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Original Article

Assessing the Impact of Capital Formation and Fiscal Deficit on Gross State Domestic Product (GSDP): A comparative study between Bihar and Kerala

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Abstract

This paper examines the impact of various macroeconomic factors on the Gross State Domestic Product (GSDP) of Bihar and Kerala. In this study, GSDP is considered the dependent variable, while capital formation and fiscal deficit are the independent variables. The analysis covers the period from 2011-12 to 2019-20 with data sourced from the Reserve Bank of India. A multiple regression analysis was conducted to empirically assess the impact of capital formation and fiscal deficit on the GSDP of Bihar and Kerala. The results indicate that capital formation and gross fiscal deficit together explain approximately 70% of the variation in Bihar's GSDP, whereas in Kerala, they account for about 86% of the variation. These findings highlight the differing economic structures and fiscal dynamics between the two states, emphasizing the varying degrees of dependency on capital formation and fiscal deficit in driving economic growth.

Keywords: *Economic growth, Capital formation, Fiscal deficit, Multiple linear regression model.*

Introduction

Simon Kuznets was the first person to develop the concept of Gross Domestic Product (GDP) for a U.S. Congress report in 1934. In his report titled *"National Income, 1929-35"*, presented to the National Bureau of Economic Research, Kuznets introduced the original formulation of GDP as a comprehensive measure of a nation's economic performance. His idea was to capture all economic production by individuals, companies, and the government in a single measure. GDP represents the total value of all goods and services produced within a country's borders over a specified time period. Similarly, Gross State Domestic Product (GSDP) is a crucial indicator used to assess the economic condition of a state. It tracks the overall health of a state's economy and is calculated as the sum of consumption expenditure, government expenditure, private investment, and net exports. GSDP represents the monetary value of all final goods and services produced within a state's geographical boundaries by both residents and non-residents during a specific period. It provides an economic snapshot of a state and serves as an important indicator of economic growth. Several factors influence a state's GSDP, including government expenditure, consumer expenditure, private investment, taxation, net exports (exports minus imports), fiscal deficit, interest rates, money supply, and foreign direct investment (FDI), among others. This study focuses on two states with distinct economic characteristics Kerala and Bihar. Kerala and Bihar differ significantly across various socio-economic parameters. According to the 2011 Census, Kerala had the highest literacy rate in India at 93.91%, while Bihar recorded the lowest at 63.82%. Additionally, Kerala ranked first in terms of the Human Development Index (HDI) for the period 1999-2000, whereas Bihar was positioned at the bottom. The *Public Affairs Index (2018)*, released by the think tank *Public Affairs Centre (PAC)* in Bangalore, ranked Bihar as the lowest-performing state in terms of governance, while Kerala emerged as the best-governed state in the country. These differences highlight the contrasting economic environments of the two states, making them an interesting subject for a comparative analysis of capital formation and fiscal deficit in relation to GSDP.

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Literature Review

The literature on Bihar and Kerala shows markedly different trajectories in capital formation, fiscal deficit, and growth in Gross State Domestic Product (GSDP). Studies on Bihar highlight persistent weaknesses in capital formation due to limited industrialization, poor infrastructure, and inadequate private investment. Rasul and Sharma (2014) argue that Bihar's low economic performance stems from structural constraints and weak governance that restrict productive investment and depress GSDP growth. District-level analysis by Santra, Kumar, and Bagaria (2014) further confirms that Bihar's capital formation remains low and uneven, limiting the expansion of non-agricultural sectors. High fiscal deficits, driven by low revenue generation and heavy dependence on central transfers, have also been identified as major barriers to Bihar's productive expenditure and long-term growth. In contrast, Kerala presents a distinct pattern where social-sector-led development and high remittance inflows compensate for low industrial capital formation. According to Subrahmanian (2006), Kerala's fiscal stress arising from high public expenditure and welfare commitments has not prevented the state from achieving relatively strong GSDP growth, largely due to the long-term productivity effects of human capital investment. Sanitha and Singla (2016) observe that while Kerala's agricultural capital base has weakened, remittances significantly support state-level capital formation and contribute to service-sector expansion. Comparative evidence suggests that Bihar's low capital formation and high fiscal deficits suppress its productive capacity and hinder GSDP growth, whereas Kerala, despite chronic fiscal deficits, benefits from remittance-driven capital inflows and strong human development foundations that sustain its growth trajectory. Neog (2017) highlights that India's structural shift has been service-led rather than industry-driven, raising concerns about employment generation.

Objectives of the Study

1. To study the impact of capital formation on the Gross State Domestic Product (GSDP) of Bihar and Kerala.
2. To study the impact of gross fiscal deficit on the Gross State Domestic Product (GSDP) of Bihar and Kerala.

Hypotheses

1. There is a significant impact of capital formation on the Gross State Domestic Product (GSDP) of Bihar and Kerala.
2. There is no significant impact of gross capital formation on the Gross State Domestic Product (GSDP) of Bihar and Kerala.

Data Sources and Research Methodology

This study adopts a quantitative research design, focusing on the impact of selected macroeconomic factors on Gross State Domestic Product (GSDP). The study relies on secondary data collected for a period of nine years, from 2011-12 to 2019-20. The data was sourced from the official website of the Reserve Bank of India (RBI). While GSDP is influenced by various economic factors, this study focuses on capital formation and fiscal deficit as the primary variables affecting GSDP during the selected period. The study utilizes a multiple linear regression model, where GSDP serves as the dependent variable, and the independent variables are capital formation and fiscal deficit.

The regression model is formulated as follows:

$\ln Y = \beta 1 + \beta 2 * X1 + \beta 3 * X 2$

$\ln GDP = \beta 1 + \beta 2 * \ln \text{Gross fiscal deficit} + \beta 3 * \ln \text{Capital Formation}$

Where,

Y= Gross State Domestic Product (GSDP)

X1= Gross fiscal deficit

X2= Capital Formation

This model aims to quantify the impact of fiscal deficit and capital formation on the economic output of Bihar and Kerala during the study period.

Result and Discussion

Table 1: Multiple Regression Model Analysis between Dependent Variable (GSDP) and Independent Variables (Capital Formation and Gross Fiscal Deficit) of Bihar

Year	LNGSDP	LNCapital Formation	LNGross Fiscal Deficit
2011-12	12.456251	8.786456	12.444247
2012-13	12.504880	9.030256	12.335661
2013-14	12.540695	9.321702	12.050313
2014-15	12.599763	9.397815	11.338798
2015-16	12.672311	9.709842	11.531207
2016-17	12.748478	9.568364	12.721940
2017-18	12.851558	9.53293	12.867874
2018-19	12.895034	9.412546	12.683474
2019-20	12.817827	10.303169	12.217774

Source: Reserve Bank of India

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SUMMARYOUTPUT								
Regression Statistics								
MultipleR	0.84193							
RSquare	0.708847							
AdjustedRSquare	0.611795							
StandardError	0.099949							
Observations	9							
ANOVA								
	df	*SS*	*MS*	*F*	*Significanc eF*			
Regression	2	0.145929	0.072965	7.303846	0.02468117			
Residual	6	0.059939	0.00999					
Total	8	0.205869						
Coefficients		*andardEr r*	*tStat*	*P-value*	*Lower95%*	*Upper95 %*	*ower95.0 %*	*pper95.0 %*
Intercept	8.190629	1.209466	6.772101	0.000506	5.231171547	11.15009	5.231172	11.15009
LN capitalformation	0.279575	0.083507	3.34793	0.015459	0.075241213	0.483909	0.075241	0.483909
LN_GROSSFISCALD EFIC	0.150553	0.067491	2.230702	0.067201	-0.014592297	0.315698	-0.01459	0.315698

The result shows that Capital Formation and Gross Fiscal Deficit together explain approximately 70% of the variation in the Gross State Domestic Product (GSDP) of Bihar. The p-value for Capital Formation is less than 0.005 ($p < 0.005$), and the t-statistic is 6.772101, which is greater than the critical t-value. This means the slope coefficient ($\beta 2$) for Capital Formation is statistically significant. Specifically, if Capital Formation increases by 1%, the GSDP will increase by approximately 0.27% on average. This result is in line with macroeconomic theory, which expects that higher capital investment should lead to higher economic output. The p-value for Gross Fiscal Deficit is also less than 0.005 ($p < 0.005$), and the t-statistic is 3.34793, which is greater than the critical t-value. This indicates that the slope coefficient ($\beta 3$) for Gross Fiscal Deficit is significant as well. If the Gross Fiscal Deficit increases by 1%, the GSDP will increase by approximately 0.15% on average. This result is also consistent with macroeconomic theory, which suggests that government fiscal spending (even if it results in a deficit) can have a positive effect on the overall economy. In summary, both Capital Formation and Gross Fiscal Deficit have a statistically significant and positive impact on the GSDP of Bihar, with Capital Formation having a slightly stronger effect than the Gross Fiscal Deficit. This supports the idea that investments in capital and fiscal policy decisions play a crucial role in driving economic growth.

Table No-2: Multiple Regression Model Analysis between Dependent Variable GSDP and All Independent Variables of Kerala

Year	LNGSDP	LNCapitalFormation	LNGrossFiscalDeficit
2011-12	12.805041	12.891036	9.458371
2012-13	12.867970	12.846765	9.615938
2013-14	12.906149	13.621777	9.737669
2014-15	12.947904	13.274540	9.833172
2015-16	13.019688	13.873733	9.787964
2016-17	13.092526	14.136359	10.182935
2017-18	13.154230	13.389201	10.197536
2018-19	13.225332	13.539074	10.202035
2019-20	13.234252	13.898660	10.079036

Source: Reserve Bank of India

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SUMMARYOUTPUT								
RegressionStatistics								
MultipleR	0.927501							
RSquare	0.860258							
AdjustedRSquare	0.813677							
StandardError	0.067947							
Observations	9							
ANOVA								
	df	*SS*	*MS*	*F*	*SignificanceF*			
Regression	2	0.170529	0.085264	18.46808	0.002728878			
Residual	6	0.027701	0.004617					
Total	8	0.19823						
Coefficients		*andardEr r*	*tStat*	*P-value*	*Lower95%*	*Upper95 %*	*ower95.0 %*	*pper95.0 %*
Intercept	7.73365	0.889606	8.69334	0.000128	5.556861882	9.910438	5.556862	9.910438
LN capitalformation	0.022707	0.071076	0.319474	0.760198	-0.151210025	0.196624	-0.15121	0.196624
LN_GROSSFISCALD EFIC	0.503869	0.114318	4.4076	0.004531	0.224142194	0.783595	0.224142	0.783595

Table-2 regression results for Kerala suggest that both Capital Formation and Gross Fiscal Deficit together explain approximately 86% of the variation in the Gross State Domestic Product (GSDP).The p-value for Capital Formation is greater than 0.005, indicating that it is insignificant in explaining changes in GSDP. The t-statistic for Capital Formation is 0.319474, which is less than the critical t-value, confirming the insignificance of the variable. Although Capital Formation has a positive relationship with GSDP, the estimated impact is minimal. If Capital Formation increases by 1%, GSDP is expected to increase by only 0.02% on average. The p-value for Gross Fiscal Deficit is less than 0.005 ($p < 0.005$), indicating that it is significant in explaining the variation in GSDP. The t-statistic for Gross Fiscal Deficit is 4.4076, which is greater than the critical t-value, confirming the statistical significance of this coefficient. For Gross Fiscal Deficit, if it increases by 1%, GSDP is expected to increase by approximately 0.50% on average. This regression coefficient is consistent with macroeconomic theory, indicating a positive impact.

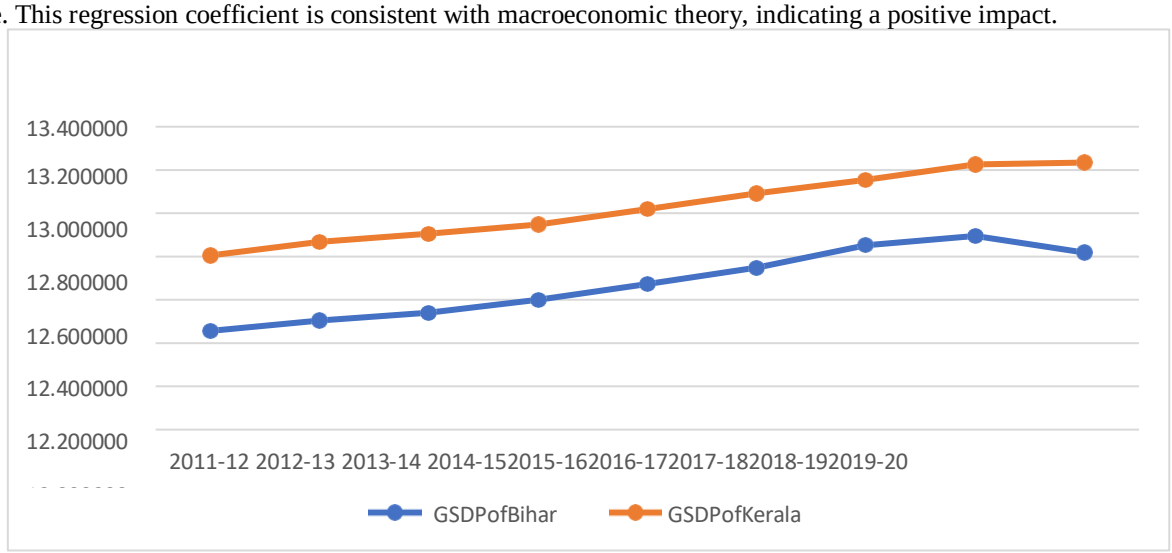

Figure no- 1 GSDP of Bihar and Kerala

Figure n-1 shows that Kerala more fluctuations in its GSDP over the years compared to Bihar, as seen in the graph. For instance, in 2011-12, Kerala's GSDP is around 12.8, while Bihar's GSDP is around 12.4, indicating that Kerala was ahead of Bihar by this margin. Over time, Kerala's GSDP consistently grows, reaching 13.2 in 2019-20, marking steady growth. Bihar, although showing an increase in GSDP, still lags behind Kerala. The gap between Kerala's and Bihar's GSDP has been consistent over the years, with Kerala maintaining a higher GSDP value at every year compared to Bihar. Kerala's GSDP has experienced more stable growth, while Bihar's growth seems less smooth, indicating that Kerala might be benefiting from better economic policies, investments, and infrastructure. Kerala's

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stronger GSDP growth could be linked to factors like higher capital formation, better fiscal management, and effective use of resources. The consistent upward trend in Kerala's GSDP demonstrates that the state has achieved relatively better economic outcomes, especially in sectors like capital formation and fiscal management. Bihar, on the other hand, despite showing positive growth, is still struggling to catch up with Kerala in terms of overall economic output, largely due to factors like lower capital formation, higher fiscal deficits, and structural challenges in its economy.

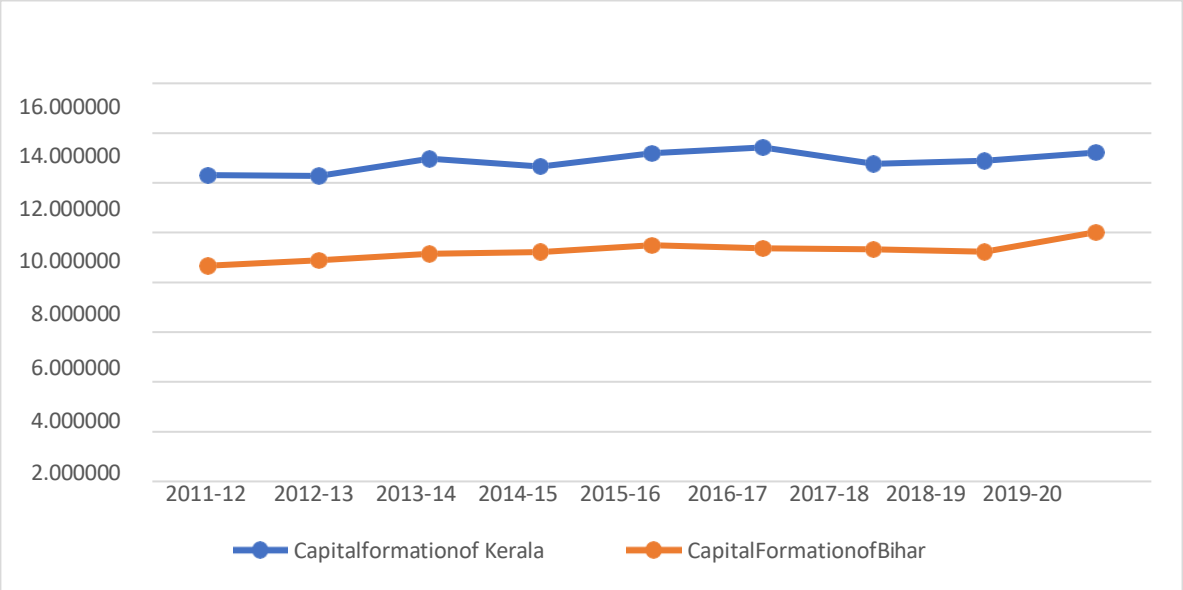

Figure No-2 Capital formation of Bihar and Kerala

As shown in Figure No-2, the fluctuations in capital formation are more evident in Kerala compared to Bihar. In 2011-12, Kerala's capital formation is around 13.0 while Bihar's capital formation is significantly lower at 9.0. This indicates that Kerala had a more robust investment formation from the start, which likely reflects better infrastructure, industrial investment, and efficient use of resources. The capital formation trend in Bihar remains relatively low compared to Kerala, with Bihar consistently lagging behind. Kerala's capital formation shows some fluctuations but remains on an upward trajectory, signaling better growth in investments, possibly due to more effective fiscal management and higher private sector participation. By 2019-20, Kerala's capital formation has grown to around 14.0, while Bihar's capital formation is still lower at 10.0. This difference further emphasizes the gap in investment levels between the two states, with Kerala benefitting from greater investments in sectors like infrastructure, education, health, and industry. As capital formation is directly linked to economic growth, Kerala's higher and more consistent capital formation explains its higher GSDP growth over the years. In contrast, Bihar's lagging capital formation contributes to its slower GSDP growth compared to Kerala. This trend highlights Kerala's better ability to mobilize investments and build capital infrastructure, which is essential for sustained economic development. Bihar, while showing progress, needs to significantly improve its capital formation to close the economic gap with Kerala.

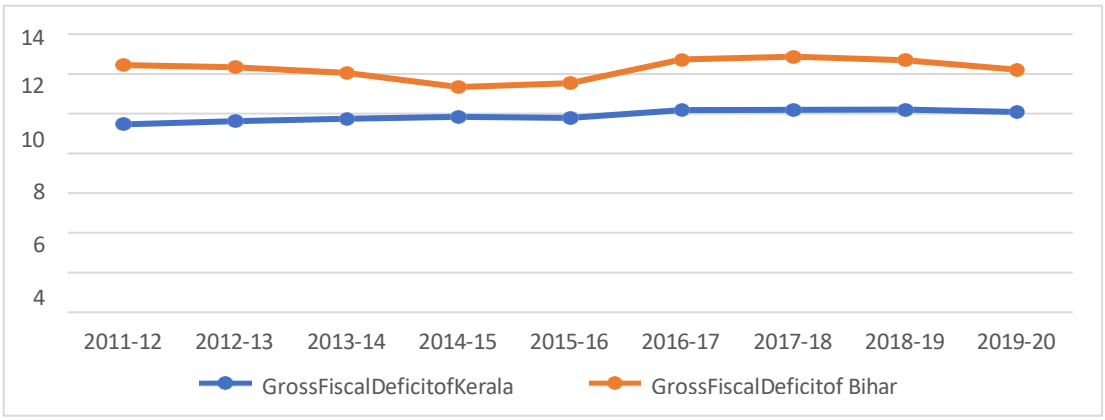

Figure No-3 Grass Fiscal Deficit of Bihar and Kerala

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As depicted in Figure No.3, the fluctuations in fiscal deficit show notable differences between Bihar and Kerala: In 2011-12, both Bihar and Kerala have parallel fiscal deficit levels. This suggests that initially, both states were facing similar challenges in managing their fiscal deficits. By 2014-15, the fiscal deficit in Bihar starts to decrease, reflecting a potential improvement in fiscal management or a reduction in government spending relative to revenue. On the other hand, Kerala's fiscal deficit remains stable, showing that the state might have adopted more consistent fiscal strategies or had a steady growth in revenue that balanced its expenditure. Starting from 2016-17, Bihar's fiscal deficit begins to increase again, indicating possible government spending on development projects or higher borrowing requirements. Kerala's fiscal deficit, however, remains constant, suggesting a more controlled approach to spending and possibly better fiscal discipline. Kerala's fiscal policies might focus on balancing development initiatives with sustainable borrowing and revenue generation. The fluctuations in Bihar's fiscal deficit reflect a more volatile fiscal situation, likely due to the challenges of balancing its expenditure and revenue in a rapidly developing state. In contrast, Kerala's stable fiscal deficit suggests a more balanced fiscal strategy with better revenue mobilization (possibly through efficient taxation policies) and a more sustainable approach to expenditure.

Conclusion

The analysis shows the Bihar, the combined effect of Capital Formation and Gross Fiscal Deficit explains approximately 70% of the variation in GSDP. Both variables show statistically significant relationships with GSDP. Specifically, an increase in Capital Formation by 1% leads to an approximate 0.27% rise in GSDP, and an increase in Gross Fiscal Deficit by 1% leads to a 0.15% rise in GSDP. For Kerala, the impact of Capital Formation and Gross Fiscal Deficit explains around 86% of the variation in GSDP. Fiscal Deficit is found to have a much stronger and significant impact on GSDP in Kerala compared to Bihar. In Bihar, both Capital Formation and Gross Fiscal Deficit have significant relationships with GSDP, and they seem to operate independently. This suggests that the funds borrowed through fiscal deficits may not always be utilized for productive investments like capital formation, but could instead be allocated to current consumption. In Kerala, the relationship between Capital Formation and Fiscal Deficit is more interlinked. The fiscal deficit funds are used more effectively for capital formation, including investment in infrastructure and industrial development. The findings suggest that Kerala's fiscal discipline is more aligned with its development goals, as the state leverages fiscal deficits for capital formation, contributing to sustained economic growth. In contrast, Bihar may need to adopt better fiscal management strategies to ensure that fiscal deficits are used productively for development and not just for consumption. The higher capital formation and more stable fiscal deficit management in Kerala seem to be driving its economic growth more effectively than in Bihar.

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