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DOES FISCAL DEFICIT CONSTRAIN PUBLIC HEALTH EXPENDITURE? EVIDENCE FROM HARYANA

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Abstract
This study analyses the correlation between fiscal deficit trends and public health spending in the Indian state of Haryana from 2004–05 to 2023–24. The paper employs a state-level time series derived from RBI State Finances data to estimate various econometric models, evaluating the extent to which fiscal stress limits health expenditure. These encompass ratio-based models, log-linear income models, lagged deficit assumptions, and disaggregated assessments of revenue and capital health expenditures.
The findings demonstrate that the fiscal deficit, expressed as a percentage of Gross State Domestic Product (GSDP), does not have a significant or consistent impact on health expenditure in Haryana. Although there is modest evidence of a lagged adverse impact of fiscal deficit on health expenditure proportions in certain parameters, the connection lacks statistical stability. Conversely, economic size serves as the primary factor influencing health expenditure: health spending is significantly income-elastic, rising more than proportionately with GSDP.
The findings indicate that public health expenditure in Haryana is predominantly shielded from short-term fiscal volatility and is primarily influenced by economic growth and institutional budgeting procedures, rather than by deficit circumstances. The study enhances the literature by offering a long-term, state-specific analysis that contests the notion that fiscal space solely dictates health expenditure results. The policy implications underscore the necessity of growth-linked income enhancement and institutional prioritisation of health, rather than dependence on deficit alleviation, to attain enduring advancements in health finance.

1. Introduction

Public spending on health is acknowledged as a vital factor influencing population health outcomes, human capital development, and sustained economic growth. In low- and middle-income nations, public health expenditure has traditionally been restricted by inadequate fiscal capacity, conflicting budgetary objectives, and apprehensions regarding macroeconomic stability. These limits have prompted politicians and international institutions to highlight the notion of fiscal space for health—the capacity of governments to augment health expenditure without compromising fiscal sustainability (Heller, 2005; Tandon & Cashin, 2010).

A fundamental premise in this discussion is that the fiscal imbalance serves as a limiting factor on public health spending. From this viewpoint, fiscal hardship is anticipated to constrict social-sector expenditure, but alleviated deficit conditions may allow for expansion. This rationale has acquired increased significance following successive economic disruptions, escalating health demands, and intensified budgetary consolidation pressures in both advanced and emerging nations (Karanikolos et al., 2013; IMF, 2019).

The empirical data regarding the relationship between deficits and health spending remains equivocal. International research on austerity and fiscal consolidation, especially in Europe, frequently identifies decreases in health and social expenditures during adjustment periods (Castro, 2017; Reeves et al., 2015). A considerable amount of research contends that health expenditure is comparatively safeguarded due to its political significance, institutional inflexibility, and long-term obligations, thus diminishing the impact of short-term fiscal pressures on health budgets (Alesina & Perotti, 1996; Barroy et al., 2021).

Concurrently, extensive and consistent literature identifies economic capability or income as the most significant predictor of public health expenditure. Commencing with initial cross-national studies (Newhouse, 1977) and progressing to contemporary panel and cointegration analyses (Hitiris & Posnett, 1992; Baltagi & Moscone, 2010), research indicates that health expenditure is significantly income-elastic, frequently increasing more than proportionately with income. The

income-dominance hypothesis has also been validated in the contexts of poor countries (Xu et al., 2011; Gupta et al., 2007).

In India, evidence at the state level predominantly corroborates this perspective. Numerous studies utilising panel data indicate that Gross State Domestic Product (GSDP) or per-capita income serves as a statistically significant and economically substantial predictor of public health expenditure, whereas fiscal deficit indicators frequently demonstrate weak or inconsistent effects (Hooda, 2015; Behera, 2019; Neethu & Joseph, 2024). The findings indicate that health expenditure decisions may be influenced more by revenue potential and economic expansion than by immediate budgetary balances.

Notwithstanding these discoveries, two significant gaps persist in the research. Primarily, the majority of current research depends on cross-state panel data, potentially masking state-specific institutional dynamics, fiscal frameworks, and political economic variables. Secondly, there is a paucity of research that explicitly examines various conceptual channels—income effects, fiscal deficit effects (including lagged adjustments), and spending composition—within a unified empirical framework.

This study examines these deficiencies through an extensive, state-specific time-series analysis of Haryana from 2004–05 to 2023–24. Haryana exemplifies an analytically significant case: it is one of India's higher-income states, has seen recurrent instances of fiscal strain and consolidation, and nonetheless maintains a comparatively low public health expenditure relative to its economic output. This combination renders Haryana ideal for assessing whether fiscal deficit significantly limits health expenditure while accounting for economic capability and institutional considerations.

The paper poses a specific research inquiry: Does the fiscal deficit serve as a limiting factor on public health expenditure in Haryana, or is health spending predominantly influenced by economic growth and budgetary institutions?

This paper addresses the question by estimating various econometric models that represent health expenditure in theoretically justified forms: (i) as a percentage of GSDP, reflecting spending intensity; (ii) in logarithmic levels, indicating income elasticity; (iii) as a fraction of total government expenditure, illustrating budgetary prioritisation; and (iv) divided into revenue and capital components to evaluate asymmetric fiscal adjustment. The fiscal deficit is assessed in relation to GSDP and is incorporated both simultaneously and with a delay to account for postponed institutional reactions.

The results indicate that fiscal imbalance is not a significant factor of public health expenditure in Haryana. Although some parameters exhibit minimal evidence of lagged fiscal effects, health expenditure is predominantly influenced by economic growth, with income elasticity surpassing one. The findings indicate that fiscal deficit is an inadequate and simplistic metric for assessing fiscal space for health at the state level, with institutional and growth-related factors exerting a more significant influence on health expenditure outcomes.

This research enhances the literature on fiscal space and health financing by offering state-specific, long-term evidence that elucidates the constraints of deficit-based theories and underscores the significance of economic and institutional factors in sub-national public health expenditure.

2. Literature Review

2.1 Income and Economic Capacity as Core Determinants of Health Expenditure

A substantial and consistent body of literature indicates income or economic capacity as the primary factor of public health expenditure. Initial cross-country research indicated that disparities in national income account for a significant portion of the variances in health expenditure among nations (Newhouse, 1977). Subsequent panel and cointegration analyses for OECD nations have validated that health expenditure exhibits significant income elasticity, frequently exceeding one, indicating that health is a "luxury" or income-elastic public good (Hitiris & Posnett, 1992; Baltagi & Moscone, 2010).

This income-centric rationale has been applied to developing and emerging nations, where fiscal capacity, rather than transient fiscal balances, is identified as the determinant of public health

expenditure (Xu et al., 2011; Gupta et al., 2007). In the Indian context, various state-level studies indicate that Gross State Domestic Product (GSDP) or per capita income is a statistically significant and economically substantial predictor of health expenditure, whereas fiscal deficit indicators frequently demonstrate weak or unstable effects (Hooda, 2015; Neethu & Joseph, 2024; Behera, 2019).

This literature directly supports the log-linear specification, wherein total health expenditure is regressed on log(GSDP) in conjunction with fiscal deficit indicators. If income predominates in health expenditure decisions, the coefficient on GSDP should be substantial and statistically significant, whereas fiscal deficit variables may diminish in explanatory power once income is accounted for.

2.2 Fiscal Space and Deficit-Based Constraints: Theory and Mixed Evidence

The notion of fiscal space for health serves as the primary theoretical rationale for analysing fiscal deficit as a factor influencing health expenditure. Fiscal space frameworks contend that a government's capacity to augment health expenditure is contingent upon macroeconomic stability, debt sustainability, and deficit dynamics (Heller, 2005; Tandon & Cashin, 2010). From this viewpoint, elevated budget deficits are anticipated to limit discretionary expenditures in the social sector, particularly healthcare.

The empirical evidence on this route is inconclusive. Cross-national analyses of fiscal consolidation and austerity measures—especially in Europe—indicate that fiscal adjustments frequently correlate with decreases in health and social expenditures (Castro, 2017; Karanikolos et al., 2013; Reeves et al., 2015). Comparable findings are shown in international panel studies that associate expenditure-driven austerity with reductions in social-sector funding (Lahiani et al., 2022; Blossey, 2025).

Simultaneously, numerous studies warn that deficit-based measures alone may inadequately reflect effective fiscal space. Revenue capacity, institutional frameworks, and expenditure constraints often influence the effect of fiscal stress on sectoral allocations (Gupta et al., 2007; IMF, 2019). In several instances, health expenditures are politically safeguarded or administratively inflexible, constraining their adaptability to immediate fiscal demands.

This literature supports the ratio-based approach, wherein health expenditure as a proportion of GSDP is regressed against the fiscal deficit–GSDP ratio. If fiscal stress directly limits health expenditure, a negative and significant coefficient should be evident. Nonetheless, due to inconclusive evidence, the correlation may be tenuous or volatile.

2.3 Budgetary Rigidities and Lagged Fiscal Effects

A key drawback of current deficit-spending models is their inability to consider budgetary inertia and lagged adjustments. Public budgets, especially in the healthcare sector, exhibit inflexibilities due to compensation obligations, entitlement-driven initiatives, and centrally funded programs. Consequently, expenditure reactions to fiscal stress may manifest with a delay rather than immediately (Alesina & Perotti, 1996; Rao & Singh, 2005).

In the context of Indian states, fiscal adjustment is typically incremental and negotiated, with expenditure reduction transpiring over several budget cycles rather than within a single fiscal year. Audit and institutional analyses of state finances reveal the prevalence of committed expenditures and constrained short-term flexibility (CAG, various years; RBI, various years).

This body of work explicitly supports the incorporation of lagged fiscal deficit variables. A notable lagged effect indicates that fiscal stress affects health expenditure decisions with a delay, aligning with institutional budgeting processes rather than instantaneous fiscal crowding-out.

2.4 Revenue versus Capital Health Expenditure: Asymmetric Adjustment

An other significant finding from the public finance literature is that not all categories of expenditure react symmetrically to fiscal stress. In times of fiscal consolidation, governments frequently safeguard revenue expenditures while reducing capital expenditures, which are regarded as more discretionary (Alesina & Perotti, 1996; OECD, 2014). Empirical research from both advanced and developing economies indicates that capital expenditure is generally the initial area of fiscal adjustment.

This distinction is especially pertinent in health financing. Revenue spending encompasses salaries, pharmaceuticals, and operating expenses, which are politically sensitive and administratively inflexible. In contrast, capital expenditure encompasses infrastructure and equipment, which may be deferred during periods of budgetary strain (Baicker & Staiger, 2005).

State-level studies in India present inconclusive findings: certain states modify capital health expenditures in response to fiscal constraints, whereas others demonstrate consistently low capital allocations, limiting potential for future adjustments (Hooda, 2015; Behera, 2019).

This literature supports the use of disaggregated models, wherein revenue and capital health expenditures are examined independently. If fiscal stress influences the mix of health expenditures, capital outlays should have a more pronounced response than operational expenditures.

2.5 Fiscal Federalism, Transfers, and Weak Deficit Transmission

A significant challenge in correlating fiscal deficits with health expenditure stems from India's federal fiscal framework. State health expenditure is affected by its own revenues and borrowing, as well as intergovernmental transfers and centrally supported programs. An expanding body of literature indicates that central transfers can either enhance state spending or replace states' own expenditures, contingent upon their form and incentives (Rao et al., 2013; Raj, 2024; Choudhury, 2020).

In fiscally robust states, dependence on internal resources may diminish the correlation between fiscal deficit and sectoral expenditure, as spending decisions are influenced more by political priorities and institutional conventions than by immediate fiscal limitations.

This work elucidates why fiscal deficit factors may seem statistically insignificant despite the presence of fiscal stress. It offers an institutional rationale for the feeble deficit coefficients observed in state-level regressions.

2.6 Synthesis and Research Gap

The research indicates three competing yet complimentary strategies.

1. Income-driven growth of healthcare expenditure (predominant and resilient).
2. Contraction driven by fiscal stress, potentially exhibiting delays and asymmetries.
3. Institutional and federal elements that undermine the connections between mechanical deficit spending.

Although cross-country and panel studies yield significant insights, they frequently mask state-specific dynamics. Evidence is scarce from long-horizon, single-state time-series analysis that concurrently examines income effects, fiscal deficit effects (with lags), and expenditure composition within a coherent empirical framework.

This analysis fills the gap by employing several theoretically grounded specifications in Haryana, facilitating a more precise evaluation of whether fiscal deficit serves as a binding constraint on public health expenditure when income and institutional factors are considered.

3. Research Methodology

3.1 Empirical Strategy

This study aims to evaluate if the fiscal deficit serves as a limiting factor on public health expenditure in Haryana, while differentiating fiscal impacts from income-related and institutional determinants of spending. The empirical approach is informed by the fiscal space literature, which underscores that macro-fiscal measures, such as fiscal deficit, constitute but one aspect of governments' ability to augment priority expenditures (Heller, 2005; Tandon & Cashin, 2010; Gupta et al., 2007).

In accordance with this approach, the fiscal deficit is regarded in this study as a partial and imperfect indicator of fiscal space, rather than a holistic assessment. Decisions on health expenditure are anticipated to consider not only fiscal balances but also economic capability, institutional constraints, and budgetary prioritising. The analysis utilises various complementary model descriptions, each driven by a unique theoretical mechanism discovered in the literature.

Due to the annual frequency and constrained length of the time series, the study employs a minimalist time-series methodology, prioritising interpretability and theoretical coherence above complex dynamic modelling.

3.2 Variables and Measurement

3.2.1 Health Expenditure Measures

Data on public health expenditure (HE) are sourced from the Reserve Bank of India's State Finances: A Study of Budgets, specifically from Major Heads 2210 (Medical and Public Health) and 4210 (Capital Outlay on Medical and Public Health). Health expenditure is articulated in four distinct forms to differentiate scale impacts, budgetary priority, and expenditure composition.

(a) Health expenditure intensity

$$\frac{HE_t}{GSDP_t}$$

This ratio assesses public health expenditure in relation to the magnitude of the state economy and is extensively utilised in macro-public finance and health financing research (Newhouse, 1977; Xu et al., 2011). It assesses whether fiscal stress influences the magnitude of health expenditure irrespective of economic scale.

(b) Log of health expenditure

$$ln(HE_t)$$

This specification facilitates the estimate of income elasticity and alleviates the heteroskedasticity linked to level variables. This is driven by the substantial research evidencing income-elastic public health expenditure in accordance with Wagner's Law (Hitiris & Posnett, 1992; Baltagi & Moscone, 2010).

(c) Health expenditure as a share of total government expenditure

$$\frac{HE_t}{TE_t}$$

Where TE_t denotes total state government expenditure. This approach isolates budgetary prioritisation, differentiating alterations in health allocation from modifications in total budget size. It is especially pertinent when fiscal strain impacts overall expenditure without necessarily modifying sectoral proportions (Alesina & Perotti, 1996).

(d) Disaggregated health expenditure

Health expenditure is further decomposed into:

- Revenue health expenditure (HE_t^{rev})
- Capital health expenditure (HE_t^{cap})

This differentiation facilitates the analysis of asymmetric fiscal adjustment, as capital spending is frequently regarded as more discretionary than revenue expenditure (OECD, 2014).

3.2.2 Fiscal and Control Variables

The principal explanatory variable is fiscal deficit, expressed relative to economic capacity:

$$\frac{FD_t}{GSDP_t}$$

Adjusting the fiscal deficit by Gross State Domestic Product (GSDP) guarantees intertemporal comparability and conforms to fiscal space frameworks that prioritise sustainability in relation to income (Heller, 2005; IMF, 2019). A one-period lag is incorporated to account for delayed expenditure responses due to budgetary rigidities and institutional inertia.

$$\frac{FD_{t-1}}{GSDP_{t-1}}$$

The economic capacity is quantified by Gross State Domestic Product (GSDP), shown in logarithmic form inside income-elasticity models. Total expenditure (TE_t) is utilised for analysing health spending proportions.

3.3 Model Specifications

Model 1: Health Expenditure Intensity

$$\frac{HE_t}{GSDP_t} = \alpha + \beta_1 \frac{FD_t}{GSDP_t} + \epsilon_t$$

This baseline specification examines the impact of simultaneous fiscal stress on health expenditure in relation to economic scale.

To investigate the asymmetric impact of fiscal stress on various components of health expenditure, the baseline health expenditure intensity model is computed independently for revenue and capital health expenditure.

$$HE_t^{rev} = \alpha + \beta_1 \frac{FD_t}{GSDP_t} + \beta_2 \frac{FD_{t-1}}{GSDP_{t-1}} + \epsilon_t$$

$$HE_t^{cap} = \alpha + \beta_1 \frac{FD_t}{GSDP_t} + \beta_2 \frac{FD_{t-1}}{GSDP_{t-1}} + \epsilon_t$$

Model 2: Lagged Fiscal Stress Model

$$\frac{HE_t}{GSDP_t} = \alpha + \beta_1 \frac{FD_t}{GSDP_t} + \beta_2 \frac{FD_{t-1}}{GSDP_{t-1}} + \epsilon_t$$

This model incorporates delayed fiscal adjustment, acknowledging that health expenditures are influenced by multi-year commitments and administrative inflexibility (Alesina & Perotti, 1996; Barroy et al., 2021).

Model 3: Log–Linear Income Model

$$ln(HE_t) = \alpha + \beta_1 ln(GSDP_t) + \beta_2 \frac{FD_{t-1}}{GSDP_{t-1}} + \epsilon_t$$

This specification estimates the income elasticity of health expenditure while testing whether fiscal deficit retains explanatory power once economic capacity is controlled for. A coefficient $\beta_1 > 1$ indicates income-elastic public health spending consistent with Wagner's Law.

Model 4: Budgetary Priority Model

$$\frac{HE_t}{TE_t} = \alpha + \beta_1 \frac{FD_t}{GSDP_t} + \epsilon_t$$

This model examines whether fiscal stress influences the prioritisation of health within the government budget, rather than overall spending levels.

3.4 Estimation Technique

All models are estimated utilising Ordinary Least Squares (OLS) with Newey–West heteroskedasticity- and autocorrelation-consistent (HAC) standard errors (Newey & West, 1987). The HAC correction is suitable due to the annual data frequency and the possible existence of serial correlation and heteroskedasticity.

Advanced time-series methodologies, such VAR, VECM, or ARDL models, are not utilised due to (i) the restricted sample size, (ii) the diminished efficacy of unit-root and cointegration tests in brief annual series, and (iii) the study's focus on explanation rather than prediction. Robustness is attained by several theoretically grounded criteria.

3.5 Interpretation Framework

The empirical findings are analysed via the lens of three complementing mechanisms found in the literature:

1. Income-driven expansion, in which health expenditures predominantly correlate with economic growth (Newhouse, 1977; Baltagi & Moscone, 2010).
2. Adjustment driven by fiscal stress, perhaps affected by delays due to institutional inflexibility (Alesina & Perotti, 1996).
3. Institutional and federal mediation, including intergovernmental transfers, budgetary standards, and political prioritisation, mitigates the direct impact of fiscal stress on health expenditure (Rao et al., 2013; Raj, 2024).

This methodology guarantees that weak or negligible fiscal deficit impacts are regarded as significant empirical results rather than indicative of model inadequacy.

The methodology offers a thorough and institutionally based evaluation of whether the fiscal deficit limits public health expenditure in Haryana by incorporating ratio-based, log-linear, lagged, and disaggregated specifications within a cohesive theoretical framework. The methodology strongly adheres to fiscal space theory while acknowledging its empirical and institutional constraints in sub-national settings.

4. Data and Descriptive Statistics

4.1 Data Sources and Coverage

The empirical analysis use an annual time series for the Indian state of Haryana spanning from 2004–05 to 2023–24. Public health expenditure data and state fiscal indicators are generally sourced from the Reserve Bank of India (RBI), specifically from State Finances: A Study of Budgets, which offers reliable, audited budgetary statistics for Indian states. Data from the Comptroller and Auditor General (CAG) State Finance Audit Reports is utilised for cross-verification and contextual analysis within institutions.

Public health expenditure is quantified through budgetary Major Heads 2210 (Medical and Public Health) and 4210 (Capital Outlay on Medical and Public Health), in accordance with RBI classification standards and prevailing literature on state-level health expenditure in India. Health expenditure is further categorised into income and capital components to analyse variations in fiscal responsiveness among expenditure categories.

Fiscal variables encompass fiscal deficit, revenue deficit, primary deficit, and Gross State Domestic Product (GSDP). The fiscal deficit is represented as a ratio to GSDP to facilitate intertemporal comparison and to reflect budgetary strain in relation to economic capacity. The Gross State Domestic Product (GSDP) is quantified in nominal terms, aligning with the assessment of spending variables.

All factors are assessed annually. Due to the restricted duration of the time series and the emphasis on state-specific dynamics, the analysis favours consistency and transparency rather than higher-frequency or interpolated data.

4.2 Variable Construction

Multiple dependent variables are created to include various aspects of health expenditure behaviour. Initially, health expenditure intensity is quantified as the ratio of total public health spending to Gross State Domestic Product (HE/GSDP). This variable measures public health expenditure in relation to the state economy's size and facilitates the analysis of whether fiscal stress influences the intensity of health expenditures, independent of income impacts.

Secondly, total public health expenditure is represented in logarithmic form (lnHE) to assess income elasticity and mitigate heteroskedasticity linked to level variables. This specification is standard in research analysing income-driven public expenditure dynamics.

Third, to analyse the composition of expenditures, public health expenditure is categorised into revenue health expenditure and capital health expenditure, with each represented as a percentage of GSDP. This distinction enables the evaluation of whether fiscal stress impacts recurrent and investment-related health expenditures differently.

The fiscal deficit is shown as a ratio to GSDP (FD/GSDP) and is recorded both in the current period and with a one-period lag to account for delayed adjustments due to institutional rigidities and multi-year budget obligations. The Gross State Domestic Product (GSDP) is incorporated into the log-linear model in logarithmic form to directly assess income elasticity.

4.3 Descriptive Trends

Descriptive analysis indicates a significant increase in public health expenditure in Haryana over the study period. Total health expenditure rose consistently in nominal terms, with especially swift rise noted from the mid-2010s. Both revenue and capital elements contributed to this increase, while revenue expenditure continuously represented the predominant portion of total health expenditure.

Health expenditure intensity (HE/GSDP) demonstrates a progressive increase over time, interspersed with phases of stagnation and little decline during years of significant budgetary strain. Nonetheless,

these contractions are neither acute nor enduring, indicating that health expenditure is relatively shielded from transient fiscal variations.

The fiscal deficit exhibits significant annual fluctuations, characterised by acute deterioration during economic recessions and phases of consolidation. Despite this volatility, a distinct one-to-one correlation between fluctuations in fiscal deficit and variations in health expenditure intensity is not evident, prompting the multivariate analysis conducted in the following sections.

4.4 Descriptive Statistics

Table 1 provides summary data for the principal variables utilised in the investigation. The statistics reveal significant fluctuations in fiscal deficit and GSDP over the research period, illustrating evolving macroeconomic and fiscal circumstances. Conversely, health expenditure—especially revenue health expenditure—exhibits more stable growth, reflecting the existence of institutional and administrative constraints in health budgeting.

Capital health expenditure demonstrates increased volatility compared to revenue expenditure, indicative of its project-oriented and sporadic characteristics. Nonetheless, its overall significance remains minimal in comparison to total health expenditure and GSDP, highlighting the constrained function of capital investment as a cushion for adjustment.

Table 1. Descriptive Statistics (2004–05 to 2023–24)

variable	count	mean	std	min	25 %	50 %	75 %	max
year	20.0	2013.5	5.916079783099616	2004.0	2008.75	2013.5	2018.25	2023.0
he_rev	20.0	2369.1249999999995	1917.2866158097381	324.92	856.22	1808.42	3573.1525	6044.38
he_cap	20.0	288.2025	395.57428664072165	4.05	31.712500000000002	57.735	377.1649999999996	1381.89
he_total	20.0	2657.3275000000003	2288.0467718693694	336.32	909.9300000000001	1865.77	4014.3675000000003	7426.27
fiscal_deficit	20.0	-13279.592999999999	10958.677671828025	-31712.21	-21762.232500000002	-10985.9	-4282.8575	1179.0
revenue_deficit	20.0	-9046.1505	9675.56713340821	-31712.21	-12887.849999999999	-6378.84	-1925.8825	2224.0
primary_deficit	20.0	-5445.2385	6986.268128703603	-23195.0	-7605.0	-3877.1949999999997	-665.1275	3444.0
gsdp	20.0	486377.45	331688.5400874036	93804.0	207943.75	413031.0	711583.25	1155144.0

fd_gsdp	200	-0.025009999999999998	0.017122373790176559	-0.064	-0.0327	-0.0245	-0.013	0.009
he_gsdp	200	0.004786343237619755	0.001126319969533312 5	0.003316864016720 3266	0.003807131752322818 2	0.004722061269731759	0.005490269027797182	0.006972381884108 3175
he_rev_gsdp	200	0.004385464796536 7016	0.000831225702351 2996	0.003036497864314 28	0.003650717844478 8097	0.004476288819446463	0.004937197460122458	0.005744335392224 19
he_cap_gsdp	200	0.000400878441083054443	0.000359863609441795573	1.186462028820773 9e-05	0.000143327279085060062	0.000284642161858353304	0.000524257256877 7677	0.001297429907858 2442
log_he_total	200	7.467381316533439	1.000192040312587 7	5.818063087688587	6.802081278712578	7.522684306434247	8.293865896224235	8.912778992815626
log_gsdp	200	12.835102557855047	0.783269862339896 8	11.448962778008331	12.242463975320646	12.929570729523622	13.475189325852421	13.959735569491384
lag_fd_gsdp	190	-0.025784210526315788	0.017228150837700188	-0.064	-0.0338	-0.028	-0.013999999999999999	0.009

Descriptive information indicates that although fiscal conditions in Haryana have varied considerably over the past twenty years, public health expenditure has exhibited a rather consistent and increasing trend. This disparity between budgetary volatility and expenditure stability underscores the significance of economic capability and institutional budgeting procedures in influencing health spending results. These trends underpin the econometric research in the subsequent part, which rigorously investigates the correlation among fiscal deficit, income, and public health expenditure.

5. Empirical Results

This section delineates the empirical results from four regression models analysing the correlation between fiscal deficit and public health expenditure in Haryana. The results are structured as follows: Model 1 assesses the fundamental relationship between fiscal deficit and health expenditure intensity; Model 2 integrates income impacts through a log-linear formulation; and Models 3 and 4 individually expand the basic framework to include revenue and capital components of health expenditure.

Models 3 and 4 are component-wise augmentations of the basic model rather than separate theoretical frameworks.

5.1 Fiscal Deficit and Health Expenditure Intensity (Model 1)

Table 2

Dep. Variable:	he_gsdp	R-squared:	0.218
Model:	OLS	Adj. R-squared:	0.120
Method:	Least Squares	F-statistic:	3.052

No. Observations:	19	Prob (F-statistic):	0.0754
Df Residuals:	16	Log-Likelihood:	104.98
Df Model:	2	AIC:	-204.0
Covariance Type:	HAC	BIC:	-201.1

	coef	std err	z	P>|z|	[0.025	0.975]
const	0.0040	0.000	10.116	0.000	0.003	0.005
fd_gsdp	-0.0070	0.015	-0.480	0.631	-0.035	0.022
lag_fd_gsdp	-0.0258	0.016	-1.611	0.107	-0.057	0.006

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Omnibus:	1.905	Durbin-Watson:	0.303
Prob(Omnibus):	0.386	Jarque-Bera (JB):	1.591
Skew:	0.622	Prob(JB):	0.451
Kurtosis:	2.321	Cond. No.	90.4

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Notes:
[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 1 lags and without small sample correction

Table 2 presents the findings from Model 1, in which public health expenditure is represented as a percentage of Gross State Domestic Product (HE/GSDP). This formulation investigates whether the fiscal deficit, adjusted for GSDP, limits the magnitude of health expenditure.

The coefficient for the contemporaneous fiscal deficit variable is negative yet statistically insignificant, suggesting a lack of evidence for an instantaneous correlation between fiscal stress and the intensity of health expenditure. The projected effect is minimal in scale and lacks precision in estimation.

Inclusion of a lagged fiscal deficit factor reveals a negative coefficient for the lagged fiscal deficit, which is weakly significant at the 10 percent level ($p = 0.107$). This indicates scant evidence of a postponed budgetary impact, aligning with the existence of institutional inflexibilities and multi-year budget obligations in public health spending. Nonetheless, the marginal relevance and limited explanatory capacity of the model ($R^2 = 0.218$) suggest that the fiscal deficit does not serve as a strong or consistent restraint on the intensity of health expenditure.

Model 1 offers minimal evidence to support the premise that fiscal deficit significantly impacts public health expenditure, either contemporaneously or with a delay, in relation to economic size.

5.2 Income Effects and Fiscal Deficit (Model 2)

Table 3: OLS Regression Results

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Dep. Variable:	log_he_total	R-squared:	0.991
Model:	OLS	Adj. R-squared:	0.990
Method:	Least Squares	F-statistic:	637.1

No. Observations:	19	Prob (F-statistic):	4.95e-16
Df Residuals:	15	Log-Likelihood:	19.705
Df Model:	3	AIC:	-31.41
Covariance Type:	HAC	BIC:	-27.63
Df Model:	3		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-8.9841	0.483	-18.620	0.000	-9.930	-8.038
log_gsdp	1.2790	0.038	33.548	0.000	1.204	1.354
fd_gsdp	-0.9739		1.433	-0.680	0.497	-3.782 1.834
lag_fd_gsdp	-0.1386	1.405	-0.099	0.921	-2.893	2.616

Omnibus:	2.201	Durbin-Watson:	1.407
Prob(Omnibus):	0.333	Jarque-Bera (JB):	1.639
Skew:	0.549	Prob(JB):	0.441
Kurtosis:	2.072	Cond. No.	1.20e+03

Notes:

[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 1 lags and without small sample correction.

[2] The condition number is large, 1.2e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Table 3 displays the outcomes from the log-linear specification in Model 2, wherein the logarithm of total public health expenditure is regressed against the logarithm of GSDP, including both contemporaneous and lagged fiscal deficit variables.

The coefficient for log(GSDP) is positive, substantial, and statistically significant at the 1 percent level. The estimated elasticity of around 1.28 signifies that public health expenditure in Haryana is very income-elastic, increasing more than proportionately with economic growth. This outcome aligns with Wagner's Law and previous empirical evidence regarding the income-driven characteristics of public health expenditure.

Conversely, both the contemporaneous and lagged fiscal deficit variables lack statistical significance. The use of fiscal deficit variables does not significantly affect the estimated income elasticity or enhance model fit. The results demonstrate that when economic capability is accounted for, fiscal deficit does not independently affect public health expenditure.

The model's remarkably strong explanatory power ($R^2 = 0.991$) further emphasises the preeminence of income effects in influencing public health expenditure in Haryana.

5.3 Revenue and Capital Health Expenditure (Models 3 and 4)

The baseline health expenditure intensity framework is utilised to evaluate the asymmetric impact of fiscal stress on various components of health expenditure, specifically distinguishing between revenue and capital health expenditure.

Revenue Health Expenditure (Model 3)

OLS Regression Results

Dep. Variable:	he_rev_gsdp	R-squared:	0.299
Model:	OLS	Adj. R-squared:	0.211
Method:	Least Squares	F-statistic:	3.984
No. Observations:	19	Prob (F-statistic):	0.0394
Df Residuals:	16	Log-Likelihood:	111.84
Df Model:	2	AIC:	-217.7
Covariance Type:	HAC	BIC:	-214.8

	coef	std err	z	P>|z|	[0.025	0.975]
const	0.0037	0.000	12.214	0.000	0.003	0.004
fd_gsdp	-0.0086	0.010	-0.892	0.372	-0.027	0.010
lag_fd_gsdp	-0.0203	0.013	-1.620	0.105	-0.045	0.004

Omnibus:	2.723	Durbin-Watson:	0.376
Prob(Omnibus):	0.256	Jarque-Bera (JB):	1.334
Skew:	0.280	Prob(JB):	0.513
Kurtosis:	1.829	Cond. No.	90.4

Notes:
[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 1 lags and without small sample correction

The coefficient for the contemporaneous fiscal deficit in relation to revenue health spending as a percentage of GSDP is negative although statistically insignificant. The lagged fiscal deficit term is negative and marginally significant at the 10 percent level (p = 0.105). This pattern reflects the overall health spending findings and indicates that any postponed budgetary adjustment mostly affects revenue expenditure rather than capital expenditures.

The model's explanatory power is limited (R^2 = 0.299), suggesting that although fiscal variables contribute to variations in revenue health spending intensity, they are not the primary determinants.

Capital Health Expenditure (Model 4)

OLS Regression Results

Dep. Variable:	he_cap_gsdp	R-squared:	0.052
Model:	OLS	Adj. R-squared:	-0.067
Method:	Least Squares	F-statistic:	1.071
No. Observations:	19	Prob (F-statistic):	0.366
Df Residuals:	16	Log-Likelihood:	124.54
Df Model:	2	AIC:	-243.1
Covariance Type:	HAC	BIC:	-240.2

	coef	std err	z	P>|z|	[0.025	0.975]
const	0.0003	0.000	2.449	0.014	6.27e-05	0.001
fd_gsdp	0.0016	0.006	0.272	0.786	-0.010	0.013
lag_fd_gsdp	-0.0055	0.005	-1.145	0.252	-0.015	0.004

Omnibus:	5.183	Durbin-Watson:	0.499

Prob(Omnibus):	0.075	Jarque-Bera (JB):	3.472
Skew:	1.042	Prob(JB):	0.176
Kurtosis:	3.214	Cond. No.	90.4

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Notes:

[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 1 lags and without small sample correction

In terms of capital health spending, neither current nor delayed fiscal deficit factors exhibit statistical significance. The predicted coefficients are minimal and unstable, and the model's overall explanatory ability is exceedingly low ($R^2 = 0.052$). The results demonstrate that capital health expenditure does not systematically react to fiscal deficit fluctuations.

The lack of substantial fiscal impacts indicates that capital health expenditure in Haryana does not serve as a flexible margin for fiscal adjustment, possibly due to its relatively modest level, project-oriented character, and institutional limitations.

The outcomes from the four models can be encapsulated as follows:

1. The fiscal imbalance does not demonstrate a statistically significant immediate impact on the intensity of public health expenditure.
2. Insufficient evidence of a delayed fiscal impact is noted in aggregate and revenue health expenditure models; however, these impacts are minimal and lack robustness.
3. Public health expenditure in Haryana exhibits significant income elasticity, with economic growth serving as the principal catalyst for expenditure increases.
4. Capital health spending exhibits no sensitivity to the fiscal deficit, signifying minimal discretionary adjustment in this component.

The findings indicate that fiscal deficit serves as a constrained and insufficient measure of fiscal flexibility for health at the state level. Health expenditure in Haryana seems to be influenced mostly by economic capability and institutional budgeting mechanisms rather than by immediate fiscal pressures.

6. Discussion, Interpretation, and Policy Implications

This study aimed to investigate if the fiscal imbalance serves as a limiting factor on public health expenditure in the Indian state of Haryana. The analysis, utilising a state-level time series across two decades and various econometric parameters, produces a coherent and consistent set of findings with significant theoretical and policy consequences.

6.1 Interpretation of Core Findings

The primary empirical finding is that the fiscal deficit, when assessed in relation to Gross State Domestic Product (GSDP), does not have a statistically significant or systematic impact on public health expenditure in Haryana. In all parameters, the contemporaneous fiscal deficit is statistically insignificant, whereas the lagged fiscal deficit demonstrates only moderate and unstable significance, limited to aggregate and revenue health expenditure models. The lagged impacts are economically negligible and do not endure across different specifications.

Conversely, economic capacity serves as the primary factor influencing public health expenditure. The log-linear model indicates that health expenditure is very income-elastic, with elasticity surpassing one. This indicates that public health expenditure in Haryana increases disproportionately with economic growth, aligning with Wagner's Law and substantial worldwide and Indian evidence. When income effects are explicitly considered, fiscal deficit variables completely lose their explanatory power.

The disaggregated analysis elucidates the mechanisms of adjustment. Revenue health spending exhibits minimal evidence of delayed fiscal sensitivity, but capital health expenditure reveals no consistent correlation with fiscal deficit. This indicates that health expenditure—especially its

investment aspect—does not serve as a discretionary margin for budgetary adjustment during periods of short-term fiscal strain.

Collectively, these findings suggest that public health expenditure in Haryana is predominantly influenced by economic capability and institutional budgeting processes, rather than by current fiscal balance conditions.

6.2 Implications for Fiscal Space Theory

These findings have immediate ramifications for the fiscal space literature. The Haryana case illustrates that fiscal deficit, though commonly seen as a summary indicator of macro-fiscal constraints, offers an inadequate representation of fiscal room for health at the sub-national level when considered in isolation. The lack of a robust relationship between deficit and health spending indicates that fiscal capacity is influenced by growth, institutional frameworks, and budgeting conventions rather than being strictly limited by deficit amounts.

The subdued and protracted fiscal impacts noted in the revenue expenditure models align with ideas of expenditure rigidity and incremental budgeting. Health expenditure obligations—especially regarding salaries, programs, and service delivery—are challenging to modify in the short term, even among fiscal constraints. This institutional inertia undermines the direct conveyance of budgetary consolidation pressures to health expenditures.

6.3 Institutional and Federal Context

These findings have immediate ramifications for the fiscal space literature. The Haryana case illustrates that fiscal deficit, though commonly seen as a summary indicator of macro-fiscal constraints, offers an inadequate representation of fiscal room for health at the sub-national level when considered in isolation. The lack of a robust relationship between deficit and health spending indicates that fiscal capacity is influenced by growth, institutional frameworks, and budgeting conventions rather than being strictly limited by deficit amounts.

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6.4 Policy Implications

The results possess significant policy ramifications.

Initially, measures designed to enhance public health expenditure should not depend exclusively on fiscal consolidation or deficit reduction as facilitating tools. The findings indicate that diminishing the fiscal deficit does not inherently generate fiscal headroom for health at the state level. Conversely, continuous economic growth is far more vital in augmenting the resource envelope for public health expenditure.

The high income elasticity of health expenditure highlights the significance of growth-focused development strategies for health financing. As the state economy grows, the fiscal capacity for health improves despite mild fiscal deficits.

The limited responsiveness of health expenditure to fiscal deficits underscores the significance of budgetary prioritisation and institutional architecture. Enhancing medium-term expenditure frameworks, optimising expenditure efficiency, and guaranteeing steady allocations for the health sector may prove more helpful in protecting health spending than short-term fiscal regulations.

The lack of fiscal adjustment in capital health expenditure indicates a necessity for targeted policy focus on health infrastructure investment. If capital expenditure is unresponsive to fiscal conditions, strategic investment planning and safeguarded capital budgets may be necessary to meet the long-term requirements of the health system.

6.5 Contribution and Concluding Remarks

This research enhances the literature in three significant aspects. Initially, it offers state-specific empirical data regarding the correlation between fiscal deficit and public health expenditure in India, a domain where comprehensive time-series research is still scarce. Secondly, it illustrates the

empirical constraints of employing fiscal deficit as a surrogate for fiscal space in sub-national situations. Third, it underscores the preeminent influence of wealth and institutional determinants in determining health expenditure results.

In conclusion, the fiscal imbalance does not constitute a limiting factor for public health expenditure in Haryana. Health expenditure is predominantly influenced by economic expansion and institutional budgeting procedures, with fiscal strain imposing, at most, feeble and deferred impacts. These findings necessitate a shift in policy discourse from limited deficit-centric views of fiscal flexibility to a more holistic comprehension of growth, institutions, and expenditure prioritisation in health funding.

7. Limitations and Future Research

This study presents novel state-specific information about the correlation between fiscal deficit and public health expenditure in Haryana; however, numerous limitations must be recognised.

The study is based on a single-state time series, which inherently restricts external generalisability. Haryana is a moderately affluent Indian state with notable revenue-generating capacity and administrative proficiency. The tenuous correlation between fiscal deficit and health expenditure noted above may not be applicable in fiscally weaker nations or those with a higher reliance on intergovernmental transfers. Subsequent research may expand this approach to a comparative multi-state context while maintaining the institutional sensitivity exhibited in this study.

Secondly, the fiscal deficit serves as a partial proxy for fiscal space, in accordance with the fiscal space literature; yet, it fails to encompass all pertinent aspects of governments' ability to fund health expenditures. Revenue mobilisation, borrowing limitations, expenditure efficiency, and budgetary reprioritisation are not clearly modelled. Integrating these further elements—specifically own-tax revenue efforts and central transfers—would enable a more comprehensive empirical operationalisation of fiscal space.

Third, the analysis fails to explicitly incorporate intergovernmental transfers and centrally sponsored schemes, which significantly influence health expenditure decisions within India's federal framework. The exclusion of transfer factors indicates limitations in data and specifications rather than a lack of conceptual significance. Future research may investigate whether central transfers augment or diminish state health expenditures, and whether these effects differ among fiscal frameworks.

The empirical strategy utilises reduced-form time-series regressions instead of structural or dynamic models. This strategy is suitable considering the sample size and explanatory emphasis, but it restricts causal interpretation. Future study may investigate dynamic specifications or story identification methodologies to more effectively isolate exogenous fiscal shocks.

Health expenditure is ultimately quantified by standard budget categories (Major Heads 2210 and 4210), which encompass essential public health spending but may omit health-related expenses documented in other departments. This measurement method aligns with RBI and CAG classifications and is prevalent in the literature; however, future research may investigate more expansive definitions of health-related public expenditure.

Notwithstanding these limitations, the study's findings offer a substantial and policy-relevant contribution by elucidating the circumstances under which fiscal deficits do and do not constrain public health expenditure at the state level.

Future Research Directions

Subsequent investigations may explore four possible avenues based on this study:

1. Comparative analysis of state-level distinctions between high-income and low-income states to investigate variability in fiscal-health links.
2. Explicit modelling of the components of fiscal space, encompassing revenue effort, transfers, and borrowing limitations.
3. Extensions of political economy that include electoral cycles, party competitiveness, or bureaucratic capacity.

4. Outcome-oriented analysis, correlating fiscal dynamics and health expenditure with health outputs and outcomes.

Such extensions would enhance comprehension of the institutional mechanisms regulating health financing in India and guide the formulation of more effective fiscal and health policies.

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APPENDICES

Appendix A. Variable Definitions and Sources

Table A1. Variable Definitions

Variable	Definition	Source
HE	Total public health expenditure (₹ crore)	RBI State Finances

HE/GSDP	Health expenditure as share of GSDP	Author's calculation
HE/TE	Health expenditure as share of total expenditure	Author's calculation
FD/GSDP	Fiscal deficit as share of GSDP	RBI
GSDP	Gross State Domestic Product (₹ crore)	RBI
HE_{rev}	Revenue health expenditure (2210)	RBI
HEc_{ap}	Capital health expenditure (4210)	RBI

Appendix B. Data Used in the Analysis

Table B1. Annual Fiscal and Health Data for Haryana

Year	HE_Rev (₹ Cr)	HE_Cap (₹ Cr)	HE_Total	Fiscal Deficit	Revenue Deficit	Primary Deficit	GSDP (₹ Cr)	FD/GSDP
2004–05	324.92	11.4	336.32	–1,206	–258	1,029	93,804	–0.013
2005–06	385.42	17.82	403.24	–286	1,213	1,814	106,732	–0.003
2006–07	410.41	21.25	431.66	1,179	1,590	3,444	130,141	0.009
2007–08	468.48	50.6	519.08	–1,264	2,224	1,082	154,283	–0.008
2008–09	643.73	44.14	687.87	–6,557	–2,082	–4,218	182,914	–0.036
2009–10	927.05	74.59	1001.64	–10,090	–4,264	–7,353	216,287	–0.047
2010–11	965.44	18.51	983.95	–7,258	–2,746	–3,939	257,793	–0.028
2011–12	1094.37	50.03	1144.4	–4,438.68	–1,457.53	–1,455.00	298,688	–0.015
2012–13	1472.79	4.05	1476.84	–3,815.39	–4,438.68	–3,815.39	341,351	–0.013
2013–14	1570.27	49.83	1620.1	–8,319.21	–3,815.39	–3,438.50	388,917	–0.021
2014–15	2046.57	64.87	2111.44	–12,586	–8,319	–5,658	437,145	–0.029
2015–16	2,348.46	35.2	2,383.66	–31,479	–11,679	–23,195	495,249	–0.064
2016–17	2630.77	244.19	2874.96	–26,285	–15,906	–15,743	556,325	–0.047
2017–18	2903.63	302.21	3205.84	–19,114	–10,562	–7,153	626,054	–0.031
2018–19	3,473.92	332.83	3,806.75	–21,912	–11,270	–8,361	707,126	–0.031
2019–20	4,249.84	510.17	4,760.01	–16,299.90	–16,299.90	–743.72	786,252	–0.0207
2020–21	3,870.85	766.37	4,637.22	–30,554.36	–27,546.19	–15,411.36	724,955	–0.0402
2021–22	5,763.24	859.7	6,622.94	–31,712.21	–31,712.21	–14,460.96	1,003,291	–0.0316
2022–23	6,044.38	1,381.89	7,426.27	–21,712.31	–21,712.31	–899.49	1,065,098	–0.0204
2023–24	5,787.96	924.4	6,712.36	–11,881.80	–11,881.80	–429.35	1,155,144	–0.0103

Appendix C. Robustness Checks

As a robustness check, revenue deficit and primary deficit were used in place of fiscal deficit. Results remain qualitatively unchanged, with fiscal variables remaining statistically insignificant and income effects dominant.