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GST and Debt Sustainability: The Indian Experience

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Abstract

In the context of a perceptible rise in the share of sub-national debt in India's total public debt, and the predominant role of GST as a revenue source for the state, this study attempts to analyse the sustainability of debt policies adopted by sub-national governments in the context of GST. It looks at the 20 major Indian states, using the fiscal policy response function, two alternative specifications, and panel data methodology to analyse the issue at aggregate and disaggregate levels during GST regime. The results indicate that the debt policy is sustainable at the aggregate level, but only in 9 states at the disaggregate level during the GST regime. However, when GST compensation is excluded from the model, the test results do not indicate that Indian states pursued sustainable debt policies. The observed results are then amplified and corroborated using an indicator-based approach, and it is concluded that the GST remains an undermining factor of debt sustainability. Overall, the study draws attention to the states' poor revenue performance after GST, and the challenges to the sustainability of their debt position. Policy intervention should be sought to improve the debt situation through an effective GST mechanism in states where the debt is unsustainable.

Keywords: Public debt; primary balance; GST; debt sustainability; fiscal reaction function; Indian states, panel data

JEL Codes: E62, H71, H72, H74

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1. Introduction

Inadequate revenue generation and high borrowing persistence are the two major policy concerns often confronted by national and subnational governments globally. These governments heavily depend on borrowed resources to meet their expenditure commitments. With the growing tendency towards decentralization, borrowing has become an increasingly important source of finance in countries with federal governments. In turn, this leads to enormous debt accrual in sub-national budgets.

It is often perceived that the lower the ratio of debt to state domestic product, the more sound the State economy. There is a high chance that the state experiences fiscal stress or falls into a debt trap when this ratio is high (Paras, 2017). The issue of debt sustainability – the ability of a government to sustain its debt policies in the long-run, while remaining solvent – arises as there exists a chain of action between various budgetary variables in the higher debt accumulation process (Ianachovichna et al., 2006). An unsustainable debt position is shown to be instrumental in determining insolvency, no-Ponzi condition (i.e., issuance of new debt to pay off existing loans), re-orientation of priority spending, and growth slowdowns (Renjith and Shanmugam, 2019).

India provides an ideal setting to analyse sub-national fiscal policies, as one-third of its total government debt is owned by state governments, accompanied by persistent growth in their budget deficits and borrowing requirements (RBI, 2021). Remarkably, India's sub-national debt-deficit position has significantly improved during the initial phase of fiscal consolidation (Kaur et al., 2017). However, the signs of fiscal stress have re-emerged in the latter phase of fiscal consolidation, on the back of poor performance of state public sector enterprises, additional debt liabilities as part of the financial and operational restructuring of state power distribution companies, high cost of borrowings, 7th Pay Commission implementation, and rolling subsidy bills etc. As a result, the debt ratio frequently crossed the prescribed limit in most states.

While sub-national debt has shown a gradual rise, India's adoption of Goods and Service Tax (GST), considered to be the most decisive indirect tax reform since independence, has created intense policy discussion on the revenue generation capacity of the states (as they had to surrender their taxing powers)[1]. It was expected that the GST implementation would benefit the states in terms of higher revenue collection, enhanced tax compliance, improved export competitiveness, minimized cascading effect, higher interstate trade, and increased economic activities – thereby reducing the horizontal fiscal imbalance across states.

It was further anticipated that state governments' revenue would increase under the GST regime, and be inversely proportional to the debt-to-GSDP (Gross State Domestic Product) ratio, ensuring a sustainable debt position.[2] However, GST collection has not been as expected, due to its design, compliance, and administrative issues. Researchers have argued that revenue shock in GST collection may lead to a fiscal shock to state finances (Rao, 2022; Mukharjee, 2020; Dash and Kakarlapudi, 2021).

Nonetheless, GST has become the largest source of the state's own tax revenue. States had to rely on the GST compensation grants (stipulated under the GST Compensation Act, 2017) in the initial years after implementation, since the proposed 14 percent growth was far from the reality for many state governments.[3] However, GST compensation assured to the states was delayed due to the revenue shortage faced by the Centre. This has further contributed to the adverse debt position of the states.

In addition, as long as constitutional demarcation on expenditure commitment and revenue generation remains a disproportionate burden on state governments, there is little room for reducing their expenditure. As a result, revenue collection becomes vital to state finances. Since GST is the major source of state finance, this increases the susceptibility towards all changes on states' revenue productivity (assuming minimal possibility to mitigate expenditure). This implies that any changes in the primary deficit/surplus, and thereby debt accumulation of the state, is a reflection of GST performance (with or without the GST compensation).

The aggregate debt of all the states rose from ₹22103 billion (≈ US $285 billion) in 2011-12 to ₹ 53430 billion (≈ US $689 billion) in 2019-20, and the debt to GSDP ratio reached about 27% in 2019-20. Notably, all states remained in a primary deficit position during the period (RBI, 2021). Though the State GST (including the Integrated GST settlement on State GST account)[4] revenue progressed over the years in most states, the growth rate of SGST for the period from 2017-18 to 2019-20 remained lower than the average annual growth rate of taxes subsumed in GST for the period 2014-15 to 2016-17 while their dependence on GST compensation had also gone up during the period (Mukharjee, 2021).

In light of the mounding debt burden, the persistence of primary deficit, and poor growth in the state GST collection, it is imperative to study the public debt situation of the state governments during the GST period in a comprehensive manner. More specifically, it is important to examine the following questions:

i. Has the regime shift from VAT to GST aggravated the debt position?
ii. Do state governments in India hold a sustainable debt position under the GST regime?
iii. Does GST undermine the sustainable debt position for Indian states?
iv. Is there any significant change in sustainability indicators after GST?

To address these questions, the study first assesses the sustainable debt policies of the states during the GST regime through the fiscal policy response function (FPRF) proposed by Henning Bohn in 1998. It empirically tests whether the primary surplus-GDP ratio is positive and, at least, a linearly rising function of the debt-GDP ratio. If so, the initial stock of debt equals the sum of the present discounted values of the primary surpluses. Thus, the intertemporal budget constraint (IBC) is satisfied, ensuring debt sustainability (Bohn, 1998).[5]

This study utilizes the panel data version of the FPRF to test the sustainability of public debt of 20 Indian states during the GST regime. The study further extends the fiscal policy response function by adjusting the GST components in the primary balance, to check whether the regime shift from

VAT to GST weakened the sustainable debt position. Accordingly, some changes are made in the baseline equation. The estimated results are then supplemented using the indicator approach to capture the spillover effects. The empirical analysis is first done at the aggregate level and then at the disaggregated level.

The remainder of the paper proceeds as follows: Section 2 presents a short review of the literature. Then, while the methodology is discussed in section 3, the empirical results are presented and discussed in section 4. Finally, section 5 concludes the study.

2. Review of literature

Public debt sustainability has always been a paramount area of research in public finance, both through cross-country comparisons, and within a country (looking at sub-national units). However, the broad interpretation of sustainability does not reveal a comprehensive and true picture of the actual fiscal stance of federal systems. While the level of debt reflects the cumulative effect of government borrowings due to the expenditure-revenue mismatch, a set of other fiscal indicators are involved in its size and composition. There is a chain of action between various policy variables, whose end result is debt sustainability (Renjith and Shanmugam, 2020).

According to Bohn (2007), a fiscal policy satisfies *ad hoc* sustainability if it is on a trajectory such that the expected present value of future primary surpluses equals the initial debt. The hypothesis of fiscal policy sustainability is related to the condition that the trajectory of the main macroeconomic variables is not affected by the choice between debt issuance and an increase in taxation (Afonso, 2005). Comprehensively, sub-national fiscal sustainability is the ability of the sub-national government to sustain its fiscal policies in the long-run, while remaining solvent (able to service its debts).

However, sub-national governments have less incentive than national governments in the sustainability and macroeconomic impact of fiscal policies. A few earlier studies held the view that fiscal decentralization can enhance the overall fiscal sustainability, as sub-national spending also boosts infrastructure development and productive environment (Fukasaku & De Mello, 1998). Moreover, borrowing has become an important source of financing of sub-national governments in the wake of an increase in decentralization practices.

The proponents of sub-national borrowing have cited the following potential benefits (Freire & Petersen, 2004):

i. increased fiscal space for infrastructure funding locally
ii. competent and beneficial outcomes for future generations, due to deficit spending on infrastructure,
iii. transparency and good governance, and
iv. expansion of financial markets.

On the other hand, Mikesell (2007) argues that sub-national borrowing could contrast with national policy. Sub-national borrowing may lead to a crisis and an unstable fiscal and macroeconomic environment if taken up without an effective regulatory framework. Further, borrowings for operating deficit may lead to long-term fiscal sustainability problems, unmanageable debt burden, and growth of the public sector beyond its optimal size (Dafflon, 2002).

Some argue that carefully synchronized sub-national borrowing is the key factor in ensuring the decentralized system's fiscal sustainability (Ter-Minassian, 2015). Therefore, a coordinated sub-national borrowing is a prerequisite for maintaining a sound fiscal policy of the sub-national governments. Many studies have quoted a lack of coordination between fiscal variables, especially in the context of huge public debt accumulation, as the root cause for insolvency and fiscal stress of many sub-national governments (Ianchovichina et al., 2006; Ghosh et al., 2013; Liu and Weiber, 2008).

The coordination issue of public debt with other fiscal indicators is often cited as a cause for many federal debt crises, like the Brazilian crisis in 1991, the Argentina crisis in 2001, and the Eurozone crisis of 2011 (Potrafke and Reischmann, 2015). Experience from these events points out the weakness of addressing sustainability issues in a uniform manner, as this may lead to misleading conclusions – especially in countries with a federal system, due to their institutional settings, domestic demands, and differences in resource mobilization capabilities. Therefore, realizing the need to extend the understanding of sustainability issues from a sub-national level perspective, a few studies have attempted to study this issue in greater detail, in the context of some developed economies (Claeys et al. (2008) for US, and Fincke and Greiner (2011a) for Germany).

Potrafke and Reischmann (2015) extended the examination of sustainability issues at the sub-national level (US states and German länder) with fiscal coordination. It explicitly takes into account fiscal transfers when assessing fiscal sustainability. It draws attention to the fact that some sub-national governments are sustainable only because of fiscal transfers from the central government, and not because of their adopted fiscal measures. Mahdavi and Westerlund (2011) investigated fiscal policies of US state and local governments and concluded that without federal grants, state and local governments are unable to fund their current operational expenditures.

The empirical framework used by Potrafke and Reischmann (2015) is an extension of the fiscal policy response function (FPRF) developed by Bohn (1998). The approach received popularity among economists when Inter-temporal Budget Constraint (IBC) was added to the sustainability analysis.[6] It implies that the outstanding debt today must be equal to the present value of future primary surpluses of the government. In other words, as long as a government generates the debt-stabilizing primary balance to cover its debt in future, its current debt level is sustainable. The conventional sustainability equation is thus linked to the IBC through a dynamic debt equation.

The conventional debt accumulation equation can be written in a compact form as:

$$\frac{D_t}{Y_t} = \frac{\mathrm{P_t}}{Y_t} + \frac{1+i_t}{1+g_t} \cdot \frac{D_{t-1}}{Y_t} \qquad (1)$$

Where

- D_t is the stock of debt at the t[th] period,
- P_t is the primary deficit at the t[th] period,
- i is the real interest rate on debt, and
- g is the real rate of growth of GDP (or Y).

The equation (1) can be written more compactly as:

$$d_t = p_t + d_{t-1}[(1 + i_t)/(1 + g_t)] \quad (2)$$

- $d_t = D_t/Y_t$ is the debt to GDP ratio in period t; and
- p_t is the primary deficit relative to GDP in period t.

Further, equation (2) can be re-written as:

$$d_t = (1 + r_t)\, d_{t-1} - s_t \quad (3)$$

Where

- $r_t = (1 + i_t)/(1 + g_t)$,
- $s_t = -(P_t/Y_t)$ primary surplus to GDP ratio.
- Also note that $r_t = (1 + i_t)/(1 + g_t) - 1 \cong i_t - g_t$ is the gross return on public debt.

The present value of borrowing constraint derived from equation (3) is:

$$d_t^* = \sum_{j=1}^{\infty} \frac{1}{(1+r)^j} E_t [s_{t+j}] + \lim_{n\to\infty} \frac{1}{(1+r)^n} E_t [d_{t+n}] \quad (4)$$

Where

- $d_t^* = (1+ r_t)$.
- d_{t-1} is the stock of debt-output ratio at the beginning of period t, and
- $E_t [.]$ denotes the expectation operator conditional on the information available at time t.

The debt policy is sustainable if the outstanding debt of the initial period is equal to the present value of the future primary surpluses (i.e., in line with IBC).

The IBC, $d_t^* = \sum_{j=1}^{\infty} \frac{1}{(1+r)^j} E_t [s_{t+j}]$, is satisfied if and only if the sum of end-period debt converges to zero, i.e., $\lim_{n\to\infty} \frac{1}{(1+r)^n} E_t [d_{t+n}] = 0$.

Further, it satisfies two supplementary conditions too:

i. the no-Ponzi game condition (NPC) and
ii. the transversality condition (TC).

- The required condition in the NPC is that the debt growth rate has to be lower than the real interest rate.
- TC $[\lim_{n\to\infty} \frac{1}{(1+r)^n} E_t [d_{t+n}] = 0]$ requires that the real public debt growth rate must be lower than the real GDP growth (Azizi et al., 2012).

Bohn (1995) viewed that the convergence (TC and IBC) portrayed in the above two empirical or time-series approaches is not a necessary condition for sustainability. Therefore, he constructs a general equilibrium framework with a stochastic version of TC and IBC (assuming infinitely lived agents, complete financial markets, and optimizing behaviour of lenders under uncertainty). Following this stochastic framework, he proposed a model-based approach in 1998 to test empirically whether the primary surplus-GDP ratio (s_t) is positive and, at least, a linearly rising function of the debt-GDP ratio (d_t):

$$s_t = \alpha + \psi\, d_t + \varepsilon_t \qquad (5)$$

where

- ε is the random error, and
- α and ψ are the parameters to be estimated.
- If $\psi > 0$ and statistically significant, the debt is sustainable, which means that the initial stock of debt is equal to the sum of the present discounted values of the primary surpluses.
- The IBC is satisfied if the discounted sum of the end period debt converges to zero. Thus, the positive reaction coefficient ψ ensures this convergence.

In fact, Bohn (1998) utilizes Barro's (1979) tax-smoothening hypothesis, according to which the public deficit should be used in order to keep tax rates constant, which in turn minimizes the excess burden of taxation. Hence, the normal expenditure can be financed by regular revenues and unexpected spending could be financed by deficits.

Based on this, Bohn (1998) derived the following fiscal policy response reaction function[7] from equation 5 for testing fiscal sustainability:

$$s_t = \alpha + \psi\, d_{t-1} + \phi_1 yvar_t + \phi_2 gvar_t + \varepsilon_t \qquad (6)$$

where

- the debt to GDP ratio is substituted with d_{t-1}, a lagged debt ratio (since budget plans are usually made one fiscal year ahead and also to take account of the endogeneity problem of the public debt to GDP ratio.)
- $yvar$ and $gvar$ are business cycle indicators.
    - $yvar$ accounts for fluctuations in revenues and reflects the deviation of real GDP from its trend, computed using the Hodrick-Prescott (HP) filter. Positive values for $yvar$ indicate booms and negative values indicate recessions.
    - $gvar$ reflects the deviation of real primary spending from its normal value (computed again using the HP Filter), with positive values indicating the expenditures above the normal level and vice versa (Greiner and Fincke, 2015).

This approach has received great attention in the literature because of its intuitiveness (*i.e.,* if governments run into debt today, they would have to take corrective actions in the future by increasing the primary surplus) and robust statistical properties (the positive response of primary

surplus to the government debt implies a mean-reverting process).[8] Accordingly, it has later been extended by many researchers (Abiad and Ostry, 2005; Haber and Neck, 2006; Greiner and Kaurmann, 2008; Fincke and Greiner, 2011; Mahdavi, 2014) by

i. adding other determinants of primary balance,

ii. incorporating unobserved heterogeneity factors using the panel data structures, and

iii. using other estimation techniques (p-spline), specifying non-linearity and time-varying coefficients in the model etc.

The latest extension in this regard is the exclusion of various components in the left-hand side variable i.e., primary balance. This will map which component is the driving force of fiscal unsustainability. Potrafke and Reischmann (2015) exclude the federal transfers to the states from the revenue side in calculating new primary balance, to evaluate the government's discretionary fiscal policy. This study concludes that the central transfers implicitly subsidize the state government's debt in Germany and the US.

It was further extended by analysing the primary deficit gap and the tax gap (Uryszek, 2016). However, no studies exclusively attempted to capture the effects that conceal the debt sustainability, despite of few observation of its relevance (Nguyan, 2013; Bhatt and Scorromossino, 2016). Therefore, it is imperative to account the undermining factors of debt sustainability analysis of Indian states.

3. Methodology

In order to test the debt sustainability of the Indian states during GST regime, the study first specifies the following panel form of fiscal policy response function from equation (6):

$$S_{it} = \phi_0 + \psi\, d_{\text{it-1}} + \phi_1 yvar_{\text{it}} + \phi_2 gvar_{\text{it}} + \lambda_{\text{i}} + \mu_{\text{t}} + \epsilon_{\text{it}} \qquad (7)$$

where,

- S_{it} is the primary surplus-GSDP ratio for i^{th} state in the t^{th} time period,
- $d_{\text{it-1}}$ is the debt-GSDP ratio for i^{th} state in $t\text{-}1^{th}$ period,
- $yvar_{\text{it}}$ and $gvar_{\text{it}}$ are business cycle variables to account for fluctuations in GSDP and primary public spending respectively.
- λ_{i} and μ_{t} are individual (states) effects and time effects (year), respectively.
- It is noticed that the lagged debt ratio is used to take into account the endogeneity issue.
- If $\psi > 0$ and statistically significant, debt policy is sustainable.

Equation (7) can be estimated using the standard panel data techniques: fixed effects (FEs) and random effects (REs). The former posits that the unobserved heterogeneity factors, λ_{I}, and time

effects, μ_t, is correlated with other X variables included in the equation ($yvar$ and $gvar$), while the latter assumes that they are not correlated.

The choice of a relevant model depends on the Hausman statistics. If it supports the FEs model, then OLS (i.e., LSDV) can be used to estimate the equation (7) i.e., incorporating λ_i and μ_t in the form of state and year dummies. If the Hausman statistics support the REs model, the GLS estimation procedure can be used.

Further, to examine whether GST is a weakening factor for debt sustainability, an adjustment is made in the primary balance calculation (assuming only changes in the revenue of a state as already mentioned) of each state, i.e., exclusion of GST compensation in the primary balance equation.

This newly adjusted variable is called the "Adjusted Primary Balance" or "GST Compensation Adjusted Primary Balance". The link between the adjusted dependent variable and the baseline dependent variable is expressed below.

> Primary Balance (baseline model) = [state's own tax+ states' own non-tax + state's share in union taxes and duties + grants in aid from government of India, including protected GST compensation + non-debt capital receipts] – [(revenue expenditure-interest payment) + capital expenditure + disbursement of loans and advances][9]
>
> Adjusted primary balance = [state's own tax+ states' own non-tax + state's share in union taxes and duties + grants in aid excluding GST compensation grants+ non-debt capital receipts + Central Transfers]- [Primary Expenditure]

The rationale behind these adjustments is

i. many states have realized the 14% revenue, and the gap is mainly dealt with by compensation. So it is essential to see a sustainable debt position in the absence of GST compensation, which will be the reality after June 2022; and

ii. since the GST compensation starts after 2017, the model adjustments can capture the regime shift effect.

The State, as per the Goods and Services (Compensation to States) Act, 2017, will get compensation for the loss on account of the introduction of GST for five years from the date of implementation, i.e., July 2017 to July 2022. For the purpose of compensation, net collection of taxes subsumed under GST in the year 2015-16 has been taken as the base year and 14percent is assumed as the annual growth rate to determine the protected revenue in a year after the introduction of GST. The growth rate is applied to the base year collection to calculate the protected revenue. The actual collection is deducted from the protected revenue (projected revenue) and the balance is given as compensation on a bi-monthly basis. The union government created a GST compensation fund which is financed through the GST Compensation Cess (GSTCC) on select commodities.

Compensation Amount= Protected Revenue-Actual Revenue of the State

Protected Revenue in year n = Revenue from the subsumed taxes in 2015-16 * [1+ 0.14]

For the purpose of analysis, the revenue shortfall is calculated without considering the collection of arrear taxes in respect of various Acts, which are subsumed under GST as the data of all the States are not available. The revenue shortfall (which is protected revenue minus actual collection) for major States and Union Territories are reported in Table 1.

Table 1: The Shortfall in GST Revenue (Rs. Crore)

States	2017-18	2018-19	2019-20	2020-21	2021-22
Andhra Pradesh	-3227	1994	3651	8865	7218
Assam	-1111	1440	1588	3486	2986
Bihar	-336	5458	6015	9329	9312
Chhattisgarh	896	3877	4801	6803	7217
Gujarat	2151	10722	14016	24897	17570
Haryana	1019	5998	6869	11256	9619
Himachal Pradesh	1273	1835	2655	3695	3579
Jharkhand	130	2339	2674	4959	4925
Karnataka	4310	16533	18871	31388	28241
Kerala	471	6536	9021	14719	14344
Madhya Pradesh	171	5746	7123	12214	12131
Maharashtra	-4549	13636	19224	45627	32331
Odisha	1721	5782	5654	8507	7962
Punjab	5298	10222	11744	16623	16223
Rajasthan	-1464	4869	7361	13027	10546
Tamil Nadu	-3271	2453	3796	8716	6128
Telangana	-427	7205	10166	22319	19052
Uttar Pradesh	-5410	8282	9984	22994	19643
Uttarakhand	1488	3277	3584	5308	5178
West Bengal	-2047	5671	7060	14438	13627

Source: Budget Documents of States, various years

Since there is a growing gap between compensation due to the states and compensation cess collected, one question is to what extent the compensation cess as it exists today has been adequate to meet the required revenue. Any analysis in this direction is almost impossible, because the required disaggregated data regarding GST cess collection by the centre is yet to be published. The analysis of the compensation released shows that Central Government has partially paid the compensation from 2017-18 to 2021-22 (see Table 2)

Table 2: GST Compensation Payments to Major States (Rs. Crore)

States	Compensation released in 2017-18	Compensation released in 2018-19	Compensation released in 2019-20	Compensation released in 2020-21	Compensation released in 2021-22
Andhra Pradesh	619	0	3028	5220	2536
Assam	980	454	1306	1875	40
Bihar	3140	2798	5464	4039	0
Chhattisgarh	1262	2608	4538	2846	657
Gujarat	4882	8788	15558	13719	2181
Haryana	1461	3916	6617	5453	949
Himachal Pradesh	1059	2084	2619	1623	452
Jharkhand	1368	1098	2219	2625	933
Karnataka	7670	12465	18628	15500	5707
Kerala	2102	3532	8111	7063	4121
Madhya Pradesh	2668	3302	6538	5788	1946
Maharashtra	3077	9363	19233	28421	13626
Odisha	2348	4241	5332	4243	0
Punjab	5109	8985	12187	7826	3481
Rajasthan	2899	2280	6710	6704	741
Tamil Nadu	1018	5363	11423	12739	8169
Telangana	0	0	3054	4487.45	296
Uttar Pradesh	2432	0	9123	13680	8028
Uttarakhand	1432	2442	3375	2519	1030
West Bengal	1608	2615	6200	7828	5383

Source: Ministry of Finance, Government of India (as reported on the answers to a question in Rajya Sabha – 19 July 2022)

Thus, in the baseline model (equation 7), the actual primary balance is replaced with Adjusted Primary Balances by subtracting the protected GST compensation from the model as:

$$S1_{it} = \phi_0 + \psi\, d_{\text{it-1}} + \phi_1 yvar_{\text{it}} + \phi_2 gvar_{\text{it}} + \lambda_{\text{i}} + \mu_{\text{t}} + \epsilon_{\text{it}} \qquad (8)$$

This maps the reaction of adjusted primary balances to the changes in debt. It indirectly discloses whether or not GST is a strong factor in sustainable debt position of a state.[10]

Further, to test whether the debt is sustainable in each of the major Indian states, the debt-GSDP variable is allowed to interact with the state-specific dummies.

The equation (8) can be modified as:

$$S_{it}/S1_{it} = \phi_0 + \phi_1 yvar_{\text{it}} + \phi_2 gvar_{\text{it}} + \lambda_{\text{i}} + \mu_{\text{t}} + \sum_i \psi_i K_{\text{i}} * d_{\text{it-1}} + \epsilon_{\text{it}} \qquad (9)$$

Where

- K_i's are state-specific dummies, $K_i = 1$ if i^{th} state and 0 otherwise.

- When ψ_i (which is interacted with $K_i * d_{\text{it-1}}$) > 0 and statistically significant, the debt is sustainable in state i.

It is noticed that the regular fixed effects model assumes that intercept varies across states and time while the slope parameter is constant. With a dummy interaction term, the slope parameter associated with debt varies across states but is constant for a state.[11]

Data: The study uses secondary data, covering 20 major Indian states (which account for more than 90 percent of India's population) during 2016-17 to 2021-22. The Gross State Domestic product (GSDP) data (real and nominal) are compiled from the Central Statistical Organization (CSO), while other fiscal variables from Comptroller and Auditor General (CAG) of India Audit Reports and Finance Accounts of the respective states.[12]

GST collection data is taken from GST portal (https://www.gst.gov.in/download/gststatistics). More importantly, while we use SGST and IGST settlement data for our analysis, we ignore CGST, as it does not include the tax revenue of states.

As stated above, the *yvar* is calculated by subtracting the long-term trend of GSDP, which is computed using the HP filter to the real GSDP series, from its actual values. Similarly, *gvar* is computed as realized value minus the trend value of primary expenditure. [14]

Table 3: Descriptive statistics of the study variables (2017-18 to 2021-22)

Definition	Variables	Mean	Standard Deviation
Primary balance-GSDP ratio (%)	s_{it}	-0.986	1.503
Adjusted Primary balance 1 (%)	$s1_{it}$	-2.924	1.776
Real GSDP gap (₹ billion)	$yvar_{it}$	0.0001	247.210
Real Primary Expenditure Gap (₹ billion)	$gvar_{it}$	0.00002	78.830
Debt-GSDP ratio (%)	d_{it}	28.827	7.388
Lagged debt-GSDP ratio (%)	d_{it-1}	27.947	7.367

The disaggregated picture of major variables of interest are given in Figures 1 and 2. Notably, an important indicator of debt sustainability is that the primary deficit declines over time and then turns into a surplus; however, no states are in a position to meet the condition (See Figure 1) The ratio of total outstanding debt-to-GSDP was higher than 30% in Andhra Pradesh, Bihar, Kerala, Punjab, Rajasthan, Uttar Pradesh and West Bengal while it was above 25% in Haryana, Jharkhand and Madhya Pradesh. The average for all states stood at 27.53%.

Figure 1: Primary Deficit to GSDP Ratio: (Annual Average: 2017-18 to 2021-22)

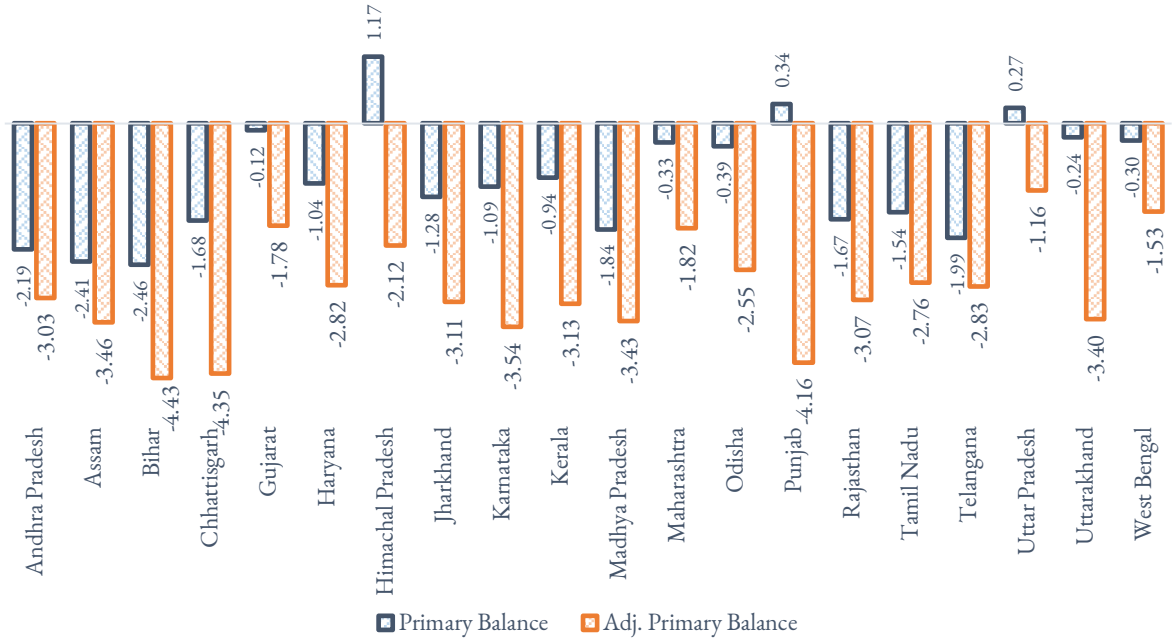
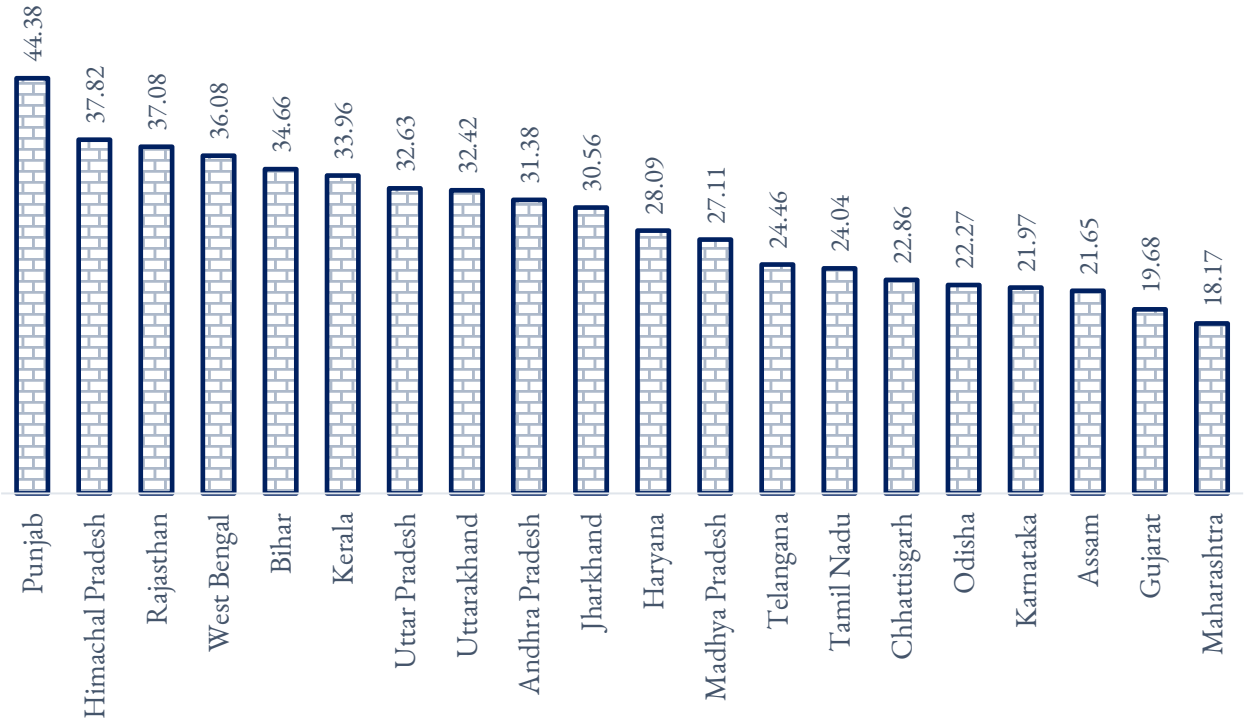


Figure 2: States' Debt-GSDP ratio (Annual Average: 2017-18 to 2021-22)



4. Empirical results

Estimation Results (aggregate): Columns 2 of Table 4 present the estimation results of equation 7. In the initial analysis the study found that the Hausman and Breusch Pagan test support the random

effects model. Therefore, the RE model results are projected, even though FEs model results are more or less similar to REs.

- The business cycle variable $yvar$ is positive and statistically significant at the 10% level.
- As expected, the primary expenditure gap variable $gvar$ has a negative coefficient and is statistically significant at 1 per cent level, implying that the primary spending above its normal value has reduced the primary surplus ratio.

The variable of interest is the debt-GSDP ratio, d_{it-1}. As predicted, its coefficient is positive, but statistically significant only at the 5% level, indicating a debt sustainability in Indian states as a whole. It is noticed that when, on average, the debt-GSDP ratio increases by 1 unit, the primary balance-GDP ratio increases by 0.0391 units.

Column 3 of Table 4 shows the estimation results of GST compensation adjusted primary balance model ($S1_{it}$). However, the coefficient of the lagged debt-to-GS1DP is negative and statistically significant, implying any increase in previous debt worsens adjusted primary balance, indicating unsound fiscal position, which is not surprising. The estimated coefficients of yvar and gvar variables in Model 2 are as expected but larger than the baseline model (Model 1).

Table 4: Panel model estimation results

	Primary Balance (RE)	GST Compensation Adjusted Primary Balance (RE)
(1)	(2)	(3)
	Model 1 Coefficient (t-value)	Model 2 Coefficient (t-value)
d_{it-1}	0.0391 (1.98)	-0.1903 (-3.29)
$yvar_{it}$	0.00001 (2.92)	0.00002 (3.55)
$gvar_{it}$	-0.0001 (-2.81)	-0.00001(-0.66)
$Constant$	-2.0786 (-2.71)	2.3926 (1.48)
f-stat/ wald chi2	22.64 [0.00]	8.28 [0.01]
R-squared		0.3781
Hausman	0.09 [0.75]	6.29 [0.04]
Sample(N)	100 (20×5)	100 (20×5)

Source: Author's estimation; t statistics in parentheses (); p value in parentheses []

Estimation Results (disaggregate): In order to check whether or not the fiscal policy is sustainable during GST regime in each of the states, Equation (9) is estimated by allowing d_{it-1} variable to interact with the state-specific dummies. The estimated results of the baseline model (primary balance without any adjustment) are shown in Model 1 (Column 2 of Table 5).

Among the control variables, *yvar* is not statistically significant, and *gvar* has a negative coefficient that is statistically significant at the 1% level. The debt interaction term is positive and statistically

significant in the cases of Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Odisha, Uttar Pradesh, and West Bengal. For these six states, debt policy is sustainable. In the other states (Assam, Bihar, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Telangana and Uttarakhand), the debt interaction coefficient is not statistically significant even at the 10% level.

When the GST compensation-adjusted primary balance is replaced with the primary balance, the results significantly varied in Model 2 (column 3 of Table 5). Notably, the response parameters of all states turn insignificant or significantly negative, implying that they failed to meet the sustainability condition. The results of the control variables are as expected in both models.

Table 5: Panel model estimation results for Indian states

Variables	Primary Balance	GST Compensation Adjusted Primary Balance (RE)
(1)	(2)	(3)
	Coefficient (t-value)	Coefficient (t-value)
d_{it-1} × *Andhra Pradesh* (K_1)	0.1691 (9.48)	-0.1535 (-2.49)
d_{it-1} × *Assam* (K_2)	-0.5643 (-4.00)	-0.2671 (-2.87)
d_{it-1} × *Bihar* (K_3)	-1.3663 (-5.32)	-0.1867 (-3.28)
d_{it-1} × *Chhattisgarh* (K_4)	0.0645 (11.32)	-0.2890 (-3.24)
d_{it-1} × *Gujarat* (K_6)	0.1226 (1.92)	-0.1734 (-1.82)
d_{it-1} × *Haryana* (K_6)	0.1772 (10.12)	-0.1652 (-2.37)
d_{it-1} × *Himachal Pradesh* K_7)	0.0204 (2.22)	-0.1028 (-2.01)
d_{it-1} × *Jharkhand* (K_9)	0.1839 (10.51)	-0.1621 (-2.53)
d_{it-1} × *Karnataka* (K_{10})	0.1896 (4.65)	-0.2566 (-2.77)
d_{it-1} × *Kerala* (K_{11})	0.0543 (3.99)	-0.1484 (-2.56)
d_{it-1} × *Madhya Pradesh* (K_{12})	-0.0052 (-0.09)	-0.2020 (-2.74)
d_{it-1} × *Maharashtra* (K_{13})	-0.0492 (-0.98)	-0.1939 (-1.85)
d_{it-1} × *Odisha* (K_{14})	0.3442 (5.04)	-0.1978 (-2.24)
d_{it-1} × *Punjab* (K_{15})	-0.0616 (-8.55)	-0.1371 (-3.10)
d_{it-1} × *Rajasthan* (K_{16})	-0.0779 (-3.28)	-0.1341 (-2.54)
d_{it-1} × *Tamil Nadu* (K_{17})	-0.0118 (-1.98)	-0.1924 (-2.37)
d_{it-1} × *Telangana* (K_{16})	-0.0505 (-0.54)	-0.1936 (-2.41)
d_{it-1} × *Uttar Pradesh* (K_{18})	0.4209 (2.43)	-0.0881 (-1.49)
d_{it-1} × *Uttarakhand* (K_{19})	0.3622 (0.65)	-0.1928 (-2.66)
d_{it-1} × *West Bengal* (K_{20})	0.0067 (1.70)	-0.0877 (-1.70)
$yvar_{it}$	-0.00001 (1.64)	-0.00002 (3.09)
$gvar_{it}$	-0.00002 (-8.30)	-0.00001 (-0.74)

$(intercept)$	-0.5480 (-2.34)	1.7225 (0.97)
f-stat/wald Chi2	3.73 [0.00]	50.32 [0.00]
Adj R-squared	0.5308	
Sample(N)	100 (20×5)	100 (20×5)

Source: Author's estimation; t statistics in parentheses (); p-value in parentheses []

Has GST increased the debt burden of Indian states?

The fiscal responses of the states alone do not provide a conclusive picture of the debt sustainability condition of a state. Therefore, an indicator approach is used as a supplementary tool. Here, one should keep in mind that if a given state's GST revenue is sufficient to service the state's liabilities, other receipts could be utilized for primary spending. Also, in case the GST revenue (particularly the SGST revenue) is adequate, there is no need to borrow again to service its existing debt. This will ensure a smooth functioning of the fiscal chain and suggest a successful GST model.

In addition to the fiscal response, sustainable debt position requires another condition to be satisfied i.e., the rate of growth of debt ($\boldsymbol{d}$) should be lower than the rate of growth of SGST ($\boldsymbol{\tau}$). In other words, a higher growth in SGST collection and lower debt growth are sufficient conditions for sustainable debt position.

If a state meets the condition, along with positive responses in the FPRF, its debt is considered strongly sustainable. On the other hand, if it satisfies at least one condition, its debt is considered weakly sustainable.

Strongly sustainable: Both FPRFs are positive & significant; $\boldsymbol{\Delta\tau - \Delta d > 0}$

Weakly Sustainable:

i. Only baseline FPRF is positive & significant; $\boldsymbol{\Delta\tau - \Delta d > 0}$
ii. Baseline FPRF is positive & significant; $\boldsymbol{\Delta\tau - \Delta d < 0}$
iii. Baseline FPRF is positive but not significant; $\boldsymbol{\Delta\tau - \Delta d > 0}$

Unsustainable: All other conditions.

Table 6 concludes the level of debt sustainability for each state using the above conditions. It is observed that none of the states are fully solvent to avoid the Ponzi scheme as all three sustainability conditions are not satisfied.

In the case of Gujarat, Haryana, Himachal Pradesh, Jharkhand, Kerala, Maharashtra, Odisha, Uttarakhand and West Bengal at least one condition is met. In all these states the growth rate of debt is higher than the growth rate of SGST.

States like Andhra Pradesh, Assam, Bihar, Chhattisgarh, Karnataka, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh do not meet any sustainability conditions. Overall, the debt policy is not sustainable in 11 states, and they deserve policy attention.

Table 6: Sustainable debt position of Indian states

States	Fiscal Response	GST Compensation Adjusted Fiscal Response	$\Delta\tau - \Delta d > 0$	Sustainability?
Andhra Pradesh	+*	-**	-0.97	Not sustainable
Assam	-***	-**	-7.78	Not sustainable
Bihar	-***	-***	0.24	Not sustainable
Chhattisgarh	+**	-***	-4.67	Not sustainable
Gujarat	+*	-	4.35	Weakly Sustainable
Haryana	+**	-*	0.81	Weakly Sustainable
Himachal Pradesh	+*	-**	5.91	Weakly Sustainable
Jharkhand	+**	-**	2.31	Weakly Sustainable
Karnataka	+**	-***	-2.88	Not sustainable
Kerala	+*	-**	2.29	Weakly Sustainable
Madhya Pradesh	-	-**	-3.25	Not sustainable
Maharashtra	-	-	6.63	Weakly Sustainable
Odisha	+***	-*	3.88	Weakly Sustainable
Punjab	-***	-***	4.17	Not sustainable
Rajasthan	-***	-**	0.10	Not sustainable
Tamil Nadu	-*	-**	-0.80	Not sustainable
Telangana	-	-**	-0.59	Not sustainable
Uttar Pradesh	+**	-	6.95	Not sustainable
Uttarakhand	+	-**	2.94	Weakly Sustainable
West Bengal	+*	-	3.98	Weakly Sustainable

Source: Author's estimation

5. Concluding remarks

This study attempted to estimate the fiscal policy responses (with two adjustments in the model), both at the aggregate and the disaggregate level during the GST Period. The estimated responses are then supplemented with a sustainability indicator. The results indicate that the primary balance of the state governments in India reacts positively to high public debt, which implies that fiscal policies are successful in sustaining the debt path of states as a whole.

However, at the state level, debt is sustainable only in 11 out of the 20 states. The test results do not indicate that Indian state governments pursued sustainable debt policies when the GST compensation is not included in the model, which implies that the observed sustainable path in the baseline model is not because of the sound fiscal policies of most states. In other words, GST compensation grants implicitly subsidized the state governments' debt.

At the disaggregated level, no other states meet the sustainability condition with GST compensation adjusted primary balance., which suggests that the debt position of many Indian states got aggravated during the GST period. When the study supplements the results with the indicator approach, it is concluded that 11 Indian states face long-run sustainability issues and deserve urgent policy attention.

This finding can be contextualized in the broad argument of poor GST revenue performance of the states, wherein very few states are in a position to register the protected growth rate. Given that the GST compensation period will end in June 2022, the realized poor GST revenue growth in many states is likely to pose severe challenges to their debt sustainability.

This study suggests three plausible ways of addressing this issue. First, realizing the severity of the problem in major states, the 48th GST council meeting can revisit the possibility of extending GST compensation period with a new formula, Second, the Centre should consider the extension of GST compensation, with a revised formula for GST rates that takes into account greater expenditure commitment of states. Third, some relaxations in FRBM targets may be given to states deviating from potential GST revenue growth, provided that debt servicing should be strictly based on own revenues and not using borrowed money.

Appendix – I

Appendix Table 1: Actual GST Revenue (Rs. Crore)

States	2017-18	2018-19	2019-20	2020-21	2021-22
Andhra Pradesh	21,257	18,559	19,780	17,847	23,234
Assam	8,890	7,428	8,521	8,038	10,152
Bihar	16,738	13,240	15,301	14,970	18,389
Chhattisgarh	8,665	7,023	7,625	7,362	8,931
Gujarat	35,351	32,030	34,721	30,664	45,769
Haryana	18,775	16,567	18,855	18,069	23,812
Jharkhand	8,201	7,159	8,153	7,383	9,146
Karnataka	42,663	37,017	42,175	38,205	51,094
Kerala	21,390	18,385	19,390	17,669	22,578
Madhya Pradesh	19,751	16,965	18,768	17,301	21,516
Maharashtra	83,181	76,004	82,966	70,870	1,00,475
Odisha	12,639	10,588	13,008	12,768	16,291
Punjab	13,510	11,218	12,699	11,241	15,542
Rajasthan	23,763	20,552	21,619	20,010	27,117
Tamil Nadu	24,206	21,412	23,411	22,300	29,230
Telangana	39,137	36,925	40,142	35,032	46,329
Uttar Pradesh	48,801	41,183	46,407	41,291	53,642
West Bengal	28,166	24,104	26,884	24,258	30,487

Appendix Table 2: Protected Revenue (Rs. Crore)

States	2017-18	2018-19	2019-20	2020-21	2021-22
Andhra Pradesh	18030	20554	23431	26712	30452
Assam	7779	8868	10109	11525	13138
Bihar	16402	18698	21316	24300	27702
Chhattisgarh	9561	10900	12426	14165	16148
Gujarat	37502	42752	48737	55561	63339
Haryana	19794	22565	25724	29325	33431
Jharkhand	8331	9497	10827	12343	14071
Karnataka	46973	53549	61046	69592	79335
Kerala	21861	24922	28411	32388	36922
Madhya Pradesh	19922	22711	25890	29515	33647
Maharashtra	78632	89640	102190	116496	132806
Odisha	14360	16370	18662	21275	24253
Punjab	18808	21441	24442	27864	31765
Rajasthan	22299	25421	28980	33037	37663
Tamil Nadu	20935	23866	27207	31016	35358
Telangana	38710	44130	50308	57351	65380
Uttar Pradesh	43391	49466	56391	64285	73285
West Bengal	26119	29776	33944	38696	44114

Source: Calculated based on data collected from GST Portal

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Notes

1. See Rao (2019) for structure, progress, performance, and prospects of GST.
2. The rationale behind this is, when the income of an individual increase, his borrowing is set to reduce until and unless he revises his expenditure to increase further. If so, it guarantees your financial sustainability.
3. The states have been enticed to compromise with a constitutional guarantee of 14% growth in their tax revenue under GST. Hence, had there been no GST Compensation through the GST compensation cess levied by the Centre, GST would not have been adopted (Joseph and Ramalingam, 2020)
4. Hereafter SGST means state GST plus IGST settlement.
5. Since this test maps the response of the primary balance to change in public debt, conditional on the control variables, this is often referred as the fiscal reaction function or the fiscal policy response function in most of the literature (D'Erasmo et al. (2016).
6. See Renjith & Shanmugam (2018) and Afonso (2005) for a brief survey of traditional empirical approaches and its criticisms.
7. Bohn model is often referred as Fiscal Reaction Function or fiscal policy response function or feedback rule, as it captures the reaction coefficient of the policy (fiscal) variable with respect to the variations in public debt.
8. Because higher debt ratios lead to an increase in the primary surplus relative to GDP, making the debt ratio decline and return to its mean.
9. Primary Expenditure = Revenue expenditure - interest payment + capital expenditure + disbursement of loans and advances

10. The incorporation of lagged debt variable is to address the endogeneity issue arising out of the correlation between adjusted primary balances and debt ratio, taken from the conventional approaches (Greiner and Fincke, 2015; Potrafke and Reischmann, 2015)
11. Spatial (state) dummies are in general useful to get state specific coefficients. This procedure is widely accepted in the econometric literature to achieve state specific coefficients.
12. The total outstanding liabilities of the undivided state at time of bifurcation stood at ₹1796.37 billion; which was to be distributed among the two new States (i.e., Andhra Pradesh and Telangana) in the proportion of population (being 58:42). As result, the new State of Andhra Pradesh had inherited an amount of ₹1041.89 billion, with the remaining allocated to Telangana. A similar approach is adopted for calculating the bifurcated data for 2012-13 and 2013-14.
13. Available at https://www.gst.gov.in/downloads/gststatistics. The methodology used by Mukharjee (2020) is adopted to fill the gaps in the GST data.
14. The real values of the fiscal variables are computed using the GSDP deflator of the respective states.