



Foreign Direct Investment and Economic Growth in India: An ARDL Approach

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Abstract

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Foreign investment has increasingly become an important component of India's integration with the global economy. At the same time, economic growth in India has also been influenced by domestic investment, trade performance, infrastructure development and macroeconomic conditions. This study examines the relationship between foreign direct investment (FDI) and economic growth in India using annual data for the period 2001-2025. In addition to FDI, exports, gross capital formation and inflation are included to capture other important macroeconomic factors influencing economic growth. FDI is measured as a percentage of GDP. The study employs descriptive statistics, the Augmented Dickey-Fuller (ADF) unit root test and the Autoregressive Distributed Lag (ARDL) approach. The ARDL (1,0,0,1,0) model was selected based on the Akaike Information Criterion. The unit root results confirmed that none of the variables was integrated of order two, making them suitable for ARDL analysis. However, the Bounds test did not establish a stable long-run relationship among GDP, FDI, exports, gross capital formation and inflation. The short-run results show that gross capital formation has a positive and statistically significant association with economic growth, while FDI does not show a statistically significant

relationship. Export performance shows a positive association with GDP in the estimated specification, whereas inflation remains statistically insignificant. Diagnostic tests indicate no evidence of serial correlation, while heteroskedasticity was addressed through robust standard errors. The findings highlight the importance of domestic capital formation in supporting India's economic growth and suggest that the growth benefits of FDI may depend on its productive utilisation, sectoral composition and linkages with the domestic economy.

Keywords: Foreign Direct Investment, Economic Growth, ARDL, Gross Capital Formation, Exports, Inflation.

1. Introduction

Economic growth remains one of the central concerns of developing economies, as sustained growth is closely associated with improvements in income, employment, productive capacity and overall economic development. Among the factors considered important for accelerating growth, foreign direct investment (FDI) has received considerable attention. Unlike short-term capital flows, FDI is generally associated with a relatively lasting investment interest and can potentially contribute to the host economy through capital formation, technology transfer, managerial knowledge and access to international markets.

The theoretical argument supporting FDI-led growth is largely based on its potential to supplement domestic resources and improve productivity. Foreign firms may introduce new technologies and management



practices, while their interaction with domestic firms can generate knowledge spillovers. Borensztein et al. (1998) found that FDI can act as an important channel for technology transfer and may contribute to growth more effectively when the host country possesses sufficient human capital. Their findings also highlighted the complementary relationship between foreign and domestic investment. Similarly, Li and Liu (2005) argued that the relationship between FDI and growth is increasingly endogenous and that the impact of FDI can also operate through its interaction with other characteristics of the host economy.

However, the relationship between FDI and economic growth is not necessarily automatic or uniform across countries. The contribution of foreign investment may depend on the absorptive capacity of the domestic economy, the availability of skilled human resources, financial and institutional development, sectoral allocation of investment and the extent of linkages between foreign and domestic firms. This helps explain why empirical studies have produced differing conclusions regarding the magnitude and direction of the FDI-growth relationship.

1.1 The Indian Context

India provides an important setting for examining this relationship because its economy has undergone significant structural and policy changes over the past few decades. Foreign investment has increasingly become an important component of India's integration with the global economy. At the same time, economic growth in India has also been influenced by domestic investment, trade performance, infrastructure development and macroeconomic conditions. Earlier evidence for India has shown that the relationship between FDI and growth is complex. Chakraborty and Basu (2002), using a cointegration approach, found evidence of a long-run relationship between FDI and GDP but reported that the direction of causality was more strongly from GDP to FDI than from FDI to GDP. This suggests that a growing economy may itself attract foreign investment, rather than FDI always acting as the primary source of growth.

More recent studies using ARDL-based approaches have also reported varying results. Shahani and Aayushi (2019) found evidence of a positive cointegrating relationship between inward FDI and economic growth in India after incorporating additional macroeconomic variables. Wani and Mir (2021), while examining globalisation and growth in India, reported a positive role of FDI but found that the effects of other trade-related variables could differ. Ravinder et al. (2022) similarly reported a positive contribution of FDI to India's growth in both the short and long run in their analysis of foreign inflows. These findings indicate that the impact of FDI may vary according to the variables included, the time period considered and the empirical approach adopted. Other India-focused research has also examined the interaction of FDI with infrastructure and other economic factors, further indicating that foreign investment operates within a broader development environment rather than in isolation (Pradhan & Bagchi, 2013).

1.2 The Role of Domestic Investment and Exports

While FDI is an important source of external investment, domestic capital formation remains fundamental to economic expansion. Investment in infrastructure, machinery, technology and other productive assets increases the productive capacity of an economy. The potential contribution of FDI may also be greater when it complements, rather than replaces, domestic investment. Borensztein et al. (1998) emphasised this complementary dimension by showing that FDI can increase total investment in the host economy.

Exports represent another important dimension of growth, particularly in an increasingly interconnected global economy. Export expansion can provide access to larger markets, encourage economies of scale and expose domestic firms to international competition. At the same time, the relationship between exports and economic growth may not always be straightforward. Wani and Mir (2021), for example, reported differing effects of globalisation-related variables in India, while Rashid et al. (2023) examined FDI, exports and other macroeconomic factors jointly using an ARDL framework. Such evidence supports the need to



consider FDI together with other macroeconomic variables rather than examining it through a simple bivariate relationship with GDP.

The relationship between foreign investment, trade and economic growth can also be influenced by the broader structure of the economy. Li and Liu (2005) demonstrated that the effect of FDI may depend on its interaction with country-specific characteristics. Similarly, Kumar and Singhal (2022), in their study of outward FDI and economic growth in India, showed that the inclusion of domestic capital formation could alter the observed relationship between investment and growth. These findings underline the importance of considering capital formation when analysing investment-related effects on economic performance.

1.3 Inflation and the Macroeconomic Environment

Macroeconomic stability is another factor that may shape economic performance and investment decisions. Inflation, when persistent or highly volatile, can create uncertainty regarding prices, production costs and future returns. It may therefore influence both domestic and foreign investment decisions. Although inflation is not necessarily expected to affect economic growth in the same manner across all periods, its inclusion provides a broader macroeconomic context for examining the relationship between FDI and GDP.

Studies using time-series methods have frequently incorporated additional macroeconomic variables to avoid attributing changes in economic growth solely to FDI. For example, Rashid et al. (2023) examined the joint relationship of FDI, exports, imports and inflation with economic growth in India. Similarly, Manickam et al. (2025) investigated the dynamic relationship among FDI inflows, economic growth and trade-related variables in India using an ARDL approach with structural breaks. Such studies demonstrate that the relationship between FDI and growth should be examined within a wider macroeconomic framework.

1.4 FDI and Growth as a Dynamic Relationship

Another important issue is the dynamic nature of the relationship between FDI and economic growth. Economic growth may attract foreign investors by creating larger markets and better profit opportunities, while FDI may itself contribute to growth through investment and productivity improvements. This possibility of two-way interaction has been highlighted in both theoretical and empirical research. Li and Liu (2005) found evidence of an endogenous relationship between FDI and growth, while Chakraborty and Basu (2002) reported evidence suggesting that economic growth in India may play an important role in attracting FDI.

These observations suggest that the FDI–growth relationship cannot be understood only by considering the current value of FDI. Past economic conditions and changes in other macroeconomic variables may also matter. Time-series approaches are therefore useful for examining how these variables interact over time. The ARDL framework is particularly suitable for such analysis because it allows the examination of dynamic relationships involving variables with different orders of integration, provided that none of the variables is integrated of order two.

Against this background, the present study examines the relationship between foreign direct investment and economic growth in India using annual data for the period 2001-2025. FDI is measured relative to GDP, while exports, gross capital formation and inflation are included to capture other important dimensions of economic activity and the macroeconomic environment. The study employs the Autoregressive Distributed Lag (ARDL) approach to investigate the existence of a level relationship among the variables and to examine their short-run dynamics. By considering FDI alongside domestic capital formation, exports and inflation, the study seeks to provide a broader empirical assessment of the factors associated with economic growth in India. The analysis is particularly relevant because the benefits of foreign investment may depend on its interaction with domestic investment, trade performance and prevailing macroeconomic conditions.



2. Literature Review

The relationship between foreign direct investment (FDI) and economic growth has been widely examined in both developed and developing economies. However, the available evidence remains mixed. While many studies report that FDI promotes growth through capital accumulation, technology transfer and productivity spillovers, others suggest that its impact depends on domestic conditions, institutional quality, human capital, financial development and the productive use of foreign investment. The following review presents important empirical studies relevant to the relationship among FDI, economic growth and related macroeconomic factors.

2.1 International Evidence on FDI and Economic Growth

Borensztein, De Gregorio, and Lee (1998) examined the impact of FDI on economic growth using cross-country data for developing economies. Their findings suggested that FDI is an important channel for technology transfer and can contribute more to growth than domestic investment. However, the positive effect was found to depend on the host country's level of human capital. **Carkovic and Levine (2005)** re-examined the relationship between FDI and economic growth using cross-country data and methods designed to address endogeneity and country-specific effects. Their results did not support a strong independent positive effect of FDI on economic growth. The study suggested that earlier positive findings may partly reflect differences in country characteristics and other growth-related factors. **Li and Liu (2005)** investigated the relationship between FDI and economic growth for a large group of countries. They found that the relationship between FDI and growth was increasingly endogenous and that FDI could influence growth through both direct and indirect channels. The study also showed that the impact of FDI depends on the interaction between foreign investment and conditions within the host economy. **Hansen and Rand (2006)** examined the relationship between FDI and growth using panel data for developing countries. Their results provided evidence of a positive relationship between FDI and economic growth. They also reported evidence supporting the existence of a long-run relationship, although the direction of causality and the magnitude of the impact varied across specifications. **Alfaro et al. (2010)** examined whether the growth benefits of FDI depend on the development of domestic financial markets. The study found that the positive effect of FDI on economic growth was stronger in countries with well-developed financial systems. This highlighted the importance of domestic absorptive capacity in converting foreign investment into broader economic benefits. **Alfaro and Charlton (2007)** examined the composition of FDI and its relationship with growth. Their findings suggested that the nature and sectoral composition of foreign investment matter for its developmental effects. FDI directed towards productive and higher-value activities may generate different outcomes from investment concentrated in sectors with limited domestic linkages. **Pegkas (2015)** investigated the relationship between FDI and economic growth in eurozone countries. The study reported a positive long-run association between FDI and economic growth. However, the evidence also suggested that the effects of FDI could differ according to the economic characteristics of individual countries.

These international studies show that the effect of FDI on growth is neither uniform nor independent of domestic economic conditions. This has led researchers to increasingly include variables such as domestic investment, trade, inflation, financial development and institutional quality in empirical models.

2.2 Evidence from India

Chakraborty and Basu (2002) provided one of the important early studies on the relationship between FDI and economic growth in India. Using a structural cointegration model and a vector error correction framework, they found evidence of a long-run relationship between GDP and FDI. However, their causality results suggested that GDP was not Granger-caused by FDI; instead, the direction of causality was stronger from economic growth to FDI. This finding indicated that India's economic expansion itself may play an important role in attracting foreign investment. **Sahoo and Mathiyazhagan (2003)** examined the role of FDI in India's economic development and found evidence supporting a positive contribution of foreign



investment to growth. The study emphasised that FDI could supplement domestic resources and support capital formation, although its overall effect depended on the policy and economic environment. **Agrawal (2005)** analysed the relationship between FDI and economic growth in South Asian economies, including India. The findings suggested that the relationship differed across countries and that the growth effect of FDI was influenced by country-specific conditions. The study therefore did not support the assumption that similar levels of FDI would necessarily produce similar growth outcomes across economies. **Agrawal and Khan (2011)** compared the impact of FDI on economic growth in India and China. Their findings indicated that FDI had a positive relationship with economic growth, but the magnitude and nature of the effect differed between the two countries. The study highlighted the importance of differences in economic structure and the ability of domestic economies to absorb foreign investment. **Pradhan and Bagchi (2013)** examined the interaction among transport infrastructure, FDI and economic growth in India using the ARDL Bounds testing approach. Their findings supported the existence of important long-run relationships among these variables and demonstrated that infrastructure can play a significant role in strengthening the economic benefits associated with investment and growth. **Shahani and Aayushi (2019)** examined the dynamic relationship between inward FDI and economic growth in India for the period 1986-2016. Using the ARDL Bounds approach and including exports and a financial variable as control factors, the study found evidence of a positive cointegrating relationship between FDI and economic growth. The findings supported the argument that FDI can contribute to growth when considered alongside other macroeconomic influences. **Das and Sethi (2021)** examined India's productivity growth by considering technology, human capital and FDI. Using linear and non-linear ARDL models, the study found that FDI played a significant role in productivity growth, although the effect was not necessarily linear. The results indicated that the contribution of FDI may vary with changes in economic and technological conditions. **Wani and Mir (2021)** investigated the relationship between globalisation and economic growth in India using the ARDL approach. Their analysis included FDI, exports, imports and foreign remittances. The study found a positive effect of FDI on economic growth, while the effects of other globalisation-related variables differed. This showed that the relationship between FDI and growth needs to be examined within a wider macroeconomic and trade environment. **Ravinder, Saini, and Poonam (2022)** investigated whether different forms of foreign inflows contributed to economic growth in India using annual data and the ARDL approach. Their results supported a long-run relationship between foreign inflows and economic growth. FDI was found to have a positive and significant influence on growth in both the short and long run, whereas the effects of remittances and external debt differed. **Kumar et al. (2022)** examined the role of absorptive capacity in the relationship between FDI and economic growth in India. Using ARDL and threshold analysis, the study found that the FDI-growth relationship was influenced by factors such as financial development, institutional quality, technological capability and trade openness. The results further showed that the effects of absorptive capacity became more evident when non-linearity in the relationship was considered. **Alam et al. (2024)** investigated the asymmetric effects of FDI on economic growth in India for the period 1991-2019 using the non-linear ARDL approach. Their results showed that positive and negative changes in FDI did not affect economic growth in the same way. Positive shocks to FDI were associated with higher economic growth, while negative shocks had an adverse effect. This provided evidence that the FDI-growth relationship may be asymmetric. **Rashid et al. (2023)** examined the relationship among FDI, exports, imports, inflation and economic growth in India using the ARDL Bounds testing approach. Their results supported the existence of a long-run relationship among the variables. However, the individual effects of FDI, exports and inflation on economic growth were reported as positive but statistically insignificant. The study is particularly relevant because it considered several variables that are also included in the present analysis. **Mohammad and Alam (2023)** revisited the FDI-led growth hypothesis in India using the ARDL approach for the period 1990-2019. Their Bounds test supported the existence of a long-run relationship between FDI and economic growth, and the results indicated a significant impact of FDI on growth. The study added further evidence in favour of the FDI-led growth hypothesis, although its findings differ from some earlier studies. **Manickam et al. (2025)** examined the relationship among FDI inflows, economic growth, trade openness and environmental



factors in India using an ARDL approach with structural breaks. Their study reflects the recent trend towards analysing FDI and growth within a broader economic framework rather than as an isolated relationship. By considering structural changes and additional macroeconomic factors, the study recognised that the relationship may vary across different phases of economic development.

2.3 Research Gap

The existing literature on India provides mixed and sometimes contradictory evidence regarding the relationship between FDI and economic growth. While several studies have reported a positive long-run or short-run effect of FDI, others have found weak, insignificant, endogenous or asymmetric relationships. These differences may arise from variations in the measurement of FDI, the period of analysis, model specification and the control variables included. Although some previous Indian studies have used the ARDL approach, relatively fewer studies have jointly examined FDI measured relative to GDP, exports, gross capital formation and inflation within the same model using recent annual data. Gross capital formation is particularly important because domestic investment may complement or mediate the contribution of foreign investment to economic growth. At the same time, the inclusion of exports and inflation allows the FDI-growth relationship to be examined within a broader macroeconomic framework.

Further, the present study covers the period 2001-2025, extending the analysis to more recent economic conditions. By applying the ARDL Bounds testing approach, the study examines both the existence of a level relationship and the short-run dynamics among the selected variables. Thus, the study contributes to the existing literature by providing updated evidence on the relationship between FDI and economic growth in India while simultaneously considering the role of domestic capital formation, exports and inflation.

3.1 Objectives of the Study

- To examine the relationship between foreign direct investment and economic growth in India.
- To analyse the short-run relationship of exports, gross capital formation, and inflation with economic growth in India using the ARDL approach.
- To investigate whether a long-run relationship exists among economic growth, foreign direct investment, exports, gross capital formation, and inflation in India.

3.2 Need of the Study

The relationship between foreign direct investment (FDI) and economic growth remains an important area of economic research, particularly for a developing economy such as India. Although FDI is generally expected to contribute to economic growth through capital inflows, technology transfer, employment generation, and improved productivity, its actual impact may vary depending on domestic economic conditions and the nature of investment. The present study is needed to examine whether FDI has a significant relationship with India's economic growth when other important macroeconomic factors, particularly exports, gross capital formation, and inflation, are taken into account. It also examines whether these variables have a stable long-run relationship or whether their association is mainly reflected in short-run economic dynamics. The study therefore provides empirical evidence on the relative role of FDI and other macroeconomic factors in India's economic growth.

3.3 Research Methodology

The study adopts a quantitative and explanatory research design to examine the relationship between foreign direct investment (FDI) and economic growth in India. In addition to FDI, exports, gross capital formation (GCF), and inflation are included as macroeconomic variables that may influence economic growth. The analysis is based on annual secondary data covering the period 2001-2025, comprising 25 observations. The data were obtained from the World Bank's World Development Indicators (WDI) database.



Economic growth is represented by Gross Domestic Product (GDP). FDI is measured as net FDI inflows as a percentage of GDP, while exports and gross capital formation are measured using their respective constant-price series. GDP, FDI, exports, and gross capital formation were transformed into their natural logarithmic forms, denoted as $lGDP$, $lFDI$, $lEXP$, and $lGCF$, respectively. Inflation, measured as the annual percentage change in consumer prices, was retained in its original form.

Before estimating the model, the stationarity properties of the variables were examined using the Augmented Dickey-Fuller (ADF) unit root test. The purpose of this test was to determine the order of integration of the variables and, particularly, to ensure that none was integrated of order two, $I(2)$, which is a basic requirement for applying the ARDL approach.

The study employs the Autoregressive Distributed Lag (ARDL) model to analyse the relationship among the selected variables. The ARDL approach was considered appropriate because it can be used when variables are integrated at level, first difference, or a combination of $I(0)$ and $I(1)$, provided that no variable is $I(2)$. The general relationship examined in the study is expressed as:

$$lGDP_t = f(lFDI_t, lEXP_t, lGCF_t, INF_t)$$

The optimal lag structure was selected using the Akaike Information Criterion (AIC), with a maximum lag of one due to the annual nature of the data and the relatively small sample size. The AIC selected ARDL(1,0,0,1,0) as the preferred model.

The ARDL Bounds test was subsequently used to examine whether a stable long-run or level relationship existed among economic growth, FDI, exports, gross capital formation, and inflation. As the Bounds test did not establish cointegration, the study did not interpret long-run coefficients and instead focused on the short-run dynamics of the model.

Finally, diagnostic tests were conducted to assess the adequacy of the estimated model. The Breusch-Godfrey LM test was used to test for serial correlation, the Breusch-Pagan/Cook-Weisberg test was applied to examine heteroskedasticity, and the Shapiro-Wilk test was used to assess residual normality. Since heteroskedasticity was detected, heteroskedasticity-robust standard errors were used for statistical inference. All statistical and econometric analyses were carried out using Stata.

4. Interpretation and Analysis

Table-1
Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
$lGDP$	25	32.685	0.452	31.925	33.407
$lFDI$	25	0.37	0.447	-0.501	1.287
$lEXP$	25	31.117	0.589	29.806	31.904
$lGCF$	25	31.577	0.552	30.416	32.335
INF	25	6.027	2.565	2.399	11.989

Source: Authors' calculations based on World Development Indicators (WDI) database.

Table 1 presents the descriptive statistics of the variables used in the study for the period 2001-2025. All variables contain 25 observations. The mean value of log GDP ($lGDP$) is 32.685, with a standard deviation of 0.452. Its values range from 31.925 to 33.407, indicating changes in India's economic output over the study period. The mean value of log FDI ($lFDI$) is 0.370, with a standard deviation of 0.447. Its minimum and maximum values are -0.501 and 1.287, respectively. Since FDI is expressed as a percentage of GDP before applying the natural logarithm, the negative minimum value of $lFDI$ does not indicate negative FDI inflows. It simply indicates that the original FDI-to-GDP ratio was between zero and one during some years. Log exports ($lEXP$) have a mean of 31.117 and a standard deviation of 0.589, while log gross capital formation



(IGCF) has a mean of 31.577 and a standard deviation of 0.552. These figures indicate variation in India's export activity and capital formation during the period. Inflation has a mean value of 6.027 per cent and ranges from 2.399 per cent to 11.989 per cent. The relatively higher standard deviation of 2.565 indicates noticeable fluctuations in the inflation rate over the study period.

Table-2
Augmented Dickey-Fuller Unit Root Test Results

Variable	ADF Statistic at Level	p-value	ADF Statistic at First Difference	p-value	Order of Integration
IGDP	-0.963	0.7664	-3.503	0.0079	I(1)
IFDI	-1.93	0.3182	-2.924	0.0427	I(1)
IEXP	-2.501	0.1152	-2.831	0.054	I(1)*
IGCF	-2.639	0.0852	-3.136	0.024	I(1)
INF	-1.423	0.5714	-4.202†	0.0007†	I(1)

* IEXP is stationary at the 10 per cent level after first differencing, with a p-value marginally above the 5 per cent level.

† The first-difference result for INF is based on the zero-lag Dickey-Fuller specification.

Source: Authors' calculations based on World Development Indicators (WDI) database.

Table 2 presents the results of the Augmented Dickey-Fuller test used to examine the stationarity properties of the variables before estimating the ARDL model. The null hypothesis of the ADF test is that the variable contains a unit root. At level, none of the variables is stationary at the conventional 5 per cent significance level. The p-values for IGDP, IFDI, IEXP and INF are all above 0.05. Although IGCF has a p-value of 0.0852 and shows some evidence of stationarity at the 10 per cent level, it is not stationary at the 5 per cent level.

After first differencing, IGDP, IFDI and IGCF become stationary at the 5 per cent level. The first-difference result for IEXP has a p-value of 0.0540, which is marginally above 0.05 but significant at the 10 per cent level. It is therefore treated as I(1) for the purpose of the ARDL analysis. Inflation becomes stationary after first differencing when estimated using the zero-lag Dickey-Fuller specification, with a p-value of 0.0007. Overall, the results indicate that the variables are either I(0) or I(1), and there is no evidence that any variable is integrated of order two, I(2). Therefore, the basic requirement for applying the ARDL Bounds testing approach is satisfied.

Table-3
Selected ARDL Model and Bounds Test Results

Selected Model	Observations	F-statistic	t-statistic	Decision
ARDL(1,0,0,1,0)	24	2.795	-2.103	No cointegration

Critical Values and Bounds Test Decision

Significance Level	F I(0)	F I(1)	t I(0)	t I(1)
10%	2.896	4.226	-2.567	-3.677
5%	3.615	5.176	-2.963	-4.156
1%	5.47	7.614	-3.808	-5.18

Source: Authors' calculations based on World Development Indicators (WDI) database.

Table 3 presents the selected ARDL model and the results of the Bounds test for examining the existence of a level or long-run relationship among economic growth, FDI, exports, gross capital formation and inflation. Based on the Akaike Information Criterion, ARDL(1,0,0,1,0) was selected as the preferred model. The model was estimated using 24 observations covering 2002-2025. The Bounds test produced an F-statistic of 2.795 and a t-statistic of -2.103. At the 10 per cent significance level, the lower critical bounds are 2.896 for



the F-statistic and -2.567 for the t-statistic. The calculated statistics are closer to zero than their respective lower-bound critical values. The same conclusion is obtained at the 5 per cent and 1 per cent significance levels. Therefore, the null hypothesis of no level relationship cannot be rejected. The results do not provide sufficient statistical evidence of cointegration among GDP, FDI, exports, gross capital formation and inflation during the study period.

Table-4
Robust Short-Run Effect of Gross Capital Formation

Variable	Coefficient	Robust Std. Error	t-value	p-value
Δ IGCF	0.1911	0.0621	3.08	0.007***

Note: *** indicates statistical significance at the 1 per cent level. Δ denotes the first-difference operator.

Heteroskedasticity-robust standard errors are used for statistical inference.

Source: Authors' calculations based on World Development Indicators (WDI) database.

Table 4 presents the robust short-run result obtained from the selected ARDL (1,0,0,1,0) specification. Since the Bounds test did not establish a long-run relationship, the findings are interpreted in terms of short-run dynamics. The result shows that the change in gross capital formation has a positive and statistically significant association with economic growth. The coefficient of Δ IGCF is 0.1911, with a robust standard error of 0.0621 and a p-value of 0.007. The result is therefore statistically significant at the 1 per cent level. Since both GDP and gross capital formation are expressed in natural logarithmic form, the coefficient indicates that a 1 per cent increase in gross capital formation is associated with an approximately 0.19 per cent increase in GDP in the short run, other factors remaining constant. The finding remains statistically significant even after using heteroskedasticity-robust standard errors. This provides stronger support for the conclusion that gross capital formation has an important positive short-run association with economic growth during the study period.

Table-5
Diagnostic Test Results

Diagnostic Test	Test Statistic	p-value	Conclusion
Breusch-Godfrey LM Test	$\chi^2 = 0.017$	0.8962	No serial correlation
Breusch-Pagan/Cook-Weisberg Test	$\chi^2 = 12.35$	0.0004	Heteroskedasticity present
Shapiro-Wilk Test	W = 0.9462	0.2241	Residuals approximately normal

Source: Authors' calculations based on World Development Indicators (WDI) database.

Table 5 presents the diagnostic tests used to assess the statistical properties of the estimated model. First, the Breusch-Godfrey LM test was used to examine serial correlation in the residuals. The p-value is 0.8962, which is substantially higher than 0.05. Therefore, the null hypothesis of no serial correlation cannot be rejected. This indicates that there is no evidence of autocorrelation in the residuals. Second, the Breusch-Pagan/Cook-Weisberg test was used to test for heteroskedasticity. The p-value of 0.0004 is below the 5 per cent significance level. Therefore, the null hypothesis of constant variance is rejected, indicating the presence of heteroskedasticity in the residuals. To make the statistical inference more reliable, heteroskedasticity-robust standard errors were subsequently used for interpreting the estimated coefficients. Finally, the Shapiro-Wilk test was applied to examine the normality of the residuals. The p-value of 0.2241 is greater than 0.05. Therefore, there is no statistically significant evidence against the assumption of normality, suggesting that the residuals are approximately normally distributed. Overall, the diagnostic results indicate that the model is free from serial correlation and the residuals do not show a significant departure from normality. However, evidence of heteroskedasticity was found. Therefore, the final statistical inference regarding the short-run effect of gross capital formation is based on heteroskedasticity-robust standard errors.



5. Discussion of Findings

The study examined the relationship between FDI, economic growth, exports, gross capital formation (GCF), and inflation in India during 2001-2025 using the ARDL approach. The unit root results confirmed that none of the variables was integrated of order two, making the ARDL approach appropriate. Based on the AIC, ARDL (1,0,0,1,0) was selected. The Bounds test did not establish a long-run relationship among the variables, as both the F-statistic (2.795) and t-statistic (-2.103) failed to reject the null hypothesis of no level relationship. Therefore, the findings are interpreted mainly in terms of short-run dynamics. FDI, measured as a percentage of GDP, did not show a statistically significant association with economic growth. This suggests that the growth impact of FDI may depend on factors such as its sectoral allocation, productive use, and linkages with domestic industries. Exports showed a positive and significant association with GDP in the estimated specification, although this should not be interpreted as a stable long-run effect because cointegration was not established.

The most important finding relates to GCF. The short-run coefficient of Δ GCF was positive and statistically significant (0.1911), remaining significant after the use of robust standard errors ($p = 0.007$). This indicates that a 1 per cent increase in gross capital formation was associated with approximately a 0.19 per cent increase in GDP in the short run. Inflation did not show a statistically significant association with GDP. The diagnostic results showed no evidence of serial correlation, while residuals did not significantly depart from normality. Although heteroskedasticity was detected, robust standard errors were used for statistical inference. Overall, the results suggest that domestic capital formation had a stronger and more consistent short-run association with economic growth than FDI during the study period.

6. Conclusion

This study examined the relationship between FDI and economic growth in India by incorporating exports, gross capital formation, and inflation using annual data from 2001 to 2025. The ARDL Bounds approach found no evidence of a stable long-run relationship among the selected variables.

The short-run results showed that gross capital formation had a positive and statistically significant association with economic growth, with a 1 per cent increase in GCF associated with an approximately 0.19 per cent increase in GDP. This result remained significant after applying heteroskedasticity-robust standard errors. FDI, measured as a percentage of GDP, did not show a statistically significant association with economic growth, while exports showed a positive association and inflation was not statistically significant.

Overall, the findings highlight the importance of domestic capital formation in supporting short-run economic growth. They also suggest that increasing FDI inflows alone may not automatically promote growth unless such investment contributes effectively to domestic productive capacity.

7. Policy Implications

The findings suggest that policy should give continued attention to strengthening domestic capital formation, particularly investment in infrastructure, productive assets, technology, and manufacturing capacity.

Since FDI did not show a statistically significant association with economic growth, policies should focus not only on increasing the volume of foreign investment but also on its quality and productive contribution. Encouraging technology transfer, skill development, local sourcing, and stronger linkages between foreign and domestic firms may increase its potential benefits.

The positive association between exports and GDP also supports efforts to improve export competitiveness through better infrastructure, productivity, and market access. Overall, economic policy should promote complementarity between domestic investment, productive FDI, and export development to support sustainable economic growth.



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