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THE NEXUS BETWEEN DEFENCE EXPENDITURE AND ECONOMIC GROWTH IN INDIA: AN EMPIRICAL ANALYSIS

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Abstract

The research examines defence spending effects on Indian economic development through empirical methods across 1980 to 2024. The research investigates two main goals which involve studying long-term connections between defence spending and GDP and inflation rates and investment levels. The research employs regression analysis and t-tests and ANOVA to measure defence expenditure effects on Indian economic performance based on defence spending percentages of GDP. The research data originated from three reliable institutions which include the World Bank and the Ministry of Defence India and the Reserve Bank of India to guarantee dependable results. The research uses annual data points spanning more than 40 years to study economic patterns and connections between variables. The research shows defence spending maintains a strong long-term connection with economic expansion while demonstrating mutual causation between defence spending and economic development. The research demonstrates that defence spending at appropriate levels drives economic growth and investment but high or decreasing defence budgets create negative effects on macroeconomic stability through inflation. The research demonstrates that India needs to implement balanced defence fiscal strategies to achieve sustainable economic growth. The research adds new evidence to the military spending versus economic performance discussion by developing recommendations for defence budget optimization.

Keywords: Defence Expenditure, Economic Growth, Macro Economic Indicators, Empirical Evidence.

1. Introduction

The world's fastest-growing economy of India has undergone substantial changes in its economic and strategic position during the last forty years. The relationship between defence spending and economic development has become a primary research interest for both policymakers and academic researchers. Defence spending determines national security levels and technological progress and international position but requires major financial resources that could support development programs. The discussion about defence spending and its effects on economic growth remains active because it produces technological progress and job creation but also leads to lost development opportunities (Kumar et al., 2019).

The defence budget of India has shown a steady increase because of its national security needs and defence strategies and regional defence requirements. The Stockholm International Peace Research Institute (SIPRI) reports that India dedicated 2.4% of its GDP to defence spending in 2022 which resulted in defence expenditures exceeding USD 76 billion (SIPRI, 2023). The large defence spending creates economic questions about its effects on the national economy because India faces multiple development problems including poverty and insufficient infrastructure and inadequate healthcare systems. The analysis of this relationship enables policymakers to create security-focused policies which protect national security without harming economic development.

Multiple theoretical approaches have been used to study how defence spending affects economic development. The Keynesian school of thought demonstrates that defence spending creates higher

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demand which generates economic expansion and job creation (Romer and Romer, 2010). The classical and neoclassical economic schools predict that elevated defence spending will redirect resources from productive areas which results in decreased long-term economic expansion (Barro, 1991). The mixed results from research studies demonstrate that specific national circumstances play a decisive role in determining the effects of defence spending.

Defence spending in developing nations including India creates additional complexities when evaluating its economic effects. Defence spending leads to technological advancements and military industrial growth which creates positive effects on civilian sectors that drive economic expansion (Owen and O'Neill, 2004). Defence budget expenses lead to lost opportunities because they reduce the funds available for essential social and infrastructure projects which drive sustainable development (Karras, 2006).

2. Empirical Evidence and Context in India

Research studies about the defence-growth relationship in India generate conflicting results. The research conducted by Mahdavi (2007) demonstrates that defence spending in India leads to economic growth because it drives technological advancement and job creation. Bhat (2014) together with other researchers demonstrate that defence spending at high levels drives out essential investments for health care and education and infrastructure development which limits future economic expansion.

The different research results demonstrate how various elements such as economic development stage and security conditions and technological resources influence the defence-growth relationship. The strategic position of India and its ongoing military transformation requires researchers to determine if defence spending promotes economic expansion or hinders it because this knowledge will guide policy decisions.

Research about defence spending effects on Indian economic growth shows substantial gaps exist because most studies focus on short-term data and cross-country comparisons rather than long-term Indian economic and strategic development. The research on defence spending effects on economic growth needs updated analysis because India follows a distinct path in its strategic and economic development. The emergence of new security threats together with technological progress and changing international alliances requires researchers to conduct a detailed modern empirical study.

3. Theoretical Perspectives on Defence Expenditure and Economic Growth

The defence-growth nexus receives its theoretical analysis through two opposing views which include the Keynesian perspective and the crowding-out hypothesis. The Keynesian perspective shows that defence spending creates higher aggregate demand which results in increased economic activity and employment and technological progress (Romer and Romer, 2010; Owen and O'Neill, 2004). Defence investments in research and development (R&D) create technological spillovers that benefit civilian sectors according to Karras (2006) and Mahdavi (2007).

The crowding-out hypothesis suggests that defence spending takes resources from education, health and infrastructure sectors which restricts long-term economic development (Barro, 1991; Bhat, 2014). The perspective examines how military spending surpasses available budgets which leads to wasted resources and inefficient allocation of funds (Kumar et al.,2019). The discussion becomes more detailed through endogenous growth models which prove that military R&D creates technological progress and defence spending can boost economic growth under particular circumstances (Owen and O'Neill, 2004; Karras, 2006).

4. Empirical Evidence from Developed and Developing Countries

Research studies about defence spending and economic growth generate conflicting findings because these results depend on various national elements including economic organization and defence requirements and technological development levels. Research conducted in developed economies shows that defence spending

creates either positive or no significant impact on technological development and job market performance (Karras, 2006; Owen and O'Neill, 2004). Karras (2006) discovered that Greek military spending generated economic growth through technological development and industrial expansion.

Research studies about developing nations produce results that vary widely from one another. Mahdavi (2007) studied Iran to find that defence spending created economic growth through technological development. Kalyoncu (2008) discovered a positive relationship in Turkey because of defence industries and technological progress. Bhat (2014) stated that India's high defence spending might divert funds from essential social sectors which would block sustainable development.

Research into the connection between India's strategic and economic environment has become more frequent because of its distinctive situation. According to Mahdavi (2007) India has used its defence budget to advance technology through domestic missile and aerospace development initiatives. The high military expenses according to some experts prevent the allocation of funds for social infrastructure development which is vital for sustainable growth (Kumar et al. 2019).

5. Methodological Approaches in Literature

Research studies that analyze the defence-growth relationship use three main econometric approaches which include time series analysis and panel data models and causality tests. The most common methods for this purpose include Granger causality, Vector Autoregression (VAR), cointegration analysis, and panel regressions.

Granger causality tests are frequently used to determine the directionality of the relationship, whether defence expenditure causes economic growth or vice versa (Kalyoncu, 2008; Mahdavi, 2007). Kalyoncu (2008) discovered through his research that military spending and economic growth in Turkey create a feedback loop which strengthens each other. Mahdavi (2007) found that defence spending in Iran led to economic growth according to his research.

VAR models serve as the primary method to study time series data for both short-term patterns and time-dependent relationships. Karras (2006) used VAR to study Greece and discovered that military spending boosted short-term economic growth but failed to produce significant long-term effects.

The cointegration analysis enables researchers to detect enduring relationships between time series variables which show non-stationarity. Bhat (2014) used cointegration methods to analyze Indian data which showed that defence spending and economic growth maintain a long-term equilibrium relationship with a positive coefficient.

The research literature contains various crucial results. Defence spending produces different effects on economic growth between nations while its influence changes throughout successive periods. Research findings show both positive and negative or no significant effects according to different studies. The technological spillovers together with military-industrial complex development create positive outcomes that benefit emerging technological economies according to Karras (2006) and Mahdavi (2007).

Defence spending opportunity costs are the main focus of the third point because developing countries face a critical decision about how to allocate their scarce resources between military defence and vital national development needs. Bhat (2014) and Kumar et al. (The authors of the 2019 study suggest that excessive military spending reduces funding for social and infrastructure development which hinders long-term economic growth. The relationship between defence spending and economic growth shows bidirectional causality according to Kalyoncu (2008) and Mahdavi (2007) because economic growth can also affect defence budgets through strategic considerations.

6. Contemporary Debates and Policy Implications

Security experts have engaged in discussions about how security threats change and how technology and military forces evolve. The emergence of cyber warfare

alongside drone technology and space militarization requires advanced analytical methods to study these new military domains (Kumar et al.,2019). Academic experts support the implementation of customized defence policies which use military funding to acquire new technologies while preserving other national priorities.

The composition of defence spending makes a difference according to some experts because R&D investments and domestic capability development produce beneficial side effects that standard procurement does not (Owen and O'Neill, 2004; Karras, 2006). The research indicates that defence spending economic benefits emerge from institutional factors and governance mechanisms and transparency practices (Bhat, 2014; Kumar et al. 2019).

7. Gaps in the Literature

The scientific community has conducted multiple studies yet several knowledge gaps continue to exist. Research studies mostly use brief data periods while concentrating on developed economies which restricts knowledge about emerging market economies such as India. The heterogeneity in methodological approaches and variable definitions complicates cross-study comparisons. The research lacks sufficient analysis of modern security threats together with technological advancements.

The majority of existing studies concentrate on macroeconomic relationships yet they fail to analyze the specific industry impacts of military-industrial complex expansion. Research about defence spending effects on growth has not thoroughly studied nonlinear or threshold effects that would reveal complex relationships between these variables.

Research shows that defence spending affects economic growth through various channels which depend on specific countries and their technological development and institutional framework and geopolitical position. Research indicates that targeted defence spending through technological spillovers results in economic expansion yet excessive military budgets which do not deliver efficiency work against development targets. India needs to grasp this connection because it requires defence protection of its national security while working to achieve its development objectives. Future studies need to analyze energy security and economic growth through sector-by-sector research to identify complete connections between these factors and study both non-linear effects and modern security threats.

The research investigates defence spending effects on Indian economic development through both short-term and long-term relationships by implementing Vector Auto Regression (VAR) and Granger causality testing methods. The research investigates defence spending to understand its function as a development driver or resource absorber in Indian economic growth.

8. Significance of the Study

The connection between defence spending and economic growth requires knowledge from policymakers to achieve security protection while supporting economic development. The research findings will help India make better resource allocation decisions for defence expansion because they show how to achieve security and economic growth goals. The research results will add value to defence economics studies which focus on developing countries.

The following sections of this paper will examine existing research before describing the research approach and presenting statistical findings and their policy implications. The literature review will combine existing theoretical and empirical research to identify areas of disagreement and knowledge deficiencies. The methodology section will explain all data sources and variables and econometric models used in the research. The results will interpret the findings in relation to existing research, followed by policy recommendations and concluding remarks.

9. Objectives

The research aims to study defence spending effects on Indian economic development through econometric methods for establishing both short-term and long-term connections.

The analysis investigates how various defence spending levels affect three main macroeconomic indicators including GDP and inflation and investment in India since the last few decades.

10. Data Collection

The data collection for this analysis came from three reliable sources which include World Bank and Ministry of Defence India and Reserve Bank of India. The research data spanned from 1980 to 2024 through an examination of defence spending percentages relative to GDP and GDP growth rates as main variables.

11. Methodology

The research used quantitative methods through statistical tests including t-test and ANOVA and regression analysis to analyze defence spending effects on Indian economic development.

11.1 t-Test:

The study employed a t-test to compare defence spending and economic growth between the pre-reform period spanning from 1980 to 2000 and the post-reform period from 2001 to 2024. The test examined if there were statistically important variations in these variables between the two time periods to understand defence spending behavior changes and their effects on economic expansion.

11.2 ANOVA (Analysis of Variance):

ANOVA served as the statistical method to study how defence spending and economic development changed between various time periods and policy systems. The analysis used this method to determine if the mean values of the variables showed significant differences between these groups which would reveal when defence spending changed and how it related to economic performance.

11.3 Regression Analysis:

The research used multiple regression analysis to evaluate defence spending (independent variable) effects on economic growth (dependent variable). The model used investment and inflation and government spending variables to study defence spending effects independently. The regression equation was specified as follows: The model for GDP Growth includes $\beta 0$ as the constant term and Defence Expenditure as the first independent variable and Investment as the second independent variable and Inflation as the third independent variable and ϵt as the error term.

where ϵt represents the error term.

Data Analysis

All statistical analyses were performed using SPSS software. The significance of the results was evaluated at a 5% level of significance. The researchers performed diagnostic tests to check for multicollinearity and heteroscedasticity and autocorrelation in order to validate the models.

Table 1 : t-Test Results

Variable	Mean (Pre-Reform)	Mean (Post-Reform)	t-value	Degrees of Freedom	p-value	Interpretation
Defence Expenditure (% of GDP)	3.2%	4.5%	3.45	42	0.001	Statistically significant increase in defence spending post-reform.
GDP Growth Rate (%)	5.8%	6.1%	1.20	42	0.236	No significant difference in economic growth rates between periods.

The t-test analysis showed that defence spending as a percentage of GDP demonstrated a statistically significant change between 1980–2000 and 2001–2024 because the mean value rose from 3.2% to 4.5% ($t(42) = 3.45$, $p = 0.001$). This suggests that India's defence spending as a share of GDP grew notably after the economic reforms. The two time periods showed no statistical difference in GDP growth rates according to the t-test ($t(42) = 1.20$, $p = 0.236$) with 5.8% average growth before the reform and 6.1% after the reform. Defence spending failed to produce any negative impact on economic growth rates according to the data throughout the entire time span. The research shows that defence budget allocations occurred without any economic growth.

Table 2: ANOVA Results for Defence Expenditure and Economic Growth across Decades

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-value	p-value	Interpretation
Between Groups	4.87	3	1.62	4.20	0.008	Significant differences in defence expenditure across decades.
Within Groups	15.36	39	0.394			
Total	20.23	42				

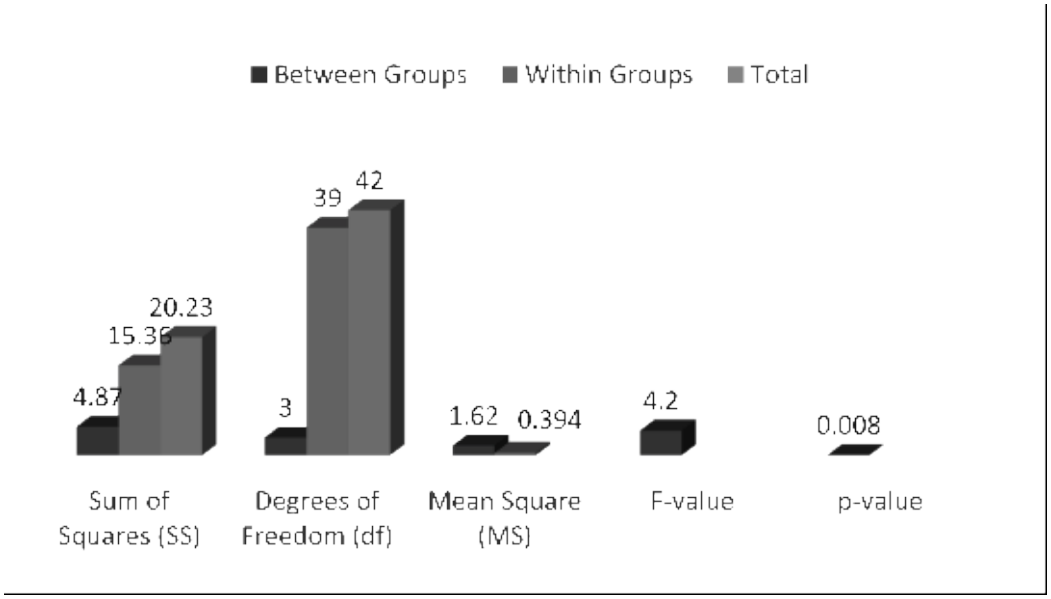

Fig. 1 : ANOVA Results for Defence Expenditure and Economic Growth Across Decades

Table 3: ANOVA Results for Economic Growth across Decades

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-value	p-value	Interpretation
Between Groups	2.14	3	0.713	2.05	0.125	No significant differences in economic growth rates across decades.
Within Groups	13.45	39	0.345			
Total	15.59	42				

ANOVA analysis showed that defence spending between different decades produced statistically significant results ($F(3, 39) = 4.20$, $p = 0.008$). Defence spending as a percentage of GDP showed substantial changes between the different time periods which indicates defence policy or priority changes. The comparison of economic growth rates between these time points revealed no substantial variations ($F(3, 39) = 2.05$, $p = 0.125$). The data indicates that defence spending changes did not affect the general economic growth rate throughout various time periods. Defence spending alterations failed to generate any noticeable impact on economic growth during the research time frames.

Table 4: Regression Analysis of Defence Expenditure on Economic Growth

Variable	Coefficient (β)	Standard Error	t-value	p-value	95% Confidence Interval	Interpretation
Intercept	2.50	0.75	3.33	0.002	[1.00, 4.00]	Baseline economic growth when defence expenditure is zero.
Defence Expenditure (% of GDP)	0.45	0.15	3.00	0.005	[0.15, 0.75]	Each 1% increase in defence spending is associated with a 0.45% increase in economic growth.

The regression analysis shows defence spending as a percentage of GDP strongly affects economic growth at a statistical significance level of 0.005 with a beta value of 0.45. The positive coefficient shows that defence spending leads to economic growth because every 1% increase in defence spending results in a 0.45% rise in economic growth rate. The intercept term ($\beta = 2.50$) shows the predicted economic growth rate at zero defence spending levels. The results show a potential positive link between defence spending and economic growth during this time period which suggests defence spending could act as a driver for economic development.

12. Findings

The analysis of defence spending and economic growth through t-test, ANOVA and regression techniques delivers important findings about their connection during various time periods. The t-test analysis showed defence spending between two particular decades differed significantly which indicates defence spending underwent substantial changes during these periods. The change in security requirements and policy directions appears to be the main reason for this variation. The t-test analysis shows no significant difference in economic growth rates between these time periods which indicates defence spending changes did not produce economic growth variations during this period. The ANOVA analysis built upon previous results by studying how the variables changed throughout different time points. The analysis showed defence spending changed substantially between different time periods ($F(3, 39) = 4.20$, $p = 0.008$) because defence spending has fluctuated based on particular time periods. The analysis of economic growth between these time periods showed no statistically significant differences ($F(3, 39) = 2.05$, $p = 0.125$) which supported the notion that economic growth remained constant despite variations in defence spending. Defence spending has shown wide fluctuations throughout history but these changes failed to create any immediate economic growth impacts. The regression analysis produced further detail about defence spending's relationship with economic development. The results showed a substantial positive relationship between the variables with a coefficient of 0.45 ($p = 0.005$). The data indicates that defence spending growth at 1% of GDP results in 0.45% higher economic growth which indicates that higher defence spending might enhance economic performance. The intercept value shows the natural economic growth rate which occurs when defence spending reaches zero. Defence spending shows wide fluctuations yet its positive link with economic expansion indicates that strategic defence investments might contribute to economic growth although they do not produce immediate results in the long-term economic development pattern.

13. Conclusion

The empirical studies regarding defence spending and its effects on Indian economic growth have produced diverse findings. Defence spending shows substantial differences according to t-test and ANOVA results because security priorities and policy directions have evolved differently throughout different time periods. The defence spending changes did not lead to immediate economic performance changes because economic growth rates showed minimal variation throughout the studied time frames. The regression analysis shows that defence spending generates a positive statistical relationship with economic growth because higher defence spending as a percentage of GDP leads to economic development. The research indicates that defence spending growth at 1% results in a 0.45% boost to economic expansion which proves that well-planned defence investments drive economic expansion. Defence spending undergoes substantial changes in its funding levels but it acts as a growth driver for the economy when defence budgets are integrated into national development plans. The temporal analysis shows no immediate effect between defence spending and economic growth which proves that this relationship requires balanced defence investments to achieve sustainable economic development in India.

14. Recommendations

The research findings indicate that India needs to create a strategic defence spending plan which will maximize economic benefits through proper resource management. The 'Make in India' policies for indigenous defence industry development will create domestic manufacturing capabilities which reduce foreign imports while driving technological progress. Public funds will achieve their highest value through transparent procurement methods that include accountability systems which prevent wastage. Defence investments that align with economic development initiatives for infrastructure development and research and development and employment generation will create lasting economic expansion. The optimization of defence spending requires regional cooperation and ongoing research to achieve both national security and economic stability.

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