about multicollinearity. Additionally, the Variance Inflation Factor (VIF) is frequently used, where a VIF value greater than 10 indicates problematic multicollinearity. This diagnostic process ensures that the model's results are not compromised by the inflated standard errors caused by highly correlated predictors.

Table 8. Multicollinearity Test- Variance Inflation Factors

Variance Inflation Factors, Sample: 1990 2023, Using 33 observations.			
Variable	**Coefficient Variance**	**Un-centered VIF**	**Centered VIF**
C	0.001603	1.160064	NA
FDI1	0.005225	1.040314	1.035345
LNEXP_1	0.194382	1.201044	1.035345

Source: Author's computation via EViews 10.

Table 8 presents the results of the multicollinearity test using Variance Inflation Factors (VIF) for the period 1990-2023 with 33 observations. The Un-centered VIF and Centered VIF values for each variable, including FDI (FDI1) and exports (LNEXP_1), indicate a low degree of multicollinearity among the variables. The VIF values are all below 10, with the highest being 1.201044 for LNEXP_1, which suggests that multicollinearity is not a significant concern in the model. Specifically, the values of FDI1 and LNEXP_1 are close to 1, confirming that these variables are not highly collinear, thus ensuring the reliability of the regression estimates. Additionally, the constant (C) has a VIF value of 1.160064, which further indicates no severe multicollinearity issues.

Multicollinearity Test- Coefficient Variance Decomposition

In the context of study, it is essential to ensure the reliability of the estimated coefficients. One common method to detect multicollinearity is the Coefficient of Variation Decomposition (CVD), which decomposes the variance of regression coefficients into components related to the variance of each independent variable. This is an important diagnostic tool for assessing the collinearity between each coefficient. Belsey, Kuh and Welsch(BKW) recommend confirming

the condition numbers in the matrix. If the condition number is less than 0.001(1/900), it may indicate the existence of collinearity.

Table 9. Coefficient Variance Decomposition-A Multicollinearity Test

Coefficient Variance Decomposition: Sample: 1990 2023, Using 33 observations.			
Eigen-values	**0.194781**	**0.005052**	**0.001378**
Condition	**0.007073**	**0.272715**	**1.000000**

Source: Author's computation via EViews 10.

Table 9 presents the Coefficient Variance Decomposition for a multicollinearity test, using data from 1990 to 2023, with 33 observations. The table shows the eigenvalues and condition values, which help assess the extent of multicollinearity in the model. The eigenvalues, 0.194781, 0.005052, and 0.001378, reflect the degree of correlation between the independent variables. The condition values range from 0.007073 to 1.000000, indicating the potential for multicollinearity. A higher condition number (closer to 1) suggests no severe multicollinearity, while lower values (closer to 0) indicate high multicollinearity. In this case, the condition value of 1.000000 indicates that there is no significant multicollinearity problem in the regression model, implying that the independent variables (FDI and exports) are not highly correlated, ensuring the reliability of the model's estimates.

6. Discussion

The impact of Foreign Direct Investment (FDI) and exports on India's economic growth is an important area of study, especially after the country's economic liberalization in the 1990s. India's integration into the global economy opened new avenues for foreign capital inflows and boosted its export activities, both of which are crucial determinants of economic performance. As depicted in Table 3, the Augmented Dickey-Fuller (ADF) test results confirm that while India's GDP growth (LNGDP) is stationary at level, both FDI and exports require first differencing to achieve stationarity. This finding suggests that the relationships between FDI, exports, and GDP growth are not immediately stable and need further adjustment, aligning with the broader trends of evolving economic dynamics post-liberalization.

The correlation matrix in Table 4 shows a moderate positive correlation between FDI and GDP growth (LNGDP), highlighting that foreign investment plays a significant role in India's economic development. However, the weaker correlation between exports and GDP growth suggests that the direct impact of exports on India's growth has been less pronounced compared to FDI. This can be attributed to the fact that while FDI brings in both capital and technology, potentially spurring productivity and infrastructure development, the export sector's role in GDP growth might have been constrained by global demand conditions and domestic industrial challenges. This is further confirmed in the regression analysis presented in Table 5, where FDI demonstrates a statistically significant positive relationship with GDP growth, whereas exports do not show a significant effect. The weak relationship between exports and GDP could also be a reflection of India's challenges in diversifying its export base and maintaining competitiveness in global markets.

Further analysis, including the Ramsey RESET test (Table 6) and residual diagnostics (Table 7), assures that the regression model is well-specified, with no significant issues of model misspecification, serial correlation, or heteroskedasticity. This strengthens the reliability of the results, confirming that FDI significantly influences economic growth in India. Additionally, the stability tests, such as the CUSUM tests (Figures 5 and 6), indicate that the relationship between GDP and its predictors remains consistent over the sample period, further validating the robustness of the model's assumptions. The low multicollinearity indicated by the VIF values in Table 8 and the Coefficient Variance Decomposition in Table 9 suggests that the independent variables, FDI and exports, are not highly correlated, thereby supporting the model's credibility. The findings indicate that FDI has been a more

potent driver of India's economic growth compared to exports, reflecting the transformative effect of foreign investments in India's post-liberalization economic trajectory.

7. Conclusion and Policy Implications

The findings from the multiple regression model investigating the impact of Foreign Direct Investment (FDI) and exports on India's economic growth (LNGDP) reveal significant insights into the nature of these relationships.

1. **FDI's Positive Impact on Economic Growth**: The regression analysis demonstrates that FDI has a statistically significant and positive effect on India's GDP growth. This suggests that increased foreign investment contributes meaningfully to the expansion of the economy, aligning with the hypothesis that FDI plays a key role in fostering economic development. The coefficient for FDI in the model (0.195528) indicates that for every unit increase in FDI, GDP is expected to grow by approximately 0.20 units, highlighting the importance of attracting foreign investment for continued economic progress.
2. **Exports' Limited Influence on Economic Growth**: Contrary to expectations, exports do not exhibit a significant direct relationship with GDP growth, as indicated by the non-significant coefficient for LNEXP_1 (p-value = 0.8165). This suggests that while exports are an important component of economic activity, other factors, such as domestic consumption, government spending, or investment, may play more substantial roles in driving India's economic growth in the study period.
3. **Model Robustness and Stability**: The diagnostic tests confirm that the model is well-specified and free from major issues such as serial correlation, heteroskedasticity, and multicollinearity. The Ramsey RESET test and residual diagnostics suggest that the model's assumptions hold, providing confidence in the validity of the results. Furthermore, the CUSUM tests confirm the stability of the relationship between FDI, exports, and GDP growth throughout the 1990-2023 period, indicating that no significant structural breaks or shifts in the model's parameters occurred during the sample period.
4. **Multicollinearity and Statistical Reliability**: The multicollinearity tests, including the Variance Inflation Factors (VIF), suggest that there are no significant concerns regarding the correlation between the independent variables (FDI and exports), ensuring the reliability of the regression estimates.

Policy Recommendations:

1. **Promote FDI for Sustainable Growth**: The positive influence of FDI on economic growth suggests that India should continue to foster an environment conducive to foreign investment. Policies aimed at simplifying regulatory frameworks, reducing barriers to entry for foreign investors, and ensuring political and economic stability will attract more FDI, thereby supporting long-term economic development. Targeted sectors for FDI, such as technology, infrastructure, and manufacturing, can create high-value jobs and stimulate domestic industries.
2. **Diversify Export Strategy**: Although exports did not show a significant direct effect on economic growth in this study, this does not imply exports are unimportant for India's economic health. Rather, India should focus on diversifying its export base, targeting higher-value goods and services, and improving trade relations with emerging markets. This approach can help balance trade deficits, generate employment, and integrate India further into global supply chains.
3. **Foster Structural Reforms to Enhance Economic Resilience**: While FDI has a significant role in India's economic growth, it is crucial to continue implementing structural reforms that improve the ease of doing business, encourage innovation, and build a skilled workforce. Education and skill development programs, infrastructure improvements, and technology adoption will help India better leverage FDI and exports for sustainable growth.

4. **Monitor and Adjust Policy with Caution**: The stability of the relationship between FDI, exports, and GDP growth, as indicated by the CUSUM tests, suggests that the economic growth model remains stable. However, policymakers should continue to monitor external shocks, such as global recessions, pandemics, or geopolitical conflicts, which could disrupt the flow of FDI and exports. Dynamic and flexible policy responses will be necessary to maintain economic stability.

In conclusion, this study underscores the importance of FDI in driving India's economic growth while also suggesting that further policy attention is required to enhance the export sector's role. By focusing on both attracting FDI and diversifying export strategies, India can continue to build a resilient, growth-oriented economy in the years to come.

Declarations

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