

Foreign Investment, Economic Growth and Macroeconomic Dynamics in India: Exploring Casual Linkages

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Abstract

This study examines the causal linkages among foreign direct investment (FDI), economic growth, exports, gross capital formation, and inflation in India over the period 1985-2025. Using annual secondary data obtained from the World Bank's World Development Indicators, the study employs a Vector Autoregression (VAR) framework and Granger causality approach to investigate the short-run dynamic relationships among the selected macroeconomic variables. The Augmented Dickey-Fuller test confirms that all variables are integrated of order one, while the Johansen cointegration test indicates no significant long-run equilibrium relationship among them. Accordingly, a VAR model in first differences with one lag is estimated. The Granger causality results reveal three significant unidirectional relationships: GDP Granger-causes exports, gross capital formation Granger-causes exports, and gross capital formation Granger-causes inflation. However, no significant causal relationship is found between FDI and GDP, either in the direction of FDI to growth or growth to FDI. The diagnostic tests confirm that the VAR model is stable and free from residual serial correlation, although the residuals are not jointly normally distributed. Overall, the findings indicate that domestic economic growth and capital formation play a more prominent role in India's short-run export dynamics than FDI. The study highlights the importance of strengthening domestic productive capacity, investment, and export competitiveness while ensuring that investment policies remain consistent with macroeconomic and price stability.

Keywords: Foreign Direct Investment, Economic Growth, Exports, Gross Capital Formation, Inflation, VAR, Granger Causality.

1. Introduction

Foreign investment, economic growth, exports, capital formation, and inflation are closely connected elements of a developing economy. For India, the relationship among these variables has become particularly important as the economy has moved from a relatively inward-looking policy regime toward greater integration with global markets. Foreign direct investment (FDI) is generally expected to contribute to growth by bringing capital, technology, managerial knowledge, and access to international markets. However, the actual contribution of FDI depends on the ability of the host economy to absorb these benefits and establish linkages with domestic production. Borensztein et al. (1998), for example, argue that the growth-enhancing effect of FDI is closely related to the level of human capital and the host economy's absorptive capacity.

The Indian experience, however, does not suggest a simple or uniform relationship between FDI and economic growth. Chakraborty and Basu (2002), using a cointegration and vector error correction framework, found that GDP was not Granger-caused by FDI and that the direction of causality ran more strongly from economic growth toward FDI. Their findings are important because they suggest that a growing domestic economy can itself become an attraction for foreign investors rather than FDI necessarily being the initial driver of growth. More recent evidence also reports mixed outcomes. Bhasin and Gupta (2017) found significant long-run relationships among FDI, GDP, and exports, but their results also showed that the impact of FDI on exports was not uniformly positive. Similarly, Rakshit (2022) found that FDI promoted economic growth in the long run but did not have a significant short-run effect on growth in India.

Exports represent another important channel through which international integration can influence economic performance. A stronger export sector can expand markets for domestic producers, encourage specialization, generate

foreign exchange, and improve productive efficiency. At the same time, economic growth can itself stimulate exports by increasing productive capacity and improving firms' ability to compete internationally. The empirical literature for India therefore does not provide a single answer regarding the direction of the growth-export relationship. Trivedi and Pradhan (2010) reported evidence of export-led growth, with causality running from exports to GDP, whereas other studies have identified feedback or alternative directions of causality. Sharma (2003), while examining the determinants of India's export performance, found that foreign investment did not have a statistically significant impact on exports despite having a positive coefficient. These differences suggest that the export-growth relationship is sensitive to the period, variables, and econometric approach considered.

The interaction between FDI and exports is equally complex. In theory, FDI may promote exports by adding productive capacity, transferring technology, facilitating access to foreign markets, and integrating domestic firms into global value chains. Yet foreign investors may also be primarily attracted to India's large domestic market, limiting the direct contribution of FDI to export expansion. Jana et al. (2020) found a bidirectional short-run causal relationship between FDI and foreign trade, but no long-run causality from FDI to exports, and argued that the domestic-market orientation of foreign investors may partly explain this pattern. Earlier evidence from Dash and Sharma (2011) also reported a bidirectional relationship between FDI and economic growth and a unidirectional relationship between exports and FDI, further demonstrating that the direction of these linkages remains unsettled.

Domestic capital formation adds another important dimension to these relationships. Investment in infrastructure, machinery, technology, and productive capacity provides the physical foundation needed for sustained economic activity and international competitiveness. Bal et al. (2016) found that capital formation contributes positively to economic growth in India, highlighting the importance of domestic investment in the growth process. More recent research also points to the significance of the investment environment in determining India's growth prospects. Pattanaik et al. (2022), for instance, show that investment activity in India is sensitive to macroeconomic conditions, including interest rates, while emphasizing the policy constraints involved in using monetary conditions to stimulate investment.

Inflation is another important component of the macroeconomic relationship. Persistent price pressures can affect investment decisions, household purchasing power, and international competitiveness, while economic growth and investment themselves can influence inflation through changes in demand and productive capacity. Rasool (2023), in examining inflation dynamics in India, found that output growth, monetary conditions, exchange-rate movements, and fiscal factors play important roles in shaping inflationary pressures. This indicates that inflation should not be viewed in isolation but as part of a broader macroeconomic system in which output, investment, and external-sector variables interact.

Despite the substantial literature on FDI, growth, and trade in India, the evidence remains mixed regarding both the direction and timing of causality. Some studies find that FDI contributes to growth, while others suggest that economic growth attracts FDI. Similar differences exist in the export-growth and FDI-export relationships. Singh (2024), using post-reform Indian data, found a long-run relationship among economic growth, exports, imports, and FDI, while the short-run results pointed to specific directional linkages rather than a uniform pattern across variables. Such findings reinforce the view that macroeconomic relationships in India are dynamic and may differ between the short and long run.

Against this background, the present study examines Foreign Investment, Economic Growth and Macroeconomic Dynamics in India: Exploring Causal Linkages. The study brings together five important macroeconomic variables-GDP, FDI, exports, gross capital formation, and inflation-and examines their dynamic interrelationships over the period 1985-2025. Rather than focusing only on whether the variables are associated, the study is concerned with the direction of predictive influence among them. A Vector Autoregression (VAR) framework and Granger causality analysis are therefore employed to identify short-run causal linkages after accounting for the time-series properties of the variables.

The study is motivated by the continuing uncertainty in the empirical literature and by the need to examine these relationships in an integrated framework. By considering FDI alongside economic growth, exports, capital formation, and inflation, the study seeks to provide a broader understanding of India's macroeconomic dynamics. The findings are

expected to offer useful evidence for policymakers concerned with strengthening domestic investment, improving export performance, attracting productive foreign investment, and maintaining macroeconomic stability.

2. Literature Review

The relationship between foreign direct investment (FDI), economic growth, exports, capital formation, and inflation has attracted considerable attention in the international and Indian literature. FDI is generally expected to support economic growth by increasing the availability of capital, transferring technology and managerial skills, improving productivity, and linking domestic firms with international markets. At the same time, the contribution of FDI depends on the absorptive capacity of the host economy. **Borensztein et al. (1998)**, using data for 69 developing countries, found that FDI could contribute substantially to economic growth through technology transfer, but the effect depended on the host country's level of human capital. Their findings suggest that foreign investment alone is not sufficient to ensure higher growth; domestic economic conditions also matter. The Indian evidence on the FDI-growth relationship has been particularly mixed. **Chakraborty and Basu (2002)** examined the relationship between FDI and economic growth in India using cointegration and a vector error-correction model. Although they found a long-run relationship between the variables, their short-run results indicated that GDP was not Granger-caused by FDI; rather, causality was stronger from GDP to FDI. This finding suggests that a growing domestic economy can itself attract foreign investment. **Chakraborty and Nunnenkamp (2008)** provided a more detailed perspective by examining the FDI-growth relationship at the sectoral level in India. Their panel cointegration and Granger causality results showed that the impact of FDI differed considerably across sectors. FDI and output were mutually reinforcing in manufacturing, while no significant causal relationship was found in the primary sector. In services, the effect of FDI on output was largely transitory, although service-sector FDI appeared to generate spillovers into manufacturing. These findings indicate that the effects of FDI cannot be fully understood by relying only on aggregate national-level relationships. The relationship between exports and economic growth has also produced varying results in India. **Sharma (2003)**, while examining India's export performance over 1970-1998, found that exchange-rate movements were important for export performance, while foreign investment had a positive but statistically insignificant effect on exports. The study consequently questioned the assumption that increasing FDI automatically translates into stronger export performance. **Trivedi and Pradhan (2010)** examined the export-growth relationship in India using data covering 1970-71 to 2008-09. Their findings confirmed both short-run and long-run relationships between exports and economic growth, while the Granger causality test indicated unidirectional causality from export growth to GDP growth. The study therefore provided support for the export-led growth hypothesis in India. **Dash and Sharma (2011)** considered FDI, trade, and economic growth together for post-reform India. Using a VAR framework and the Toda-Yamamoto causality procedure, they found bidirectional causality between FDI and economic growth, while exports were found to Granger-cause FDI. Their results are important because they demonstrate that the direction of causality can change when FDI, trade, and growth are examined within a common multivariate framework. **Paul and Das (2012)** revisited the export-led growth hypothesis in India and found evidence supporting the role of exports in promoting economic growth, particularly in the post-liberalisation period. Their findings highlighted the importance of the changing trade environment following economic reforms and suggested that export expansion can contribute to domestic economic activity. This evidence complements the earlier findings of Trivedi and Pradhan while also showing that the growth-export relationship may be affected by changes in India's economic policy regime. **Bal et al. (2016)** shifted attention toward domestic capital formation and its contribution to economic growth. Using an ARDL framework for India over 1970-2012, they established a long-run relationship between capital formation and growth and found that capital formation had a positive effect on economic growth. They also reported a negative short-run effect of inflation on economic growth. The study therefore emphasised the importance of domestic investment while highlighting the role of price stability in supporting growth. **Gupta and Singh (2016)** investigated the FDI-growth nexus in the BRICS economies, including India, using VECM and Granger causality techniques. Their work highlighted that the strength and direction of the FDI-growth relationship differed across countries. This finding is relevant to the present study because it reinforces the argument that causality should be examined within the specific institutional and macroeconomic context of India rather than being assumed from international evidence. **Pradeep et al. (2017)** examined firm-level evidence from more than 1,000 Indian manufacturing firms and found that foreign presence generated significant positive productivity spillovers in many cases. Their results indicate that FDI may influence the domestic economy through productivity, technology, and knowledge spillovers, rather than only through a direct effect

on aggregate GDP. The study is useful for understanding why the aggregate FDI-growth relationship may sometimes appear weak even when FDI produces benefits at the firm or sectoral level. **Sharma and Rishad (2020)** examined whether macroeconomic indicators influence FDI inflows into India using annual data for 1975-2017 and an ARDL framework. They found a long-run relationship in which GDP and trade openness positively influenced FDI inflows, whereas inflation and exchange-rate movements were negatively associated with FDI. Interestingly, they did not find significant short-run associations among the variables. Their results strengthen the argument that the FDI relationship may be more visible over the longer term and may be sensitive to macroeconomic stability. **Jana et al. (2020)** specifically examined the relationship between FDI and India's foreign trade using a time-varying parameter VAR framework. The Johansen test indicated positive long-run co-movement between FDI and foreign trade, while the Granger causality test showed bidirectional short-run causality. At the same time, the authors found no long-run causality from FDI to exports and suggested that the domestic-market orientation of foreign investors may explain the relatively weak export channel. Their study is particularly relevant to the present research because it demonstrates the usefulness of a multivariate dynamic framework in studying FDI and trade relationships. **Reddy and Lakshmi (2020/2021)** examined the causal relationship among export growth, inflation, FDI, and real GDP growth in India using a VAR and Granger causality framework for 1990-91 to 2018-19. Their findings showed that FDI and real GDP growth positively influenced export growth, while inflation alone did not cause export growth. They also found that export growth, inflation, and real GDP jointly caused FDI, whereas the selected variables did not significantly cause real GDP growth. This study is especially relevant to the present research because it combines several of the same variables and applies a similar time-series approach. **Pattanaik et al. (2022)** examined India's investment slowdown and identified a significant sensitivity of investment activity to interest-rate movements. They further argued that the ability of lower interest rates to stimulate investment is constrained when inflation is allowed to rise above its target. Their findings are important for understanding the interaction between capital formation and price stability and suggest that investment policies cannot be separated from broader macroeconomic conditions. **Wani (2022)** investigated the relationship between trade openness, capital formation, and economic growth in India using the ARDL bounds-testing approach. The results showed a negative relationship between trade openness and economic growth in both the short and long run, while the study emphasised the importance of strengthening human and physical capital so that India can better benefit from international trade. The study provides useful evidence that the gains from openness may depend on the underlying investment and productive capacity of the economy. **Rakshit (2022)** examined trade openness, FDI, and economic growth in India over 1979-2017 using ARDL, structural-break testing, and Toda-Yamamoto causality analysis. The study found that FDI promoted economic growth in the long run but did not significantly affect growth in the short run. It also reported unidirectional causality from FDI to per-capita GDP growth. These findings provide an important contrast with studies such as Chakraborty and Basu (2002), demonstrating that the observed FDI-growth relationship can differ according to the period and econometric framework. More recent studies have continued to report mixed evidence. **Alam et al. (2024)** examined the asymmetric effects of FDI on economic growth in India using a nonlinear ARDL framework for 1991-2019. They found that positive and negative changes in FDI had different effects on growth and also reported an adverse role of inflation in economic performance. This suggests that treating FDI as a simple linear explanatory variable may conceal important differences between increases and decreases in foreign investment. **Kaur et al. (2024)** examined the determinants of Indian FDI inflows from major source countries using an augmented gravity model for 2000-2019. Their results showed that FDI openness, gross fixed capital formation, and exports were positive determinants of FDI inflows. The findings are particularly relevant to the present study because they indicate that domestic investment and export performance may not only be outcomes of foreign investment but may also influence the attractiveness of India to foreign investors. **Singaram et al. (2025)** examined the combined influence of FDI, exports, imports, and inflation on India's economic growth using ARDL and ECM techniques. They found evidence of a long-run relationship among the variables, while FDI, exports, and inflation had positive but statistically insignificant effects on economic growth. Their findings once again demonstrate that the presence of a long-run relationship does not necessarily imply strong short-run causal effects. **Sayyad and Shareef (2025)** further examined the relationship between FDI, inflation, and economic growth in India using the ARDL bounds-testing approach. They reported a stable long-run relationship, but the effects of FDI and inflation on growth were positive but statistically insignificant. This evidence is useful in the context of the present study because it suggests that FDI and inflation may be associated with growth without necessarily providing strong short-run predictive power.

The existing literature therefore leaves scope for further investigation of the direction and short-run dynamics of causal relationships among foreign investment, economic growth, exports, capital formation, and inflation in India. The mixed evidence on FDI-growth, growth-exports, and FDI-exports suggests that these relationships cannot be assumed to operate in one fixed direction. The present study addresses this gap by examining GDP, FDI, exports, gross capital formation, and inflation simultaneously for India over the period 1985-2025. It employs a VAR framework and Granger causality analysis to determine whether past movements in one variable contain significant information for predicting subsequent movements in another. This integrated approach distinguishes the present study from research that concentrates primarily on the effect of FDI on GDP. It also provides a broader assessment of how foreign investment interacts with domestic growth, investment, exports, and inflation within India's macroeconomic system.

3. Need of the Study

India's economic performance is shaped by the interaction of several important macroeconomic factors, particularly economic growth, foreign direct investment (FDI), exports, gross capital formation, and inflation. These variables are closely connected, but the nature and direction of their relationships may change over time. Therefore, examining them together is important for understanding the dynamics of India's economy. The study is needed to understand whether changes in economic growth, FDI, exports, and capital formation have a short-run influence on one another and how these relationships are associated with inflation. In particular, examining the direction of causality can provide a clearer understanding of whether economic growth and investment contribute to export expansion, or whether changes in exports and foreign investment precede changes in economic activity. The study is also important because exports and capital formation are central to sustained economic development, while inflation remains an important concern for macroeconomic stability. Identifying the linkages among these variables can provide useful evidence for policymakers in formulating policies related to investment, export promotion, economic growth, and price stability. The findings may therefore contribute to a better understanding of the short-run macroeconomic dynamics of India and support more coordinated economic policy decisions.

4. Objectives of the Study

- To examine the interrelationship and short-run dynamic linkages among economic growth, foreign direct investment, exports, gross capital formation, and inflation in India.
- To investigate the direction of causal relationships among these macroeconomic variables and identify the key factors influencing India's export performance.

5. Research Methodology

The study adopts a quantitative and explanatory research design to examine the dynamic relationships among economic growth, foreign direct investment (FDI), exports, gross capital formation (GCF), and inflation in India. It specifically investigates whether past movements in these macroeconomic variables help predict their future movements using the Granger causality approach within a Vector Autoregression (VAR) framework. The study uses secondary annual data from the World Bank's World Development Indicators (WDI) for the period 1985-2025, comprising 41 observations. GDP, FDI, exports, and GCF were transformed into their natural logarithms ($LGDP$, $IFDI$, $LEXP$, and $LGCF$), while inflation was retained in its original percentage form. The initial relationship is expressed as:

$$GDP_t = f(FDI_t, EXP_t, GCF_t, INF_t)$$

However, all variables were treated as potentially endogenous in the VAR framework. The Augmented Dickey-Fuller (ADF) test showed that all variables were non-stationary at levels but stationary after first differencing, indicating that they were integrated of order one, $I(1)$. The appropriate lag length was selected using LR, FPE, AIC, HQIC, and SBIC, with a lag of one year chosen for the analysis. The Johansen cointegration test found no evidence of a long-run cointegrating relationship among the variables at the 5% significance level. Therefore, a VAR(1) model in first differences was estimated. Granger causality tests based on Wald χ^2 statistics were then used to examine the direction of predictive relationships among the variables. The null hypothesis that one variable does not Granger-cause another was rejected when $p < 0.05$. Finally, diagnostic tests, including the eigenvalue stability test, LM test for residual autocorrelation, and Jarque-Bera test for normality, were conducted.

6. Interpretation and Analysis

Table-1

Descriptive Statistics of the Study Variables

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
IGDP	41	32.204	0.721	31.046	33.407
IFDI	41	22.435	2.172	18.113	24.888
IEXP	41	30.244	1.237	28.136	31.904
IGCF	41	30.917	0.961	29.34	32.335
Inflation	41	7.066	2.95	2.399	13.87

Source: Authors' calculations based on World Bank's World Development Indicators

Table 1 presents the descriptive statistics of the study variables for the period 1985-2025. The mean value of IGDP is 32.204, with a standard deviation of 0.721, indicating relatively low variation and a steady long-term movement in India's GDP. IFDI has a mean of 22.435 and the highest standard deviation among the logged variables (2.172), suggesting that foreign direct investment experienced comparatively greater fluctuations during the study period. The mean values of IEXP and IGCF are 30.244 and 30.917, with standard deviations of 1.237 and 0.961, respectively, indicating moderate variation and a relatively steady expansion in exports and capital formation. Inflation records a mean of 7.066% and a standard deviation of 2.950, with values ranging from 2.399% to 13.870%. This comparatively wider variation indicates that inflation was more volatile than the other macroeconomic variables. Overall, the descriptive results suggest that GDP, exports, and capital formation followed relatively stable long-term trends, whereas FDI and inflation showed greater fluctuations. These preliminary patterns provide a basis for further examining the dynamic relationships among the variables through the VAR and Granger causality framework.

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	0.24	0.9744	-4.783	0.0001	I(1)
IFDI	-1.784	0.3882	-4.832	0	I(1)
IEXP	-1.703	0.4294	-4.162	0.0008	I(1)
IGCF	-0.909	0.7849	-4.353	0.0004	I(1)
Inflation	-2.189	0.2103	-6.019	0	I(1)

Source: Authors' calculations based on World Bank's World Development Indicators

Table 2 presents the results of the Augmented Dickey-Fuller (ADF) unit root test conducted to examine the stationarity of the variables. At the level form, the p-values for all five variables-IGDP (0.9744), IFDI (0.3882), IEXP (0.4294), IGCF (0.7849), and inflation (0.2103)-are greater than 0.05. Therefore, the null hypothesis of a unit root cannot be rejected, indicating that all the variables are non-stationary at their levels.

The variables were then tested at their first differences. The ADF statistics become significantly negative, with the corresponding p-values being below 0.05 for all variables. Specifically, IGDP, IFDI, IEXP, IGCF, and inflation have p-values of 0.0001, 0.0000, 0.0008, 0.0004, and 0.0000, respectively. Hence, the null hypothesis of a unit root is rejected after first differencing, confirming that all the variables become stationary at this stage. Overall, the findings establish that all study variables are integrated of order one, I(1). This result provides the necessary basis for proceeding with the Johansen cointegration test and VAR analysis in first differences. It also ensures that the subsequent Granger causality analysis is conducted using stationary series, thereby reducing the possibility of obtaining misleading relationships due to non-stationarity.

Table-3

VAR Lag-Length Selection Criteria

Lag	LR	FPE	AIC	HQIC	SBIC
0	—	3.60E-08	-2.964	-2.887	-2.746
1	63.604*	2.5e-08*	-3.331*	-2.871	-2.025
2	28.087	4.90E-08	-2.739	-1.895	-0.344
3	31.128	1.00E-07	-2.229	-1.001	1.254

Source: Authors' calculations based on World Bank's World Development Indicators

Table 3 presents the results of the VAR lag-length selection criteria used to determine the appropriate number of lags for the model. The selection is important because an insufficient number of lags may fail to capture the dynamic relationships among the variables, while excessive lags may reduce the efficiency of the estimates, particularly with a relatively small sample. The results show that the Likelihood Ratio (LR), Final Prediction Error (FPE), and Akaike Information Criterion (AIC) all select lag 1 as the optimal lag length. The LR statistic is significant at lag 1 (63.604), while the FPE and AIC also attain their minimum values at this lag. In contrast, HQIC and SBIC do not indicate a common preference for lag 1. Considering the stronger support provided by the LR, FPE, and AIC criteria, the study selects one lag for the VAR model. Accordingly, a VAR(1) specification is employed for the subsequent cointegration, causality, and diagnostic analysis. This choice also provides a reasonable balance between capturing the short-run dynamics of the variables and conserving degrees of freedom given the study's annual data and limited sample size.

Table 4

Johansen Cointegration Test Results

Null Hypothesis	Trace Statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value	Decision
$r = 0$	52.93	68.52	24.626	33.46	Do not reject H_0

Source: Authors' calculations based on World Bank's World Development Indicators

Table 4 presents the results of the Johansen cointegration test, which was conducted to determine whether a stable long-run equilibrium relationship exists among GDP, FDI, exports, gross capital formation, and inflation. The results show that the trace statistic (52.930) is lower than its 5% critical value of 68.520. Similarly, the maximum eigenvalue statistic (24.626) is below its corresponding 5% critical value of 33.460. Since both test statistics are lower than their respective critical values, the null hypothesis of no cointegrating relationship ($r = 0$) cannot be rejected at the 5% significance level. Thus, the findings indicate that the variables do not share a statistically significant long-run equilibrium relationship during the study period. The absence of cointegration suggests that although the variables may interact with one another in the short run, they do not move together in a stable long-run relationship. Therefore, the subsequent analysis is appropriately conducted using a VAR model in first differences, which also provides the basis for examining the short-run predictive relationships through Granger causality tests.

Table 5

Granger Causality Test Results

Null Hypothesis: No Granger Causality	χ^2	p-value	Result
FDI $\rightarrow$ GDP	0.004	0.948	No causality
GDP $\rightarrow$ FDI	2.034	0.154	No causality
Exports $\rightarrow$ GDP	1.047	0.306	No causality
GDP $\rightarrow$ Exports	17.254	0	Causality
GCF $\rightarrow$ GDP	0.627	0.429	No causality
GDP $\rightarrow$ GCF	0.006	0.937	No causality
Inflation $\rightarrow$ GDP	0.836	0.361	No causality
GDP $\rightarrow$ Inflation	3.627	0.057	No causality at 5%
Exports $\rightarrow$ FDI	0.7	0.403	No causality
FDI $\rightarrow$ Exports	0.879	0.348	No causality

GCF → FDI	1.873	0.171	No causality
FDI → GCF	0.896	0.344	No causality
Inflation → FDI	0.061	0.805	No causality
FDI → Inflation	0.165	0.684	No causality
GCF → Exports	35.866	0	Causality
Exports → GCF	0.078	0.78	No causality
Inflation → Exports	1.039	0.308	No causality
Exports → Inflation	0.117	0.732	No causality
Inflation → GCF	1.213	0.271	No causality
GCF → Inflation	4.063	0.044	Causality

Source: Authors' calculations based on World Bank's World Development Indicators

Table 5 presents the Granger causality test results based on the VAR(1) model estimated using first-differenced variables. The results indicate that most of the hypothesised causal relationships among GDP, FDI, exports, GCF, and inflation are statistically insignificant at the 5% level. A significant unidirectional causality from GDP to exports is observed, with a χ^2 value of 17.254 and a p-value of 0.000. This suggests that past movements in GDP contain useful information for predicting subsequent movements in exports. Similarly, GCF is found to Granger-cause exports ($\chi^2 = 35.866$, $p = 0.000$), indicating that changes in capital formation have a significant predictive influence on export performance. In addition, GCF Granger-causes inflation ($\chi^2 = 4.063$, $p = 0.044$), suggesting that changes in capital formation may also have short-run implications for inflation. However, no significant causality is found between FDI and GDP, in either direction. Likewise, the tests do not identify significant causal relationships between FDI and exports, FDI and GCF, or inflation and FDI. The relationship between exports and GDP is also one-way, as exports do not Granger-cause GDP ($p = 0.306$). Similarly, exports do not significantly Granger-cause GCF or inflation.

Overall, the findings reveal three significant unidirectional causal relationships: GDP → Exports, GCF → Exports, and GCF → Inflation. These results suggest that domestic economic growth and capital formation play a more prominent role in influencing export performance in the short run, while capital formation also has a measurable relationship with inflation. At the same time, the absence of significant causality from FDI to GDP suggests that foreign investment did not exhibit a statistically significant short-run predictive effect on economic growth during the study period.

Table-6
VAR Diagnostic Test Results

Diagnostic Test	Statistic	p-value	Conclusion
VAR Stability Test	All roots inside unit circle	—	Stable VAR
LM Test: Lag 1	$\chi^2 = 19.783$	0.7581	No serial correlation
LM Test: Lag 2	$\chi^2 = 20.123$	0.7404	No serial correlation
Jarque-Bera Normality Test (Overall)	$\chi^2 = 103.701$	0	Residuals not jointly normal

Source: Authors' calculations based on World Bank's World Development Indicators

Table 6 presents the diagnostic tests conducted to assess the reliability and adequacy of the estimated VAR model. The VAR stability test confirms that all the roots lie inside the unit circle, indicating that the estimated VAR system satisfies the stability condition and is suitable for further interpretation. The LM test for serial correlation produces p-values of 0.7581 at lag 1 and 0.7404 at lag 2, both well above the 5% significance level. Therefore, the null hypothesis of no residual autocorrelation cannot be rejected, suggesting that the model does not suffer from significant serial correlation. However, the Jarque-Bera normality test is statistically significant ($\chi^2 = 103.701$, $p = 0.000$), indicating that the residuals are not jointly normally distributed. While this represents a limitation of the model, the results of the stability and LM tests indicate that the VAR specification is dynamically stable and free from residual serial correlation. Overall, the diagnostic results provide reasonable support for the adequacy of the VAR model, with the non-normality of residuals being acknowledged when interpreting the findings.

7. Discussion of Results

The empirical findings indicate that the relationships among GDP, FDI, exports, gross capital formation, and inflation in India are primarily short-run in nature, as the Johansen cointegration test found no evidence of a stable long-run relationship. The Granger causality results reveal three significant unidirectional relationships: GDP → Exports, GCF → Exports, and GCF → Inflation. The significant causality from GDP to exports suggests that higher economic activity and improvements in domestic productive capacity support export performance. Similarly, the finding that GCF Granger-causes exports highlights the importance of domestic investment in strengthening production capacity, infrastructure, and international competitiveness. Together, these results indicate that India's export performance is closely linked to the strength of its domestic economy and investment environment.

The significant relationship between GCF and inflation indicates that changes in capital formation may also have short-run implications for price movements. This may arise when increased investment generates higher demand for resources and inputs before the resulting expansion in productive capacity fully materialises. In contrast, no significant Granger causality is found between FDI and GDP in either direction. Similarly, FDI does not show significant causal relationships with exports, GCF, or inflation. This suggests that FDI did not have a significant short-run predictive influence within the model during the study period. Overall, the results indicate that domestic economic growth and capital formation played a more prominent role than FDI in explaining the short-run dynamics of India's exports.

8. Conclusion and Policy Implications

The study examined the dynamic relationships among GDP, FDI, exports, gross capital formation, and inflation in India for the period 1985-2025 using a VAR and Granger causality framework. The results confirm that all variables are integrated of order one, while the Johansen test indicates no long-run cointegrating relationship. The analysis therefore focuses on short-run interactions among the variables.

The Granger causality results identify three significant relationships: GDP → Exports, GCF → Exports, and GCF → Inflation. These findings suggest that economic growth and domestic capital formation are important determinants of short-run export performance, while capital formation also has implications for price movements. However, no significant causal relationship is found between FDI and GDP, indicating that FDI did not have a significant short-run predictive effect on economic growth during the study period.

From a policy perspective, the findings emphasise the need to strengthen domestic investment and productive capacity to improve export performance. Greater investment in infrastructure, technology, transport, logistics, and productive sectors can enhance India's competitiveness in international markets. Since GCF is also associated with inflation, investment expansion should be supported by adequate supply-side capacity and appropriate macroeconomic management to minimise short-run price pressures.

The absence of significant FDI-GDP causality also suggests that policy should focus not only on attracting larger volumes of FDI but also on improving its quality and domestic economic linkages. FDI that promotes technology transfer, employment, productivity, skill development, and integration with domestic firms is likely to provide greater developmental benefits. Overall, a coordinated approach combining economic growth, domestic capital formation, export promotion, quality FDI, and price stability can provide a stronger foundation for sustainable economic development in India.

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