

DYNAMICS OF NATURAL RESOURCES AND GROWTH IN INDIA

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ABSTRACT

The present study intends to regulate the extent of the relationship between natural resources and Indian Economic growth by utilizing yearly data from 1971 to 2019. The findings of the ARDL bound test signify that natural resources have a long-run association with economic growth in India. Although, the impact of both natural resources and FDI negatively affect economic growth in India while the repercussions of financial development and trade openness are positive in long run. Further, in the short-run, the impact of natural resources is positive at the third lag.

Thus, the optimistic impact of natural resources in the short run signifies that in the short run, natural resources, financial development and trade openness are the primary factors fueling India's economic growth. Further, in the long run, openness to trade and financial development has a positive impact on growth illustrating that trade openness and financial development are the long-run elements of economic growth in India. The study's findings will help decision-makers develop and put into practice, the relevant policies to boost India's long-term economic growth.

Keywords: Natural Resources, Dynamics, ARDL Model, Economic Growth

INTRODUCTION

Economic Growth lies at the heart of a nation's empowerment. The Natural Resource base of a country is a vital catalyst for economic growth. Natural Resources (like iron, copper, nickel, lithium, etc.) are used as raw materials for various industries (Kwakwa *et al.*, 2021). Iron and steel are the bedrock of heavy industries which pave the way for the establishment of other industries. Certain natural resources like coal, oil etc. are the major contributors of energy for household and commercial sectors. Given all these considerations, it becomes imperative to analyze the linkage between a country's natural resource base and its economic growth.

Two schools of thought prevail in this context. The first says that natural resources are vital ingredients of economic development (Tahir *et al.*, 2022) and hence, the natural resource base holds a positive relationship with the economic well-being of a nation (Hayat and Tahir, 2021; Kwakwa *et al.* 2021; Moshiri and Hayati, 2017). On the other hand, another school of thought says that the

abundance of natural resources is negatively correlated with economic development (Tahir *et al.*, 2022; Sachs and Warner, 2001). This happens mainly because the real exchange rate gets appreciated in such a scenario, resulting in uncompetitive non-resources tradeable sectors. Another reason is that volatility in commodity prices has a negative relation to the economic development of a nation (Hayat and Tahir, 2020; Frankel, 2012).

Various researchers have tried addressing this puzzle of the linkage of natural resources base and economic growth; though, the debate remains inconclusive (Tahir *et al.*, 2022; Epo and Nochi Faha, 2020). In line with all this discussion, this paper objects to find out the repercussions of the natural resource base of India with the level of its economic development. The natural resources rent is taken as a proxy for the natural resource base, while economic development is presented through GDP Per Capita. The study is entrenched over a period of 8 years. ARDL model is used to analyze the relationship taking reference from these papers (Tahir *et al.*, 2022; Kwakwa *et al.* 2021).

REVIEW OF LITERATURE

Natural resources have been the subject of much controversy in recent years. Some authors discover a beneficial association, while others discover a negative one (Epo and Nochi Faha, 2020). Kwakwa *et al.* (2021) used annual data from 1970 to 2018 to observe the repercussions of natural resources on Tunisia's economic growth and also looked for the repercussions of the political system adopted by the country. They discovered that for the nation to effectively use its resources and make long-term economic success, a democratic government is necessary. Hayat and Tahir (2020) used a nonlinear model to explore the repercussions of natural resource copiousness on the FDI-development nexus, and their findings revealed that FDI had robust optimistic repercussions on the output growth of the host country. Hayat and Tahir (2021) used the ARDL cointegration approach to look at how changes in natural resources affect output growth in three gulf countries and found the optimistic and considerably momentous repercussions of natural resources on the economic advancement of UAE and Saudi Arabia but for Oman, it is optimistic and irrelevant relationship. Also, they found that the volatility of natural resources hurt the growth of all three economies

considerably. Ridzuan *et al.* (2021) studied the repercussions of economic advancement on natural resources in the ASEAN nations from 2000 to 2016 and they found that in their study, FDI and direct investment have had negative repercussions on natural resource copiousness while economic advancement has had positive repercussions with the other factors such as trade openness with governance and financial development having no repercussions. Haseeb *et al.* (2020) examined the repercussions of natural resources on economic advancement using the q-on-q framework in the topmost five designated Asian countries for the period 1970-2018. Their finding confirmed that natural resources have had optimistic and considerable repercussions on economic advancement in all states, excluding India. Tahir *et al.* (2022) discovered the repercussions of natural resources on the economic advancement of Brunei Darussalam using the ARDL modeling approach for the period 1989-2020. The nonappearance of the resource curse theory in Brunei Darussalam was confirmed in the study with the positive repercussions of natural resources on economic advancement.

DATA DESCRIPTION AND METHODOLOGY

The current study objects to observe the extent of the nexus between natural resources and economic growth in India. For the accomplishment of this objective, annual data from 1971 to 2019 is obtained from World Development Indicator. Economic growth (ECONGR) is the per capita GDP while Natural resources (NATRES) are represented as natural resources rent (per cent of GDP) and FDI is taken as net foreign inflows (per cent of GDP) and Financial development (FINDEV) is taken as inland credit (per cent of GDP).

The article proceeds with the estimation of preliminary analysis and unit root testing. Unit root testing is done to examine for integrating effects in the series. Since the variables are found to be of mixed order of integration and no variable is integrated at order 2, thus we applied the ARDL model to inspect the dynamic connection between natural resources and economic growth. ARDL offers various advantages such as it offers efficient outcomes in case of the small sample. Further, it can be used with mixed order of integration. Also, it considers the lead and lags of the variables thus,

eliminating the possibility of endogenic variables in the model (Arya and Singh, 2022).

The ARDL model is estimated as:

$$\Delta(\text{ECONGR}_t) = \beta_0 + \delta_1 L(\text{NATRES}_{t-1}) + \delta_2 L(\text{FDI}_{t-1}) + \delta_3 L(\text{FINDEV}_{t-1}) + \delta_4 L(\text{TOP}_{t-1}) + \sum_{i=1}^p \phi_{1i} \Delta(\text{NATRES}_{t-i}) + \sum_{i=0}^p \phi_{2i} \Delta(\text{FDI}_{t-i}) + \sum_{i=0}^p \phi_{3i} \Delta(\text{FINDEV}_{t-i}) + \sum_{i=0}^p \phi_{4i} \Delta(\text{TOP}_{t-i}) + \varepsilon_t$$

Where ECONGR is the per capita GDP, NATRES indicates the natural resources rent (per cent of GDP) and FDI signifies the net foreign inflows (per cent of GDP) and FINDEV is representing the financial development.

The null hypothesis of ARDL is of no cointegrating nexus between the variables. If the value of joint F-statistics surpasses the value determined as per Narayan (2004), the null gets rejected while if the statistics lie between upper and lower bounds, the decision remains indeterminate.

Further, to govern the short-run causality, the Wald Granger causality is used. As specified by Granger (1969), this test observes whether the changes that occurred in one variable in the previous period assist in forecasting the current variations in another variable. Augmented Granger causality test based on VAR with delaying the variables with 2, chosen based on the minimum AIC is applied as given in the following equation:

$$\Delta Y_{it} = \alpha_0 + \sum_{i=1}^p \phi_i \Delta Y_{t-i} + \sum_{j=0}^q \delta_j \Delta X_{t-j} + \lambda DMV + \varepsilon_t$$

Where Δ represents the first difference; ΔY_{t-i} and ΔX_{t-j} indicate the impact of independent variables, i.e., NATRES, FDI and FINDEV.

Empirical Methodology

Preliminary Statistics

The statistical properties of the data have been summarized in Table 1. It can be observed from Table 2 that, the per capita GDP of India ranges from a maximum of 1972 US \$ to a minimum of 618.36US\$, with an average of 797.62 US\$, which shows that India is making significant progress. Further, the natural resources rent varies from 7.1 to 0.83, with an average of 2.86 per cent. This implies that the natural resources rent is increasing in India. Although, the financial development of India is lying between 52.38 per cent to 12.49 per cent with wide fluctuation. This suggests that the domestic financial development of India is high, indicating that India is providing good credits for various developmental activities. The foreign inflows are also showing an increasing trend while the trade openness ratio is found to be below 1. Further, natural resources, economic growth and FDI are having leptokurtic distribution while the rest are platykurtic in distribution. Further, all the series, except for GOVCONS and GFIXCA, all the series are non-normally distributed.

Table 1: Descriptive Statistics

	NATRES	ECONGR	FDI	FINDEV	GFIXCA	GOVCONS	TRADEOP
Mean	2.861308	797.6285	0.756459	30.89837	25.52045	10.55942	0.264928
Median	2.793775	618.3678	0.472645	25.27512	25.13692	10.53848	0.219295
Maximum	7.100894	1972.758	3.620522	52.38571	35.81288	12.17549	0.557937
Minimum	0.833664	349.7257	-0.02968	12.49344	15.90729	8.407362	0.076696
Std. Dev.	1.148342	467.8288	0.880231	13.12092	5.516558	0.867095	0.151397
Skewness	0.996898	1.068579	1.133172	0.519579	0.065083	-0.27902	0.589457
Kurtosis	5.389083	3.024483	3.683631	1.816389	2.01617	2.677348	1.891657
Jarque-Bera	19.76933	9.326421	11.44082	5.06494	2.010767	0.848333	5.345614
Probability	0.000051	0.009436	0.003278	0.079463	0.365904	0.654315	0.069058
Observations	49	49	49	49	49	49	49
<i>Correlation matrix</i>							
NATRES	1						
ECONGR	0.101358	1					
FDI	0.413077	0.803508	1				
FIN_DEV	0.386801	0.92391	0.876063	1			
GFIXCA	0.457602	0.734225	0.834511	0.881	1		
GOVCONS	-0.0067	0.243075	0.180317	0.291371	0.476451	1	
TRADEOP	0.440012	0.860297	0.901038	0.954625	0.915376	0.219955	1

Source: Author's own compilation

The bottom panel of Table 1 provides the results of the unconditional association between the studied variables. As shown by the results, there is an optimistic association between natural resources and economic growth, which further stimulates the premise that the availability of natural resources optimistically contributes to the output growth of a

nation. Further, FDI, financial development, capital formation and trade openness are also optimistically linked to economic growth in India, suggesting that these macroeconomic variables have a stimulating impact on economic growth in the country.

Unit Root Test

Table 2: Unit Root Test

	Constant		Constant and Slope		Without Constant and Slope	
<i>At level</i>						
NATRES	-3.1047	-0.0328	-2.9265	0.1636	-0.7028	0.4071
ECONGR	20.8296	-0.856	5.8396	1.000	13.4715	1.00
FDI	-1.4082	0.5706	-3.0671	0.1257	-0.6196	0.4438
FIN_DEV	-0.5436	0.8732	-1.699	0.7364	1.8335	0.9827
GFIXCA	-1.5377	0.5062	-1.2684	0.8838	0.9876	0.9122
GOVCONS	-2.0208	0.2773	-1.9728	0.6009	0.2969	0.7677
TRADEOP	-1.0217	0.7383	-1.528	0.8059	0.6617	0.8556
<i>At first difference</i>						
NATRES	-8.8914	0.000	-8.9185	0.000	-8.9803	0.000
ECONGR	-2.2724	0.1849	-4.9507	0.0011	-0.9335	0.0072
FDI	-8.4031	0.000	-8.3041	0.000	-8.0767	0.000
FIN_DEV	-6.0751	0.0000	-6.0216	0.000	-5.2057	0.000
GFIXCA	-7.5288	0.000	-7.6714	0.000	-7.355	0.000
GOVCONS	-5.1083	0.0001	-5.0451	0.0008	-5.1511	0.000
TRADEOP	-5.9138	0.000	-5.8784	0.0001	-5.7075	0.000

Source: Author's own compilation

It is essential to examine the series for the incidence of stationarity because the results applied on a non-stationary series are not efficient and best. Thus, we have used ADF at the level and first difference. As illustrated in Table 2, except Natural resources (NRR), other variable series, i.e., GDP, FDI, GFICA, GOVCONS and TRADEOP are non-stationary at level, though, these variables are

stationary at 1st difference. While the NATRES is stationary at the level as well as at first transformation. Thus, the variables are integrated in mixed order, therefore we have applied the ARDL framework to observe the long and short-run relationship between the variables.

ARDL Cointegration and Causality

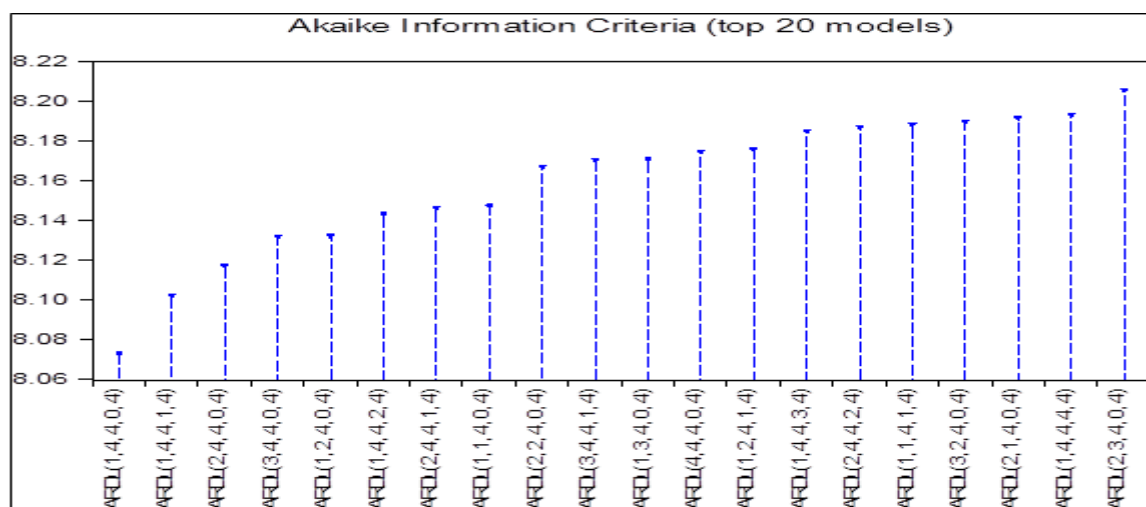


Figure 1. Lag Length Criterion

Figure 1 shows the top 20 ARDL models generated at the 1st interval, following the AIC criterion. Thus, Figure 1, shows that the ARDL model (1, 4, 4, 0, 4) has the least criterion. Therefore, the explanation of the long-run cointegrating linkage between natural resources and economic growth is taken on the basis of the ARDL (1, 4, 4, 0, 4) model.

Table 3: ARDL Test

Long-run Coefficients			Short-run coefficients		
Constant	-15.6126	0.3472	$\Delta(\text{NATRES})$	3.641362	0.3343
ECONGR(-1)*	-0.06716	0.0294	$\Delta(\text{NATRES}(-1))$	9.354051	0.0527
NATRES(-1)	-17.5726	0.0014	$\Delta(\text{NATRES}(-2))$	4.802263	0.3191
FDI(-1)	-48.7069	0.0033	$\Delta(\text{NATRES}(-3))$	8.314431	0.052
FIN_DEV**	1.905549	0.0596	FDI	-22.5361	0.0144
TRADEOP (-1)	516.8706	0.0001	$\Delta\text{FDI}(-1)$	23.73629	0.0229
			$\Delta\text{FDI}(-2)$	28.13166	0.0153
			$\Delta\text{FDI}(-3)$	31.74262	0.0062
			ΔTOP	-307.723	0.0196
			$\Delta\text{TOP}(-1)$	-252.772	0.0605
			$\Delta\text{TOP}(-2)$	-226.767	0.1255
			$\Delta\text{TOP}(-3)$	-621.058	0.0011
			ECT	-0.06716	0
F-Bounds Test					
	Value	Signif.	I(0)	I(1)	
F-statistic	86.49957				
		10%	2.402	3.345	
		5%	2.85	3.905	
		1%	3.892	5.173	
		2.50%	2.88	3.87	
		1%	3.29	4.37	
Diagnostic Testing of Regression					
R-squared	0.91615	AIC	7.850627		
Adjusted R-squared	0.884706	SIC	8.372552		
Log likelihood	-163.639	HQC	8.045196		
Durbin-Watson stat	2.037772				
Breusch-Godfrey Auto Correlation LM Test:					
Chi-sq	0.870808	p-value (2,25)	0.4309		
Breusch-Pagan-Godfrey Heteroskedasticity Test:					
Chi-sq	0.98732	p-value (17,27)	0.4982		
Ramsey RESET Test					
F-statistic	1.697153	p-value (1, 26)	0.2041		
Normality test					
Chi-sq	0.6565	p-value	0.7021		

Table 3 illustrates the results of cointegrating linkage between the variables. The computed F-value is 86.49 that is larger than the higher bound threshold value of 4.37 at the 5 per cent conventional level, signifying the cointegrating linkage in long run between natural resources and economic growth in India.

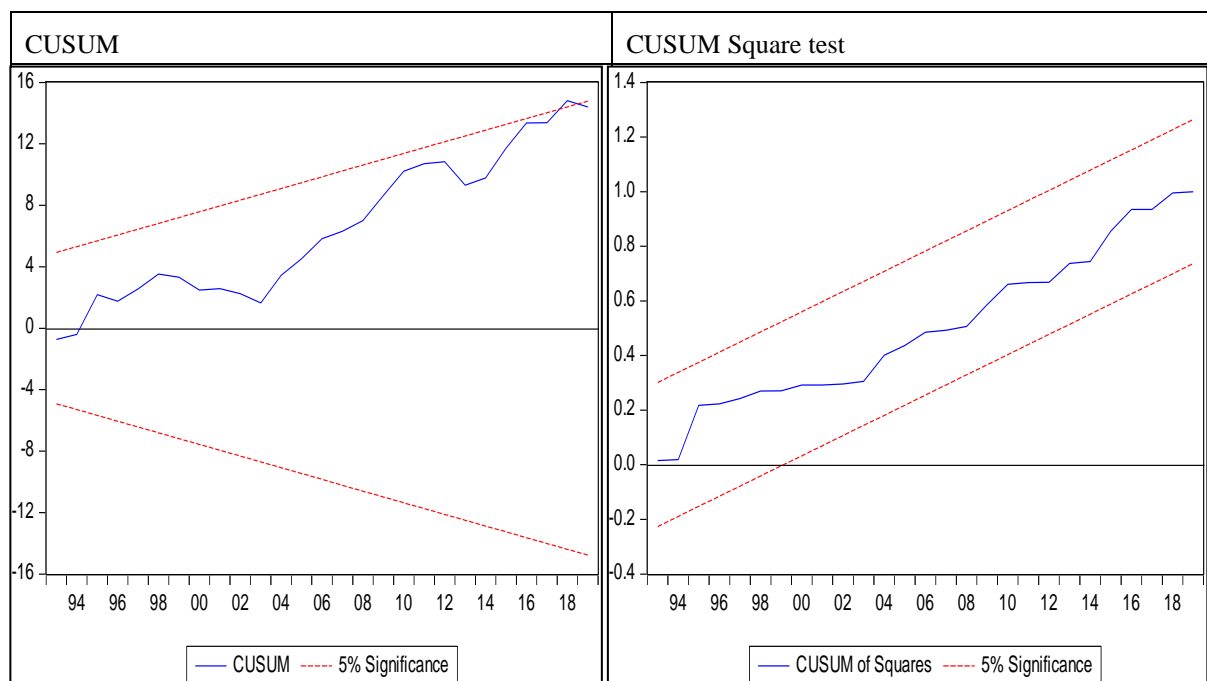
Further, the assessed long-run coefficients of the variables are indicated in Table 3. It designates that the variables of both natural resources (-17.572) and FDI (-47.706) negatively influence economic growth in India at a 1 per cent level of significance. Further, the repercussions of financial development (1.905) and trade openness (516.87) at 5 per cent and 1 per cent conventional levels respectively.

Short-run results indicate that the repercussions of natural resources on economic growth are positive at the third lag at a 10 per cent level of significance. Further, the impact of FDI is although negative (-22.53) and considerable but it becomes positive and significant for subsequent previous years. Likewise, repercussions of Trade openness are

positive (516.87) in long run but are adverse in the short-run (-307.723).

Diagnostic Testing

The bottom panel of table 4 provides the results of diagnostic testing. The estimated value of the Breusch–Godfrey autocorrelation LM test is greater than the 5 per cent conventional level, signifying that the assessed values are free from autocorrelational biasness. Likewise, the calculated value of the heteroskedasticity ARCH test exceeds the 5 per cent conventional level, which also signifies that the series does not have varying variances. Thus the series is homoscedastic. The RAMSEY outcomes also suggest that the model specification made in the article is correctly specified. Lastly, the outcomes of the Jarque Bera indicated the normality of the approximated coefficients. Further, the Cumulative Sum of Recursive Residuals (CUSUM) and its square plots are lying within the critical thresholds, suggesting that the residuals are stable (Fig. 2).



Source: Author's own compilation

Figure 2. CUSUM And CUSUM Square Test

Granger Casualty Test

Table 4: Granger Causality Test

Null Premise:	Obs	F-Stat.	p-value
ECONGR are not Granger Causing NATRES	47	6.20433	0.0044
NATRES are not Granger Causing ECONGR		1.09367	0.3443
FDI is not Granger Causing NATRES	47	4.6437	0.0151
NATRES are not Granger Causing FDI		1.09355	0.3444
FIN_DEV are not Granger Causing NATRES	47	0.72568	0.49
NATRES are not Granger Causing FIN_DEV		0.01578	0.9844
GFIXCA are not Granger Causing NATRES	47	1.86057	0.1682
NATRES are not Granger Causing GFIXCA		2.05235	0.1411
GOVCONS are not Granger Causing NATRES	47	1.63357	0.2074
NATRES are not Granger Causing GOVCONS		1.71248	0.1928
TRADEOP are not Granger Causing NATRES	47	0.01681	0.9833
NATRES are not Granger Causing TRADEOP		1.4903	0.237
FDI is not Granger Causing ECONGR	47	1.08959	0.3457
ECONGR is not Granger Causing FDI		3.17909	0.0518
FIN_DEV are not Granger Causing ECONGR	47	1.66453	0.2015
ECONGR is not Granger Causing FIN_DEV		3.81198	0.0301
GFIXCA are not Granger Causing ECONGR	47	2.99702	0.0607
ECONGR are not Granger Causing FIXCA		1.96907	0.1523
GOVCONS are not Granger Causing ECONGR	47	0.29032	0.7495
ECONGR are not Granger Causing GOVCONS		0.48165	0.6211
TRADEOP is not Granger Causing ECONGR	47	2.4	0.1031
ECONGR are not Granger Causing TRADEOP		4.89362	0.0123
FIN_DEV is not Granger Causing FDI	47	5.52833	0.0074
FDI is not Granger Causing FIN_DEV		3.14976	0.0531
GFIXCA are not Granger Causing FDI	47	5.51671	0.0075
FDI is not Granger Causing GFIXCA		0.68921	0.5076
GOVCONS are not Granger Causing FDI	47	1.85222	0.1695
FDI is not Granger Causing GOVCONS		1.20943	0.3085
TRADEOP is not Granger Causing FDI	47	6.08766	0.0048
FDI is not Granger Causing TRADEOP		11.5882	0.0001
GFIXCA are not Granger Causing FIN_DEV	47	7.5536	0.0016
FIN_DEV are not Granger Causing GFIXCA		3.66	0.0343
GOVCONS are not Granger Causing FIN_DEV	47	0.0601	0.9418
FIN_DEV are not Granger Causing GOVCONS		0.18309	0.8334
TRADEOP is not Granger Causing FIN_DEV	47	3.57554	0.0368
FIN_DEV are not Granger Causing TRADEOP		0.31696	0.7301
GOVCONS are not Granger Causing GFIXCA	47	0.45544	0.6373
GFIXCA are not Granger Causing GOVCONS		0.37927	0.6867
TRADEOP is not Granger Causing GFIXCA	47	2.897	0.0663
GFIXCA are not Granger Causing TRADEOP		5.92104	0.0054
TRADEOP are not Granger Causing GOVCONS	47	0.18078	0.8353
GOVCONS are not Granger Causing TRADEOP		1.20413	0.3101

Source: Author's own compilation

Further, to examine the direction of causality of variables, we applied the Granger causality test based on VAR. As Table 5 indicates, Granger causality from ECONOGR to NATRES is found as the null premise of no Granger Causation from natural resources to economic growth is disallowed at 1 per cent conventional level. Likewise, as results indicate, FDI is also Granger causing Natural resources while FDI is granger caused by Economic growth. Further, TRADEOP is Granger caused by ECONGR and FDI while financial development and capital formation are Granger causing each other. Further, Trade openness also granger causes Financial development and Capital formation.

CONCLUSION

The present study features the dynamics of linkage between natural resources and economic growth in India considering the repercussions of FDI, financial development and trade openness using annual data from 1971 to 2019. The results of the ARDL bound cointegration test divulge that natural resources have long-run repercussions on economic growth in India. Although, the repercussions of both natural resources and FDI are adverse on economic growth in India while the repercussions of financial development and trade openness are positive in long run. Further, in the short-run, the repercussions of natural resources are positive at the third lag. Thus, natural resources have a favorable short-term effect.

Additionally, natural resources, financial development and trade openness are the primary propulsive factors leading to the economic growth of India. Further, in the long run, trade openness and financial development have positive repercussions on growth, illustrating that trade openness and financial development are the long-run determinants of economic growth in India.

The study's findings offer a range of recommendations for policymakers to develop and put into practice appropriate policies in order to enhance India's long-term economic growth. Natural resources have boosted India's economic growth temporarily; as a result, the nation should focus on making more wise use of its resources. Furthermore, because natural resources run out quickly, it is not a wise decision to rely too heavily on them. Therefore, policymakers ought to make clear progress in that direction. Natural resources

have enhanced the output growth of India in the short run, thus, the country should emphasize on more sagacious use of the resources. Furthermore, the natural resources diminish swiftly, thus, relying too heavily on them is not a wise decision. Therefore, policymakers should take discernible and clear steps in this direction. The results show that trade openness has favorable repercussions on economic growth. It is also true that during the period under consideration, India has adopted fairly liberal trade policies. To further boost economic performance, the nation should keep moving in this direction by lowering both tariff and non-tariff barriers.

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