



International Journal of Contemporary Research In Multidisciplinary

Research Article

Foreign Direct Investment and Macroeconomic Indicators in India: A Granger Causality Analysis

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DOI: <https://doi.org/10.5281/zenodo.21332315>

Abstract

Foreign Direct Investment (FDI) has emerged as one of the most significant sources of capital formation and economic development in emerging economies such as India. The relationship between FDI and macroeconomic variables is dynamic and often characterized by feedback effects. This study investigates the causal relationship between Foreign Direct Investment (FDI) and selected macroeconomic variables, namely Gross Domestic Product (GDP), Gross Domestic Savings (GDS), Gross Fixed Capital Formation (GFCF), Exports (EXP), Imports (IMP), Gross National Income (GNI), Net National Income (NNI), and Per Capita Income (PCI), using annual time-series data for India. The study employs the Granger causality framework after testing the stationarity and long-run equilibrium relationship among the variables. The empirical findings reveal both bidirectional and unidirectional causal relationships, suggesting that macroeconomic fundamentals significantly influence FDI inflows while FDI also contributes to economic growth.

Manuscript Information

- ISSN No: 2583-7397
- Received: 07-06-2026
- Accepted: 10-07-2026
- Published: 13-07-2026
- IJCRM:5(4); 2026: 145-150
- ©2026, All Rights Reserved
- Plagiarism Checked: Yes
- Peer Review Process: Yes

How to Cite this Article

Kumari N, Kumari S. Foreign Direct Investment and Macroeconomic Indicators in India: A Granger Causality Analysis. Int J Contemp Res Multidiscip. 2026;5(4):145-150.

Access this Article Online



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KEYWORDS: Foreign Direct Investment, Granger Causality, India, GDP, Exports, GDS.

1. INTRODUCTION

Foreign Direct Investment (FDI) has become one of the most important drivers of globalization and economic integration. For developing economies like India, FDI serves as a major source of capital formation, technological advancement, employment generation, productivity enhancement, and export promotion. This relationship indicates that an increase in foreign investment enhances productive capacity through capital accumulation, technology transfer, managerial efficiency, and productivity improvements. The empirical relationship between FDI and macroeconomic variables may therefore be represented as

$$FDI=f(GDP, GDS, GFCF, EXP, IMP, GNI, NNI, PCI)$$

2. OBJECTIVES OF THE STUDY

The study has the following objectives:

1. To examine whether FDI Granger causes selected macroeconomic variables.
2. To investigate whether macroeconomic variables Granger-cause FDI.
3. To identify the direction of causality between FDI and major macroeconomic indicators of the Indian economy.

3. LITERATURE REVIEW

One of the earliest studies examining the causal impact of FDI on economic growth was conducted by **Borensztein, De Gregorio, and Lee (1998)**. Using panel data for 69 developing countries during 1970–1989, the authors employed cross-country regression techniques and found that FDI significantly enhances economic growth by facilitating technology transfer. However, the positive impact depends on the host country's human capital. Their findings imply that FDI Granger causes economic growth only when adequate absorptive capacity exists.

De Mello (1999) investigated the relationship between FDI and economic growth in both OECD and non-OECD countries. Applying endogenous growth models, the study concluded that FDI contributes positively to productivity growth through capital accumulation and technological spillovers. The study emphasized that the growth-enhancing effect of FDI is stronger in developing economies with stable macroeconomic environments.

Chakraborty and Basu (2002) analyzed India's post-liberalization period using cointegration and Granger causality techniques. Their findings indicated a unidirectional causality running from GDP to FDI rather than from FDI to GDP. However, the study acknowledged that FDI positively influences productivity and industrial output over the long run.

Alfaro et al. (2004) by using a panel of developing economies, demonstrated that FDI positively affects economic growth when supported by well-developed financial markets. The study highlighted that financial development strengthens the transmission mechanism through which FDI influences macroeconomic performance.

Agrawal (2015) examined the impact of FDI on economic growth using Johansen cointegration and Granger causality analysis for the period 1993–2013. The results revealed long-run cointegration and unidirectional causality from FDI to

GDP, confirming that foreign investment contributes significantly to India's economic expansion.

Dunning (1993) proposed the Eclectic (OLI) Paradigm, emphasizing that market size, infrastructure, trade openness, and macroeconomic stability are major determinants of FDI. According to this framework, multinational enterprises invest in countries offering location-specific advantages supported by stable macroeconomic conditions.

Asiedu (2002) investigated FDI determinants in developing countries and found that infrastructure development, openness to trade, and macroeconomic stability significantly attract foreign investors. The study concluded that policy reforms improving macroeconomic fundamentals substantially increase FDI inflows.

Pradhan (2009) examined the relationship between FDI, exports, and economic growth using cointegration and Granger causality tests. The study reported that GDP growth and exports Granger cause FDI, indicating that foreign investors are attracted by expanding markets and strong export performance.

Dash and Parida (2013) analyzed India's macroeconomic indicators and observed that GDP growth, domestic savings, inflation, exchange rate stability, and infrastructure development significantly determine FDI inflows. Their results suggested that improvements in macroeconomic fundamentals create a conducive environment for foreign investment.

Determining the direction of causality between FDI and macroeconomic variables remains one of the most debated issues in international economics. **Hsiao and Hsiao (2006)** analyzed East Asian economies using panel Granger causality tests and found bidirectional causality between FDI and GDP in several countries, indicating a mutually reinforcing relationship.

Herzer, Klasen, and Nowak-Lehmann (2008) investigated developing economies and concluded that bidirectional causality exists between FDI and economic growth in countries with higher institutional quality and financial development.

Srinivasan, Kalaivani, and Ibrahim (2011) examined FDI and economic growth using Johansen cointegration and Vector Error Correction Models. Their findings suggested bidirectional causality between FDI and GDP in both the short and long run, implying that economic growth attracts foreign investment while FDI simultaneously stimulates growth.

Pradhan, Arvin, and Hall (2014) extended this analysis by incorporating exports and financial development into the causal framework. Their results revealed bidirectional relationships among FDI, exports, and economic growth, emphasizing the interconnectedness of macroeconomic variables.

Sarker and Khan (2020) examined South Asian economies and found mixed causal relationships depending on country-specific economic structures. India exhibited evidence of bidirectional causality between FDI and GDP, while relationships with exports and savings varied over time.

Balasubramanyam, Salisu, and Sapsford (1996) concluded that countries pursuing export-oriented trade policies derive greater benefits from FDI than those following import substitution strategies. Their findings support policies promoting trade liberalization.

Alfaro et al. (2004) recommended strengthening financial institutions to maximize the growth-enhancing effects of FDI.

They argued that domestic financial market development enables efficient allocation of foreign capital.

Kumar and Pradhan (2002) emphasized improving infrastructure, simplifying regulatory procedures, and enhancing institutional quality to attract sustainable FDI inflows into India. They argued that policy consistency significantly influences investor confidence.

OECD (2008) highlighted the importance of transparent investment policies, good governance, legal certainty, and macroeconomic stability in attracting long-term FDI. The report stressed that FDI contributes more effectively to development when supported by strong domestic institutions.

UNCTAD (2023) observed that countries emphasizing digital infrastructure, renewable energy, manufacturing competitiveness, and policy stability continue to attract larger FDI inflows despite global economic uncertainties. The report recommended strengthening institutional quality and investment facilitation mechanisms to sustain long-term foreign investment.

4. DATA AND METHODOLOGY

The present study adopts a quantitative and explanatory research design to examine the causal relationship between Foreign Direct Investment (FDI) and selected macroeconomic indicators of the Indian economy using annual time-series data for the period 1991–92 to 2021–22 (31 observations). The study is based entirely on secondary data collected from reliable sources, including the Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry, Government of India, the Reserve Bank of India (RBI) Handbook of Statistics on the Indian Economy, the National Statistical Office (NSO), Ministry of Statistics and Programme Implementation (MoSPI), and the World Bank's World Development Indicators (WDI) database. The variables included in the study are Foreign Direct Investment (FDI), Gross Domestic Product (GDP), Gross Domestic Savings (GDS), Gross Fixed Capital Formation (GFCF), Exports (EXP), Imports (IMP), Gross National Income (GNI), Net National Income (NNI), and Per Capita Income (PCI). To stabilize the variance, reduce heteroscedasticity, and facilitate interpretation of the results, all variables are transformed into their natural logarithmic forms. The primary econometric technique employed in this study is the Granger Causality Test, which is used to examine the direction of causality between FDI and each selected macroeconomic variable. The test evaluates whether the past values of one variable provide statistically significant information for predicting the current values of another variable beyond the information contained in its own past values. For each pair of variables, two null hypotheses are tested: (i) FDI does not Granger-cause the macroeconomic variable, and (ii) the macroeconomic variable does not Granger-cause FDI. Based on the F-statistics and corresponding probability values, the study identifies whether the causal relationship is unidirectional, bidirectional, or nonexistent. The optimal lag length is determined using standard lag selection criteria, and the empirical analysis is carried out using EViews econometric software, with statistical significance evaluated at the 1%, 5%, and 10% levels.

Equation (1): Effect on Macroeconomic Variable on FDI

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln X_{t-1} + \epsilon_t$$

$$\ln X_t = \delta_0 + \sum \alpha_i \ln X_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \epsilon_t$$

Where X = (GDP, GDS, GFCF, EXP, IMP, GNI, NNI, PCI)

The Hypotheses are

$$H_0: \beta_1 = \beta_2 = \dots = \beta_3 = 0$$

Macro-economic variables do not Granger –Cause FDI

and $H_0: \theta_1 = \theta_2 = \dots = \theta_3 = 0$

FDI does not Granger-cause the macroeconomic Variable

5. EMPIRICAL RESULTS

The pairwise Granger causality analysis was conducted to examine the direction of causality between Foreign Direct Investment (FDI) and selected macroeconomic variables in India using annual time-series data comprising 31 observations. The Granger causality test determines whether past values of one variable significantly improve the prediction of another variable beyond its own historical values. The null hypothesis assumes that one variable does not Granger-cause the other. Rejection of the null hypothesis indicates the existence of predictive causality.

The empirical findings reveal a combination of bidirectional and unidirectional causal relationships between FDI and the selected macroeconomic indicators. These results provide valuable insights into the dynamic interactions between foreign investment and India's macroeconomic environment.

Granger Causality between FDI and Exports

The following pairwise equations were estimated:

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln EXP_{t-1} + \epsilon_t$$

$$\ln EXP_t = \alpha_0 + \sum \alpha_i \ln EXP_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \epsilon_t$$

were:

- $\ln FDI$ denotes Foreign Direct Investment,
- $\ln EXP$ denotes Exports,

The results presented in Table 4.15 indicate a bidirectional Granger causality between Foreign Direct Investment (FDI) and exports. The null hypothesis that FDI does not Granger-cause exports was rejected ($F = 2.1885$; $p = 0.0293$), while the null hypothesis that exports do not Granger-cause FDI was also rejected ($F = 5.7559$; $p = 0.0085$). These findings demonstrate the existence of a feedback relationship between the two variables.

The causality running from FDI to exports suggests that foreign investment enhances export performance through several channels. Multinational enterprises generally possess advanced

production technologies, superior managerial capabilities, international marketing networks, and access to global value chains. These advantages improve the competitiveness of domestic industries, resulting in increased export capacity and greater participation in international trade. Furthermore, export-oriented foreign firms establish production facilities specifically to serve international markets, thereby directly contributing to export growth.

Conversely, the causality from exports to FDI indicates that strong export performance serves as an important signal to foreign investors regarding market competitiveness, industrial efficiency, and the country's integration into global markets. Higher export growth reflects improved infrastructure, favourable trade policies, and greater production efficiency, thereby reducing investment risks and attracting additional foreign investment.

The existence of bidirectional causality confirms the complementary relationship between trade and foreign investment. These findings support the theoretical arguments of international trade and investment theories, particularly the Eclectic Paradigm proposed by Dunning (1993), which emphasizes that multinational firms are attracted to economies possessing competitive production advantages and access to international markets. The findings are also consistent with studies by Krugman and Obstfeld (2009), which highlight the mutually reinforcing relationship between exports and foreign investment.

Granger Causality between FDI and Gross Fixed Capital Formation (GFCF)

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln GFCF_{t-1} + \epsilon_t$$

$$\ln GFCF_t = \alpha_0 + \sum \alpha_i \ln GFCF_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \epsilon_t$$

were:

- In FDI denotes Foreign Direct Investment,
- In GFCF denotes Gross Fixed Capital Formation,

The results reveal **unidirectional causality from GFCF to FDI**, as the null hypothesis that GFCF does not Granger-cause FDI was rejected ($F = 3.9349$; $p = 0.0321$). However, the reverse relationship was found to be statistically insignificant ($F = 1.7922$; $p = 0.1866$). This finding indicates that domestic capital formation plays a significant role in attracting foreign investment. Higher levels of investment in infrastructure, manufacturing facilities, machinery, transportation networks, and industrial assets improve the productive capacity of the economy. Such improvements reduce production costs, increase operational efficiency, and create a more favourable business environment for multinational corporations. The absence of reverse causality suggests that although FDI contributes to capital accumulation, its immediate impact on aggregate gross fixed capital formation is limited within the sample period. This may be attributed to the relatively smaller share of FDI compared to total domestic investment or the time lag associated with implementing foreign investment projects. These findings support development theories emphasizing that

domestic investment serves as a foundation for attracting foreign capital. The results are consistent with Todaro and Smith (2015), who argue that countries with stronger infrastructure and higher domestic investment are more successful in attracting long-term foreign investment.

Granger Causality between FDI and Gross Domestic Product (GDP)

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln GDP_{t-1} + \epsilon_t$$

$$\ln GDP_t = \alpha_0 + \sum \alpha_i \ln GDP_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \epsilon_t$$

were:

- In FDI denotes Foreign Direct Investment,
- In GDP denotes Gross Domestic Product,

The results reveal **bidirectional Granger causality** between Gross Domestic Product and Foreign Direct Investment. The null hypotheses in both directions were rejected, indicating that GDP Granger-causes FDI ($F = 3.8096$; $p = 0.0354$), while FDI also Granger-causes GDP ($F = 5.5711$; $p = 0.0018$). The causality from GDP to FDI indicates that economic growth enhances the attractiveness of India as an investment destination. A growing economy generally reflects macroeconomic stability, expanding markets, increasing consumer demand, better infrastructure, and favourable investment opportunities. These factors encourage multinational corporations to establish or expand their operations within the country. The reverse causality from FDI to GDP demonstrates that foreign investment contributes significantly to economic growth by increasing capital formation, facilitating technology transfer, improving labour productivity, generating employment opportunities, and enhancing industrial competitiveness. Foreign firms also introduce advanced management practices and innovation, thereby increasing overall economic efficiency. The presence of bidirectional causality suggests the existence of a virtuous cycle in which economic growth attracts foreign investment, while foreign investment further accelerates economic growth. These findings strongly support endogenous growth theory and are consistent with Barro and Sala-i-Martin (2004), who emphasize the importance of capital accumulation and technological progress as key drivers of sustained economic growth.

Granger Causality between FDI and Gross Domestic Savings (GDS)

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln GDS_{t-1} + \epsilon_t$$

$$\ln GDS_t = \alpha_0 + \sum \alpha_i \ln GDS_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \epsilon_t$$

were:

- In FDI denotes Foreign Direct Investment,
- In GDS denotes Gross Domestic Savings

The empirical results indicate **unidirectional causality from Gross Domestic Savings to FDI**. The null hypothesis that GDS does not Granger-cause FDI was rejected at the 1% significance

level ($F = 8.5691$; $p = 0.0015$), whereas the reverse causality was statistically insignificant ($F = 0.0980$; $p = 0.9070$). This finding implies that higher domestic savings strengthen the country's investment climate by increasing the availability of financial resources for infrastructure development and productive investment. A high domestic savings rate reflects macroeconomic stability, lower dependence on external borrowing, and greater financial resilience, all of which increase investor confidence. The absence of causality from FDI to domestic savings suggests that foreign investment does not immediately influence household or institutional saving behaviour. Savings are largely determined by income levels, fiscal policies, financial institutions, and demographic factors rather than short-term changes in foreign investment inflows.

Granger Causality between FDI and Gross National Income (GNI)

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln GNI_{t-1} + \varepsilon_t$$

$$\ln GNI_t = \alpha_0 + \sum \alpha_i \ln GNI_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \varepsilon_t$$

were:

- $\ln FDI$ denotes Foreign Direct Investment,
- $\ln GNI$ denotes Gross National Income

The results indicate unidirectional causality from Gross National Income to FDI. The null hypothesis that GNI does not Granger-cause FDI was rejected ($F = 3.0788$; $p = 0.0431$), whereas no evidence was found supporting causality from FDI to GNI ($F = 0.5271$; $p = 0.5965$).

Higher national income reflects stronger purchasing power, larger markets, and improved economic stability. These characteristics increase the attractiveness of the economy for multinational enterprises seeking profitable investment opportunities. The absence of reverse causality suggests that the contribution of FDI to national income may require a longer time horizon before becoming statistically observable.

Granger Causality between FDI and Imports

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln IMP_{t-1} + \varepsilon_t$$

$$\ln IMP_t = \alpha_0 + \sum \alpha_i \ln IMP_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \varepsilon_t$$

were:

- $\ln FDI$ denotes Foreign Direct Investment,
- $\ln IMP$ denotes Imports

Unidirectional causality from imports to FDI.

Imports significantly Granger-cause FDI ($F = 7.0585$; $p = 0.0036$), whereas FDI does not Granger-cause imports ($F = 1.0602$; $p = 0.3609$). Higher import levels often reflect expanding industrial production, greater demand for intermediate goods, technological modernization, and increasing integration into global supply chains. These factors create favorable conditions for foreign investors by signaling

market expansion and production opportunities. The absence of reverse causality suggests that although foreign investment may increase imports of machinery and intermediate goods, such effects are not immediately reflected in aggregate import statistics.

Granger Causality between FDI and Net National Income (NNI)

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln NNI_{t-1} + \varepsilon_t$$

$$\ln NNI_t = \alpha_0 + \sum \alpha_i \ln NNI_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \varepsilon_t$$

were:

- $\ln FDI$ denotes Foreign Direct Investment,
- $\ln NNI$ denotes Net National Income

The results indicate weak unidirectional causality from Net National Income to FDI. The causality is significant only at the 10% level ($F = 3.0516$; $p = 0.0645$), indicating relatively weaker evidence compared to other variables. No significant causality was observed from FDI to NNI. The relatively weaker significance suggests that although higher net national income may improve market attractiveness, its influence on foreign investment decisions is less pronounced than GDP or exports.

Granger Causality between FDI and Per Capita Income (PCI)

The following equations were estimated.

$$\ln FDI_t = \alpha_0 + \sum \alpha_i \ln FDI_{t-1} + \sum \alpha_i \ln PCI_{t-1} + \varepsilon_t$$

$$\ln PCI_t = \alpha_0 + \sum \alpha_i \ln PCI_{t-1} + \sum \alpha_i \ln FDI_{t-1} + \varepsilon_t$$

were:

- $\ln FDI$ denotes Foreign Direct Investment,
- $\ln PCI$ denotes Per Capita Income

The empirical results reveal unidirectional causality from Per Capita Income to FDI. The null hypothesis was rejected ($F = 2.9338$; $p = 0.0310$), while the reverse relationship remained statistically insignificant. Higher per capita income reflects improved living standards, stronger purchasing power, and expanding domestic demand. These characteristics increase the profitability of foreign investment, particularly in consumer-oriented industries. The absence of reverse causality suggests that improvements in individual income resulting from FDI may require a longer adjustment period before becoming statistically significant.

Overall Findings

The overall Granger causality analysis demonstrates that the relationship between Foreign Direct Investment and macroeconomic variables in India is characterized by both bidirectional and unidirectional causal mechanisms. Bidirectional causality exists between FDI and GDP as well as FDI and exports, highlighting a mutually reinforcing

relationship between economic growth, international trade, and foreign investment. In contrast, Gross Fixed Capital Formation, Gross Domestic Savings, Gross National Income, Imports, Net National Income, and Per Capita Income primarily Granger-cause FDI, suggesting that strong domestic macroeconomic fundamentals are important prerequisites for attracting foreign investment.

These findings imply that while FDI contributes to economic development, its sustainability depends largely on the strength of domestic economic conditions. Therefore, policies aimed at increasing infrastructure investment, domestic savings, industrial productivity, export competitiveness, and income growth are likely to create a more attractive environment for foreign investors. Simultaneously, policies encouraging high-quality FDI can further stimulate economic growth and strengthen India's integration into the global economy.

6. DISCUSSION

The empirical results support endogenous growth theory, suggesting that FDI and economic growth reinforce each other. Furthermore, higher domestic savings, capital formation, income levels, and trade openness create a favorable investment climate for foreign investors. The bidirectional relationships between FDI, GDP, and exports highlight the importance of integrating investment and trade policies to achieve sustainable economic growth.

7. CONCLUSION

The study concludes that the relationship between FDI and macroeconomic variables in India is characterized by both feedback and one-way causal mechanisms. While GDP and exports maintain a mutually reinforcing relationship with FDI, domestic savings, capital formation, national income, imports, and per capita income primarily act as determinants of foreign investment inflows. Policymakers should therefore focus on strengthening domestic macroeconomic fundamentals to attract stable and sustainable FDI, which, in turn, contributes to long-term economic growth and development.

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