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Dynamic Impacts of Exports, ODA, FDI and Remittances on Economic Growth in India: An ARDL approach

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Abstract
This study examines the impact of foreign capital—specifically exports, official development assistance (ODA), foreign direct investment (FDI), remittances, and trade openness—on India's economic growth from 1975 to 2022 using ARDL and Forecast Error Variance Decomposition. Results show that exports and ODA positively influence growth, while FDI, remittances, and trade openness have negative effects. Except for FDI, all variables are statistically significant at the 5% level. The study emphasizes the need for improved governance and policy frameworks to optimize foreign capital utilization.

Keywords: Foreign Capital, ARDL Approach, economic growths, India

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1.0 Introduction

India's remarkable economic growth, with an impressive 8.2% rate in 2023-24, firmly establishes it as the fastest-growing major economy. Key sources of foreign capital— foreign direct investment (FDI), official development assistance (ODA), remittances, and trade—have profoundly influenced India's development. Since the 1991 economic reforms, FDI surged, peaking at USD$84.83 billion in 2021-22 and reaching US$70.95 billion in 2023-24. Remittances, totaling US$125 billion in 2023, cemented India's position as the world's largest recipient, with future estimates rising to US$129 billion by 2025. Additionally, India received US$3.4 billion in ODA for infrastructure in 2021, and Japan committed JPY 3.1 trillion to Indian infrastructure projects between 2010 and 2020. Total exports for 2023-24 are projected to reach US$778.2 billion, underscoring India's growing global integration.

The role of foreign capital in promoting economic growth remains contested, with studies like Pal (2023) recognizing its potential to support and impede growth. The relationship between economic growth and FDI, remittances, ODA, and exports has been extensively studied, but the findings remain inconclusive. A critical gap in the literature is the absence of any single study that combines all four variables in a single analysis, particularly in the Indian context. India's global economic importance, distinct structure, and varied capital

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inflows make it a compelling case. By isolating these foreign capital sources, existing research risks overlooking their interconnected impacts, potentially misrepresenting their true influence on economic growth.

This paper is the first empirical study to examine both short- and long-run impacts of foreign capital on India's growth, using export, ODA, FDI, and trade openness (TO) as control variables over the period 1975–2022. Advanced econometric techniques, including the ARDL model and variance decomposition, are applied. The structure of the paper is as follows: Part 2 provides a literature review on the effects of foreign capital inflows on economic growth. Part 3 outlines the data, econometric models, and methodological approaches. Part 4 presents the empirical findings, while Part 5 offers conclusions and policy implications.

2.0 Literature Review

The export-led growth (ELG) hypothesis proposes that export growth promotes resource efficiency, technological advancement, and specialization, which drive economic growth. This theory posits that increased exports enhance foreign exchange reserves, facilitating essential imports and investments that boost productivity (Istaiteyeh et al., 2023). Empirical studies, such as Raghuramapatruni and Chaitanya (2020) and Subhan et al. (2021) identified a strong positive linkage between exports and growth, with unidirectional causality in India. In contrast, Edo et al. (2020) emphasized the detrimental impacts of exports and external debt on economic growth in sub-Saharan Africa.

Many studies have observed the relationship between FDI, TO, and growth, yielding mixed results. Theoretically, trade openness fosters economic growth by improving resource allocation, specialization, and technology transfer. Jabbar et al. (2024) and Riaz et al. (2024) found positive effects of trade openness on growth in Luxembourg and Portugal, respectively. However, according to Hye and Lau (2015), higher trade openness adversely affected economic growth and real income in India. The neoclassical growth theory posits that FDI, similar to domestic investment, stimulates growth in the short term (Solow, 1956). Lucas (1988) suggests FDI supports long-term growth through technology integration and knowledge spillovers. Rashid et al. (2023) observe that FDI and exports positively impact India's short-term growth, while Sahoo and Sethi (2023) highlighted the long-term benefits of trade openness and financial globalization. However, Shaikh and Noorani (2021) found no long-term FDI-growth link in South Asia, despite short-term significance.

As external financing, remittances ease credit constraints and boost investment, contributing to economic growth. They also raise disposable income, especially during recessions. However, remittances can induce Dutch disease or reduce labour supply (Cazachevici et al., 2020). Roy (2023) found remittances negatively affect India's long-term growth. Sutradhar (2020) reported negative impacts in Bangladesh, Pakistan, and Sri Lanka, but a positive effect for India. Jui et al. (2024) analyzed remittances, FDI, and inflation in Bangladesh, Pakistan, and Sri Lanka, finding no significant impact on GDP in Bangladesh and Sri Lanka, but a positive influence on GDP in Pakistan.

Since the establishment of foreign aid programs post-World War II, the effectiveness of aid in promoting growth has been debated. Boone (1996) argues that aid can lead to unproductive consumption, substituting rather than complementing domestic resources. Pal (2023) found a positive long run relationship between foreign aid and growth in India, whereas Rao et al. (2023) concluded that foreign aid negatively affects FDI and growth in Southeast and South Asia. Based on the literature reviewed, it is evident that no single study examines the combined impacts of capital inflows on economic growth. This study seeks to address this gap.

3.0 Data and Methododology

3.1 Data

This study focuses on the relationship between foreign capital inflows and India's economic growth over a period of 48 years, from 1975 to 2022, limited to this timeframe due to data availability from the World Bank. Specifically, *lnEG* represents GDP per capita (constant 2015 US$), *lnEXPORT* refers to exports of goods and services (constant 2015 US$), *lnODA* captures net official development assistance and official aid received (constant 2021 US$), *lnFDI* reflects foreign direct investment net inflows (% of GDP), *lnREM* denotes personal remittances received (current US$) adjusted by the GDP deflator, and *lnTO* represents trade openness, calculated as the sum of exports and imports over GDP (current US$). To improve the reliability of the empirical estimates and aid in interpreting the coefficient values, all variables have been logarithmically transformed (Ridzuan et al., 2020).

3.2 Econometric Modelling

Recognizing the potential influence of foreign capital variables on economic growth in India, the multivariate equation is formulated as follows in Equation (1), in line with the models by Subhan et al. (2021), Rashid et al. (2023) and Roy (2023):

$$lnEG_t = f(lnEXPORT_t, lnODA_t, lnFDI_t, lnREM_t, lnTO_t) \tag{1}$$

The reduced form of this model is expressed as Eq. (2).

$$lnEG_t = \beta + \gamma_1 lnEXPORT_t + \gamma_2 lnODA_t + \gamma_3 lnFDI_t + \gamma_4 lnREM_t + \gamma_5 lnTO_t + \varepsilon_t \tag{2}$$

where β is the intercept, ε_t is the error term and the parameters γ_1- γ_5 are the estimated coefficients. The coefficient for β is anticipated to be positive, while the other variables may display either positive or negative signs.

3.3 ARDL model

The study employs the ARDL method developed by Pesaran et al. (2001) to long-run cointegration among the variables. This model offers statistical advantages, is resilient to endogeneity concerns, and accommodates variables with varying orders of integration, rendering it particularly beneficial for small sample sizes, nevertheless is sensitive to lag selection. Following Raghuramapatruni and Chaitanya (2020), the ARDL model representing the underlying variables is formulated as follows:

$$\Delta lnEG_t = \beta_0 + \sum_{i=1}^{\rho} \gamma_{1i}\Delta EG_{t-i} + \sum_{i=0}^{\rho} \gamma_{2i}\Delta EXPORT_{t-i} + \sum_{i=0}^{\rho} \gamma_{3i}\Delta ODA_{t-i} + \sum_{i=0}^{\rho} \gamma_{4i}\Delta FDI_{t-i} + \sum_{i=0}^{\rho} \gamma_{5i}\Delta REM_{t-i} + \sum_{i=0}^{\rho} \gamma_{6i}\Delta TO_{t-i} + \gamma_7 lnEG_{t-1} + \gamma_8 lnEXPORT_{t-1} + \gamma_9 lnODA_{t-1} + \gamma_{10} lnFDI_{t-1} + \gamma_{11} lnREM_{t-1} + \gamma_{12} lnT0_{t-1} + \varepsilon_t \qquad (3+$$

where β is the constant term, Δ is the first difference operator, γ_1- γ_6 are the coefficients for short term, while γ_7- γ_{12} are the coefficients for long run. The ARDL procedure involves two steps: optimal lag selection and an F-test to evaluate long-run relationships among the variables. Cointegration is confirmed if the F-statistic surpasses Narayan's (2005) upper bound critical value; conversely, if it falls below the lower bound, no cointegration exists. Intermediate values yield inconclusive results. Selecting an appropriate lag length is critical for ensuring consistent empirical results, particularly when the sample size is fewer than 60 observations. In accordance with Liew's (2004) guidance, this study utilizes a lag length of 4, selected based on the Akaike Information Criterion (AIC), to enhance the reliability of the findings.

4.0 Empirical Results and Discussion

4.1 Unit root analyses

This study utilizes the Zivot and Andrews (1992) test to examine the stationarity of time series data, addressing the shortcomings of conventional unit root tests like the ADF test by considering potential structural breaks. Breakpoints are determined based on T-statistics, enhancing the robustness and explanatory power of the analysis. As shown in Table 1, *lnODA* is stationary at level (I(0)), while all other variables become stationary after first differencing (I(1)) in ADF Tests. However, under the ZA test, all variables exhibit level stationarity (I(0)).

Table 1: Results of Unit root test

Variables	ADF (Level)	ADF (Δ)	ZA (Level)	Break Year	ZA (Δ)	Break Year
lnEG	1.9326	-6.7238***	-3.1059**	2004	-7.4612	1994
lnEXPORT	0.1894	-6.0105***	-2.7179**	1999	-7.4185***	2009
lnODA	-3.1938**	-8.3220***	-3.5902***	1998	-6.6730**	2009
LnFDI	-1.7841	-7.1922***	-4.4619***	1992	-5.3783**	1992
LnREM	-1.7318	-7.3538***	-3.5999**	2000	-6.2847***	1994
lnTO	-0.6268	-5.6330***	-4.1348***	2014	-6.6730***	2009

Note: The values displayed in the table correspond to the statistical outcomes of the ADF and Zivot-Andrews tests. Asterisks ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

4.2 Bayer-Hanck Cointegration Results

Bayer and Hanck (2013) introduced a method that combines multiple non-cointegration tests through Fisher's formula, providing more precise and robust outcomes compared to traditional cointegration tests. As indicated in Table 2, the Bayer-Hanck cointegration results demonstrate that the F-values from both the EG-J and EG-J-BA-BO tests exceed the critical values, thereby confirming long-run cointegration among the variables examined.

Table 2: Bayer-Hanck Cointegration Results

	Engle-Granger (EG)	Johansen (J)	Banerjee (Ba)	Boswijk (Bo)
Test- Stat	-4.7910	65.2607	-5.792	46.9893
p-value	0.0357	0.0000	0.0000	0.0000
Fisher Type Test statistics, Bayer Hanck Test				
EG-J	61.9273		5% critical value	10.419
EG-J-Ba-Bo	133.4128		5% critical value	19.888

4.3 ARDL-Bounds Test Result

Table 3 displays the results of the bounds testing, where the F-statistic (7.9557) surpasses the critical value of 4.68 at the 1% significance level. This result aligns with the findings of the Bayer-Hanck Cointegration Test, confirming a significant long-run cointegrating relationship among economic growth, exports, ODA, FDI, remittances, and trade openness in India.

Table 3: ARDL bound test result

Test Statistic	Value	K
F-statistic	7.9557	5
Critical Value Bounds		
Significance	I (0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.9
1%	3.41	4.68

Source: Eviews estimation

4.4 Results of Long- Run and Short-Run Coefficients and Discussions

The long-run coefficients of the ARDL model, as displayed in Table 4, indicate that all explanatory variables, except for FDI, are statistically significant. The findings highlight that exports are not only essential but also the largest contributor to India's economic growth compared to other variables in the model, as evidenced by the ARDL results. A 1% increase in *lnEXPORT* leads to a 0.66318% rise in economic growth, underscoring the main role of exports in shaping the country's economic growth. In recent years there has been a heightened protectionism in global trade, yet the post-pandemic restructuring of worldwide value chains offers unique prospects for India. India's National Logistics Policy, coupled with numerous digital initiatives, has enhanced the nation's competitiveness by cutting trade costs. India stands to gain significantly from further tapping into its global trade capacity. Beyond its traditional strengths in IT, business services, and pharmaceuticals, there is opportunity for diversification. Expanding exports in sectors like textiles, apparel, footwear, electronics, and green technology can further accelerate economic growth. India's export performance has climbed since independence, jumping from a mere $1.27 billion in 1950-51 to a remarkable $777 billion by 2023—a massive 600-fold increase in total exports. This trend supports the export-led growth theory, which advocates that higher exports significantly fuel economic development. Our findings match those of Raghuramapatruni and Chaitanya (2020) and Subhan et al. (2021), who highlight how crucial exports are in promoting growth. This reinforces the idea that expanding exports is vital to economic development across different economies.

Notably, finding that a 1% increase in *lnODA* leads to only a 0.082% rise in economic growth highlights the meager impact of ODA on India's economy. This result is consistent with the studies by Jabbar et al. (2024) and Riaz et al. (2024). This modest effect is intertwined to the country's absorptive capacity, which is hampered by several structural challenges. India is rich in labor but most of it is low-skilled: approximately 80% of the working-age population hasn't finished higher secondary education, and only about one in eight has studied beyond high school. This skill gap suggestively restrains India's capacity to use ODA efficiently for economic development, as low-skilled labor hinders productivity gains and reduces the efficacy of aid-funded projects. India also faces substantial resource limitations, particularly concerning water availability. Though India accounts for 18% of the world's population, it has only 4% of global water resources, making it one of the most water-scarce countries (World Bank, 2023). This scarcity intensifies governance challenges and complicates resource distribution, thereby hindering the effectiveness of development agendas. Additionally, prevalent corruption and unequal resource distribution worsen these problems, undermining the impact of ODA (UND, 2020).

Remittances, though an important source of external financing, have surprisingly shown a negative impact on India's economic growth. A 1% rise in *lnREM* leads to a 0.08% decline in *lnEG*, in spite of India receiving a record $125 billion in remittances in 2023—nearly twice as much as Mexico's $66 billion in the same year. This result aligns with the findings of Roy (2023) but contrasts with the conclusions of Sutradhar (2020) and Jui et al. (2024). Two main reasons help clarify this unforeseen result. First, remittances in India are essentially directed toward consumption, such as household expenses, daily needs, and non-productive assets, rather than being invested in industries or infrastructure that drive economic growth (Afram, 2012). As a result, remittances do not generate the structural changes necessary for economic growth. While remittances help lessen poverty and improve living standards in the short term, they have limited impacts on broader economic transformation. Second, corruption in India further curtails the potential benefits of remittance inflows. Ranked 93rd out of 180 countries in the 2023 Corruption Perceptions Index (HT News Desk, 2024), India struggles with governance issues that minimise the effectiveness of these funds. Issues such as bureaucratic inefficiencies, dishonest practices, and rent-seeking behaviours often deter remittance funds away from productive uses such as infrastructure, education, or entrepreneurship.

Additionally, a 1% increase in trade openness (*lnTO*) leading to a 0.5371% drop in *lnEG* raises concerns about India's limited technological advancements and financial constraints. This finding aligns with Hye and Lau (2015), who reported that greater TO negatively impacted economic growth and real income in India. While trade openness is generally associated with positive economic development, it can present substantial challenges, particularly for developing nations. In India, the capacity to effectively adopt and integrate technologies from advanced economies is often limited by social and technical barriers. These limitations stem from inadequate infrastructure, insufficient investment in education and skills development, and restricted access to advanced technologies. India's budgetary allocation for education, now just 2.51% of GDP, has declined from 2.57% in 2023, exacerbating a critical shortage of over one million teachers. Moreover, 70% of the population has limited or no access to digital services (Telecomreview, 2023), further impeding technological integration. Many Indian manufacturers, especially MSMEs, still operate with legacy equipment and outdated processes, restricting their ability to adopt Industry 4.0 technologies such as automation, robotics, and cloud computing. As a result, trade openness, instead of fostering growth, may exacerbate existing structural weaknesses in India's economy.

The finding that a 1% increase in FDI is associated with a surprising 0.001% decrease in economic growth underscores a concerning and counterintuitive trend. While it is generally expected that FDI would contribute positively to economic development, this insignificant and negative impact can again be attributed to India's weak infrastructure base and limited absorptive capacity.

Table 4: ARDL bound test (Long Run) Results

Dependent Variable: lnEG		
Lag (2,4,4,2,2,0)		
Variable	**Coefficient**	**t-stat**
LnEXPORT	0.6631***	34.6219
LnODA	0.0824***	3.3161
LnFDI	-0.001	-0.1857
LnREM	-0.0824***	-3.5279
LnT0	-0.5371***	-11.2302
C	-10.912***	-12.657
Diagnostic Test	**F- stat**	**p-value**
BG-LM	0.7020	0.7826
Breusch-Pagan-Godfrey	1.0574	0.5894
Jarque-Bera	5.7361	0.0568
Ramsey-RESET	0.0445	0.8348

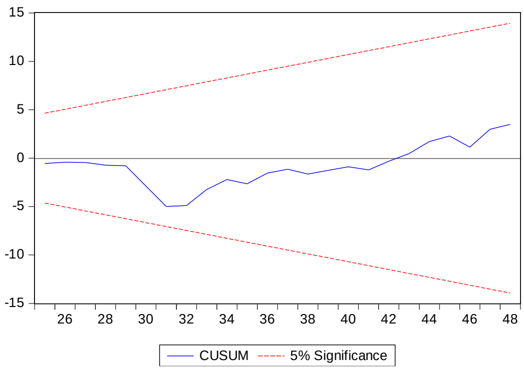
*Note:The asterisk ***, ** and * represent level of significance at 1%, 5% and 10% respectively.*

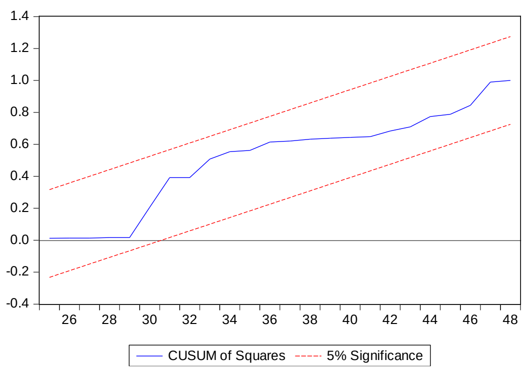
Table 5: ARDL bound test (Short Run)

Dependent Variable: lnCEREAL		
Variable	Coefficient	t-stat
Δ ln(EG-1)	0.2834	1.8199
Δ lnEXPORT	0.467***	5.0336
Δ lnEXPORT(-1)	-0.3204**	-2.7077
ΔlnEXPORT(-2)	0.0446	0.7086
ΔlnEXPORT(-3)	-0.0839	-1.5207
ΔlnODA	0.0368***	3.0642
ΔlnODA(-1)	-0.0350**	-2.4142
ΔlnFDI	0.0012	-0.1846
ΔlnREM	-0.0372	-1.3118
ΔlnREM(-1)	-0.0303	1.0338
ΔlnREM(-2)	-0.0432	-1.4822
ΔlnREM(-3)	-0.0486**	2.1327
ΔlnTO	-0.3847***	-4.5497
ΔlnTO(-1)	0.4076***	4.0272
ECT(-1)	-0.9174***	-6.0176

*Note:The asterisk ***, ** and * represent level of significance at 1%, 5% and 10% respectively.*

Table 5 demonstrates a strong long-run relationship among the variables, as indicated by a significant negative lagged error correction term (ECT(-1)) at the 1% significance level. The estimated EC(-1)T value of 0.92 indicates a rapid adjustment rate, suggesting that the system converges to equilibrium within approximately one year. These findings underscore the reliability and stability of the relationship. Additionally, the diagnostic tests shown in Table 6 indicated no evidence of serial correlation, non-normality, or heteroscedasticity. The Ramsey-RESET test further validates the model's functional form, while the CUSUM and CUSUMQ tests verify the model's stability and the absence of endogeneity, reinforcing its applicability for policy recommendations.





4.5 Robustness Tests

Robustness tests employing Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), and Canonical Cointegrating Regression (CCR) estimators (Škare & Porada-Rochoń, 2023) further corroborate the findings from the ARDL model. Table 6 presents consistent results, revealing that exports and ODA positively impact economic growth, while FDI, remittances, and TO exhibit negative effects. All variables, except FDI, are statistically significant at the 5% level. The high R^2 values indicate a strong model fit and substantial explanatory power. Collectively, these tests reinforce the reliability of the ARDL model and highlight the significant role of foreign capital in influencing economic growth in India from 1975 to 2022.

Table 6: Robustness Test (FMOLS, DOLS and CCR estimations)

	FMOLS Model		DOLS Model		CCR Models	
Variable	*Coefficient*	*t-stat*	*Coefficient*	*t-stat*	*Coefficient*	*t-stat*
LnEXPORT	*0.6780****	*-2.3393*	*0.6486****	*-2.568*	*0.6775****	*-2.330*
LnODA	*0.0527****	*3.0353*	*0.1225****	*4.2890*	*0.0633****	*2.8757*
LnFDI	*-0.0092*	*-1.1981*	*0.0149*	*1.3142*	*-0.0077*	*-0.8567*
LnREM	*-0.0555***	*-2.3393*	*-0.0611***	*-2.568*	*-0.0614***	*-2.3304*
lnTO	*-0.6120****	*-12.477*	*-0.5683****	*-11.57*	*-0.5988****	*-11.367*
C	*-11.347****	*-20.277*	*-11.861****	*-16.52*	*-11.380****	*-18.969*
R-squared	*0.9969*		*0.9991*		*0.9967*	
Adjusted R-squared	*0.9965*		*0.9983*		*0.9963*	

*Note:The asterisk ***, ** and * represent level of significance at 1%, 5% and 10% respectively.*

4.6 Forecast Error Variance Decomposition

The Forecast Error Variance Decomposition illustrates the significance of a variable in explaining the variability of another variable. As shown in Table 7, export shocks account for the majority of this variability, starting at approximately 0% at the initial impact (t=0) and increasing to over 20% by the 10th period, reflecting the long run. In contrast, shocks associated with trade openness(TO) and official development assistance (ODA) explain only about 9% and 8% of the variability in economic growth in the long run, respectively. Notably, the variability in economic growth is primarily driven by shocks to economic growth itself, which accounts for over 54% of the variability at t=10. These findings further corroborate the ARDL model results, emphasizing the dynamic long-run relationships among these variables in India.

Table 7: Forecast Error Variance Decomposition of LnEG

t	*LnEG*	*LnREM*	*LnEXPORT*	*LnODA*	*LnTO*	*LnFDI*
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	95.46568	0.004532	3.705533	0.184106	0.434133	0.206017
3	91.44333	0.299867	4.671652	0.132520	3.079826	0.372809
4	85.52089	0.568408	6.033615	1.028387	5.773499	1.075205
5	80.56659	0.619732	7.999675	2.215623	6.814750	1.783627
6	75.51948	0.784964	10.91885	3.184781	7.399624	2.192303
7	70.13967	1.238243	13.84199	4.247841	8.024415	2.507840
8	64.55560	1.902705	16.44518	5.590726	8.604619	2.901167
9	59.06678	2.736476	18.81480	7.016794	9.048820	3.316332
10	53.79152	3.819489	20.93312	8.395090	9.408064	3.652712

5.0 Conclusion, policy implications, limitation and future research direction

This study examines the impact of foreign capital—specifically exports, ODA, FDI, remittances, and TO—on economic growth in India from 1975 to 2022. The findings suggest that exports and ODA positively influence economic growth, while FDI, remittances, and trade openness have negative effects. All variables are statistically significant at the 5% level, except for FDI. To optimize the benefits of foreign capital for economic growth, The Government of India must specifically enhance governance, strengthen policy frameworks, and improve its capacity to absorb and utilize remittances and FDI effectively. Key measures include addressing the skills gap and ensuring better resource allocation, as deficiencies in transportation, energy supply, and logistical systems hinder effective resource utilization. Additionally, the significant portion of the labor force lacking higher secondary education limits the country's ability to implement and manage these resources effectively.

However, this study has limitations, primarily its focus on India and data constraints. The dependence on time-series data may constrain the capacity to account for certain variables or capture regional variations within India. Future research should expand sample sizes and consider additional variables such as imports, institutional quality, and human capital. Employing non-linear techniques, such as non-linear ARDL, could further elucidate the complex dynamics between foreign capital and economic growth.

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Paper Contribution to Related Field of Study

This paper adds to the literature by analyzing the impact of various foreign capital inflows on India's economic growth from 1975 to 2022. It reveals a positive effect of exports and ODA, but negative effects of FDI, remittances, and trade openness. The study highlights the need for improved governance and resource allocation, offering insights for policymakers and suggesting future research using non-linear techniques for deeper analysis.

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