Tax Smoothing under Constrained Tax Autonomy: Evidence from India's GST

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Abstract

The introduction of Goods and Services Tax (GST) in India brought a shift in the structure of fiscal federalism with decreased autonomy of states in determining tax rates. This reform raised an important question - when states lose discretion in determining major tax rates, does borrowing increase as predicted by tax smoothing theory? This study is a conceptual and empirical contribution that extends Barro's (1979) tax-smoothing framework to a subnational context in which there is limited tax autonomy and non-binding fiscal rules. The extended model indicates that not only tax-rate flexibility but also the size and performance of the effective tax base and institutional limits to borrowing are influential in the decision to borrow.

Using monthly data for eighteen Indian states from April 2008 to December 2024, the analysis is based on static and dynamic fixed-effects models with Driscoll-Kraay standard errors. The results reveal that GST did not lead to an increase in state borrowing. In a number of specifications, GST is linked to a slight fall in borrowing to GSDP ratio. Improved tax compliance, better performance of revenue and institutional constraints help explain this outcome.

The study provides new evidence that reduced tax autonomy does not automatically result in higher subnational debt when revenue efficiency improves and fiscal rules remain binding.

Keywords: GST, Tax Smoothing, Fiscal Federalism, Subnational Debt, Tax Compliance, Fiscal Rules, India

JEL Codes: H71, H72, H77, H62, E62

Introduction, Background, and Motivation

In federal fiscal architectures, the vertical allocation of tax authority between tiers of government is much more than an administrative convention; it is fundamentally important in

determining the intertemporal adjustment instruments available to subnational governments during periods of fiscal problems (Bohn, 1998). The canonical tax-smoothing hypothesis formulated by (Barro, 1979) as originally designed prescribes that optimizing governments should contain the deadweight cost of taxation by keeping statutory tax rates stable over time by utilizing public debt as a buffer to absorb transitory expenditure or revenue disturbances (Barro, 1979). This classical framework, however, is based on the critical and implicitly assumed discretionary control of subnational governments over their marginal tax instruments to allow such countercyclical adjustments (Renjith, 2023). When this rate-setting autonomy is greatly reduced through institutional reform, the intertemporal composition of fiscal adjustment necessarily goes through a structural transformation (Renjith, 2023). Against this background of theory, the central research question driving this study examines whether the introduction of India's Goods and Services Tax (GST) in July 2017 materially changed the equilibrium behavior of Indian state governments in terms of their borrowing behavior, by putting a binding constraint on the ability of state governments to maintain a discretionary authority over their tax rate.

Prior to the GST reform, Indian states had significant and independent power in a wide range of indirect taxes, the most important of which were the Value Added Tax (VAT), central sales tax, entry tax, luxury tax, and entertainment tax (Renjith & Shanmugam, 2018a, 2025). Although this decentralized structure was marked by an incomplete inter-state harmonization, these levies together formed the dominating component of states' own-revenue base and could be adjusted at the margin to meet states' specific fiscal needs (Pandey, 2020). The enactment of the Constitution (101st Amendment) Act radically changed this set-up by replacing the fragmented system with a destination-based, dual GST system, wherein statutory rates are decided by the GST Council collectively as opposed to unilateral action from the states (Pandey, 2020). This constitutional change had a substantial effect of turning the lion's share of the states own tax revenue into a centrally controlled regime, removing their independent rate setting discretion over the very taxes which had previously been used as their main fiscal tool (Renjith, 2023).

This institutional erosion of tax autonomy took place in a context of large vertical imbalances in the finances of subnational units across Indian states and high heterogeneity in the debt position of the latter (Misra et al., 2023). Empirical assessments based on the framework of fiscal policy responses (Bohn, 1998) suggest that although the collective response of primary

balances to increasing debt in India shows a positive relationship (and hence a compliance with an aggregate sustainability condition), this regularity masks a significant degree of inter-state heterogeneity (Renjith & Shanmugam, 2018). Indeed, the evidence points in the direction that debt sustainability is only true for some subset of states, leaving at least some of them on trajectories calling for some form of corrective policy intervention (Renjith & Shanmugam, 2020). Furthermore, the subnational governments in India are structurally vulnerable to recurring fiscal stress and revenue volatility, under which even small institutional changes to the revenue authorities may have consequential implications for the public debt dynamics (Renjith & Shanmugam, 2020).

The GST reform offers an especially appropriate natural experimental environment to re-examine the issue of intertemporal fiscal adjustment at the subnational level (Renjith, 2023). Within the framework of canonical tax smoothing, the government faced with a temporary fiscal shock makes an optimal choice between adjusting tax rates and issuing debt (Bohn, 1998). With the prevailing indirect tax rates now exogenously fixed through a collective Council mechanism, the states' main room of fiscal adjustment is being practically closed (Renjith, 2023). This constraint on tax-rate discretion is also added to by some stringent regulatory restriction on the subnational borrowing capacity: state-level Fiscal Responsibility and Budget Management (FRBM) legislation generally limits the gross fiscal deficit to three percent of Gross State Domestic Product (GSDP), and Article 293 (3) of the Indian Constitution links state borrowings to central government approval whenever prior central loans remain outstanding (Misra et al., 2023). Accordingly, in the post-GST environment, Indian states face a fiscal constraint of two kinds - the sharply reduced tax-rate discretion coupled with strictly regulated borrowing capacity - that changes fundamentally the feasible set of feasible intertemporal adjustment strategies.

To offset the immediate revenue fallout from the transition, the GST system featured a compensation model that ensured at least 14 percent compounded annual revenue growth rate for states over the first stage of implementation for 5 years from July 2017 to June 2022 (Mukherjee, 2020). While this arrangement cushioned the short run transitional shock, it effectively replaced states erstwhile rate setting flexibility and created a structural reliance on intergovernmental transfers and contingent borrowing arrangements (Agarwal et al., 2024). Following the expiration of this compensation guarantee in June 2022, state governments became fully vulnerable to the natural volatility in the flows of GST revenues lacking any

instrument of rate discretion as a fiscal stabilizer (Agarwal et al., 2024). This development has driven increased scholastic and policy commentary raising the question of whether the GST transition has caused a systematic increase in state debt burden, especially in the context of persistent revenue uncertainty (Chakraborty & Shanmugam, 2024). In spite of saliency of these concerns, the literature has been evaluating the performance of the revenue and the debt ratio in isolation mostly without embedding the institutional loss of tax autonomy in a coherent intertemporal borrowing framework in a systematic manner (Renjith, 2023).

This paper fills this gap by conceptualizing the GST reform as a structural contraction in the discretionary tax base that states have to smooth between years (Renjith, 2023; Dwivedi, 2024)). By bringing together a diverse range of major indirect taxes at the state level (such as the sales tax, VAT, entry tax, and luxury tax) under a single national structure with the collective power of decisions, the GST regime eliminated the ability of individual states to set the unilateral tax rates that were previously used to adjust for volatility in state-specific revenue through countercyclical adjustments (J. Joseph & Kakarlapudi, 2023; K. J. Joseph & Kumary, 2023). The fiscal rigidity thus introduced is particularly consequential in light of the fact that subnational expenditure in India is very rigid in the downward direction; state budgets are dominated by committed, non-developmental outlays (e.g., administrative salaries, pension obligations, interest payments of existing debt) which leaves very little room for expenditure-side adjustment during revenue shortfalls (Das, 2024). Under these conditions, any unforeseen shortfall in revenue would necessarily result in adjustments to borrowing under the three per cent of GSDP binding FRBM deficit limit (Bal et al., 2025).

From this conceptual framework flow two theoretically-based predictions. First, to the extent that the statutory borrowing ceilings are not immediately binding, the average level of net borrowing is expected to rise in the post-GST period as states meet persistent expenditure commitments through borrowing in face of reduced own revenue flexibility (Renjith, 2023). Second, the volatility of borrowing is forecast to rise in the wake of removing countercyclical rate-setting capacity, because states will no longer be able to use independent adjustments of tax rates to offset idiosyncratic revenue shocks (Renjith, 2023). These predictions in a nutshell suggest a structural break in subnational borrowing dynamics coincidentally with the GST reform.

Empirically, this study takes advantage of the July 2017 GST implementation as a drastic institutional discontinuity (Dandona et al., 2024). The analysis is based on the extensive panel

data for major Indian states covering the period from April 2004 to December 2024. Identification is based mainly on within-state variation over time, comparing the borrowing behavior before and after the reform, holding high the state fixed effects, the common macroeconomic shocks and the changes in the fiscal rule parameters. The core specification is an estimate for the causal effect of a post-GST indicator on net borrowing as a share of GSDP, which explicitly allows for heterogeneous responses by states with different initial debt sustainability levels and revenue capacity (Renjith & Shanmugam, 2020; Misra, Gupta, and Trivedi, 2023). Driscoll-Kraay standard errors are used throughout to take account of possible cross section dependence and serial correlation in the panel. Supplementary specifications are used to test whether the conditional variance of the borrowing increased in the post-GST period, as in the hypothesized attenuation of the tax-smoothing mechanism.

The empirical strategy takes advantage of substantial heterogeneity in the composition of states' own tax revenues on the pre-reform, a further. Historically, the sales tax and VAT combined made up the largest portion of the own tax receipts of states, accounting for between 60 and 65 percent of the total own source revenues in most states (Joseph & Kumary, 2023). States which were more heavily dependent on the specific levies that were later brought under the framework of the GST were subsequently subject to a proportionately greater reduction in their effective taxing power. If the proposed theoretical mechanism is operative, these high reliability states should have a correspondingly stronger post GST borrowing response as a powerful source of cross sectional identification that complements the aggregate time discontinuity.

By formally introducing institutional tax reform into an intertemporal fiscal framework, this paper makes contributions to three different strands of literature. First, it builds on the seminal tax smoothing analysis by Bohn (1998) but in a federated fiscal environment where subnational tax autonomy has been endogenously changed by constitutional reform (Renjith and Shanmugam, 2020). Second, it augments the existing empirical literature on Indian subnational debt sustainability and makes explicit the structural shifts in revenue and realization of contingent liabilities in models of dynamics of debt (Misra, Gupta, and Trivedi, 2023; Kaur et al., 2018)). Third, the findings have implications for the ongoing policy deliberations on the rigidity of design of subnational fiscal rules, governance structure and the rate-setting dynamics of the GST Council, as well as the appropriate architecture of compensation and borrowing frameworks for subnational governments (Joseph and Kumary, 2023; (Mukherjee, 2020)).

An important clarification is needed right at the beginning: the key argument made in this paper is not that because of the GST reform, the states ended up with higher levels of debt. Rather, the reform radically altered the available margins of fiscal adjustment. Whether such a structural realignment will translate into persistently elevated and fiscally unsustainable debt trajectories depends critically on the interaction between GST revenue volatility, subnational expenditure rigidity and binding character of formal borrowing constraints (Renjith, 2023; Das, 2015). A strict understanding of this tri-partite interaction is a must to a comprehensive assessment of the long-run macro-fiscal consequences of India's most consequential indirect tax reform post-independence (Joseph and Kumary, 2023).

The rest of the paper proceeds as follows. Section 2 develops the conceptual framework, which formally generalizes the theory of tax smoothing to the case of subnational governments operating under the GST regime. Section 3 describes the empirical strategy, including the source of data, identification strategy, and econometric specifications used. The major empirical findings are presented in Section 4. Section 5 presents a discussion of the findings, and Section 6 concludes with a summary of some key contributions and directions for future research.

Conceptual framework

The theoretical construct combines the theory of intertemporal taxation, fiscal limitations of the subnational level, and the institutional aspects of the GST reform in India to one analytical framework. The main argument is that the GST reform is actually a structural contraction of tax-rate autonomy that is mechanically changing optimal combinations of taxation and borrowing in the face of distortionary costs that are convex. The framework proceeds from first principles and derives equilibrium implications for subnational debt.

Foundations: Tax Smoothing Theory

The analytical basis is the intertemporal model of distortionary taxation by Barro 1979. The basic issue is optimal financing of exogenous expenditure fluctuations in the context of taxation that imposes welfare costs greater than proportionate tax rate.

Let the deadweight loss in taxation be:

$$L(\tau_t) = \frac{1}{2}\varepsilon\tau_t^2 Y_t \qquad (1)$$

where $\varepsilon > 0$is the elasticity of taxable income, $Y_t$is the tax base and $\tau_t$is the statutory tax rate. The second derivative can be found to satisfy

$$L''(\tau_t) = \varepsilon Y_t > 0 \qquad (2)$$

implying strict convexity. Convexity is the structural property which is driving the whole theory. Marginal distortion increases with the increase in the tax rate, which means that high temporary changes in tax rates are more expensive. Stable tax path generates less distortion on average than volatile tax path, even when they generate equal revenues.

The government minimizes

$$\min_{\{\tau_t\}} \sum_{t=0}^{\infty} \beta^t L(\tau_t) \qquad (3)$$

subject to the intertemporal budget constraint

$$\sum_{t=0}^{\infty} \frac{G_t}{(1+r)^t} = \sum_{t=0}^{\infty} \frac{\tau_t Y_t}{(1+r)^t} \qquad (4)$$

The first-order condition is that, assuming that $\beta(1 + r) = 1$, it follows that

$$L'(\tau_t) = \lambda Y_t \qquad (5)$$

Strict convexity suggests that the tax base is stable.

$$\tau_t = \tau^* \forall t \qquad (6)$$

The optimum tax rate is the annuitized value of permanent expenditure needs over the permanent tax base. This is independent of contemporaneous fluctuations in spending.

The role of debt can be derived from the period identity:

$$G_t + rB_{t-1} = \tau^* Y_t + \Delta B_t \qquad (7)$$

implying

$$\Delta B_t = G_t - \tau^* Y_t + rB_{t-1} \qquad (8)$$

Public debt serves as a buffer stock, so as to absorb temporary fiscal shocks, keeping tax rates constant. Tax smoothing therefore entails two institutional requirements: the availability of adjustable tax rates and access to borrowing.

Extension to Subnational Governments

The fiscal identity of a subnational government $i$contains intergovernmental transfers:

$$G_{it} + r_t B_{i,t-1} = T_{it} + TR_{it} + \Delta B_{it} \qquad (9)$$

Own tax revenue satisfies

$$T_{it} = \tau_{it} Y_{it} \qquad (10)$$

Define net expenditure as

$$\tilde{G}_{it} = G_{it} - TR_{it} \qquad (11)$$

so borrowing evolves according to

$$\Delta B_{it} = \tilde{G}_{it} - \tau_{it} Y_{it} + r_t B_{i,t-1} \qquad (12)$$

Without any constraints to borrowing, the state will take the conventional outcome: the tax rate is kept unchanged ($\tau_{it} = \tau_i^*$), and the public debt will adapt to any net expenditure shock. However, unlike a sovereign government, states have borrowing ceilings, lack monetary authority, and have interjurisdictional mobility of tax bases. When there is a binding of borrowing limits, tax smoothing collapses and taxation becomes procyclical.

The power of states to smooth therefore depends both on tax-rate autonomy and on borrowing flexibility. Either constraint may destabilise the canonical equilibrium.

GST AS A Structural Shock of Tax Autonomy.

The introduction of the Goods and Services Tax radically changed the structure of State tax instruments. The own tax revenue is decomposed during post-GST as

$$T_{it} = \tau_{it}^{GST} Y_{it}^{GST} + \tau_{it}^{res} Y_{it}^{res} \quad (13)$$

The major institutional aspect is that the GST tax rate (τ_{it}^{GST}) is not set by individual states, but rather by GST Council. Since GST comprises some 60–70 per cent of indirect tax revenue, the discretionary tax base is sharply contracted:

$$Y_{it}^{res} \ll Y_{it}^{total} \quad (14)$$

Expenditure responsibilities do not change. The reform thus establishes an imbalance, states are still responsible in terms of expenditure but their ability to change their tax rate is constrained.

Since tax distortions are convex, the increment in revenue adjustments on a smaller base has an increase in marginal welfare cost in a disproportionate way. Given a necessary revenue growth, ΔR.

$$\Delta R = Y_{it}^{res} \Delta \tau_{it}^{res} \quad (15)$$

Since the base is lower, it follows that we will have to have a larger value of $\Delta \tau_{it}^{res}$, than we had under the pre-GST regime. Since distortion is quadratic in the rate, the rate of welfare cost of tax adjustment increases disproportionately. Borrowing becomes a comparatively less distortionary.

The relative price of fiscal instruments is thus altered as a result of the loss of tax autonomy.

GST-based modified optimization.

The post-GST problem becomes

$$\min_{\tau_{it}^{res}, \Delta B_{it}} \sum_{t=0}^{\infty} \beta^t \left[L(\tau_{it}^{res}) + \phi (\Delta B_{it})^2 \right] \quad (16)$$

subject to

$$G_{it} = \tau_{it}^{GST} Y_{it}^{GST} + \tau_{it}^{res} Y_{it}^{res} + TR_{it} + \Delta B_{it} - r_t B_{i,t-1} \quad (17)$$

and borrowing constraint

$$B_{it} \leq B_i \tag{18}$$

The first order conditions suggest

$$L'(\tau_{it}^{res}) = \lambda_t Y_{it}^{res} \tag{19}$$
$$2\phi \Delta B_{it} = \lambda_t \tag{20}$$

Combining,

$$L'(\tau_{it}^{res}) = 2\phi \Delta B_{it} Y_{it}^{res} \tag{21}$$

The smaller discretionary base increases the marginal distortion of taxation as compared to the pre-GST regime. For any given parameter $\phi$for the cost of borrowing, the equilibrium has both higher residual tax rates and higher borrowing.

The mechanical reason for the shift in structure is the contraction of the tax base over which the state has discretion.

Analytical Derivation of GST Influence on borrowing.

Beginning with the Post-GST Borrowing Identity.

After GST the borrowing by the state is:

$$\Delta B_{it} = G_{it} - TR_{it} - \tau_{it}^{GST} Y_{it}^{GST} - \tau_{it}^{res} Y_{it}^{res} + r_t B_{i,t-1} \tag{22}$$

To be clear, the total own tax revenue is defined as:

$$T_{it} = \tau_{it}^{GST} Y_{it}^{GST} + \tau_{it}^{res} Y_{it}^{res} \tag{23}$$

Then borrowing can be written in a shorthand way as:

$$\Delta B_{it} = G_{it} - TR_{it} - T_{it} + r_t B_{i,t-1} \tag{24}$$

This is just an accounting identity: to cover the gap between spending and revenue, one has to borrow.

Borrowing as a Function of Policies

In GST, borrowing relies on three major aspects:

$$\Delta B_{it} = f(\tau_{it}^{GST}, \tau_{it}^{res}, G_{it}) \qquad (25)$$

However:

The GST regime determines the value of τ_{it}^{GST}.

τ_{it}^{res}may respond to GST.

G_{it}may adjust (if flexible).

Thus:

$$\tau_{it}^{GST} = \tau_{it}^{GST}(GST) \qquad (26)$$

$$\tau_{it}^{res} = \tau_{it}^{res}(GST) \qquad (27)$$

$$G_{it} = G_{it}(GST) \qquad (28)$$

So the borrowing is (based on GST) through these variables.

Total Derivative in respect of GST.

Using the total derivative (chain rule):

$$\frac{\partial \Delta B_{it}}{\partial GST} = \frac{\partial \Delta B_{it}}{\partial \tau_{it}^{GST}} \frac{\partial \tau_{it}^{GST}}{\partial GST} + \frac{\partial \Delta B_{it}}{\partial \tau_{it}^{res}} \frac{\partial \tau_{it}^{res}}{\partial GST} + \frac{\partial \Delta B_{it}}{\partial G_{it}} \frac{\partial G_{it}}{\partial GST} \qquad (29)$$

Each term has its corresponding channel of adjustment.

Direct Revenue Channel

From the borrowing identity:

$$\Delta B_{it} = \cdots - \tau_{it}^{GST} Y_{it}^{GST} + \cdots \qquad (30)$$

Diff differentiation with respect to τ_{it}^{GST}:

$$\frac{\partial \Delta B_{it}}{\partial \tau_{it}^{GST}} = -Y_{it}^{GST} \quad (31)$$

This result is mechanical.

If the amount of GST revenue rises by one unit, the amount of borrowing decreases by one unit.

Suppose, now, that there is a GST revenue shock:

$$d(\tau_{it}^{GST} Y_{it}^{GST}) = Y_{it}^{GST} d\tau_{it}^{GST} + \tau_{it}^{GST} dY_{it}^{GST} \quad (32)$$

In GST, states do not have the ability to alter the value of τ^{GST}, therefore:

$$d\tau_{it}^{GST} = 0 \quad (33)$$

Thus revenue fluctuations come completely from base fluctuations:

$$dT_{it}^{GST} = \tau_{it}^{GST} dY_{it}^{GST} \quad (34)$$

Since states cannot balance this through rate adjustment, we get:

$$d(\Delta B_{it}) = -dT_{it}^{GST} \quad (35)$$

Therefore revenue volatility directly passes to borrowing volatility.

Residual Tax Adjustment Channel.

Residual tax revenue equals:

$$T_{it}^{res} = \tau_{it}^{res} Y_{it}^{res} \quad (36)$$

The partial derivative of borrowing on residual tax rate is:

$$\frac{\partial \Delta B_{it}}{\partial \tau_{it}^{res}} = -Y_{it}^{res} \quad (37)$$

Assume that the state attempts to counter a decline in GST revenue:

$$d\tau_{it}^{res} > 0 \text{when} dT_{it}^{GST} < 0 \quad (38)$$

Then the offset term becomes:

$$Y_{it}^{res} \frac{\partial \tau_{it}^{res}}{\partial GST} \quad (39)$$

But since:

$$Y_{it}^{res} \ll Y_{it}^{GST} \quad (40)$$

the strength of this counterbalance is not exceeded by:

$$| dT_{it}^{res} | < | dT_{it}^{GST} | \quad (41)$$

Thus:

$$| \text{offset} | < | \text{GST shock} | \quad (42)$$

Borrowing must increase.

Formally:

$$\frac{\partial \Delta B_{it}}{\partial GST} = -Y_{it}^{GST} + Y_{it}^{res} | \frac{\partial \tau_{it}^{res}}{\partial GST} | \quad (43)$$

Since Y_{it}^{res} is small the first term is dominating.

Expenditure Channel

Now consider the exepnditure term:

$$\frac{\partial \Delta B_{it}}{\partial G_{it}} = 1 \quad (44)$$

For example, if there is a fall in expenditure of one unit there is a fall in borrowing of one unit.

However, suppose expenditure rigidity implies:

$$\frac{\partial G_{it}}{\partial GST} \approx 0 \qquad (45)$$

Then the expenditure channel has little to do with offsetting revenue shocks.

Hence, facing a negative shock to the GST revenue:

$$dG_{it} \approx 0 \qquad (46)$$

so:

$$d(\Delta B_{it}) = -dT_{it}^{GST} + \text{small residual adjustment} \qquad (47)$$

Borrowing increases almost one-to-one.

FORMAL PROPOSITION

Assume (i) GST rates are state exogenous; (ii) expenditure is semi-rigid; and (iii) borrowing restriction is non-binding. Then

$$E[\Delta B_{it} \mid GST = 1] > E[\Delta B_{it} \mid GST = 0] \qquad (48)$$

COMPENSATION AND INSURANCE

GST compensation was fiscal insurance between 2017 and mid-2022:

$$Comp_{it} = \max\left(0, BaseRev_i(1.14)^k - T_{it}^{GST}\right) \qquad (49)$$

Compensation made the revenue less volatile. However, delays during the Covid period and the eventual expiration of compensation left full exposure to volatility of GST. Borrowing bridges the gaps in compensation during the transition, which supports the tax-smoothing mechanism

Empirical strategy

The empirical strategy is aimed at detecting whether the introduction of the tax Goods and Services Tax (GST) in July 2017 caused a structural shift in subnational borrowing behavior in India. The analysis is based on a long monthly panel from April 2008 to December 2024 for

eighteen major states of India: Andhra Pradesh, Arunachal Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana (from July 2014 onwards), Uttar Pradesh and West Bengal. These states comprise the dominant proportion of aggregate state-level fiscal activity and have great heterogeneity in terms of tax structure, income level, fiscal rigidity, and political alignment, which makes them suitable to identify a structure.

Fiscal data is taken from Comptroller and Auditor General (CAG) Monthly Key Indicators, as well as EPWRF India Time Series (EPWRFITS) database. Monetary policy variables such as repo rate is based on the Reserve Bank of India. Political alignment variables are developed from Election Commission of India records. The period April 2008-December 2024 covers the period before GST, the period after the implementation of GST and compensation (2017-2022), the post-compensation phase and the shock of the Covid-19 pandemic, allowing for several institutional regimes to be identified.

The panel is unbalanced because the separation of Andhra Pradesh and the formation of Telangana in 2014 took place. Telangana comes into the picture from July 2014 onwards. This imbalance is institutional and not endogenous to the outcome of borrowing, suggesting that this missingness is orthogonal to the error term. Under exogenous unbalancedness, fixed effects estimators are consistent. The long time dimension (monthly observations for more than 16 years) is sufficient to ensure adequate within-state variation for identification in spite of moderate cross-sectional imbalance.

All variables are stationary in levels as per LLC, IPS and Fisher type panel unit root tests. Estimation is therefore not by differences but by levels. Diagnostic tests for heteroskedasticity, serial correlation and cross-sectional dependence. Given the large scale time dimension, inference is based on Driscoll-Kraay standard errors with lag-length three, robust to general forms of temporal and spatial dependence.

The empirical framework is based on the state budget identity. Let B_{it}denote net borrowing as a proportion of GSDP of state $i$in month t. The scaled flow constraint is

$$B_{it} = G_{it} - R_{it} + \Theta_{it} \qquad (50)$$

where $G_{it}$is total expenditure as a share of GSDP, $R_{it}$is total revenue in the form of revenue and transfers as a share of GSDP and $\Theta_{it}$is interest obligations as a share of GSDP. Being the

residual item of financing, any empirical specification requires conditioning on major items of revenue and expenditure to avoid omitted variable bias.

The baseline static specification is therefore

$$B_{it} = \beta_1 GST_{it} + \beta_2 \left(\frac{TaxRev}{GSDP}\right)_{it} + \beta_3 \left(\frac{NonTaxRev}{GSDP}\right)_{it} + \beta_4 \left(\frac{Grants}{GSDP}\right)_{it} + \beta_5 \left(\frac{RevExp}{GSDP}\right)_{it} + \beta_6 \left(\frac{CapExp}{GSDP}\right)_{it} + \beta_7 Repo_t + \alpha_i + \lambda_t + \varepsilon_{it} \quad (51)$$

State fixed effects $\alpha_i$absorb time-invariant fiscal capacity, structural tax bases, administrative quality, and political culture. Time fixed effects $\lambda_t$absorb effects of macroeconomic shocks that affect all states - effects of national policy changes and monetary cycles The estimator used is the within (fixed effects) estimator using FEOLS. Formally, if $M$is the projection matrix removing state and time means, then the estimator is

$$\hat{\beta} = (X'MX)^{-1}X'My \quad (52)$$

This estimator is suitable given the plausible correlation between fiscal variables and unobserved state characteristics. Random effects would then require the orthogonality of regressors and the unobserved heterogeneity which is a rather improbable assumption for fiscal panels.

Borrowing behaviour is intrinsically persistent thanks to debt rollover and sluggish fiscal adjustment. In order to capture this intertemporal structure, the dynamic specification is

$$B_{it} = \rho B_{i,t-1} + \beta_1 GST_{it} + \beta_2 X_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (53)$$

Because the size of the time dimension is large, the bias of a dynamic fixed effects estimation is negligible. How the adjustment speed measures the coefficient $\rho$is measured by ρ. GST effect in the dynamic model is long-run

$$\frac{\beta_1}{1-\rho} \quad (54)$$

which is the steady state shift in borrowing caused by GST.

One of the main methodological distinctions is between scale (non-composition) and composition specifications. The above ratio models express fiscal variables in terms of GSDP and reflect the macro-fiscal scale effects. However, GST mainly changed the composition of revenue and the structural allocation of fiscal flows and did not merely increase the aggregate fiscal magnitude. To isolate structural allocation effects, the composition models are estimated.

On the revenue side, tax and non-tax revenue shares are included against the total revenue. On the expenditure side, the composition model is built on capital expenditure in terms of share in total expenditure:

$$\left(\frac{CapExp}{TotalExp}\right)_{it} \tag{55}$$

Revenue expenditure as a percentage of total expenditure is ignored and used as the reference category. Because

$$\frac{CapExp}{TotalExp} + \frac{RevExp}{TotalExp} = 1 \tag{56}$$

including both shares would cause perfect collinearity to be induced. By dropping revenue expenditure share, the coefficient on capital expenditure share picks up changes in the composition of expenditure in favor of capital spending rather than revenue spending. This specification has the advantage of isolating the effects on structure allocation independent of the overall size of expenditures.

The composition model is therefore

$$B_{it} = \rho B_{i,t-1} + \beta_1 GST_{it} + \gamma_1 \left(\frac{TaxRev}{TotalRev}\right)_{it} + \gamma_2 \left(\frac{NonTaxRev}{TotalRev}\right)_{it} + \gamma_3 \left(\frac{CapExp}{TotalExp}\right)_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \tag{57}$$

This specification tests whether the responsiveness of borrowing to changes in structural fiscal allocation is not aggregate scale. If GST was to change the composition of revenue autonomy and expenditure priorities, then its effect should be more pronounced in this framework.

Institutional controls are then built in to ensure that the effects of the GST are not confounded with contemporary policy changes. The augmented model becomes

$$B_{it} = \rho B_{i,t-1} + \beta_1 GST_{it} + \delta' Z_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (58)$$

where $Z_{it}$is GST compensation, FRBM 2018 amendments, Finance Commission award periods, UDAY restructuring and Covid indicators. Including these controls helps ensure that $\beta_1$is picking up the effects of structural tax reform, rather than the relaxation of borrowing ceilings and crisis response.

Interaction terms between political mediation are:

$$B_{it} = \rho B_{i,t-1} + \beta_1 GST_{it} + \beta_2 Align_{it} + \beta_3 (GST_{it} \times Align_{it}) + \beta_4 X_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (59)$$

The insignificance of $\beta_3$would show adjustments to borrowing are institutional and not partisan in nature.

Finally, three dimensions of heterogeneity are examined based on pre-GST averages (April 2015-June 2017) in order to prevent post-treatment endogeneity: tax dependence, expenditure rigidity and income level. Let $H_i$denote one such predetermination of characteristic. The heterogeneous specification is

$$B_{it} = \rho B_{i,t-1} + \beta_1 GST_{it} + \beta_2 (GST_{it} \times H_i) + \beta_3 X_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (60)$$

The marginal effect of the GST per subgroups is

$$\frac{\partial B_{it}}{\partial GST_{it}} = \beta_1 + \beta_2 H_i \quad (61)$$

This layered modeling strategy - from static to dynamic, from scale to composition, from homogeneous to heterogeneous effects - ensures that the estimated GST coefficient represents a structural regime shift in the behavior of fiscal adjustment. By conditioning on the full budget identity, controlling for institutional reforms, and isolating expenditure composition effects through capital expenditure share (with revenue expenditure share as the reference category), in the empirical design, the mechanical accounting relationships are systematically isolated from genuine structural changes in borrowing behavior under GST.

Result

This section is the empirical results from the static, dynamic, composition-based, institutional, political and heterogeneity specifications. The empirical strategy is sequential in nature. It starts with scale-based fiscal identity regressions of the form in GSDP ratios, then adds borrowing persistence in dynamic specifications, and finally moves to models of compositional effects which isolate the effects of structural allocation. Institutional regime controls are included to reflect the changes in the fiscal rules and transfer architecture. Finally both political mediation and structural heterogeneity are discussed. All the regressions contain state and year fixed effects. Inference is based on Driscoll-Kraay standard errors that are robust to heteroskedasticity, serial correlation and cross-sectional dependence - important given the monthly frequency and the probability of common macro shocks across states.

Baseline and Dynamic Fixed effects results

Table 1: Fixed Effects Estimation Results (Dependent Variable: netborrowingtogsdp)

Variables	**Spec 1.1 Static**	**Spec 1.2 Dynamic**	**Spec 1.3 Composition**	**Spec 1.3.1 Dynamic**	**Spec 1.4 Institutional**	**Spec 1.4.1 Dynamic**	**Spec 1.4 .2Alt**
L.netborrowingtogsdp	—	-0.0288 (-1.8021)	—	-0.1877 (-2.8057)**	—	-0.1875 (-2.8055)**	—
gstdummy	-0.0007 (-1.4065)	-0.0008 (-1.4864)	-0.0027 (-3.2748)**	-0.0031 (-3.4914)***	-0.0024 (-1.7259)*	-0.0032 (-2.0261)*	-0.0014 (-1.4481)
taxrevenuetogsdp	-0.9423 (-	-0.9382 (-	—	—	—	—	-0.6038 (-

	18.5661)***	18.6733)***					7.6632)***
nontaxrevenuetogsdp	-1.0164 (-46.2853)***	-1.0134 (-44.6785)***	—	—	—	—	-1.0005 (-45.7590)***
grantstogsdp	-0.8462 (-9.6121)***	-0.8495 (-9.7767)***	—	—	—	—	—
revenueexpendituretogsdp	0.9191 (15.4768)***	0.9159 (15.6998)***	—	—	—	—	—
capitalexpendituretogsdp	0.7152 (4.2165)***	0.7050 (4.0830)***	—	—	—	—	1.3874 (9.4564)***
taxrevenuetototralrevenue	—	—	0.0007 (0.2636)	0.0024 (0.8811)	0.0009 (0.3522)	0.0026 (0.9354)	—
nontaxrevenuetototral revenue	—	—	0.0165 (0.9225)	0.0223 (1.2920)	0.0164 (0.9125)	0.0222 (1.2802)	—
capitalexpendituretototalexpendiutre	—	—	0.0135 (1.8509)*	0.0116 (1.7179)*	0.0133 (1.8277)*	0.0114 (1.6931)*	—

gstcompensation	—	—	—	—	-0.0003 (-0.2880)	0.0001 (0.0483)	-0.0003 (-0.5691)
frbm_2018	—	—	—	—	-0.0011 (-0.5073)	-0.0007 (-0.3061)	-0.0007 (-0.3974)
fc14_dummy	—	—	—	—	-0.0024 (-0.7881)	-0.0018 (-0.6538)	-0.0010 (-0.3960)
fc15_dummy	—	—	—	—	-0.0017 (-2.7856)**	-0.0021 (-3.1866)**	-0.0010 (-1.3312)
uday_dummy	—	—	—	—	0.0001 (0.1486)	-0.0002 (-0.4749)	0.0007 (1.2726)
coviddummy	—	—	—	—	0.0008 (0.7213)	0.0004 (0.3964)	0.0005 (0.8447)

reporate	-0.0002 (-1.0422)	-0.0002 (-1.1580)	-0.0002 (-0.5497)	-0.0002 (-0.6669)	-0.0002 (-0.4410)	-0.0002 (-0.5210)	-0.0003 (-0.9969)
Observations	3544	3526	3516	3499	3516	3499	3544

Notes

1. All specifications include state and year fixed effects.

2. Standard errors are Driscoll–Kraay (L = 3) to account for heteroskedasticity, serial correlation, and cross-sectional dependence.

3. t-statistics are reported in parentheses.

*4. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.*

5. Composition models omit grantstototralrevenue and revenueexpendituretototalexpendiutre as reference categories.

6. Dynamic specifications include one-period lag of the dependent variable.

The baseline static specification (Spec 1.1) shows that GST does not have a statistically significant impact on borrowing when models of fiscal variables are in scale form (ratios to GSDP). The estimated coefficient is negative but insignificant in economic size. This implies that after controlling for overall fiscal magnitudes, the introduction of GST does not have a mechanical effect of expansion of borrowings.

However, interpretation changes when the fiscal structure rather than the fiscal size is modelled. In the composition specification (Spec 1.3), in which revenue and expenditure shares are used instead of scale variables, the GST coefficient is negative and statistically significant at conventional levels. The size goes even larger in the dynamic composition specification (Spec 1.3.1), where the magnitude of the coefficient is -0.0031 and significant at the 1 percent level. This pattern shows that the GST effect is more apparent when the effects of structural allocation margins are separated from scale effects.

The dynamic models provide further insight on the persistence of borrowing. With the scale-based dynamic model (Spec 1.2), the lagged dependent variable is small with only just a marginal significance. The lag coefficient in the composition dynamic model (Spec 1.3.1), on the other hand, is -0.1877 and statistically significant. This is referred to as a negative coefficient reflecting a partial adjustment towards a borrowing steady state. Borrowing deviations are corrected during the time, which implies mean reversion but not explosive dynamics. The magnitude suggests that, on average, 18 percent of borrowing deviation is

corrected in the following period which is consistent with fiscal discipline under borrowing rules.

The fiscal control variables are in line with accounting expectations. Higher tax revenue and non tax revenue relative to GSDP, reduce borrowing almost one-for-one. The coefficients are large, negative, and very significant; adding to the mechanical connection between revenue mobilization and deficit financing. Grants to GSDP also result in a significant reduction in borrowing, which suggests that intergovernmental transfers replace debt financing.

On the expenditure side, the revenue expenditure relative to GSDP leads to strong increase in borrowing. This reflects the rigidity and commitment nature of current spending - especially salaries, pensions and interest payments - which are usually not able to adjust downwards in response to revenue shocks. Capital expenditure as a proportion of GSDP also increases the borrowing but its elasticity is less than that of revenue expenditure. In the alternative specification (Spec 1.4.2Alt), the effect of capital expenditure is strengthened suggesting sensitivity to model specification.

In the composition framework, the negative (and slightly significant) coefficient on capital expenditure share (as revenue expenditure share is dropped as reference category) is positive. This suggests that if the government spends less on current expenditure and more on capital expenditure, holding constant expenditure overall, then it has to borrow more. The result is an indication of the financing pattern of capital projects, which are frequently financed by borrowings. Even if there is no increase in total expenditure, a change toward capital-intensive allocation may lead to an increase in borrowing.

There is selective significance of institutional controls. GST compensation does not have a statistically robust effect, although this indicates that compensation payments had no systematic effect on changing borrowing ratios, controlling for other factors. The dummy for the FRBM amendment is not significant, suggesting that there is no discrete structural break in the behavior of borrowing behavior related to the 2018 amendment once fiscal controls are taken into account. The Fifteenth Finance Commission dummy is however, negative and significant in institutional dynamic specifications, pointing to a decrease in the borrowing during that regime. This may be due to changes in devolution formula or improved fiscal monitoring.

Overall, the underlying data shows that GST has no net effect on increasing borrowing in scale based models but has a negative effect on reducing borrowing in structural composition models,

especially when dynamic adjustment is taken into account. The results suggest that fiscal reallocation and institutional adaptation rather than debt expansion characterised the post-GST borrowing response

Political Alignment and Bargaining

Table 2: Political Alignment and Bargaining Effects on Net Borrowing (Dependent Variable: netborrowingtogsdp)

Variables	**Align 21**	**Align 211**	**Align 2111 (Dyn)**	**Barg 22**	**Barg 221**	**Barg 2212 (Dyn)**
L.netborrowingtogsdp	—	—	-0.1877 (-2.8020)**	—	—	-0.1877 (-2.8013)**
gstdummy	-0.0004 (-0.6146)	-0.0030 (-1.7392)*	-0.0037 (-1.9222)*	-0.0004 (-0.6298)	-0.0031 (-1.7507)*	-0.0037 (-1.9325)*
samealliance	0.0000 (0.1934)	-0.0003 (-0.5401)	-0.0003 (-0.4626)	-0.0000 (-0.0774)	-0.0004 (-0.5482)	-0.0004 (-0.4852)
non.normalisedbargainingpower	—	—	—	0.0000 (1.0391)	0.0000 (0.5171)	0.0000 (0.5166)
gstcompensation	-0.0001 (-0.3123)	0.0001 (0.0469)	0.0003 (0.2070)	-0.0001 (-0.3118)	0.0001 (0.0482)	0.0003 (0.2082)

taxrevenuetogsdp	-0.9416 (-18.5833)***	—	—	-0.9416 (-18.5929)***	—	—
nontaxrevenuetogsdp	-1.0165 (-46.2412)***	—	—	-1.0165 (-46.2552)***	—	—
grantstogsdp	-0.8472 (-9.6489)***	—	—	-0.8470 (-9.6303)***	—	—
revenueexpendituretogsdp	0.9187 (15.4464)***	—	—	0.9179 (15.3809)***	—	—
capitalexpendituretogsdp	0.7161 (4.2300)***	—	—	0.7171 (4.2426)***	—	—
taxrevenuetototralrevenue	—	0.0006 (0.2279)	0.0024 (0.8546)	—	0.0006 (0.2262)	0.0023 (0.8543)
nontaxrevenuetototralrevenue	—	0.0165 (0.9241)	0.0224 (1.2916)	—	0.0164 (0.9144)	0.0223 (1.2785)
capitalexpendituretototalexpendiutre	—	0.0136 (1.8460)*	0.0117 (1.7151)*	—	0.0136 (1.8470)*	0.0117 (1.7165)*
reporate	-0.0002 (-0.9638)	-0.0002 (-	-0.0002 (-	-0.0002 (-0.9642)	-0.0002 (-	-0.0002 (-

		0.4688)	0.4883)		0.4716)	0.4908)
gstdummy:samealliance	-0.0004 (-1.1737)	0.0005 (0.6947)	0.0005 (0.6162)	-0.0004 (-1.1140)	0.0004 (0.5575)	0.0004 (0.5015)
gstdummy:non.normalisedbargainingpower	—	—	—	0.0000 (0.4768)	0.0000 (0.4657)	0.0000 (0.3672)
Observations	3544	3516	3499	3544	3516	3499

Notes

1. All models include state and year fixed effects.

2. Standard errors are Driscoll–Kraay (L = 3), robust to heteroskedasticity, serial correlation, and cross-sectional dependence.

3. t-statistics are reported in parentheses.

*4. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.*

5. Dynamic models include one-period lag of the dependent variable.

6. Composition-based specifications use revenue shares, while baseline alignment models use GSDP ratios.

7. Interaction terms test whether GST effects vary by political alignment or bargaining power.

A natural concern in assessing the fiscal implications of GST is whether the responses to borrowing are structural fiscal adjustment or political mediocrity. In an environment of a federal system with potential interdependence of the borrowing rights, transfers and timing of compensation on intergovernmental bargaining, the post-reform borrowing path might be systematically different across politically aligned and non-aligned states. If the Centre conferred discretionary flexibility on the states that are aligned - either through more accommodative ceiling for borrowing or more lubricating flow of compensation - one would expect that the borrowing-effect of GST could vary with the level of political alignment.

The evidence is not in favor of such a channel. Across specifications, the interaction between GST and political alignment is small economically and statistically indistinguishable from zero. The alignment variable itself does not play a major role in explaining borrowing when state and time fixed effects, and fiscal controls, are introduced. Importantly the estimated GST coefficient in the composition based and the dynamic models is stable after introducing political interactions. This stability means that the response to borrowing believed to be the work of GST is not captured in partisan affiliation.

A similar conclusion results when bargaining power is added as a moderating variable. If the strength of negotiation within federal institutions had material influence on the space for borrowing, then the interaction between GST and the bargaining power would be a capture of differential treatment. Instead, the interaction terms are still statistically small and economically insignificant. The lack of a bargaining effect implies that there is no systematic political leverage of borrowing outcomes under GST.

These results point to a rule-based adjustment mechanism as opposed to discretionary fiscal accommodation. The borrowing response seems to stem from the structural nature of the GST regime - specifically, from the reconfiguration of the tax autonomy and fiscal composition - more than from partisan negotiation. In this regard, the fiscal implication of the reform is widely similar across states in line with the constitutional design and collective governance of the reform through the GST Council.

Heterogeneity analysis

Table 3: Heterogeneity Analysis — Fiscal Dependence, Expenditure Rigidity, and Income; Dependent Variable: netborrowingtogsdp

Variables	**(1) High Tax Dependence**	**(2) High Expenditure Rigidity**	**(3) High Income (GSDP)**
L.netborrowingtogsdp	-0.1878 (-2.8065)**	—	—
gstdummy	-0.0036 (-2.4420)**	-0.0025 (-1.8692)*	-0.0024 (-1.6544)*
gstdummy × HighTaxDep	0.0007 (0.9311)	—	—
gstdummy × HighRigidExp	—	0.0002 (0.3787)	—
gstdummy × HighIncome	—	—	-0.0001 (-0.1613)
gstcompensation	0.0001 (0.1057)	-0.0003 (-0.2224)	-0.0003 (-0.2207)

coviddummy	0.0005 (0.4416)	0.0009 (0.7675)	0.0009 (0.7673)
taxrevenuetototralrevenue	0.0026 (0.9438)	0.0007 (0.2792)	0.0007 (0.2828)
nontaxrevenuetototralrevenue	0.0225 (1.2913)	0.0166 (0.9236)	0.0165 (0.9238)
capitalexpendituretototalexpendiutre	0.0117 (1.7239)*	0.0135 (1.8489)*	0.0135 (1.8488)*
reporate	-0.0002 (-0.3814)	-0.0001 (-0.2801)	-0.0001 (-0.2801)
Observations	3499	3516	3516

Notes

1. All models include state and year fixed effects.

2. Standard errors are Driscoll–Kraay (L = 3). t-statistics are reported in parentheses.

3. HighTaxDep equals 1 for states with above-median average tax revenue share (tax revenue to total revenue) during April 2015–June 2017.

4. HighRigidExp equals 1 for states with above-median average revenue expenditure share (revenue expenditure to total expenditure) during April 2015–June 2017.

5. HighIncome equals 1 for states with above-median average per capita GSDP during April 2015–June 2017.

6. The heterogeneity indicators are constructed using pre-GST averages to avoid post-reform endogeneity.

*7. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

While there seems to be limited scope for political mediation, there is still scope for a GST affected state differently based on its fiscal structure before reform. States differ greatly in the extent to which they depend on tax revenue, in the degree of commitment of expenditures, and in their level of economic growth. These structural features might conditioning the capacity to absorb the changes in tax autonomy.

The heterogeneity analysis shows that the GST effect is there across structural categories but with modest differences in magnitude. In states with relatively low pre-GST tax dependence, the borrowed less due to GST statistically stronger. By contrast states that were highly dependent on tax revenue show some degree of attenuation. This pattern is consistent with the views that diversified revenue structures make adaptation to fiscal changes easier, while high reliance on own-tax revenue makes fiscal adaptation harder under a harmonized tax structure.

Nevertheless, the interaction effects are not precisely estimated, which implies that structural tax dependence does not fundamentally modify the direction of the borrowing response.

The pattern is the same with expenditure rigidity. States with more flexible expenditure structures show a better response in terms of reduction in their borrowing after GST, whereas the effect in highly rigid states is less. Fiscal Rigidity - Proxied by high share of revenue expenditure - limits the ability of reallocate expenditure in response to altered tax autonomy. However, the differences between the rigidity groups are still moderate and are statistically delicate. The response to the borrowing is found in both categories, implying that GST brought about broad-based fiscal adaptation and not sharply differentiated outcomes.

Income heterogeneity does not have a material impact on the GST effect. Both lower income and higher income states have similar borrowing responses and interaction terms are not statistically significant. This uniformity suggests that borrower consequences of GST is not caused mostly by economic scale and development levels differences. Instead, they mirror structural aspects of fiscal accounting that are common across states.

Taken together, the heterogeneity analysis implies that the impact of GST on borrowing is systemic as opposed to localized. The intensity of adjustment at the margin may be affected by structural characteristics, but the structural characteristics do not reverse or fundamentally change the direction of the effect. The borrowing reaction is therefore best seen as a fiscal adaptation to the redesign of tax autonomy in general rather than being an outcome which is limited to specific state types.

Marginal Effects

Table 4: Average Marginal Effect of GST Across Heterogeneity Groups Dependent Variable: netborrowingtogsdp

Grouping Variable	**Group**	**Marginal Effect of GST**	**Std. Error**	**z/t value**	**p-value**	**95% CI**
High Tax Dependence	0 (Low Tax Dep.)	-0.0036	0.0015	-2.4420	0.0146	[-0.0065, -0.0007]
	1 (High Tax Dep.)	-0.0029	0.0018	-1.6345	0.1022	[-0.0063, 0.0006]

High Expenditure Rigidity	0 (Low Rigidity)	-0.0025	0.0013	-1.8692	0.0616	[-0.0052, 0.0001]
	1 (High Rigidity)	-0.0023	0.0014	-1.6160	0.1061	[-0.0052, 0.0005]
High Income	0 (Low Income)	-0.0025	0.0014	-1.8250	0.0680	[-0.0052, 0.0002]
	1 (High Income)	-0.0024	0.0014	-1.6544	0.0980	[-0.0051, 0.0004]

Notes

1. Marginal effects represent the average partial effect of gstdummy on net borrowing within each subgroup.

2 .Standard errors are computed using Driscoll–Kraay correction.

3. HighTaxDep equals 1 for states with above-median pre-GST tax revenue share (April 2015–June 2017).

4. HighRigidExp equals 1 for states with above-median pre-GST revenue expenditure share.

5. HighIncome equals 1 for states with above-median pre-GST per capita GSDP.

6. Confidence intervals are based on robust standard errors.

7. Effects are interpreted relative to the omitted reference group in each heterogeneity specification.

To gauge the economic importance of heterogeneous responses, average marginal impacts of GST are calculated by structural groups. These effects convert interaction coefficients into subgroup specific changes in borrowing so that fiscal impact can be directly compared.

The estimated marginal effects for this implies that GST is linked to a reduction in net borrowing against GSDP in most subgroups. Effect is statistically strongest in the less tax-dependent states with a decrease in borrowing of about 0.36 percentage points of GSDP. Among high-tax-dependent states, the estimated reduction is smaller, and is not statistically precise. However, confidence intervals have a large degree of overlap, suggesting little cross-group divergence.

For expenditure rigidity, the marginal effect is a little higher in states that have more flexible expenditure structures. Yet again, differences between groups are small and statistically weak. The borrowing response is still negative in high as well as low rigidity states which strengthens the interpretation that GST caused broad based fiscal adjustment rather than selective fiscal stress.

Income based marginal effects are almost symmetric. Both lower- and higher-income states have similar reductions in borrowing. The lack of statistically significant divergence confirms

the fact that the borrowing consequences of GST are not concentrated among fiscally weaker economic strength.

Overall, the marginal effects analysis highlights two conclusions. First, GST does not create heterogeneous expansions of borrowing across structural categories but rather it is linked to small reductions in borrowing in most groups. Second, although fiscal structure tends to condition the intensity of adjustment at the margin, differences among subgroups are not large enough to imply the existence of segmented fiscal regimes. The borrowing response seems ingrained into the structural transformation of subnational fiscal systems and not dependent on political alignment, economic development, or narrow fiscal characteristics.

In sum, the extended analysis of political and structural heterogeneity reinforces the central empirical finding: the post-GST borrowing trajectory reflects systemic fiscal adaptation, not partisan mediation or concentrated fiscal distress

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Discussion

The empirical results provide a finding that is at the same time counterintuitive and theoretically instructive: introduction of the Goods and Services Tax (GST) is not correlated with subnational borrowing. Across a number of econometric specifications (most notably, those where the fiscal structure is decomposed using detailed revenue and expenditure shares) the GST coefficient is found to be negative and statistically significant. This finding calls for systematic interpretation via the lens of the intertemporal tax smoothing framework and the literature on sub-national fiscal adjustment in federal systems in general (Barro, 1979; Bohn, 1998; Renjith, 2023). The theoretical benchmark formulated in Section 2 is that subnational net borrowing is a combined function of the interplay between the two factors of discretionary tax autonomy and the productive performance of the underlying tax base and the binding nature of statutory borrowing constraints. Under the framework of canonical tax smoothing (Bohn, 1998), a sudden reduction of a government's rate-setting discretion, combined with structurally inflexible expenditure commitments, should be an anticipated cause of increasing reliance on debt financing, unless the decline in rate autonomy was made up by a sufficiently large improvement in the effective yield of the tax base (Renjith, 2023; Renjith and Shanmugam, 2020). The empirical evidence in this paper suggests that just such an offset mechanism was operative on the Indian terrain.

The underlying budget identity of this adjustment mechanism helps to understand the fiscal arithmetic. A reduction in the borrowing requirements can be achieved not only through expenditure compression but, equally, through a significant expansion in effective tax revenue as a share of GSDP. While it is undeniable that Indian states lost their unilateral freedom of action to set statutory rates of GST schedule, their access to a greatly expanded and more efficiently administered consumption tax base remained (Joseph and Kumary, 2023; Das, 2024). The purpose of the GST reform was specifically to remove the cascading distortions of tax within tax of the existing tax regimes of VAT and Central Sales Tax to increase the effective coverage of taxation on consumption, to increase the formalization of inter-state trade and enhance the overall efficiency of revenue administration (Prajapati, 2025; Das, 2024; Pandey, 2020). These systemic improvements brought significant boosts in buoyancy and yields to the GST base, and so created fiscal space that was enough to accommodate the loss in marginal rate flexibility (Das, 2024; Dwivedi, 2024). Negative GST coefficient in the composition-based specifications is thus consistent with a structural improvement in the revenue side of state budgets: higher actual GST revenues relative to GSDP had the mechanical effect of reducing the need for deficit financing, implying that the reform successfully replaced discretionary rate-setting powers by structurally superior base performance (Renjith, 2023).

This interpretation is strongly supported by the emerging empirical and administrative literature on the compliance-enhancing impacts of the GST architecture. The introduction of a system of comprehensive input tax credit (ITC), which creates self-enforcing audit trails under the invoice-matching system severely curtailed the scope for tax evasion at each stage in the supply chain (Das, 2024; Dwivedi, 2024). Complementing this design feature, mandatory use of digital reporting infrastructure, such as electronic way bills (e-way bills) and e-invoicing, further simplified tax administration and improved real-time monitoring of revenues (Das, 2024; Prajapati, 2025). Crucially, the shift from a fragmented, origin-based indirect tax structure to a unified, destination-based, national market framework was in the nature of formalising sizeable parts of the previously unorganised economy that had been significantly diluting evasion in inter-state commerce (Joseph and Kumary, 2023; Dwivedi, 2024; Mukherjee, 2021). As compliance rates and administrative transparency improved, a systematic increase in the effective tax yield per unit of economic activity can be observed. Even in the total lack of autonomy in setting rates at the state level, this improved the effective performance of revenue translated directly, through the budget identity, into lower borrowing needs (Renjith, 2023; Das, 2024).

The GST revenue compensation mechanism makes an equally important complementary explanation for the constrained pattern of subnational borrowing that is observed in the transitional period. Under the provisions of GST (Compensation to States) Act, 2017, the state governments were assured of a 14 percent compounded annual growth rate in GST-attributable revenues over the first five-year period of implementation of GST tax, that is, in between July 2017 to June 2022 (Mukherjee, 2021; Joseph and Kakarlapudi, 2023; Agarwal et al., 2024). While the corresponding compensation dummy variable might not achieve conventional levels of statistical significance in all regression specifications (a fact that may possibly reflect the colinearity between this guarantee and the more general post-GST indicator), its institutional significance as a fiscal stabilizer is not thereby diminished (Mukherjee, 2020). By creating a revenue floor that is unconditional, the compensation architecture effectively insulated state budgets from the short-run revenue volatility and transition risks present in adopting an entirely new tax system. This ensured revenue stream directly constrained the incentive-and the necessity-for state governments to go to bond markets in response to transitory fiscal shocks (Renjith, 2023). In the analytical framework of this paper, the compensating mechanism operated by stabilising the effective revenue component of state budget constraint thus dampening the variance of subnational borrowing during the anti-cyclical period and partially substituting for the counter cyclical rate adjustment capacity that was surrendered (Renjith, 2023; Misra, Gupta, and Trivedi, 2023).

The statistical insignificance of political alignment and center-state bargaining interaction terms across specifications provides other analytical insight into the nature of this fiscal adjustment. The lack of any systematic relationship between the outcome of borrowing and whether a state government is a member of the center-based political coalition or not, or how much bargain power that state government has in intergovernmental fiscal negotiations, indicates that the patterns are not due to some discretionary political accommodation (Dwivedi, 2024; Joseph and Kumary, 2023). This finding is in line with the structurally rule-bound nature of the GST Council's decision-making structure where rate and base decisions are made through a formal and weighted voting mechanism instead of bilateral bargaining (Pandey, 2020; Mukherjee, 2021). Moreover, the automatic fiscal accounting and transfer systems that are in the GST system mitigate the potential scope for politically motivated manipulation of revenue. In aggregate, these features support the interpretation that post-GST borrowing patterns are largely structural fiscal determinants (that is, the revenue buoyancy of the reformed tax base, the binding nature of the FRBM deficit ceilings, and the stabilizer role of the

compensation mechanism) more than discretionary or politically contingent fiscal accommodation (Misra, Gupta, and Trivedi, 2023; Dwivedi, 2024).

The heterogeneity analysis provides some important complementary evidence on state-level conditioning factors that influence the magnitude of the borrowing response. A state's pre-existing fiscal structure i.e. the relative flexibility of expenditure commitments and earlier intensity of dependence on taxes that were later subsumed under the GST, condition the magnitude of adjustments to borrowing after the reform, though does not reverse the fundamental direction of the impact (Renjith and Shanmugam, 2020; Agarwal et al., 2024). States with more flexible fiscal structures have somewhat larger reductions in borrowing, consistent with the higher degree of ex ante adaptive capacity to absorb structural revenue shocks (Renjith and Shanmugam, 2018). Nonetheless, the direction and large qualitative features of the response to borrowing are still substantially uniform across states with different per capita incomes and expenditures that are rigid. This pervasive uniformity suggests that the fiscal consequence of the GST reform is a systemic phenomenon rather than segmental with respect to developmental and fiscal capacity (Agarwal et al., 2024; Dwivedi, 2024). The adoption of a nation-wide destination-based consumption tax effectively unified the commodity market structure and therefore the changes in the state budget dynamics were broadly consistent throughout the federal fiscal system, regardless of the developmental status or pre-GST tax-raising capacity of the individual states (Dwivedi, 2024; Joseph and Kumary, 2023).

In synthesis, it appears that the theory that higher-level subnational borrowing will happen with reduced tax-rate autonomy is not supported by the empirical evidence (Renjith, 2023; Bohn, 1998). Classical tax-smoothing theory suggests that a sudden loss of discretionary authority over the rate structure - coupled with extremely rigid expenditure structures - should force subnational governments to close their fiscal gaps with higher debt issuance (Barro, 1979; Bohn, 1998). The expected surge in deficit financing did not happen, however, because the structural contraction in unilateral rate-setting capacity was well compensated by commensurate, and arguably superior, improvements in effective revenue yield, administrative efficiency and compliance architecture of the reformed tax base (Das, 2024; Prajapati, 2025; Dwivedi, 2024). This finding has an important implication for the theoretical framework in that it shows that the canonical tax smoothing channel (in which rate discretion replaces debt issuance) may be replaced in practice by a base-improvement channel (in which structural improvements in tax productivity play an equivalent stabilising role) (Renjith, 2023). In this

regard, the GST reform did not just displace the former discretionary rate setting by the states, but instead replaced it with a more buoyant, transparent, and administratively efficient national tax regime, the performance of which in terms of revenue provided a structurally determined fiscal buffer (Das, 2024; Mukherjee, 2021; Joseph and Kumary, 2023). These results have direct implications for current debates on how best to allocate taxing powers in federal systems and how to structure compensation and borrowing arrangements for subnational governments that are subject to pooled indirect taxation regimes (Mukherjee, 2020; Misra, Gupta, and Trivedi, 2023).

Conclusion

This study investigates whether GST introduced changes in the subnational borrowing behavior in India using a monthly panel of eighteen states from April 2008 to December 2024. The empirical analysis includes dynamic adjustment, the composition of fiscal, the institutional regimes, the political interactions and the heterogeneity of structure in a fixed effects framework robust against cross-sectional dependence and serial correlation.

The major conclusion is that GST does not raise subnational borrowing. In several specifications especially those on the role of fiscal composition, GST is linked to a slight but statistically significant decrease in net borrowing as a share of GSDP. Borrowing dynamics still continue to be mean reverting however, and there is no evidence of any structural debt acceleration after the reform.

These results narrow the implications of the tax-smoothing framework in a strapped federal context. The removing of tax rate discretion at the State level does not necessarily lead to an increase in borrowing when two countervailing forces operate. First, there is an institutional constraint on borrowing itself through fiscal rules and approval mechanisms. Second, the reform might improve tax compliance and revenue efficiency, which will improve the effective GST tax base. An increase in $\tau^{GST} * Y^{GST}$reduces the borrowing directly through the budget identity, counteracting the pressure on the budgets that follows from a reduced autonomy in theory.

The mechanism of compensation further reduced short-term fiscal stress by ensuring revenue increase in the transition period. Even though its direct coefficient is statistically insignificant, the institutional design must have stabilized the expectation of revenue and muted the volatility of borrowing.

The lack of political mediation effects suggests that the outcome of borrowing is not due to partisan discretion. Structural heterogeneity across states impacts on the intensity rather than the direction of the GST effect. The borrowing response is therefore best interpreted as an institutional reconfiguration, rather than debt-inducing shock.

From a broader fiscal federalism perspective, the evidence suggests that harmonization of indirect taxation can co-exist with stable subnational debt dynamics provided there are institutional borrowing constraints and greater revenue efficiency. The experiences of the GST prove that the losses in tax rate autonomy do not have to affect the sustainability of debt, provided that compliance improvements and fiscal rules work.

Future research may expand this study by analyzing long-run debt sustainability under different interest-growth differentials and investigating whether off-budget liabilities or contingent risks changed differently under the GST regime. Nonetheless, the current results suggest that GST is a structural change of tax administration and the fiscal relations between governments without leading systemic subnational debt expansion.

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