



REGIONAL AFFILIATION AND INDIAN TAX DEVOLUTION: A SMALL-CLUSTER-ROBUST TEST OF THE NORTH–SOUTH DIVIDE

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Abstract

The Finance Commission's horizontal devolution framework primarily allocates tax devolution based on income distance, making per capita income the principal determinant of interstate tax devolution. Public debate and Finance Commission submissions have long argued that Southern states are systematically disadvantaged relative to Northern states even after accounting for income, but this claim has rarely been tested using inference methods appropriate to the underlying panel structure, in which a small number of states are each observed repeatedly over time. This study examines whether a state's North–South regional classification is significantly associated with interstate tax devolution after controlling for Per Capita Real Net State Domestic Product (PCRNSDP) and Finance Commission period, using a panel of 110 state-year observations covering eleven major Indian states during FY2016–FY2025. Three nested pooled Ordinary Least Squares (OLS) models were estimated with standard errors clustered by state and corrected using bias-reduced linearization (CR2) with Satterthwaite degrees of freedom - the estimation strategy suited to a panel built from a small number of independent state clusters - followed by a robustness analysis using the Devolution-to-GSDP ratio. The results provide directional support for the Finance Commission's income-distance criterion and statistical evidence of a Finance Commission period effect. Regional classification, however, is not significantly associated with interstate tax devolution in any specification, and this finding is robust across the alternative devolution measure. The study provides rigorously tested statistical evidence on the North–South devolution debate and demonstrates the importance of small-cluster-appropriate inference in Indian state-panel research.

Keywords: Cluster-robust inference; Finance Commission; Fiscal federalism; Income distance; India; Regional classification; Tax devolution.

1. Introduction

Union tax devolution is one of the single most consequential fiscal levers shaping what Indian state governments can actually spend on development and welfare programmes. States raise a comparatively narrow range of their own taxes, and this dependence deepened further after the Goods and Services Tax reform absorbed much of their earlier indirect-tax autonomy into a jointly administered levy; in this setting, a state's share of the Finance Commission's divisible pool is not a marginal transfer but a first-order determinant of its fiscal room to maneuver (Rangarajan & Srivastava, 2008). How that pool is divided among states, and whether the division is seen as fair, is therefore not merely a technical question of public finance but an active fault line in India's contemporary political economy.

That fault line has become sharply regional. Southern state governments have publicly argued, in submissions to successive Finance Commissions and in the popular press, that they are penalised twice over: once through the population criterion, for having achieved earlier demographic transition than the north, and again through the income-distance criterion, for having grown their economies faster (Mohan, 2023). Ramakumar (2024) lends empirical weight to this grievance, showing that several southern states' share of net proceeds has fallen across the Fourteenth and Fifteenth Finance Commission periods, and Murugan (2025) frames this decline explicitly as a case of discrimination against southern India, pointing to the mismatch between the region's tax effort and its devolution outcomes. At the same time, Joseph and Kakarlapudi (2025) show, independently of the regional debate, that the formula's own equalising power has been eroding, which raises the question of how much of any observed North–South gap is simply income inequality re-expressed and how much reflects something more specific to region itself.



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That question has so far been argued largely in descriptive and political terms rather than tested statistically and with insufficient attention to the inferential challenges posed by comparing a small number of states. Public debate and Finance Commission submissions compare regional totals or individual formula weights, and even where regression-based evidence exists, it has not accounted for the fact that a panel of this kind rests on a small number of independent state clusters. This leaves the central empirical question unresolved: once income differences are properly controlled for, and once inference appropriate to a small-cluster panel is applied, does a state's location in the north or south still carry any independent statistical association with the devolution it receives?

This study addresses that question directly, using inference methods suited to the panel's structure from the outset. Using a state-year panel of eleven major northern and southern states across the Fourteenth and Fifteenth Finance Commission award periods, it estimates a sequence of nested regression models that introduce per capita real income, a regional dummy, and a Finance Commission period dummy in turn, with bias-reduced cluster-robust standard errors appropriate for a small number of state clusters, and cross-checks the results against an alternative devolution-to-GSDP measure. The remainder of the paper proceeds as follows: the next section situates this approach within the existing literature on Indian fiscal federalism and on small-cluster inference; the following sections then set out the data and methodology, present the regression results, and discuss their implications for the ongoing debate over regional equity in India's devolution framework.

2. Literature Review

The theoretical foundation for India's Finance Commission is based on classical fiscal federalism principles. Musgrave (1959) argued that redistributive roles are best handled by higher government levels because local units competing for resources cannot effectively redistribute without risking economic losses. Oates (1972) showed welfare improves when local public goods are provided close to citizens, while central transfers address fiscal capacity gaps left by decentralization. In India, Rao and Singh (2004) note that due to vast differences in state size, population, and capacity, a uniform transfer formula affects states differently, making it more of a political-institutional compromise than a purely technical tool. This explains the study's focus on shifts in formula use between the Fourteenth and Fifteenth Finance Commissions.

The income-distance criterion within the formula has received the most empirical focus because it has held the largest weight among horizontal criteria since the Ninth Finance Commission (Srivastava et al., 2024). Srivastava et al. (2024) demonstrate that the weight of income distance has steadily decreased over successive commissions, reducing the formula's ability to equalize fiscal capacity despite the criterion remaining formally dominant. Joseph and Kakarlapudi (2025) highlight an income-distance paradox, where lower-income states' share of the divisible pool has fallen even as their incomes rise relative to the national average. Rangarajan and Srivastava (2008) note that this horizontal fluctuation happens alongside a stable overall vertical share for states, indicating that inter-state redistribution is more disputed than the center-state division. This body of work confirms per capita income as the key intended predictor of devolution share, which is why this study uses Per Capita Real Net State Domestic Product as its baseline control (Model 1) to isolate any additional regional effects beyond income.

A closely related and more contemporary strand of literature speaks directly to the regional hypothesis tested here. Mohan (2023) points out that southern states argue the 2011 Census population base penalizes them for earlier demographic success, turning that into a fiscal disadvantage. Ramakumar (2024) shows that several southern states' shares of the divisible pool have declined during the Fourteenth and Fifteenth Finance Commission periods due to combined income-distance and demographic factors. Murugan (2025) adds that southern states' higher tax efforts and better social indicators are undervalued in a formula dominated by income-distance and population criteria, causing grievances that the South subsidizes the North. This literature typically compares regional shares descriptively or through regression models that do not address the clustered structure of the underlying panel - a gap this study is designed to close. Methodologically, panel studies like Mukherjee's (2020) on GST efficiency and Kumar and Kaur's (2023) on transfer effects support using pooled data over years and states to isolate regional characteristics from income variations, motivating the pooled OLS design used here, with inference corrected for the small number of state clusters.



A separate methodological literature directly informed the design of this study. Cameron and Miller (2015) show that conventional cluster-robust standard errors can substantially understate uncertainty when the number of clusters is small, leading researchers to over-reject true null hypotheses. Conley and Taber (2011) demonstrate that this problem is most acute precisely when the regressor of interest - such as a regional or group classification - does not vary within cluster, which is exactly the structure of the Region variable examined here. Pustejovsky and Tipton (2018) develop the bias-reduced linearization correction adopted in this study to address this concern in small-cluster panel settings. Given that the panel analysed comprises only eleven state clusters, and Region is invariant within state across the full study period, this literature was used to select the estimation strategy set out in Section 4.3, in preference to conventional heteroscedasticity-robust inference alone.

This body of literature collectively shows that fiscal federalism theory supports equalizing transfers to address horizontal fiscal disparities (Musgrave, 1959; Oates, 1972), that India's income-distance criterion is significant but only partially effective in achieving fiscal equality (Srivastava et al., 2024; Joseph & Kakarlapudi, 2025), that southern states have a well-documented descriptive grievance of fiscal disadvantage compared to northern states (Mohan, 2023; Ramakumar, 2024; Murugan, 2025), and that comparisons of this kind require inference methods suited to a small number of independent clusters (Cameron & Miller, 2015; Conley & Taber, 2011; Pustejovsky & Tipton, 2018). No existing study has formally tested the North–South grievance as a statistical hypothesis while both controlling for income within a multivariate panel framework and applying inference appropriate to the small number of underlying state clusters. This study fills that gap by analyzing eleven major northern and southern states across the Fourteenth and Fifteenth Finance Commission periods, using nested OLS models with regional and commission-period dummies, small-cluster-corrected standard errors, and a robustness check based on devolution-to-GSDP ratios.

3. Objective of the Study

To statistically test, using inference methods appropriate for a panel built from a small number of state clusters, whether regional affiliation is significantly associated with interstate tax devolution after accounting for differences in per capita income and Finance Commission period.

4. Methodology

4.1. Data Extraction and Sample Size

The study draws on secondary data from official Government of India sources, forming a balanced panel of eleven key Indian states over ten financial years (2015–16 to 2024–25, referred to as FY2016–FY2025). It includes six Northern states—Himachal Pradesh, Haryana, Punjab, Rajasthan, Uttarakhand, and Uttar Pradesh—and five Southern states—Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana—totalling 110 state-year observations. The states were selected on the basis of the Northern and Southern Zonal Councils' classification given under the States Reorganization Act of 1956. Uttarakhand and Uttar Pradesh were chosen from the Central Zonal Council states due to their proximity to the northern region and support from existing literature.

Central tax devolution data were collected from the Statement Showing State-wise Distribution of Net Proceeds of Union Taxes and Duties found in Annexures 4, 4A, and 4B of the Receipts Budget for each year. Information on horizontal devolution criteria, state-wise shares, and Finance Commission recommendations was sourced from the Fourteenth and Fifteenth Finance Commission reports and cross-checked with Union Budget documents to maintain consistency. Data on Per Capita Real Net State Domestic Product (PCRNSDP) at constant prices and Gross State Domestic Product (GSDP) were obtained from the Reserve Bank of India's Handbook of Statistics on Indian States. Additional macroeconomic and fiscal data were verified through publications from the Ministry of Finance, Department of Expenditure, and Ministry of Statistics and Programme Implementation (MoSPI).



This comprehensive dataset of 110 state-year observations enables analysis of the links between economic development, regional factors, Finance Commission cycles, and tax devolution among the selected states. The exclusive use of official government sources enhances the dataset's reliability, comparability, and consistency for the empirical study.

4.2. Variable Construction and Model Specification

Two dependent variables were created for the main empirical analysis and to check robustness. The primary variable, devolution percentage, indicates each state's share of the divisible central tax pool as recommended by the Finance Commission. This variable is key for analysing interstate differences in tax devolution.

For robustness, an alternative dependent variable, the Devolution-to-GSDP Ratio, was calculated by dividing the actual tax devolution received by a state (in ₹ crore) by its Gross State Domestic Product (in ₹ crore) for the same year. This ratio reflects the fiscal importance of tax devolution relative to the size of a state's economy. Using these alternative variable tests whether findings hold under a different fiscal transfer measure.

The main explanatory variable is Region, a binary indicator coded 0 for Northern states and 1 for Southern states, used to examine systematic differences in tax devolution between these regions after controlling for economic and institutional factors.

Two control variables are included: Per Capita Real Net State Domestic Product (PCRNSDP) at constant prices, which proxies the economic development level. Since the Finance Commission gives weight to income distance, poorer states are expected to receive more tax devolution, so PCRNSDP's coefficient is expected to be negative. The second control is Finance Commission Period (FC Period), a binary variable coded 0 for the Fourteenth Finance Commission period (FY2016–FY2020) and 1 for the Fifteenth (FY2021–FY2025), controlling for changes in the devolution formula over time.

Three regression models were estimated sequentially using Ordinary Least Squares (OLS) to assess the contribution of each variable: Model 1 examines the link between economic development (PCRNSDP) and tax devolution; Model 2 adds the regional dummy to test regional effects beyond income; Model 3 includes the Finance Commission period dummy to control for institutional changes.

To check robustness, these models were re-estimated using the devolution-to-GSDP ratio as the dependent variable, applying the same estimation and inference procedure described in Section 4.3.

4.3. Inference Strategy and Diagnostic Tests

The choice of estimation and inference strategy was made at the design stage, based on two known features of the data: the panel comprises repeated observations on a small number of states, and the variable of central interest, Region, does not vary within a state over time. Both features carry specific, well-documented consequences for statistical inference, and the strategy adopted here follows directly from the applied econometrics literature on panels of this kind.

Multicollinearity among explanatory variables was checked using the Variance Inflation Factor (VIF). All VIF values were below 1.3, well under the common threshold of 5, indicating no multicollinearity issues and stable regression coefficients.

The Breusch–Pagan test was used to detect heteroscedasticity in the residuals and rejected the null hypothesis of constant variance ($p < 0.01$) in all models. In addition to this, because the dataset comprises 110 state-year observations drawn from only eleven states observed repeatedly over ten years, residuals are also expected to be correlated within each state over time. Standard heteroscedasticity-consistent standard errors do not correct for this within-cluster dependence, and would overstate the precision of the estimates, particularly for the Region variable, which is invariant within each state across the panel. Standard errors were therefore clustered by state throughout. Because the number of clusters (eleven) is below the threshold generally considered sufficient for standard asymptotic cluster-robust inference (Cameron & Miller, 2015), bias-



reduced linearization (CR2) standard errors with Satterthwaite degrees-of-freedom corrections were applied to Models 2 and 3, and to the corresponding robustness specifications, following Pustejovsky and Tipton (2018). This correction directly addresses the small-cluster bias that Conley and Taber (2011) show is most severe when the regressor of central interest does not vary within cluster - precisely the structure of region in this design - and was adopted as the primary estimation strategy for that reason, rather than as a supplementary check.

Pooled OLS, rather than a state fixed-effects specification, was chosen because Region is time-invariant: a fixed-effects transformation would absorb all cross-state variation and mechanically remove Region from the model, making it impossible to test the study's central hypothesis. A random-effects specification was not adopted either, since it requires the assumption that state-level unobserved heterogeneity is uncorrelated with region-an assumption unlikely to hold given that regional classification is plausibly correlated with unobserved, time-invariant state characteristics such as administrative capacity and historical development patterns. Pooled OLS with small-cluster-corrected standard errors was therefore selected as the specification best suited to isolating the Region coefficient while providing statistically defensible inference, consistent with standard practice for panels with a limited number of clusters and a cluster-invariant regressor of interest (Cameron & Miller, 2015; Conley & Taber, 2011).

Robustness was further checked by re-estimating all models using the devolution-to-GSDP ratio as an alternative dependent variable, applying the same clustering and small-sample correction throughout. Consistent coefficient signs and significance patterns across both dependent variables would confirm that the findings are stable regardless of the choice of dependent variable.

5. Results

5.1. Regional Patterns in Tax Devolution and Economic Development

The study analysed 110 observations, where the average percentage share of tax devolution (Devolution Percentage) was 4.11% (SD = 4.66; median = 2.47). The average Per Capita Real Net State Domestic Product (PCRNSDP) was ₹127,634 (SD = ₹38,935), and the average Devolution-to-GSDP ratio was 0.03 (SD = 0.02). The distribution of devolution percentage is positively skewed (skewness = 2.27), mainly due to Uttar Pradesh's large tax share linked to its population, while the PCRNSDP distribution is fairly symmetric (skewness = -0.59).

Table 1 shows descriptive statistics for Northern and Southern states separately. Northern states received a higher average tax devolution share (4.72%, SD = 6.21; n = 60) compared to Southern states (3.38%, SD = 0.98; n = 50). The greater variation among Northern states is largely due to Uttar Pradesh's high allocation. Aligning with the Finance Commission's income-distance principle, Northern states had a lower average PCRNSDP (₹114,442) than Southern states (₹143,465). The Northern states also had a higher average devolution-to-GSDP ratio (0.0373) than the Southern states (0.0215), indicating they received a larger share of tax devolution relative to their economic size. Whether this descriptive gap reflects a statistically significant regional effect, once income differences and the panel's clustered structure are properly accounted for, is tested formally in Section 5.2.

	North (n=60)	South (n=50)
Mean Percentage Devolution	4.72	3.38
SD Percentage Devolution	6.21	0.98
Mean PCRNSDP	1,14,442	1,43,465
Mean Devolution to GSDP Ratio	0.0373	0.0215

Table 1. Descriptive comparison of North and South Indian states on key study variables.



5.2. Regression Results: Testing the Role of Regional Affiliation in Tax Devolution

This section presents the regression results testing whether regional affiliation is associated with tax devolution after accounting for Per Capita Real Net State Domestic Product (PCRNSDP) and Finance Commission period. Three nested regression models were estimated step-by-step. Standard errors are clustered by state throughout, with bias-reduced linearization (CR2) and Satterthwaite degrees-of-freedom corrections applied to Models 2 and 3, which include the time-invariant Region variable.

Model 1 establishes the baseline relationship between income and devolution, with per capita income as the sole predictor:

$$\text{Devolution Percentage}_{it} = 15.51 - 0.0000893\text{PCRNSDP}_{it}$$

The coefficient of PCRNSDP is negative, consistent with the Finance Commission's income-distance criterion under which relatively lower-income states receive a larger share of central tax devolution.

Model 2 introduces the Region dummy, addressing the study's principal question:

$$\text{Devolution Percentage}_{it} = 15.70 - 0.0000962\text{PCRNSDP}_{it} + 1.453\text{Region}_i$$

PCRNSDP is negative but not statistically significant at conventional levels ($p = 0.107$). The region coefficient is positive but is likewise not statistically significant ($p = 0.277$).

Model 3 additionally includes the finance commission period dummy:

$$\text{Devolution Percentage}_{it} = 15.62 - 0.000104\text{PCRNSDP}_{it} + 1.671\text{Region}_i + 1.951\text{FC Period}_t$$

The Region coefficient remains positive but statistically insignificant ($p = 0.247$). PCRNSDP remains negative but is likewise not significant at conventional levels ($p = 0.104$). The Finance Commission period coefficient is positive and significant at the 10% level ($p = 0.060$), indicating some evidence that average devolution shares differed between the Fourteenth and Fifteenth Finance Commission periods after adjusting for income and region.

	Model 1	Model 2	Model 3
Constant	15.51	15.70	15.62
PCRNSDP	-0.0000893	-0.0000962 ($p = 0.107$)	-0.000104 ($p = 0.104$)
Region	—	1.453 ($p = 0.277$)	1.671 ($p = 0.247$)
FC Period	—	—	1.951 ($p = 0.060$)
Observations	110	110	110
R ²	0.556	0.577	0.618
SE type	Clustered (state)	CR2, Satterthwaite df	CR2, Satterthwaite df

Table 2. Regression results for Devolution Percentage, with state-clustered standard errors (Model 1) and CR2 small-cluster-corrected standard errors with Satterthwaite degrees of freedom (Models 2–3).



Across all three specifications, regional affiliation does not carry a statistically significant, independent association with tax devolution once inference appropriate to a panel with eleven independent state clusters is applied. The descriptive North–South gap documented in Section 5.1 is therefore not statistically distinguishable from sampling variation at conventional significance levels.

5.3. Estimated Robustness Models

Model 1: $Devolution/GSDP_{it} = 0.0775 - 0.000000372PCRNSDP_{it}$

Model 2: $Devolution/GSDP_{it} = 0.0766 - 0.000000344PCRNSDP_{it} - 0.00575Region_i$

Model 3: $Devolution/GSDP_{it} = 0.0763 - 0.000000368PCRNSDP_{it} - 0.00507Region_i$
 $+0.00611FC\ Period_t$

The robustness analysis, estimated with the same clustering and CR2 correction applied to the primary specification, is consistent with the main results. PCRNSDP remains negative and statistically significant in both Model 2 ($p = 0.038$) and Model 3 ($p = 0.034$), reinforcing the Finance Commission's income-distance criterion using an alternative tax devolution measure. The Finance Commission period coefficient is also significant in Model 3 ($p = 0.010$).

The Region coefficient, however, is not statistically significant in either Model 2 ($p = 0.266$) or Model 3 ($p = 0.318$). This mirrors the result obtained for the primary devolution-percentage specification and confirms that the absence of a detectable regional effect is not an artifact of the choice of dependent variable.

	Model 1	Model 2	Model 3
Constant	0.0775	0.0766	0.0763
PCRNSDP	–0.000000372	–0.000000344 ($p = 0.038$)	–0.000000368 ($p = 0.034$)
Region	—	–0.00575 ($p = 0.266$)	–0.00507 ($p = 0.318$)
FC Period	—	—	0.00611 ($p = 0.010$)
Observations	110	110	110
R ²	0.666	0.689	0.717
SE type	Clustered (state)	CR2, Satterthwaite df	CR2, Satterthwaite df

Table 3. Regression results for the Devolution-to-GSDP Ratio, with state-clustered standard errors (Model 1) and CR2 small-cluster-corrected standard errors with Satterthwaite degrees of freedom (Models 2–3).

Taken together, the robustness analysis reinforces the main finding: regional affiliation does not carry statistical significance once standard errors are corrected for the small number of state clusters underlying the panel, regardless of whether tax devolution is measured as a percentage share of the divisible pool or relative to state economic size.



6. Discussion

This study tested whether regional differences in interstate tax devolution persist once per capita income and Finance Commission period are held constant, using inference methods appropriate for a panel built from a small number of state clusters.

The regression findings offer qualified support for the Finance Commission's income-distance criterion. PCRNSDP is consistently negative across specifications, and this relationship is statistically robust in the devolution-to-GSDP models, though it falls short of conventional significance thresholds in the percentage-share models. This suggests that the inverse relationship between income and devolution, while directionally consistent with the Finance Commission's formula, is estimated with limited precision given that the underlying variation is ultimately drawn from only eleven states.

The central finding of this study concerns the Region coefficient. Across all four specifications that include Region, the coefficient is not statistically significant: t-statistics range from 1.08 to 1.27, well short of conventional significance thresholds. This indicates that regional affiliation does not carry a detectable, independent association with tax devolution once per capita income, Finance Commission period, and the panel's clustered structure are properly accounted for.

This null result should be interpreted carefully rather than read as definitive evidence that no regional disparity exists. With only eleven state clusters, the statistical power available to detect a genuine regional effect is inherently limited, and a true effect of moderate size could plausibly go undetected (Cameron & Miller, 2015). What the analysis does establish is that, once inference is conducted at a standard appropriate to the number of independent clusters in the data, the descriptive North–South gap documented by Mohan (2023), Ramakumar (2024), and Murugan (2025) does not translate into statistically significant evidence of a regional effect independent of income. Conley and Taber (2011) note that this is a recognized hazard in applied panel work precisely when the regressor of central interest, such as a regional or group classification, does not vary within the clusters being compared - underscoring the importance of the estimation strategy adopted in this study.

The Finance Commission period variable is the one time-varying regressor that retains statistical significance in the robustness specification and is marginally significant in the primary specification. This indicates some evidence that average devolution shares shifted between the Fourteenth and Fifteenth Finance Commission periods after adjusting for income and region, though this should be read as an average association rather than a causal claim; no interaction terms were estimated to test whether any regional gap widened or narrowed across periods.

These findings carry a methodological implication beyond the specific case of Indian tax devolution. Much of the existing literature on the North–South devolution debate relies on descriptive comparisons of regional totals or, where regression-based, does not account for the clustered structure of state-year panels. The results here suggest that such comparisons risk overstating the statistical certainty of a regional effect. Given that most Indian state-panel studies of this kind necessarily involve a limited number of states, the small-cluster-robust approach adopted here is likely to be informative for similar research designs more broadly.

Three limitations bound these conclusions. First, the panel covers eleven major states over ten years and excludes North-Eastern states and Union Territories, limiting generalizability. Second, the specification omits several Finance Commission formula criteria - population, area, forest and ecology, demographic performance, and tax effort - so any regional association would not, in any case, have supported a causal interpretation. Third, and most fundamentally, the small number of state clusters limits the statistical power available to this design; a larger panel, whether through a longer time span or an expanded set of states, would improve the precision with which a genuine regional effect, if present, could be detected.



7. Conclusion

Recent academic and policy debates have increasingly questioned whether the current horizontal tax devolution framework has achieved equitable outcomes between Northern and Southern Indian states, especially after the Fourteenth and Fifteenth Finance Commissions (Murugan, 2025). This study tested whether regional differences in interstate tax devolution persist after accounting for Per Capita Real Net State Domestic Product (PCRNSDP) and Finance Commission period, using inference methods suited to a panel built from a small number of state clusters.

The results show that regional affiliation is not statistically significantly associated with interstate tax devolution, in either the primary specification or the devolution-to-GSDP robustness check, once standard errors are appropriately corrected for the small number of independent state clusters underlying the panel.

This study's contribution is therefore twofold. Substantively, it finds that the descriptive North–South devolution gap, while real in the raw data, is not supported by statistically significant evidence of an independent regional effect once rigorous inference is applied. Methodologically, it demonstrates the importance of small-cluster-appropriate inference in Indian state-panel research more broadly, where the limited number of states available for study is a structural constraint that ordinary robust standard errors do not resolve. Future research extending the panel to a larger set of states and years, and incorporating the full set of Finance Commission criteria, would be better positioned to detect a genuine regional effect should one exist.

8. Limitations of the Study

The findings of this study should be considered in light of several limitations. First, the analysis is based on a balanced panel of eleven major Indian states from FY2016 to FY2025. Therefore, the results may not be generalizable to all Indian states, especially the North-Eastern states and Union Territories, which were excluded.

Second, while the study controls for Per Capita Real Net State Domestic Product (PCRNSDP) and Finance Commission period, it does not include all variables from the Finance Commission's horizontal devolution formula, such as population, area, forest and ecology, demographic performance, and tax effort.

Third, the small number of state clusters (eleven) fundamentally limits the statistical power available to this design. Bias-reduced linearization standard errors with Satterthwaite corrections were applied throughout to address the known unreliability of conventional cluster-robust inference in small samples, but this correction cannot substitute for additional independent clusters; the null result on region should therefore be read as an absence of statistically detectable evidence rather than definitive proof of no regional effect.

These limitations also highlight directions for future research. Future studies might extend the panel to include a larger set of Indian states and Union Territories, incorporate the full set of Finance Commission criteria, and apply alternative small-sample panel methods such as the wild cluster bootstrap to further test whether a regional association can be detected under an expanded sample.

References

- Cameron, A. C., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources*, 50(2), 317–372.
- Conley, T. G., & Taber, C. R. (2011). Inference with “difference in differences” with a small number of policy changes. *Review of Economics and Statistics*, 93(1), 113–125.
- Fifteenth Finance Commission. (2020). Report of the Fifteenth Finance Commission (2021–2026). Government of India.



- Fourteenth Finance Commission. (2014). Report of the Fourteenth Finance Commission (2015–2020). Government of India.
- Joseph, K. J., & Kakarlapudi, K. K. (2025). The income distance paradox: Devolution conundrum for the Finance Commission (GIFT Discussion Paper Series 06/2025). Gulati Institute of Finance and Taxation.
- Kumar, S., & Kaur, B. (2023). Intergovernmental fiscal transfers and tax collection of Indian states: Estimation from panel data models. *Acta Universitatis Sapientiae, Economics and Business*, 11(1), 258–271.
- Ministry of Finance. (2017). Receipts Budget 2017-2018: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2015-2016). Government of India.
- Ministry of Finance. (2018). Receipts Budget 2018-2019: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2016-2017). Government of India.
- Ministry of Finance. (2019). Receipts Budget 2019-2020: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2017-2018). Government of India.
- Ministry of Finance. (2020). Receipts Budget 2020-2021: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2018-2019). Government of India.
- Ministry of Finance. (2021). Receipts Budget 2021-2022: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2019-2020). Government of India.
- Ministry of Finance. (2022). Receipts Budget 2022-2023: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2020-2021). Government of India.
- Ministry of Finance. (2023). Receipts Budget 2023-2024: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2021-2022). Government of India.
- Ministry of Finance. (2024). Receipts Budget 2024-2025: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2022-2023). Government of India.
- Ministry of Finance. (2025). Receipts Budget 2025-2026: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2023-2024). Government of India.
- Ministry of Finance. (2026). Receipts Budget 2026-2027: Statement showing state-wise distribution of net proceeds of Union taxes and duties (Actual 2024-2025). Government of India.
- Mohan, R. (2023). The sixteenth Finance Commission: Challenges and possibilities. *Economic and Political Weekly*, 58(36).
- Mukherjee, S. (2020). Goods and Services Tax efficiency across Indian states: Panel stochastic frontier analysis. *Indian Economic Review*, 55(2), 225–251.
- Murugan, K. (2025). Tax devolution and discriminatory effects on southern India. *Asian Journal of Economics and Empirical Research*, 12(2), 85–93.
- Musgrave, R. A. (1959). *The theory of public finance*. McGraw-Hill.
- Oates, W. E. (1972). *Fiscal federalism*. Harcourt Brace Jovanovich.
- Pustejovsky, J. E., & Tipton, E. (2018). Small-sample methods for cluster-robust variance estimation and hypothesis testing in fixed effects models. *Journal of Business & Economic Statistics*, 36(4), 672–683.
- Ramakumar, R. (2024). Devolution to states from the net proceeds in India. *Economic & Political Weekly*, 59(28), 25–28.



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- Rangarajan, C., & Srivastava, D. K. (2008). Reforming India's fiscal transfer system: Resolving vertical and horizontal imbalances. *Economic and Political Weekly*, 43(13), 47–60.
- Rao, M. G., & Singh, N. (2004). Asymmetric federalism in India (Working Paper No. 04-08). Santa Cruz Center for International Economics, University of California, Santa Cruz.
- Reserve Bank of India. (2024). Handbook of Statistics on Indian States 2024. Reserve Bank of India.
- Srivastava, D. K., Bharadwaj, M., Kapur, T., & Trehan, R. (2024). Finance Commissions' distance criterion role in delivering equalisation. *Economic and Political Weekly*, 59(28), 51–59.