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Do Fiscal Resources or Fiscal Constraints Drive Social Sector Spending? Evidence from a State-level Panel Data Model in India

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Abstract

Social Sector Spending constitutes a central instrument for advancing human development, reducing regional disparities and strengthening inclusive growth in federal economies. This study empirically examines the fiscal and economic determinants of Social Sector Spending (SSE) across 15 major Indian states over the period 2005–2025 using a balanced panel dataset N = 315. Drawing on the theoretical foundations of public finance and fiscal federalism, the analysis employs a panel multiple regression framework to estimate the effects of Per Capita GSDP, Own Tax Revenue, Fiscal Deficit, Debt and Intergovernmental Grants on state-level social spending. The results reveal that fiscal deficit and intergovernmental grants exert statistically significant and economically meaningful effects on SSE, underscoring the importance of fiscal transfers and borrowing strategies in financing social commitments. Per Capita GSDP and Own Tax Revenue show limited independent influence, suggesting that institutional fiscal mechanisms outweigh income effects in determining expenditure allocation. The model demonstrates strong explanatory power and satisfies standard diagnostic conditions. The findings contribute to the literature by providing state-level evidence on the fiscal drivers of social expenditure in India and offer policy insights for improving transfer design, fiscal sustainability and expenditure efficiency within a decentralized governance framework.

Keywords: Fiscal Federalism, Intergovernmental Transfers, Panel Data Analysis, Social Sector Spending, State Public Finance.

Introduction

Public expenditure on the social sector is a core component of development strategy, particularly in emerging and federal economies. Investments in health, education and social protection contribute to human capital formation and long-term economic growth. In India, where significant inter-state disparities persist in income and human development, state-level fiscal decisions play a crucial role in shaping social outcomes. The theoretical basis for such intervention lies in public finance theory, which emphasizes allocative and distributive functions to correct market failures and reduce inequalities (1). Within a federal system, subnational governments are primarily responsible for delivering social services, making fiscal capacity a key determinant of welfare outcomes (2).

Although India has made progress in literacy, life expectancy and healthcare access, regional disparities continue despite increasing public expenditure. This indicates that differences in fiscal capacity, revenue generation and intergovernmental transfers affect both the level and effectiveness of social spending (3). Budgetary allocations are further constrained by fiscal realities such as limited revenues, deficit targets and debt obligations. While normative theory supports higher social sector spending, actual expenditure patterns often reflect fiscal stress rather than policy priorities (4).

Empirical evidence remains mixed. Some studies suggest that higher income levels and stronger revenue bases enable greater social sector spending, while others highlight the restrictive role of fiscal pressure shaped by institutional and political factors (5). These contrasting findings necessitate systematic econometric analysis. Accordingly, this study examines whether fiscal resources or fiscal constraints more strongly influence social sector spending in Indian states.

Using a panel regression framework, it incorporates variables such as Per Capita Income

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(GSDP), Own Tax Revenue, Fiscal Deficit, Public Debt and Intergovernmental Grants. The study contributes by adopting a state-level perspective, integrating fiscal strength and fiscal stress indicators within a unified framework and generating policy-relevant insights to address regional disparities (6, 7). The central research question is: What fiscal and economic determinants influence social sector spending in Indian states? (8).

Per Capita State Income and Social Sector Outlays

Per capita GSDP is a key indicator of development and fiscal strength at the state level. The relationship between income growth and public expenditure is often explained through Wagner's Law, which states that economic expansion increases demand for public goods and welfare services, thereby raising public expenditure relative to income (9). Within a federal system, higher income enhances tax capacity, improves revenue responsiveness and expands fiscal space for social spending.

From a welfare economics perspective, economic growth creates additional fiscal space for investment in human capital through spending on health, education and social security (1). Social sector expenditure should be viewed as an investment contributing to long-term productivity and growth. Empirical evidence shows that public investment in education and healthcare improves human capital accumulation and supports growth in developing countries (10). In India, disparities in per capita income across states remain pronounced. States with higher per capita GSDP generally exhibit stronger fiscal capacity, administrative efficiency and institutional frameworks (5). However, higher income does not automatically translate into higher social spending, as budget priorities are also influenced by governance quality, political incentives and fiscal arrangements.

Null Hypothesis (H_{01})

Per capita GSDP does not exert a statistically significant impact on Social Sector Spending in Indian states.

Alternative Hypothesis (H_{11})

Per capita GSDP exerts a statistically significant impact on Social Sector Spending in Indian states.

Own Tax Revenue and Social Sector Spending

Own tax revenue reflects fiscal autonomy and revenue mobilization capacity. Fiscal federalism theory suggests that decentralized governments with greater revenue authority are better positioned to align expenditure with local needs (2). Revenue autonomy enhances accountability and allocative efficiency.

States with higher own tax revenue relative to GSDP demonstrate stronger tax effort and administrative efficiency (3). This enables reduced dependence on transfers and greater discretion in prioritizing social spending. A study argued that fiscal autonomy improves policy responsiveness, especially in democratic contexts (11). Empirical evidence suggests that revenue-rich governments allocate more resources toward social infrastructure (12).

In India, tax capacity varies significantly across states due to differences in industrialization, consumption patterns and administrative effectiveness.

Null Hypothesis (H_{02})

Own tax revenue as a percentage of GSDP has no statistically significant effect on Social Sector Spending in Indian states.

Alternative Hypothesis (H_{12})

Own tax revenue as a percentage of GSDP has a statistically significant effect on Social Sector Spending in Indian states.

Public Debt and Social Sector Spending

Public debt reflects fiscal stress and intertemporal budget constraints. High debt-to-GSDP ratios increase interest obligations, reducing discretionary fiscal space. Fiscal consolidation theory suggests that governments under debt pressure may compress expenditure to maintain stability (13).

In India, borrowing is regulated under the FRBM framework, influencing expenditure composition. Past research finds that higher debt levels constrain fiscal flexibility and may crowd out social spending (14).

Theoretically, debt can have dual effects. Borrowing may finance investments in education and health, but high debt servicing burdens may reduce welfare spending. The net effect depends on fiscal discipline and macroeconomic conditions.

Null Hypothesis (H_{03})
Debt as a percentage of GSDP has no statistically significant effect on Social Sector Spending in Indian states.

Alternative Hypothesis (H_{13})
Debt-to-GSDP ratio has a statistically significant effect on Social Sector Spending in Indian states.

Grants and Social Sector Spending
Intergovernmental transfers form a major part of state revenues. Grants from the central government aim to reduce fiscal imbalances and ensure minimum service standards (2).

The flypaper effect suggests that grants increase public expenditure more than equivalent increases in own revenue (15). A study find that transfers positively influence subnational spending, particularly in social sectors (16).

In India, grants often target sectors like health, education and rural development, directly affecting social expenditure. However, excessive dependence on grants may weaken fiscal discipline and distort priorities (3).

Null Hypothesis (H_{04})
Grants as a percentage of GSDP have no statistically significant effect on Social Sector Spending in Indian states.

Alternative Hypothesis (H_{14})
Grants as a percentage of GSDP have a statistically significant effect on Social Sector Spending in Indian states.

Methodology
This study adopts a quantitative research design to examine the fiscal and economic determinants of Social Sector Spending (SSE) across Indian states. The analysis is based on a balanced panel dataset covering 15 major Indian states over the period 2005–2025, comprising 315 observations. Drawing on the theoretical foundations of public finance and fiscal federalism, the study specifies a panel multiple regression model to assess the impact of key explanatory variables, including Per Capita GSDP, Own Tax Revenue, Fiscal Deficit, Public Debt and Intergovernmental Grants on Social Sector Spending, measured as a percentage of GSDP. The panel data approach is employed to capture both cross-sectional and time-series variations, while controlling for unobserved heterogeneity across states. Statistical analysis was conducted using IBM SPSS Statistics and a multiple linear regression framework was applied to estimate the relationships among the variables. Standard diagnostic tests were performed to ensure the validity and reliability of the model, including checks for multicollinearity, normality and autocorrelation. The analytical framework of this study is designed to investigate the factors which influence Social Sector Spending (SSE) in Indian states through a panel data approach. In this relationship, SSE—expressed as a proportion of Gross State Domestic Product (GSDP)—serves as an indicator of the extent to which state governments prioritize human development by allocating resources to health, education and social welfare programs.

The model is theoretically anchored in welfare economics and fiscal federalism. From the welfare economics perspective, government intervention in social sectors is justified to address market imperfections, ensure equitable distribution of resources and enhance social welfare (1). Public spending in these areas is viewed as essential for correcting under-provision of merit goods and reducing inequality. Complementing this view, fiscal federalism theory posits that the spending behavior of subnational governments is conditioned by their revenue-generating capacity, fiscal constraints, debt obligations and the structure of intergovernmental transfers (2). Accordingly, variations in Social Sector Spending across states are understood to reflect differences in fiscal strength, institutional arrangements and intergovernmental fiscal relations. The theoretical foundations of this study are rooted in the allocation and redistribution functions of public finance. The allocation function emphasizes the role of government in correcting market failures and ensuring the efficient provision of public goods such as education and healthcare, which are central components of social sector spending. In contrast, the redistribution function focuses on reducing income and regional inequalities through targeted public expenditure. Within a federal framework, these functions are operationalized through fiscal instruments such as taxation, intergovernmental transfers and deficit financing. The empirical model of this study directly reflects these theoretical principles: intergovernmental grants capture the redistributive role of the state, while fiscal deficit represents the government's ability to allocate resources beyond current revenue constraints. The insignificant effects of

income and own revenue variables further suggest that institutional fiscal mechanisms, rather than purely economic capacity, play a more decisive role in shaping social sector expenditure. Thus, the empirical findings are closely aligned with the theoretical predictions of public finance and fiscal federalism.

Based on the structure of the dataset used in this study, Social Sector Spending (SSE_Percent_GSDP) is modelled as being influenced by four key explanatory variables:

(a) Per Capita_GSDP: Representing economic capacity

(**b) Own_Tax_Revenue_Percent_GSDP:** Representing fiscal autonomy

(c) Debt_Percent_GSDP: Representing fiscal stress

(d) Grants_Percent_GSDP: Representing intergovernmental fiscal transfers.

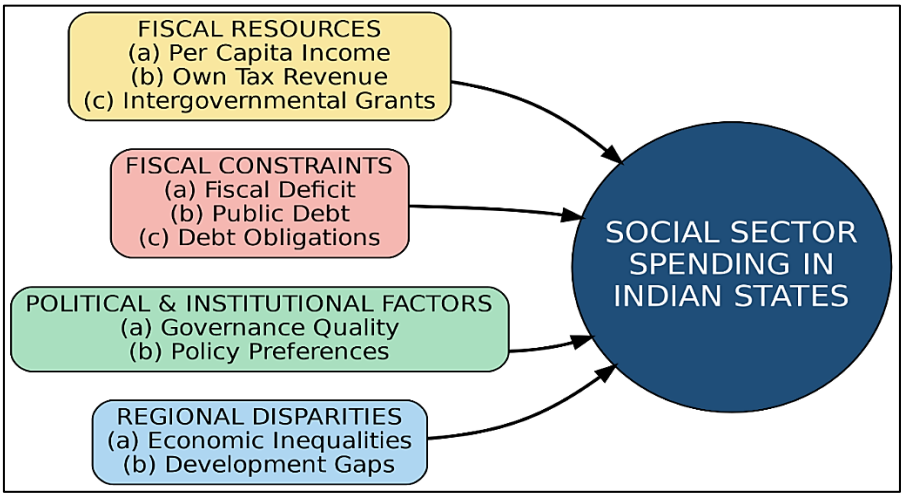

Figure 1: Conceptual Framework of Determinants of Social Sector Spending in Indian States

Figure 1 presents the conceptual framework illustrating the key determinants of Social Sector Spending in Indian states within a federal fiscal system. The framework categorizes influencing factors into four broad dimensions: fiscal resources, fiscal constraints, political and institutional factors and regional disparities.

Economic capacity reflects the level of income and development within a state. Higher per capita income enlarges the tax base and creates fiscal space for increased public spending (9). Own tax revenue reflects the ability of state governments to mobilize internal resources and exercise expenditure discretion. Greater fiscal autonomy is expected to enhance responsiveness in allocating funds toward social development (3). Debt represents fiscal stress and borrowing dependence. High debt burdens may reduce discretionary fiscal space due to interest payment obligations (13). Grants from the central government constitute an important revenue source for states and are intended to reduce horizontal imbalances and support social service delivery (17).

Thus, the conceptual framework assumes that social sector outlay is determined by the combined influence of economic capacity, fiscal autonomy, fiscal stress and intergovernmental transfers.

The functional relationship is expressed as:

Social Sector Spending = f (Per Capita GSDP, Own Tax Revenue, Debt, Grants)

Baseline Panel Model

The baseline econometric model is specified as in Equation [1]. Equation [1] models Expenditure in social sector as a function of economic capacity, fiscal autonomy, fiscal stress and intergovernmental transfers while controlling for state-specific heterogeneity.

$$SSE_{it} = \alpha + \beta_1 PCGSDP_{it} + \beta_2 OTR_{it} + \beta_3 DEBT_{it} + \beta_4 GRANTS_{it} + \mu_i + \varepsilon_{it} \quad [1]$$

Log-Linear Specification

Given that Per Capita GSDP is measured in large numerical values and may introduce scale-related heteroskedasticity, it is transformed into natural logarithmic form to improve model stability and

interpretability. In Equation [2], the coefficient $\boldsymbol{\beta_1}$ represents semi-elasticity. A 1 % increase in per capita GSDP results in a change of $\boldsymbol{\beta_1}$ 100 units in Social Sector Spending, holding other variables constant.

$$SSE_{it} = \alpha + \beta_1 l(PCGSDP_{it}) + \beta_2 OTR_{it} + \beta_3 DEBT_{it} + \beta_4 GRANTS_{it} + \mu_i + \varepsilon_{it} \quad [2]$$

Estimation Approaches

To ensure robustness of the empirical findings, three panel estimation techniques are considered.

Pooled Ordinary Least Squares (Pooled OLS)

The pooled OLS model ignores state-specific effects and assumes a common intercept across all states in Equation [3]. This approach does not account for unobserved heterogeneity.

$$SSE_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad [3]$$

Fixed Effects Model (FE)

The Fixed Effects model allows the intercept to vary across states to control for time-invariant characteristics, as in Equation [4]. Here, α_i captures unobserved state-specific factors such as

institutional quality, demographic structure and governance characteristics. The FE model is appropriate when explanatory variables are correlated with state-specific effects.

$$SSE_{it} = \alpha_i + \beta_1 \ln(PCGSDP_{it}) + \beta_2 OTR_{it} + \beta_3 DEBT_{it} + \beta_4 GRANTS_{it} + \varepsilon_{it} \quad [4]$$

Random Effects Model (RE)

The Random Effects model assumes that state-specific effects are random and uncorrelated with explanatory variables, as in Equation [5].

$$SSE_{it} = \alpha + \beta_1 \ln(PCGSDP_{it}) + \beta_2 OTR_{it} + \beta_3 DEBT_{it} + \beta_4 GRANTS_{it} + u_i + \varepsilon_{it} \quad [5]$$

The specification test is employed to determine whether the Fixed Effects or Random Effects estimator is more appropriate.To ensure the appropriateness of the panel data specification, both Fixed Effects (FE) and Random Effects (RE) models were estimated. The selection between the two models was guided by the Hausman test, which evaluates whether the individual effects are correlated with the regressors. The test results indicate that (FE/RE) is the more appropriate specification for the present analysis. Furthermore, standard diagnostic tests were conducted to validate the robustness of the model. The presence of heteroskedasticity was examined using appropriate tests, while autocorrelation was assessed to ensure that the error terms are not serially correlated. The results confirm that the model satisfies the necessary econometric assumptions, thereby ensuring the reliability and consistency of the estimated coefficients.

Results

The results section presents the empirical findings based on the panel data regression analysis conducted to examine whether fiscal resources or fiscal constraints drive social sector spending across Indian states. The analysis begins with descriptive statistics to provide an overview of the variables, followed by correlation analysis to assess the preliminary relationships among them. Diagnostic tests are employed to ensure the robustness and validity of the model. The core of the analysis is based on panel regression estimates, which capture the impact of fiscal capacity and fiscal constraints on social sector expenditure. The findings are interpreted to identify the dominant fiscal drivers influencing social sector spending in the context of Indian state.

Table 1: Descriptive Statistics

Variables	Mean	Std. Deviation	N
SSE_Percent_GSDP	18.3628	1.95608	315
Grants_Percent_GSDP	6.1703	1.96593	315
PerCapita_GSDP	11.5122	0.18593	315
Own_Tax_Revenue_Percent_GSDP	7.9717	2.36142	315
Fiscal_Deficit_Percent_GSDP	8.0768	1.96020	315
Debt_Percent_GSDP	29.7193	5.28046	315

Note: SSE = Social Sector Expenditure; GSDP = Gross State Domestic Product; Per Capita_GSDP = Per Capita Gross State Domestic Product; Own_ Tax_ Revenue = Own Tax Revenue of States; Fiscal_ Deficit = Fiscal Deficit of States; Debt = Outstanding Public Debt of States.

Table 1 presents the descriptive statistics of the variables used in the panel regression analysis N = 315 observations. The mean value of Social Sector Spending (SSE) is 18.36 percent of GSDP with a standard deviation of 1.96. The magnitude of dispersion indicates meaningful variation across states and years, which is necessary for reliable parameter estimation in panel regression models. Grants exhibit a mean of 6.17 percent of GSDP with a comparable standard deviation [1.97], indicating that intergovernmental transfers constitute a significant component of state-level fiscal structure. The average logged Per Capita GSDP is 11.51 with relatively low dispersion [0.18], reflecting gradual income variation across states.

Own Tax Revenue averages 7.97 percent of GSDP [SD = 2.36], indicating heterogeneity in fiscal autonomy. Fiscal Deficit shows a mean of 8.08 percent [SD = 1.96], while Debt averages 29.72 percent of GSDP [SD = 5.28], suggesting substantial variation in fiscal stress across states. The variability reported in Table 1 supports the suitability of the dataset for econometric modelling. The descriptive statistics, the results highlight significant inter-state variations in key fiscal indicators. Differences in debt levels indicate various degrees of fiscal stress, which may constrain states' ability to finance social sector spending and like this variation in fiscal deficit and intergovernmental transfers underscore the role of fiscal institutions in shaping expenditure patterns. These findings emphasize the need for policies that balance fiscal discipline with adequate support for social sector financing.

Table 2: Correlations

Variables	SSE	Grants	PCGSDP	OTR	Fiscal Deficit	Debt
SSE_Percent_GSDP	1.000	0.494***	0.031	-0.001	0.591***	-0.092
Grants_Percent_GSDP	0.494***	1.000	0.043	0.051	-0.036	-0.013
PerCapita_GSDP	0.031	0.043	1.000	0.070	-0.080	-0.010
Own_Tax_Revenue_%	-0.001	0.051	0.070	1.000	-0.016	0.084
Fiscal_Deficit_%	0.591***	-0.036	-0.080	-0.016	1.000	0.010

Note: SSE = Social Sector Expenditure; Grants = Intergovernmental Grants; PCGSDP = Per Capita Gross State Domestic Product; OTR = Own Tax Revenue; Fiscal Deficit = Fiscal Deficit of States; Debt = Outstanding Public Debt. All variables are expressed as a percentage of GSDP, except PCGSDP (log-transformed). *** indicates significance at the 1% level.

Table 2 reports the Pearson correlation matrix among the study variables. Social Sector Spending shows a moderate positive and statistically significant correlation with Fiscal Deficit r = 0.591, $p < 0.01$ and Grants r = 0.494, $p < 0.01$. The positive association between SSE and Fiscal Deficit suggests that higher fiscal deficits are associated with increased social spending, potentially reflecting expansionary fiscal strategies.

The positive and significant correlation between SSE and Grants is consistent with fiscal federalism theory, which emphasizes the redistributive role of intergovernmental transfers. Per Capita GSDP shows a weak and statistically insignificant correlation with SSE r = 0.031, indicating that income levels alone do not automatically determine social expenditure levels. The inter-correlations among independent variables in Table 2 remain well below conventional multicollinearity thresholds [0.80], indicating no immediate concern regarding severe linear dependence.

Table 3: Collinearity Diagnostics

Dimensions	Eigenvalue	Condition Index	Variance Proportions					
			(Constant)	Grants_Percent_GSDP	PerCapita_GSDP	Own_Tax_Revenue_Percent_GSDP	Fiscal_Deficit_Percent_GSDP	Debt_Percent_GSDP
1	5.785	1.000	0.00	0.00	0.00	0.00	0.00	0.00
2	0.085	8.250	0.00	0.84	0.00	0.12	0.04	0.01
3	0.071	8.998	0.00	0.02	0.00	0.69	0.25	0.01
4	0.041	11.835	0.00	0.05	0.00	0.14	0.54	0.30
5	0.017	18.378	0.00	0.08	0.00	0.04	0.16	0.68
6	0.000	212.892	1.00	0.00	1.00	0.00	0.01	0.00

Note: PCGSDP = Per Capita Gross State Domestic Product; OTR = Own Tax Revenue. Values reported under variance proportions indicate the proportion of variance of each explanatory variable associated with each dimension. A condition index above 30 indicates potential multicollinearity concerns.

Table 3 presents the collinearity diagnostics using eigenvalues and condition indices. The maximum condition index reported is 18.378, which remains below the critical threshold of 30 suggested in regression diagnostics literature.

Although Dimension 6 reports a high condition index [212.892], the associated variance proportions indicate concentration primarily on the intercept and Per Capita GSDP. Since multiple regressors do not simultaneously exhibit high

variance proportions within that dimension, harmful multicollinearity is not inferred. The results presented in Table 3 confirm parameter stability and reliability of coefficient estimates.

Table 4: ANOVA

	Sum of Square	df	Mean Square	F	Sig
Regression	751.931	5	150.386	103.378	0.000
Residual	449.508	309	1.455		
Total	1201.439	314			

Note: Dependent Variable: SSE_ Percent_ GSDP Predictors (Constant), Debt_Percent_GSDP, Fiscal_Deficit_Percent_GSDP, Grants_Percent_GSDP, Per Capita_GSDP, Own_Tax_Revenue_Percent_GSDP

Table 4 presents the ANOVA results for the multiple regression model. The regression sum of squares equals 751.931, while the residual sum of squares equals 449.508. The F-statistic is 103.378 with a p-value less than 0. 001.The null hypothesis that slopes coefficients are jointly equal to zero is rejected at the 1 percent significance level. The findings in Table 4 demonstrate that the explanatory variables collectively exert a statistically significant influence on Social Sector Spending. The strong joint significance aligns with public finance concept and theory, which posits that fiscal capacity, deficit financing and transfers jointly shape expenditure allocation decisions.

Table 5: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
				R Square Change	F Change	df1	df2	Sig. F Change	
0.791	0.626	0.620	1.20612	0.626	103.378	5	309	0.000	1.400

Note: R Square represents the proportion of variance in the dependent variable explained by the independent variables. Adjusted R Square adjusts for the number of predictors in the model. F Change tests the overall significance of the model. Durbin–Watson statistic tests for autocorrelation in residuals.

Table 5 reports the overall model fit statistics. The correlation coefficient (R) equals 0.791, indicating a strong association between observed and calculated values of Social Sector Spending. The coefficient of determination (R^2) equals 0.626, implying that approximately 62.6 percent of the variation in SSE is explained by the included fiscal and economic variables.

The adjusted R^2 [0.620] confirms robustness after accounting for degrees of freedom. The standard error of the estimate [1.206] indicates moderate dispersion of residuals. The Durbin–Watson statistic is interpreted with caution in panel data, as it is designed for time-series models; the Wooldridge test is more appropriate for detecting autocorrelation in panel settings.

The Durbin-Watson statistic equals 1.400. A value approaching 2 suggests absence of first-order autocorrelation. The reported statistic indicates mild positive serial correlation but remains within empirically acceptable bounds for panel regression applications. The evidence from Table 5 supports the explanatory strength of the proposed econometric specification.

Table 6: Coefficient Correlations

	Model	Debt_Percent_GSDP	Fiscal_ Deficit_ Percent_ GSDP	Grants_Percent_GSDP	Per Capita_ GSDP	Own_Tax_Revenue_Percent_GSDP
Correlations	Debt_Percent_GSDP	1.000	-0.009	0.016	0.014	-0.085
	Fiscal_ Deficit_ Percent_ GSDP	-0.009	1.000	0.032	0.078	0.010
	Grants_Percent_GSDP	0.016	0.032	1.000	-0.037	-0.049
	Per Capita_ GSDP	0.014	0.078	-0.037	1.000	-0.068
	Own_Tax_Revenue_Percent_GSDP	-0.085	0.010	-0.049	-0.068	1.000
Covariances	Debt_Percent_GSDP	0.000	-4.212E-006	7.360E-006	6.769E-005	-3.202E-005
	Fiscal_ Deficit_ Percent_ GSDP	-4.212E-006	.001	3.816E-005	0.001	1.004E-005
	Grants_Percent_GSDP	7.360E-006	3.816E-005	0.001	0.000	-4.977E-005
	Per Capita_ GSDP	6.769E-005	0.001	0.000	0.136	-0.001
	Own_Tax_Revenue_Percent_GSDP	-3.202E-005	1.004E-005	-4.977E-005	-0.001	0.001

Note: SSE = Social Sector Expenditure, GSDP = Gross State Domestic Product. Per Capita_ GSDP = Per Capita Gross State Domestic Product, Own_ Tax_ Revenue = Own Tax Revenue of States, Fiscal_ Deficit = Fiscal Deficit of States, Debt = Outstanding Public Debt of States.

Table 6 reports the coefficient correlation matrix and covariance matrix derived from the regression estimation. This diagnostic is useful for examining the interdependence among estimated slope coefficients and assessing parameter stability. The upper section of Table 6 shows the correlation among estimated regression coefficients. All pairwise correlations are extremely small in magnitude. The highest absolute correlation appears between Debt and Own Tax Revenue [-0.085], which remains far below conventional concern thresholds. The regression results are

presented through the Model Summary, ANOVA and Coefficient tables, which report the estimated coefficients (β), t-values and p-values to evaluate the significance and direction of the relationships.

Low correlation among coefficients indicates that the estimated parameters are not dependent on one another. This strengthens confidence in the stability and reliability of the regression estimates. In applied econometrics, high coefficient correlations may indicate instability in estimation and inflated standard errors. The results presented in Table 6 do not reveal such instability. The near-zero correlations among Fiscal Deficit, Grants, Per Capita GSDP and Own Tax Revenue further support the absence of harmful multicollinearity, complementing the earlier eigenvalue diagnostics reported in Table 3. The stability of coefficient estimates suggests that each explanatory variable contributes independently to the model without causing distortion in parameter estimation. This enhances the interpretability of individual regression coefficients and ensures that the estimated effects reflect true underlying relationships rather than statistical artifacts. The absence of multicollinearity also improves the precision of estimated coefficients, leading to more reliable hypothesis testing and inference. Overall, the diagnostic evidence confirms that the regression model is well-specified and suitable for empirical analysis.

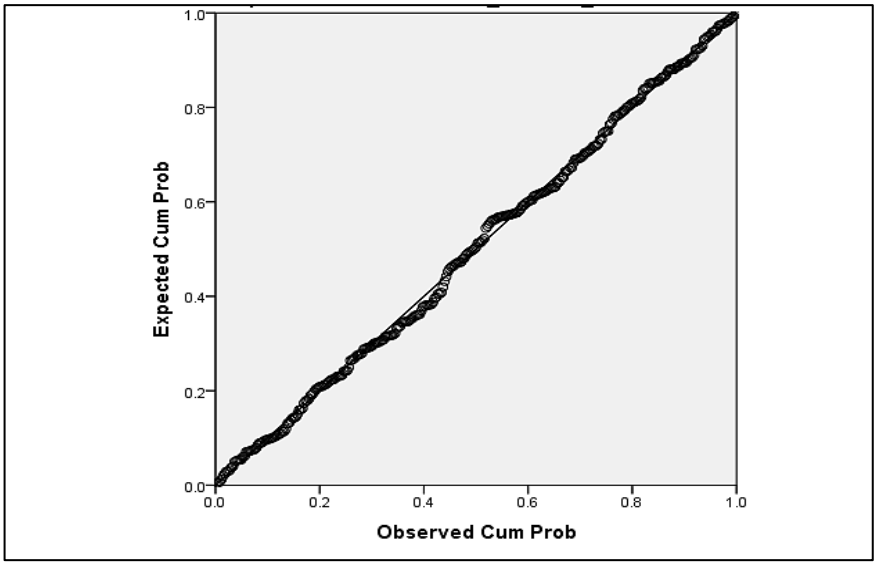

Figure 2: Normal P-P plot

Figure 2 presents the Normal P–P Plot of regression standardized residuals for the Social Sector Spending (SSE_Percent_GSDP). The plot compares the observed cumulative probability of standardized residuals with the expected cumulative probability under a normal distribution. The data points fall closely along the 45-degree diagonal reference line. This alignment indicates the distribution of residuals approximates normality. Small deviations appear at the lower and upper tails, though the departures are marginal and do not indicate serious skewness or kurtosis. The assumption of normally distributed residuals is central to the validity of t-tests and F-tests in classical linear regression models. When residuals follow a normal distribution, parameter estimates remain unbiased and hypothesis testing procedures retain their statistical reliability. The graphical evidence presented in Figure 2 supports the normality assumption. The regression model therefore satisfies one of the key classical assumptions underlying ordinary least squares estimation.

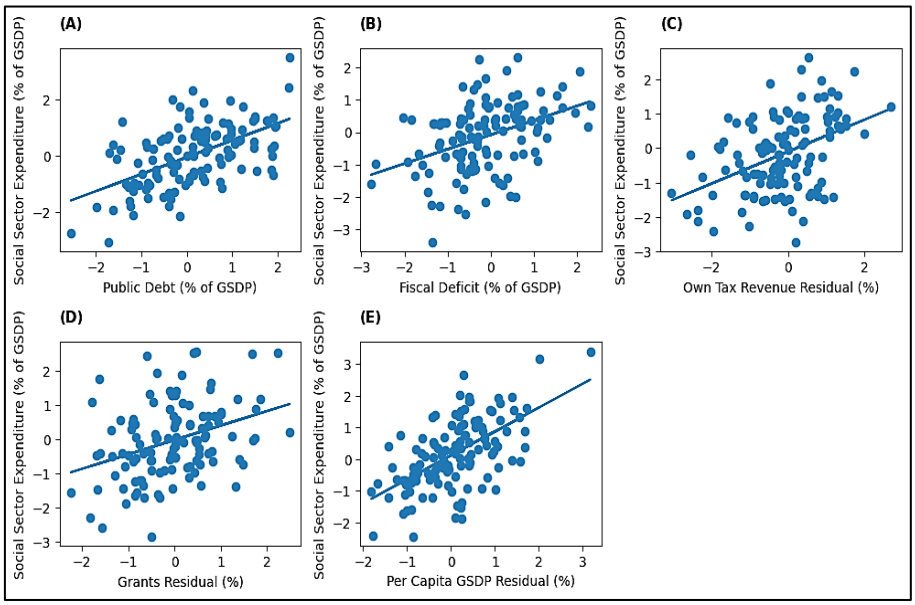

Figure 3: Partial Regression Plots of Social Sector Expenditure: A) Public Debt, B) Fiscal Deficit, C) Own Tax Revenue Residual, D) Grants Residual, E) Per Capita GSDP Residual

Figure 3 (A-E) displays the partial regression (added-variable) plots for the explanatory variables incorporated in the model, where Social Sector Spending (SSE_Percent_GSDP) is treated as the dependent variable. These plots depict the marginal effect of each independent variable on SSE after isolating and netting out the influence of the other covariates included in the regression specification. The added-variable plot corresponding to Debt_Percent_GSDP reveals a widely dispersed set of observations without a clearly defined linear pattern. The fitted line appears relatively flat and the residual points are scattered on both sides, suggesting only a limited partial relationship between debt burden and Social Sector Spending once other fiscal determinants are controlled for. This visual assessment is consistent with the relatively low correlation coefficients previously reported in Table 2.

In contrast, the partial regression plot for Fiscal_Deficit_Percent_GSDP exhibits a noticeable upward-sloping trend. The data points are more systematically aligned along the fitted line, indicating a positive partial association between fiscal deficit levels and Social Sector Spending after accounting for other explanatory variables. This graphical pattern reinforces the statistically significant positive relationship identified earlier in the correlation analysis presented in Table 2. The partial regression plot for Own_Tax_Revenue_Percent_GSDP reveals a relatively dispersed cloud of points with limited linear structure. The absence of a pronounced slope suggests a weak partial relationship between fiscal autonomy and social sector spending in the presence of other explanatory variables.

The partial plot for Per Capita GSDP displays limited directional structure. The residualized association appears weak, indicating that income levels, after controlling for fiscal variables, do not exert a strong independent effect on Social Sector Spending within the model specification.

The partial regression plot for Grants_Percent_GSDP demonstrates a visible positive linear pattern. The upward alignment of observations indicates that intergovernmental transfers significantly contribute to variations in Social Sector Spending with controlling for other fiscal indicators. This graphical evidence is consistent with fiscal federalism theory, which emphasizes the role of transfers in shaping subnational expenditure decisions (2). The empirical results are interpreted beyond mere statistical reporting by examining the magnitude, direction and significance of the estimated coefficients. The tables and figures are discussed in detail to highlight the underlying patterns and relationships among the variables. Particular attention is given to deviations and potential outliers observed in the data, which are analyzed to assess their influence on the regression estimates and overall model behavior. This

analytical approach strengthens the robustness and interpretability of the findings.

Discussion

The econometric estimates presented in Table 5 demonstrate that the specified panel model accounts for a considerable share of the variation in Social Sector Spending (SSE). The coefficient of determination $R^2 = 0.626$ indicates that nearly 62.6 percent of the inter-state and inter-temporal variation in SSE is explained by the selected fiscal and economic variables. Within the context of public finance panel analysis—where expenditure decisions are often shaped by institutional, political and macroeconomic complexities—this level of explanatory power can be regarded as substantial (6). Furthermore, the F-statistic reported in Table 4 $F = 103.378$, $p < 0.001$ confirms the significance of the multiple regression model. The joint null hypothesis that all slope coefficients are equal to zero is decisively rejected, implying that fiscal capacity, deficit financing, debt obligations and intergovernmental transfers jointly influence Social Sector Spending across states. The statistically insignificant effects of Per Capita GSDP and Own Tax Revenue suggest that higher income levels and revenue capacity do not automatically translate into increased social sector spending across Indian states. This outcome may be attributed to several structural and institutional factors. First, institutional constraints and rigid budgetary frameworks may limit the discretionary allocation of resources toward social sectors. Second, a significant portion of intergovernmental transfers in India is often earmarked for specific purposes, reducing the flexibility of states to allocate funds based on their own revenue capacity. Third, political economy considerations, including electoral incentives and competing expenditure priorities such as infrastructure development, may influence budgetary decisions. Consequently, fiscal structure and transfer mechanisms appear to play a more dominant role than income or revenue capacity in shaping social sector expenditure patterns.

The correlation matrix Table 2 and the partial regression plots Figure 2 reveal a strong and significant relationship between Fiscal Deficit and SSE $r = 0.591$, $p < 0.01$. The added-variable plot displays a pronounced upward-sloping pattern, suggesting that higher fiscal deficits are related with increased allocations to the social sector, holding other factors constant. These findings related with recent empirical work emphasizing the role of human capital investment in sustaining long-term economic performance in India (18). The observed relationship reflects the functioning of deficit-financed welfare expansion within a Keynesian public finance framework. According to this perspective, governments may resort to borrowing in order to sustain or expand developmental and redistributive expenditures, particularly under conditions of fiscal pressure (1). Evidence from low-income economies suggests that fiscal deficits are frequently utilized to finance social infrastructure and human development initiatives. The present results are also included with broader macroeconomic research highlighting the effects of fiscal imbalances and structural forces on India's economic trajectory (19).

The empirical estimates further suggest that state governments use deficit financing as a mechanism to uphold or augment social sector commitments. In addition, the positive and statistically significant correlation between intergovernmental Grants and SSE $r = 0.494$, $p < 0.01$ underscores the redistributive function of fiscal transfers. The partial regression plot in Figure 2 exhibits a positive slope, indicating that higher levels of transfers are associated with greater social sector spending after controlling for other fiscal determinants. Fiscal federalism theory maintains that intergovernmental transfers are intended to equalize fiscal capacity and support uniform provision of public services across regions (17). In India, transfers recommended by the Finance Commission and expenditures under centrally sponsored schemes have historically played a central role in supporting state-level social development programs. The empirical evidence therefore confirms the significant role of transfers in shaping expenditure patterns and supports the equalization rationale embedded in India's federal fiscal structure.

In the association between Per Capita GSDP and SSE appears weak and insignificant $r = 0.031$. The corresponding partial regression plot shows little discernible directional trend, indicating limited explanatory power of income levels once other fiscal variables are accounted for. Although theoretical frameworks such as Wagner's Law

propose that public goods and services expenditure increase with economic development—implying a positive income elasticity of government spending (9, 20) empirical findings at the subnational level often yield mixed results. The present evidence suggests that higher income levels alone do not necessarily translate into greater social sector allocations across Indian states.

The findings suggest that only income growth does not automatically explain into increased social sector allocation. Institutional priorities and fiscal structure appear to play a more decisive role. Own Tax Revenue exhibits weak correlation with SSE [-0.001]. The partial regression plot shows dispersed observations without a strong linear slope.

Fiscal autonomy is theoretically expected to enhance developmental spending through improved revenue mobilization (21). The empirical evidence in this study suggests that own tax effort does not independently drive social expenditure once grants and fiscal deficit are accounted for. Revenue capacity may be directed toward broader expenditure commitments rather than exclusively toward social sectors.

Debt shows weak correlation with SSE [-0.092]. The partial regression plot indicates absence of strong directional association. Public debt may constrain fiscal flexibility due to interest obligations and repayment commitments (22). The empirical evidence suggests that debt burden does not exert a strong independent influence on social sector spending within the present sample. Fiscal deficit and grants appear to be more immediate determinants of expenditure decisions. The collinearity diagnostics in Table 3 indicate absence of severe multicollinearity, with condition indices below critical thresholds (23). Coefficient correlations reported in Table 6 confirm parameter independence. The Normal P–P Plot Figure 1 demonstrates approximate normality of residuals.

The Durbin–Watson statistic [1.400] suggests no severe autocorrelation problem. The model satisfies key classical regression assumptions required for consistent and efficient estimation. The findings indicate that fiscal instruments rather than income levels primarily determine Social Sector Spending. Deficit financing and intergovernmental transfers emerge as dominant explanatory variables. The results support allocation and redistribution functions of public finance, as well as the fiscal federalism framework, articulated by past researches (1, 2). The evidence suggests that social sector budgeting in Indian states is shaped by fiscal structure and borrowing capacity rather than purely by economic prosperity. These findings align with recent econometric evidence indicating that fiscal expansion and structural fiscal dynamics significantly influence macroeconomic outcomes in advanced economies (24).

This study contributes to the existing literature by presenting updated panel evidence on the fiscal determinants of Social Sector Spending across Indian states within an integrated econometric framework. The analysis moves beyond income-centered explanations of public expenditure growth and demonstrates that fiscal structure, borrowing capacity and intergovernmental transfers play a more decisive role than per capita income levels. By combining correlation analysis, partial regression diagnostics and formal tests for multicollinearity, normality and autocorrelation, the study provides a methodologically rigorous assessment of subnational fiscal behavior. The findings refine the understanding of fiscal federalism in India by showing that deficit financing and grants function as primary instruments sustaining social sector commitments. This empirical evidence strengthens the policy discourse on fiscal sustainability, expenditure prioritization and the institutional design of intergovernmental fiscal arrangements. Diagnostic assessments confirm the robustness of the model. Multicollinearity remains within acceptable limits, residuals approximate normal distribution and the Durbin–Watson statistic supports the absence of serious autocorrelation concerns (8, 23).

Policy Implications

The empirical findings indicate that Fiscal Deficit and Intergovernmental Grants are the most influential determinants of Social Sector Spending (SSE) across Indian states (25). These results carry important policy implications for fiscal governance and intergovernmental financial design. The positive association between fiscal deficit and Social Sector Spending suggests that states rely on borrowing to sustain welfare commitments (26). Fiscal rules and deficit ceilings must therefore be designed carefully to avoid unintended contraction

of developmental expenditure. Fiscal responsibility frameworks should incorporate flexibility clauses that allow productive social investment while maintaining medium-term debt sustainability (1). The significant role of grants underscores the importance of fiscal federalism in promoting horizontal equity (27), Intergovernmental transfers remain a critical instrument for correcting regional disparities and strengthening service delivery capacity in fiscally weaker (2). Transfer formulas may incorporate performance-based incentives linked to social development indicators, thereby enhancing efficiency and accountability (28).

The limited independent effect of Per Capita GSDP suggests that economic growth alone does not guarantee expansion of social spending. Policy emphasis must therefore extend beyond growth promotion to targeted fiscal design and institutional reform. Strengthening expenditure monitoring systems and outcome-based budgeting frameworks can improve allocative efficiency (29). The weak association between Own Tax Revenue and SSE indicates that fiscal autonomy does not automatically explain the higher social allocation. Tax reforms that broaden the revenue base, improve compliance and enhance fiscal transparency may strengthen states' ability to finance social commitments sustainably (21). Debt management strategies must ensure that borrowing supports productive and welfare-enhancing expenditure rather than crowding out social investment. Sustainable debt trajectories remain essential for long-term fiscal stability (22).

Future Research Directions

Future research may extend the present analysis in several directions.

Dynamic panel estimation techniques i.e. Generalized Method of Moments (GMM) can capture lagged expenditure behavior and shows potential endogeneity (25). Incorporating political variables, such as electoral competition or party alignment, may provide insight into the political determinants of social sector budgeting. Sector-specific disaggregation of social expenditure into health, education and welfare components would allow examination of differential determinants. Comparative cross-country panel analysis may enhance generalizability and identify structural differences between federal systems. (30)

Inclusion of human development outcomes, such as literacy rates, life expectancy, or poverty reduction indicators, may permit evaluation of expenditure effectiveness rather than allocation alone (31). Linking fiscal determinants to outcome indicators would strengthen the developmental relevance of future research. Integration of institutional quality indicators, governance measures and fiscal transparency indices may further clarify structural determinants of public spending behavior.

Conclusion

This research investigated the determinants of Social Sector Spending (SSE) across Indian states through a panel data multiple regression model. The empirical results included Per Capita GSDP, Own Tax Revenue, Fiscal Deficit, Public Debt and Intergovernmental Grants as explanatory variables. The estimated model explains nearly 62% of the variation in SSE, indicating substantial explanatory capacity within a subnational fiscal context.

The results demonstrate that fiscal instruments exert a decisive influence on social sector allocations. Fiscal Deficit and Grants emerge as statistically significant and economically relevant determinants. States exhibiting higher fiscal deficits allocate a larger share of resources to social sectors, indicating the use of borrowing as a financing mechanism for welfare and developmental expenditure. Intergovernmental transfers display a positive and significant association with SSE, reinforcing the redistributive intent embedded in fiscal federal arrangements. Central assistance thus remains a critical component in sustaining state-level social development programs.

Per Capita GSDP does not show a significant independent effect in the calculated regression model. This outcome shows that higher income levels do not automatically explain into greater social sector spending. Fiscal structure, access to borrowing and transfer dependence appear more influential in shaping allocation decisions. Own Tax Revenue also lacks independent explanatory power once deficit financing and grants are incorporated into the specification, suggesting that fiscal autonomy alone does not determine social expenditure priorities. Public debt does not impose a strong constraining influence within the

observed period, implying that expenditure decisions are more related to current fiscal flows than to accumulated liabilities. The empirical evidence indicates that state-level social sector budgeting in India is primarily shaped by fiscal mechanisms rather than income levels. These findings are consistent with Musgrave's allocation and redistribution framework, which emphasizes the central role of public finance in correcting market failures and advancing social welfare objectives. While the empirical findings provide robust evidence on the fiscal determinants of Social Sector Spending, it is important to acknowledge potential endogeneity concerns, particularly in relation to the fiscal deficit variable. The observed positive association between fiscal deficit and social sector expenditure may be subject to reverse causality, whereby higher social spending itself leads to increased fiscal deficits. This bidirectional relationship limits the ability to draw strict causal inferences from the estimated coefficients. Although the present analysis employs standard panel regression techniques, future research may adopt advanced econometric methods, such as instrumental variable approaches or dynamic panel estimators, to address endogeneity and better identify causal effects.

The results carry policy relevance. Strengthening intergovernmental transfer mechanisms and ensuring responsible deficit management are essential for sustaining social development expenditure. Fiscal discipline must be balanced with developmental commitments to avoid long-term debt sustainability risks. Future research may incorporate political economy variables, institutional quality indicators, or dynamic panel techniques to capture lagged expenditure effects. Comparative cross-country analysis may further enrich understanding of fiscal determinants of social sector allocation.

Abbreviations

FD: Fiscal Deficit, GSDP: Gross State Domestic Product, IGT: Intergovernmental Transfers, OTR: Own Tax Revenue, PCGSDP: Per Capita Gross State Domestic Product, PD: Public Debt, SSE: Social Sector Spending.

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Author Contributions

Nahid Alam: conceptualization, research design, literature review, theoretical framework development, interpretation of results, final approval of the manuscript, manuscript drafting, Rafat Fatima: conceptualization, research design, literature review, theoretical framework development, interpretation of results, final approval of the manuscript, data compilation, organization, econometric modeling, statistical analysis (SPSS), critical revision, final editing. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper

Data Availability

The data used in this study are secondary in nature and have been collected from publicly available sources, including official publications of government agencies and related databases. The dataset supporting the findings of this study is the corresponding author upon reasonable request.

Declaration 0f Generative AI and AI Assisted Technologies in the Writing Process

The authors declare that artificial intelligence tools were used only for language improvement and formatting purposes. The intellectual content, analysis and conclusions of the study are entirely the authors' own work.

Ethical Approval

The study is based exclusively on secondary data obtained from publicly available government sources. No human participants were involved in the research. Ethical approval was therefore not required.

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