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Tax Performance and Tax Effort of Andhra Pradesh State in India

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Abstract

This paper examines the tax performance and tax effort of Andhra Pradesh, a State carved out by the reorganisation of 2014, over the eleven financial years 2014-15 to 2024-25. Using State's Own Tax Revenue (SOTR), the State's share in central taxes and Gross State Domestic Product (GSDP) at current prices, performance is judged through tax-GSDP ratios, the composition of tax revenue, growth rates and buoyancy. Tax effort is measured as the ratio of actual SOTR to the SOTR predicted by a tax-capacity function in which SOTR is regressed on GSDP (SOTR = 12,344 + 0.0496 GSDP; $R^2 = 0.977$). The SOTR-GSDP ratio fell from 8.12 per cent in 2014-15 to 5.57 per cent in 2024-25, and the total tax-GSDP ratio from 11.03 to 8.81 per cent, because SOTR grew at 7.7 per cent per annum against 11.8 per cent for GSDP (elasticity of about 0.8). The share of central taxes in total tax revenue rose from 26.4 to 36.8 per cent. The tax effort index moved in a narrow band of 94.3 to 111.0 (mean 100.1) and exceeded 100 in five of the eleven years; the shortfalls were concentrated in 2015-16 to 2017-18, the pandemic year 2020-21 and 2024-25. The decline in the ratio therefore reflects a structurally GSDP-inelastic tax base more than a persistent lapse in effort. The paper suggests base-broadening, compliance-oriented administrative reform and revenue stabilisation to arrest the decline in the tax-GSDP ratio and to reduce growing reliance on central transfers.

Keywords: *tax effort; tax capacity; tax buoyancy; State's own tax revenue; Andhra Pradesh; fiscal federalism*

JEL Classification: H20, H71, H77, O23

1. Introduction

Taxation is the principal instrument through which a State government in India finances the delivery of public services, and the strength of its own tax revenue determines how far it can set its own expenditure priorities without depending on transfers from the Union Government. Under the Indian Constitution, the States are assigned a large share of expenditure responsibilities, particularly in health, education, agriculture, irrigation, roads and the maintenance of law and order, but a comparatively narrow set of tax powers. The resulting vertical fiscal imbalance is bridged by the devolution of a share of central taxes recommended by the Finance Commissions, and by grants. How a State performs on the tax side, and how much of its taxable potential it actually realises, are therefore central questions in public finance.

Andhra Pradesh presents a particularly instructive case. The Andhra Pradesh Reorganisation Act, 2014 created the residuary State with effect from 2 June 2014 and transferred Hyderabad, the single largest concentration of the undivided State's commercial and service-sector activity, to Telangana. The residuary State thus began its existence with a smaller and more agriculture-dependent tax base, large capital needs and a revenue deficit. Since then, it has

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passed through several major fiscal events: the enhancement of the State's share in the divisible pool of central taxes under the Fourteenth Finance Commission from 2015-16, the introduction of the Goods and Services Tax (GST) on 1 July 2017, the contraction caused by the COVID-19 pandemic in 2020-21, the Fifteenth Finance Commission period from 2020-21, and the expiry of the GST compensation arrangement in June 2022.

This paper analyses the tax performance and tax effort of Andhra Pradesh across eleven financial years, 2014-15 to 2024-25. It addresses four questions. First, how have the level and composition of the State's total tax revenue, comprising its own taxes and its share in central taxes, changed? Second, how have tax-GSDP ratios and the growth and buoyancy of tax revenue behaved? Third, what is the State's tax capacity, as indicated by the relationship between GSDP and SOTR? Fourth, how far has the State's actual tax collection fallen short of, or exceeded, that capacity, that is, what has been its tax effort in each year?

The remainder of the paper is organised as follows. Section 2 sets out the conceptual background. Section 3 describes the data and methodology. Section 4 presents the empirical results, including the three charts prepared from the study workbook and two additional charts on tax capacity and tax effort. Section 5 discusses the findings by phase, and Section 6 concludes with policy implications and the limitations of the study.

2. Conceptual Framework and Review

2.1 Tax performance, tax capacity and tax effort

Tax performance is commonly summarised by the tax-to-income ratio and by the growth and buoyancy of tax revenue. A ratio, however, does not say whether a low yield reflects a narrow base or inadequate exploitation of a reasonable base. The notion of *tax capacity* was developed to address this: it is the amount of revenue that a jurisdiction could be expected to raise, given its economic and structural characteristics, if it applied an average tax effort. *Tax effort* is then the ratio of actual collection to this estimated capacity. An index above 100 indicates that the jurisdiction collects more than its predicted capacity, and an index below 100 indicates a shortfall.

2.2 Approaches to measurement

The literature has used three broad approaches. The first is the representative tax system (RTS) approach, which applies average national tax rates to the actual or potential base of each tax. The second is the regression approach, introduced by Lotz and Morss (1967), refined by Bahl (1971) and Chelliah (1971) and extended by Chelliah, Baas and Kelly (1975), in which the tax ratio or tax revenue is regressed on indicators of capacity, such as per capita income, the share of agriculture or mining in output, and openness; the fitted value is taken as capacity and the ratio of actual to fitted value as effort. The third, more recent, approach uses stochastic frontier analysis, which treats the highest observed collection for a given set of determinants as the frontier and the shortfall from it as inefficiency (for example, Pessino and Fenochietto, 2010). Studies of Indian States have mostly used the regression approach in cross-section or panel form, with State income and structural variables as determinants, and have generally found that tax effort varies substantially across States even after controlling for income (see Rao and Singh, 2005, on the wider federal context).

The present study applies a parsimonious time-series variant of the regression approach to a single State. Capacity is represented by the State's own GSDP, the broadest available measure of the State's taxable base, and the fitted relationship between SOTR and GSDP over the study period defines expected revenue in each year. The index so obtained is best read as a measure of how each year's collection compares with the State's own average relationship between tax revenue and income over the period; it is not a comparison with other States.

2.3 Institutional context of Andhra Pradesh

Three features of the institutional setting bear on the interpretation of the results. First, a State's own taxes consist mainly of the State GST, tax on petroleum and alcohol (State excise and value added tax), stamps and registration fees, motor vehicle taxes and a few smaller levies; of these, only some move closely with GSDP, and the revenue from motor fuel and liquor depends on policy decisions on rates and pricing. Second, the share in central taxes is determined by the size of the divisible pool and by the horizontal formula of the Finance Commission in force, with the Fourteenth Finance Commission raising the States' aggregate share to 42 per cent for 2015-20 and the Fifteenth

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setting it at 41 per cent for 2020-26. It therefore moves with central tax performance and Finance Commission awards and not with the State's own effort. Third, since July 2017 the State's own tax base has been shaped by the GST, in which the compensation guarantee to States for revenue shortfalls applied until June 2022.

3. Data and Methodology

3.1 Data

The analysis uses annual data for eleven years from 2014-15 to 2024-25 on four variables, all at current prices and in Rs. crore: GSDP, State's Own Tax Revenue (SOTR), the State's share in central taxes, and total tax revenue (the sum of the last two). The time series data were collected from (1) Government of Andhra Pradesh: Budget in Brief for various years and (2) Government of Andhra Pradesh: Socio-Economic Survey for various years. Table 1 defines the variables and indicators used.

Table 1: Variables and indicators

Variable / indicator	Definition and formula
GSDP	Gross State Domestic Product at current prices (Rs. crore)
SOTR	State's Own Tax Revenue (Rs. crore)
Share in central taxes	State's share in the divisible pool of central taxes (Rs. crore)
Total tax revenue (TTR)	SOTR + share in central taxes (Rs. crore)
SOTR-GSDP ratio	(SOTR / GSDP) x 100
Central taxes-GSDP ratio	(Share in central taxes / GSDP) x 100
TTR-GSDP ratio	(TTR / GSDP) x 100
Share of SOTR / central taxes in TTR	(SOTR / TTR) x 100 and (Central taxes / TTR) x 100
Buoyancy	Percentage growth in tax revenue/percentage growth in GSDP
Estimated SOTR (tax capacity)	Fitted value from the regression of SOTR on GSDP
Tax effort index	(Actual SOTR / Estimated SOTR) x 100

3.2 Methods

Tax performance is first assessed through descriptive indicators: the levels, shares and ratios in Table 1, compound annual growth rates (CAGR) and year-on-year buoyancy. The buoyancy of a tax is defined as the ratio of its percentage growth to the percentage growth of GSDP. Because buoyancy is calculated on actual collections, it includes the effect of discretionary changes in rates and base as well as the automatic response of revenue to income growth.

Tax capacity is estimated by a simple linear regression of SOTR on GSDP:

$$SOTR_t = \alpha + \beta\, GSDP_t + u_t \qquad (1)$$

where α is the autonomous component of revenue, β is the marginal yield of SOTR with respect to GSDP, and u_t is a disturbance. The workbook's estimated values use the coefficients rounded to α = 12,344 and β = 0.0496, which are the ordinary least squares estimates for the eleven observations and are the trend-line equation displayed on the scatter chart. The estimated SOTR for each year, which is taken as the State's tax capacity, is the fitted value from equation (1). The tax effort index (TEI) and the gap between actual and estimated ratios are then computed as:

$$TEI_t = (SOTR_t / SOTR^*_t) \times 100 \qquad (2)$$

$$Gap_t = (SOTR_t / GSDP_t - SOTR^*_t / GSDP_t) \times 100 \qquad (3)$$

where SOTR* is the estimated SOTR. A TEI above 100, or a positive gap, signifies that the State raised more than its estimated capacity in that year. Because the regression is fitted on the same eleven observations that are then

evaluated, the residuals sum to approximately zero by construction, and the mean TEI is close to 100. The index therefore measures the year-to-year pattern of effort around the period's average relationship and cannot, by itself, reveal a long-run drift in effort. This point is taken up in Section 6.

4. Empirical Results

4.1 Growth and composition of tax revenue

Table 2 gives the basic data. GSDP at current prices grew from Rs. 5,24,976 crore in 2014-15 to Rs. 16,06,109 crore in 2024-25, a rise of 3.06 times. Total tax revenue rose from Rs. 57,917 crore to Rs. 1,41,515 crore, or 2.44 times. Within this, SOTR increased 2.10 times, from Rs. 42,618 crore to Rs. 89,435 crore, whereas the State's share in central taxes increased 3.40 times, from Rs. 15,299 crore to Rs. 52,080 crore. The State's own tax revenue has thus lagged behind both GSDP and central transfers.

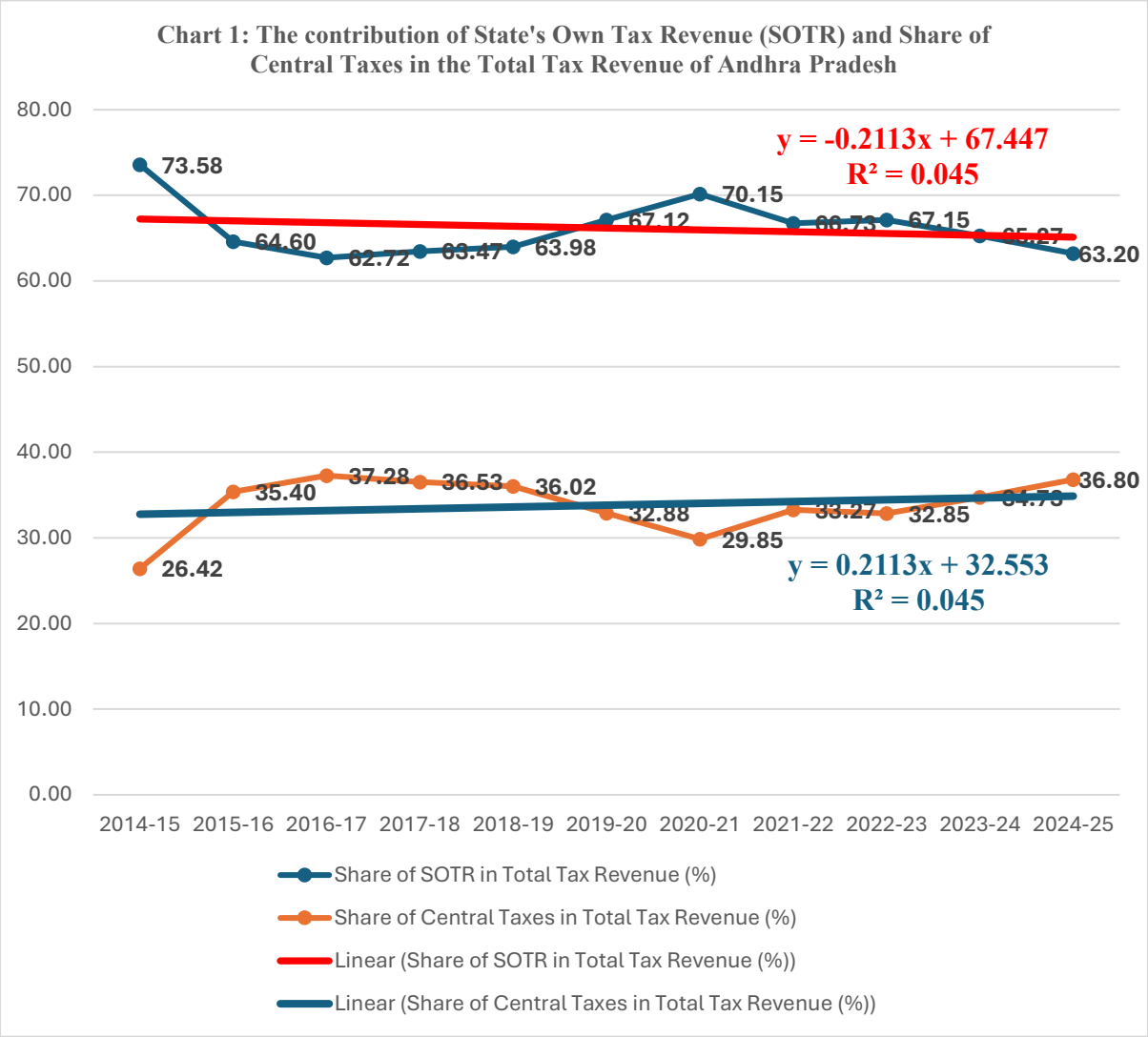
Table 2: GSDP and tax revenue of Andhra Pradesh, 2014-15 to 2024-25 (Rs. crore)

Year	GSDP at current prices	State's Own Tax Revenue	Share in Central Taxes	Total Tax Revenue
2014-15	5,24,976	42,618.15	15,299.12	57,917.27
2015-16	6,04,229	39,921.74	21,878.59	61,800.33
2016-17	6,84,416	44,181.46	26,263.81	70,445.27
2017-18	7,86,135	49,812.68	28,674.89	78,487.57
2018-19	8,73,721	58,107.29	32,710.71	90,818.00
2019-20	9,25,839	57,618.82	28,224.50	85,843.32
2020-21	9,78,581	57,427.74	24,441.40	81,869.14
2021-22	11,31,629	70,980.00	35,386.00	1,06,366.00
2022-23	13,09,464	78,026.00	38,177.00	1,16,203.00
2023-24	14,22,094	85,922.00	45,711.00	1,31,633.00
2024-25	16,06,109	89,435.00	52,080.00	1,41,515.00

Source:1. Government of Andhra Pradesh: Budget in Brief for various years; and

2. Government of Andhra Pradesh: Socio-Economic Survey for various years

Chart 1 shows the contribution of the two components to total tax revenue. SOTR provided 73.6 per cent of the total in 2014-15, but this fell sharply to 64.6 per cent in 2015-16 and to a low of 62.7 per cent in 2016-17, as the share in central taxes jumped by 43.0 per cent in 2015-16 when the higher devolution recommended by the Fourteenth Finance Commission took effect. The SOTR share then recovered gradually to 70.1 per cent in 2020-21, but this recovery did not come from stronger own-tax collection. It happened because central transfers fell by 13.7 per cent in 2019-20 and by 13.4 per cent in 2020-21, while SOTR declined only marginally (by 0.8 and 0.3 per cent respectively). After 2020-21 the SOTR share declined each year except 2022-23, reaching 63.2 per cent in 2024-25, with the share of central taxes rising to 36.8 per cent. Over the period the SOTR share averaged 66.2 per cent, so that roughly two-thirds of the State's tax revenue is raised by the State itself and one-third comes from the divisible pool.



4.2 Tax-GSDP ratios

Table 3 and Chart 2 present the tax-GSDP ratios. The SOTR-GSDP ratio fell from 8.12 per cent in 2014-15 to 5.57 per cent in 2024-25, a decline of 2.55 percentage points. Most of the fall occurred immediately: the ratio dropped to 6.61 per cent in 2015-16 and then drifted down with brief interruptions in 2018-19 (6.65 per cent) and 2021-22 (6.27 per cent). The ratio in 2024-25 is the lowest of the eleven years. The ratio of central taxes to GSDP rose from 2.91 per cent to a peak of 3.84 per cent in 2016-17, dropped to 2.50 per cent in the pandemic year 2020-21 and has recovered to 3.24 per cent. Because the own-tax ratio fell by more than central transfers gained, the ratio of total tax revenue to GSDP fell from 11.03 per cent to 8.81 per cent, with a trough of 8.37 per cent in 2020-21. Across the period the SOTR-GSDP ratio averaged 6.37 per cent, the central taxes ratio 3.26 per cent and the total tax ratio 9.63 per cent.

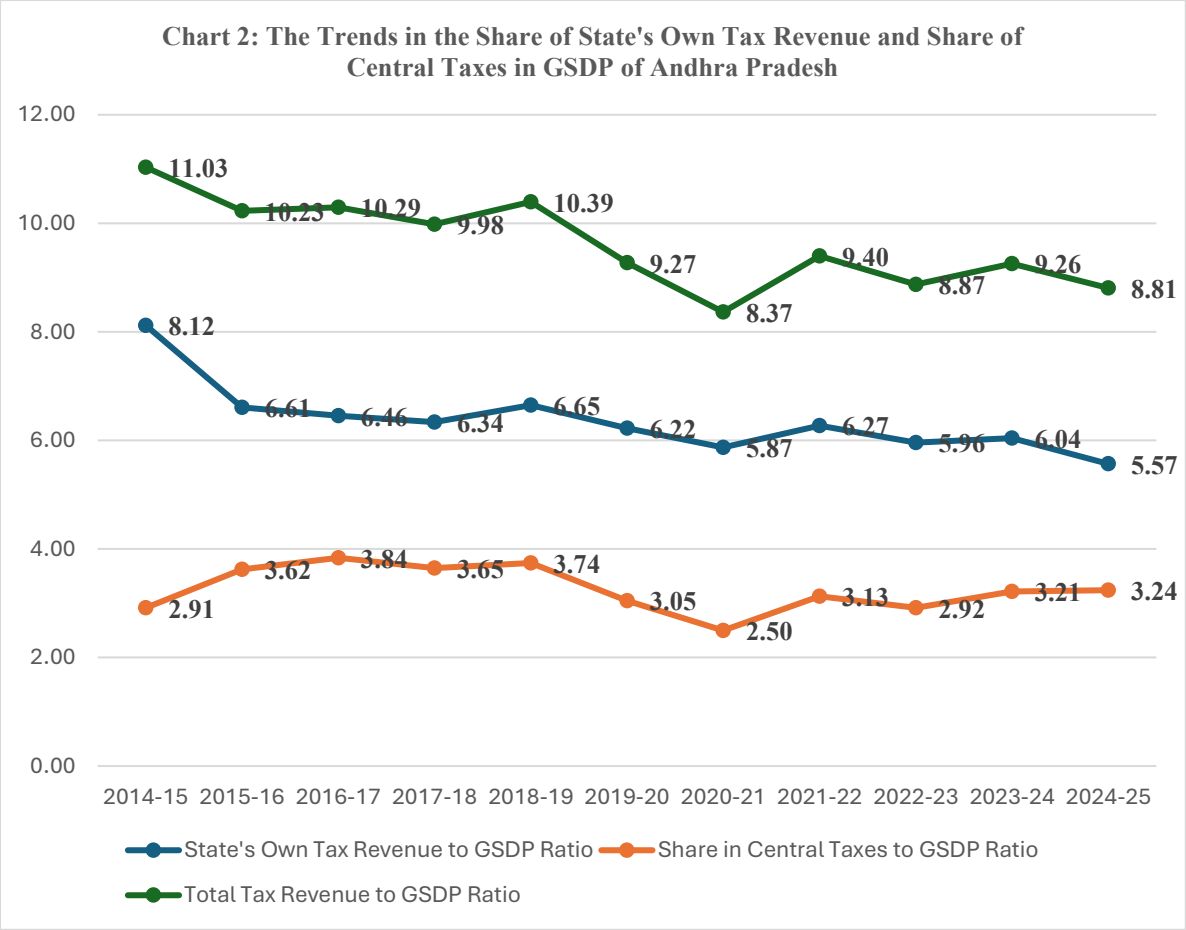
Table 3: Tax-GSDP ratios and composition of tax revenue (per cent)

Year	SOTR / GSDP	Central taxes / GSDP	Total tax / GSDP	SOTR in total tax	Central taxes in total tax
2014-15	8.12	2.91	11.03	73.6	26.4
2015-16	6.61	3.62	10.23	64.6	35.4
2016-17	6.46	3.84	10.29	62.7	37.3

Year	SOTR / GSDP	Central taxes / GSDP	Total tax / GSDP	SOTR in total tax	Central taxes in total tax
2017-18	6.34	3.65	9.98	63.5	36.5
2018-19	6.65	3.74	10.39	64.0	36.0
2019-20	6.22	3.05	9.27	67.1	32.9
2020-21	5.87	2.50	8.37	70.1	29.9
2021-22	6.27	3.13	9.40	66.7	33.3
2022-23	5.96	2.92	8.87	67.1	32.9
2023-24	6.04	3.21	9.26	65.3	34.7
2024-25	5.57	3.24	8.81	63.2	36.8
Average	6.37	3.26	9.63	66.2	33.8

Source:1. Government of Andhra Pradesh: Budget in Brief for various years; and

2. Government of Andhra Pradesh: Socio-Economic Survey for various years



4.3 Growth and buoyancy

Table 4 reports compound annual growth rates. Over the whole period GSDP grew at 11.83 per cent a year, SOTR at 7.69 per cent, central taxes at 13.03 per cent and total tax revenue at 9.35 per cent. The own-tax growth rate was thus about two-thirds of the growth rate of the economy, which is the arithmetic source of the declining ratio. The 2014-15 base year influences these figures, because 2014-15 was the first, partial-year, experience of the new State and

SOTR actually fell in 2015-16 (by 6.3 per cent). Measured from 2015-16 the CAGR of SOTR is 9.38 per cent against 11.47 per cent for GSDP, which gives a less severe but still sub-unitary buoyancy of 0.82.

Table 4: Compound annual growth rates (per cent)

Variable	CAGR 2014-15 to 2024-25	CAGR 2015-16 to 2024-25	Buoyancy w.r.t. GSDP (2014-15 to 2024-25)
GSDP at current prices	11.83	11.47	1.00
State's Own Tax Revenue	7.69	9.38	0.65
Share in Central Taxes	13.03	10.12	1.10
Total Tax Revenue	9.35	9.64	0.79

Source: Author's calculations. Buoyancy = CAGR of the variable / CAGR of GSDP.

Table 5 gives the year-on-year picture. Buoyancy of SOTR exceeded unity in only three of the ten years: 2018-19 (1.49), 2021-22 (1.51) and 2023-24 (1.18). It was negative in 2015-16 (-0.42), 2019-20 (-0.14), and 2020-21 (-0.06), which are years when the nominal growth of the economy continued, or only slowed, while own taxes were flat or fell.

Table 5: Year-on-year growth rates and buoyancy of SOTR

Year	GSDP growth	SOTR growth	Central taxes growth	Total tax growth	Buoyancy of SOTR
2015-16	15.1	-6.3	43.0	6.7	-0.42
2016-17	13.3	10.7	20.0	14.0	0.80
2017-18	14.9	12.7	9.2	11.4	0.86
2018-19	11.1	16.7	14.1	15.7	1.49
2019-20	6.0	-0.8	-13.7	-5.5	-0.14
2020-21	5.7	-0.3	-13.4	-4.6	-0.06
2021-22	15.6	23.6	44.8	29.9	1.51
2022-23	15.7	9.9	7.9	9.2	0.63
2023-24	8.6	10.1	19.7	13.3	1.18
2024-25	12.9	4.1	13.9	7.5	0.32
Average	11.9	8.0	14.6	9.8	0.62

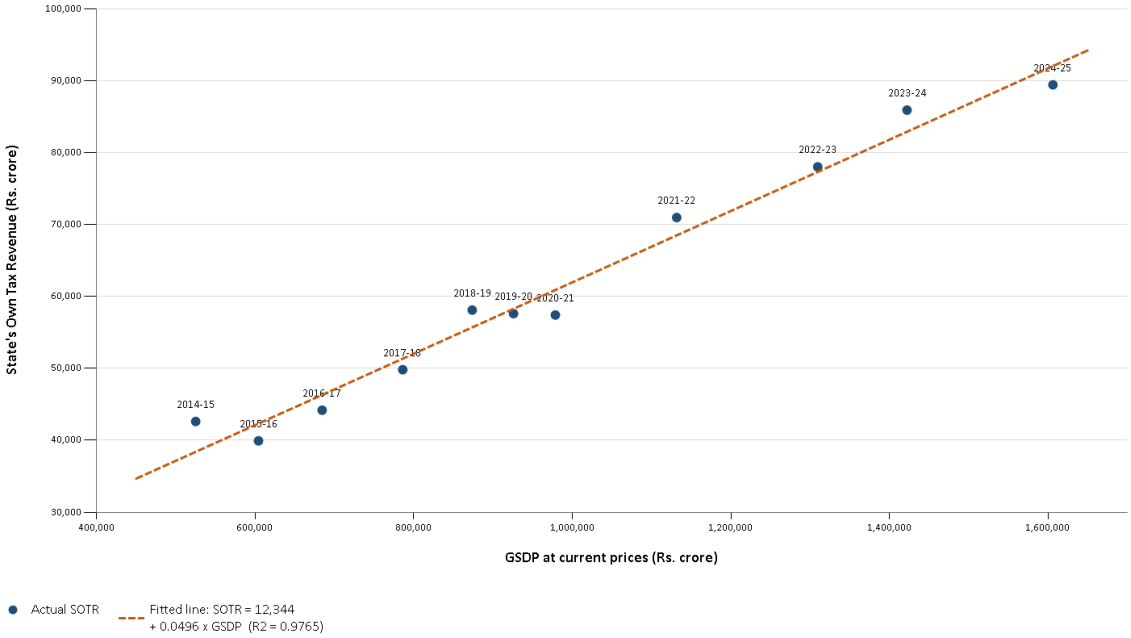
Source: Author's calculations. The last row is the simple average of the ten annual values.

The average annual buoyancy was 0.62. The highest growth in SOTR (23.6 per cent in 2021-22) came in the rebound year after the pandemic. The growth of central taxes was more volatile, from 43.0 per cent in 2015-16 and 44.8 per cent in 2021-22 to declines of 13.7 and 13.4 per cent in the two years before and during the pandemic, which is consistent with the dependence of the divisible pool on cyclical central collections.

4.4 Tax capacity: the relationship between GSDP and SOTR

Chart 3 plots SOTR against GSDP for the eleven years, with the fitted linear trend line, whose equation and R^2 are shown on the workbook's chart. The fit is very close, and the regression results are reported in Table 6.

Chart 3: Relationship between GSDP and State's Own Tax Revenue of Andhra Pradesh, 2014-15 to 2024-25 (scatter and fitted line)



Source: Author's calculations.

Table 6: Regression of SOTR on GSDP (Rs. crore), 2014-15 to 2024-25

Parameter	Estimate	Standard error	t-statistic
Intercept (α)	12,344.13	2,667.08	4.63
Slope (β)	0.0496	0.0026	19.35
R^2 / adjusted R^2	0.9765 / 0.9739		
F-statistic (1, 9 d.f.)	374.6		
Standard error of estimate	2,815.7		
Durbin-Watson statistic	2.14		
Elasticity at sample means	0.80		
Log-log elasticity	0.78		
Observations	11		

Source: Author's estimates from the study dataset. Critical value of t at the 5 per cent level with 9 d.f. = 2.26. The workbook uses the rounded coefficients 12,344 and 0.0496.

The slope coefficient, 0.0496, is highly significant (t = 19.4) and indicates that each additional Rs. 100 of GSDP is associated with about Rs. 4.96 of additional SOTR. The intercept is positive and significant (t = 4.6), and GSDP alone explains 97.7 per cent of the variation in SOTR. The Durbin-Watson statistic of 2.14 does not suggest first-order serial correlation in the residuals, although with eleven observations this test has little power. The regression carries two implications. First, because the marginal yield (4.96 per cent) is lower than the average ratio in every year, the SOTR-GSDP ratio falls mechanically as GSDP grows. The ratio implied by the capacity function falls from 7.31 per cent in 2014-15 to 5.73 per cent in 2024-25 and approaches 4.96 per cent only in the limit. Second, the elasticity of SOTR with respect to GSDP is about 0.80 at the sample means and 0.78 in a log-log specification, both below unity. The ratio of the marginal to the average yield has risen from 0.68 in 2014-15 to 0.87 in 2024-25, which indicates that the drag of the intercept on the ratio is easing as the economy grows, although the ratio is still falling.

4.5 Tax effort of Andhra Pradesh

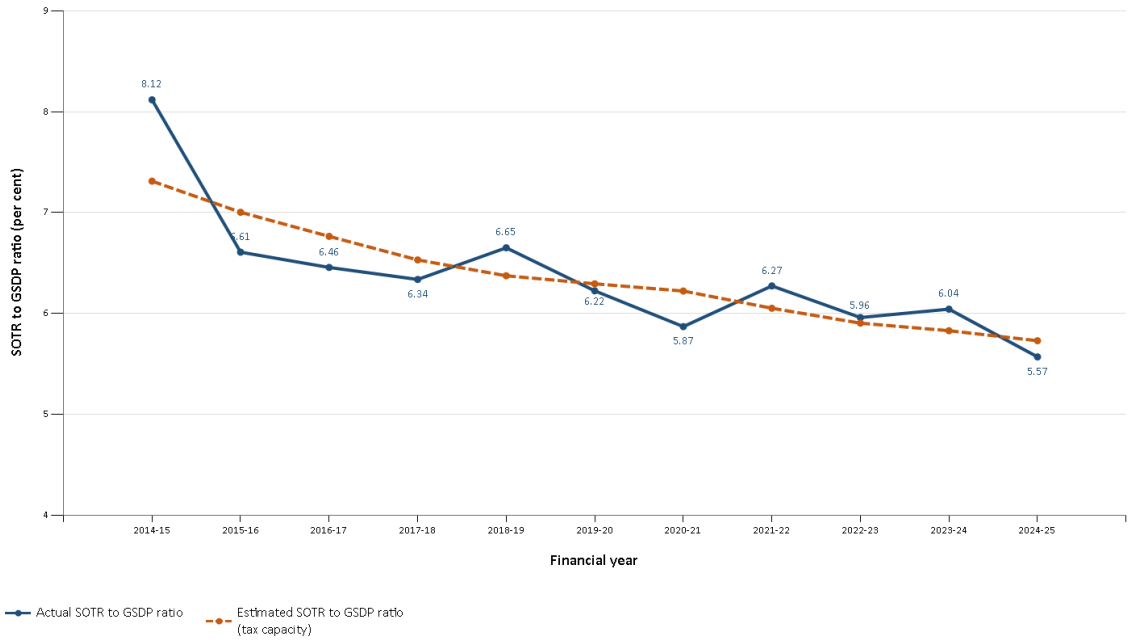
Table 7 compares actual SOTR with the SOTR estimated from equation (1), and Chart 4 compares the actual and estimated SOTR-GSDP ratios. The actual ratio was above the estimated ratio in five years (2014-15, 2018-19, 2021-22, 2022-23 and 2023-24) and below it in six.

Table 7: Actual and estimated SOTR, ratios to GSDP and tax effort index

Year	GSDP (Rs. crore)	Actual SOTR (Rs. crore)	Estimated SOTR (Rs. crore)	Actual ratio (%)	Estimated ratio (%)	Actual - estimated (pp)	Tax effort index	Actual - estimated (Rs. crore)
2014-15	5,24,976	42,618	38,383	8.12	7.31	0.81	111.0	4,235
2015-16	6,04,229	39,922	42,314	6.61	7.00	-0.40	94.3	-2,392
2016-17	6,84,416	44,181	46,291	6.46	6.76	-0.31	95.4	-2,110
2017-18	7,86,135	49,813	51,336	6.34	6.53	-0.19	97.0	-1,524
2018-19	8,73,721	58,107	55,681	6.65	6.37	0.28	104.4	2,427
2019-20	9,25,839	57,619	58,266	6.22	6.29	-0.07	98.9	-647
2020-21	9,78,581	57,428	60,882	5.87	6.22	-0.35	94.3	-3,454
2021-22	11,31,629	70,980	68,473	6.27	6.05	0.22	103.7	2,507
2022-23	13,09,464	78,026	77,293	5.96	5.90	0.06	100.9	733
2023-24	14,22,094	85,922	82,880	6.04	5.83	0.21	103.7	3,042
2024-25	16,06,109	89,435	92,007	5.57	5.73	-0.16	97.2	-2,572
Mean				6.37	6.36	0.01	100.1	

Source: Study dataset; author's calculations. Estimated SOTR = 12,344 + 0.0496 x GSDP; tax effort index = actual / estimated x 100. pp = percentage points.

Chart 4: Actual and estimated SOTR-GSDP ratios of Andhra Pradesh (per cent)

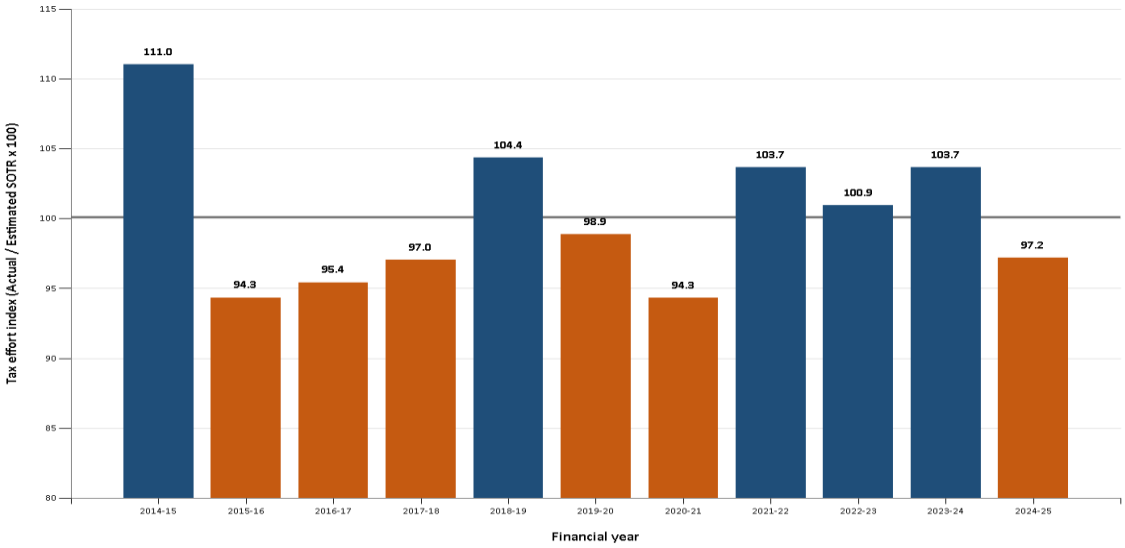


Source: Study dataset; author's chart from the estimated values.

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The tax effort index (Chart 5) ranges between a minimum of 94.3 (2015-16 and 2020-21) and a maximum of 111.0 (2014-15), with a mean of 100.1, a standard deviation of 5.2, and a coefficient of variation of about 5 per cent. The index is above 100 in 2014-15, 2018-19, 2021-22, 2022-23 and 2023-24, and below 100 in the remaining six years. Excluding 2014-15, which, as the first year of the new State, is an outlier, the mean index is 99.0, and the range is 94.3 to 104.4, so the State has realised, on average, about 99 per cent of the capacity implied by its own revenue-income relationship.

Chart 5: Tax effort index of Andhra Pradesh (Actual SOTR / Estimated SOTR x 100)



In rupee terms the shortfalls were largest in 2020-21 (Rs. 3,454 crore, or 0.35 per cent of GSDP), 2024-25 (Rs. 2,572 crore) and 2015-16 (Rs. 2,392 crore), and the largest surpluses were in 2014-15 (Rs. 4,235 crore), 2023-24 (Rs. 3,042 crore) and 2021-22 (Rs. 2,507 crore). The cumulative net shortfall for 2015-16 to 2024-25 is about Rs. 3,989 crore, which is about 0.6 per cent of the ten-year total SOTR of Rs. 6.31 lakh crore. The estimates do not show a large sustained under- or over-exploitation of capacity.

5. Discussion

The tax performance of Andhra Pradesh over the period can be divided into four phases, summarised in Table 8. The phases are defined by major fiscal events and not by statistical breaks.

Table 8: Phase-wise tax performance and tax effort

Phase	Average SOTR / GSDP (%)	Average total tax / GSDP (%)	Average central share in total tax (%)	Average tax effort index
I. Early years of the new State (2014-15 to 2016-17)	7.06	10.52	33.0	100.3
II. GST transition and slowdown (2017-18 to 2019-20)	6.40	9.88	35.1	100.1
III. COVID-19 year (2020-21)	5.87	8.37	29.9	94.3
IV. Recovery and post-compensation years (2021-22 to 2024-25)	5.96	9.09	34.4	101.4

Source: Study dataset; author's calculations (simple averages of annual values).

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Phase I (2014-15 to 2016-17). The first phase was dominated by the loss of a large part of the earlier tax base and by the shift in the revenue mix as central transfers rose from 26.4 to 37.3 per cent of total tax revenue. The index of 111.0 in the very first year is not a sign of exceptional effort; it is more likely the result of the base and the incomplete year, and the fall of own tax revenue by 6.3 per cent in 2015-16 took the index to 94.3. Revenue growth recovered in 2016-17 and 2017-18, but the index remained below 100 (95.4 and 97.0).

Phase II (2017-18 to 2019-20). Following the introduction of GST in July 2017, SOTR grew by 16.7 per cent in 2018-19, the first full year, and the index rose to 104.4, in a year that coincided with the guarantee of compensation to States for shortfalls under GST. The momentum was lost in 2019-20, when GSDP growth slowed to 6.0 per cent and SOTR fell by 0.8 per cent, bringing the index to 98.9.

Phase III (2020-21). The pandemic year recorded the lowest total tax-GSDP ratio of the period (8.37 per cent), the second-lowest SOTR-GSDP ratio (5.87 per cent) and an index of 94.3, a shortfall of Rs. 3,454 crore against capacity. Nevertheless, SOTR was more stable than central taxes, which fell by 13.4 per cent; the SOTR share in total tax revenue peaked at 70.1 per cent as a consequence. This suggests that, for a State with a significant share of consumption-linked taxes, the own-tax base can be more resilient in a downturn than the divisible pool, but it is also less buoyant in recovery.

Phase IV (2021-22 to 2024-25). The recovery was strong in 2021-22 (SOTR growth of 23.6 per cent, index 103.7), held up in 2022-23 and 2023-24 (index 100.9 and 103.7) and then faltered in 2024-25, when SOTR grew by only 4.1 per cent against GSDP growth of 12.9 per cent, giving a buoyancy of 0.32, the lowest SOTR-GSDP ratio of the period (5.57 per cent) and an index of 97.2. The ending of the GST compensation guarantee in June 2022 means that the State no longer has a safeguard for revenue shortfalls, and the 2024-25 result is a reminder of the vulnerability of own tax revenue when policy support or the cycle turns.

Effort versus structure. The most notable finding is that the sharp decline in the SOTR-GSDP ratio of 2.55 percentage points is not accompanied by a corresponding decline in the effort index, which has fluctuated around 100 throughout. This is partly an arithmetical consequence of the method: the capacity function is estimated from the same period, and the fitted ratio is itself falling, from 7.31 to 5.73 per cent, because the elasticity is below one. Taken at face value, the result says that most of the decline was predictable from the shape of the revenue-income relationship and that the State's collections in each year were close to what that relationship would suggest. It does not say that the State's performance was satisfactory in an absolute sense. A State whose tax revenue grows consistently slower than its income is losing fiscal space whether or not the shortfall is ascribed to effort or structure. As an illustration, if SOTR had been maintained at the 2015-16 to 2019-20 average ratio of 6.45 per cent of GSDP, 2024-25 revenue would have been about Rs. 1,03,666 crore, some Rs. 14,200 crore (0.9 per cent of GSDP) higher than the Rs. 89,435 crore actually collected. This is not an estimate of unrealised potential, because it ignores the structural changes in the economy and in the tax system, but it does indicate the scale of the fiscal space lost by the decline in the ratio.

6. Conclusions and Policy Implications

6.1 Main findings

The study of eleven years of data for Andhra Pradesh leads to the following conclusions.

1. **Falling tax-GSDP ratios.** The SOTR-GSDP ratio fell from 8.12 to 5.57 per cent and the total tax-GSDP ratio from 11.03 to 8.81 per cent. SOTR grew at 7.69 per cent a year against 11.83 per cent for GSDP; the average annual buoyancy of SOTR was 0.62.

2. **Growing dependence on central taxes.** The share of central taxes in total tax revenue rose from 26.4 to 36.8 per cent, with the share in central taxes growing at 13.03 per cent a year, on account of the higher devolution after 2015-16 and the recovery of the divisible pool. The State's revenue is therefore increasingly exposed to central tax performance and to the Finance Commission awards.

3. **A close but inelastic relationship between GSDP and SOTR.** GSDP explains 97.7 per cent of the variation in SOTR (SOTR = 12,344 + 0.0496 GSDP), but the elasticity (about 0.8) is below unity, so the ratio falls automatically as the economy expands.

4. **Tax effort close to capacity, with cyclical swings.** The tax effort index averaged 100.1 (99.0 excluding 2014-15), ranged between 94.3 and 111.0 and was above 100 in five years. The shortfalls were concentrated in the early post-reorganisation years, the pandemic year and 2024-25. The fall in the ratio has been more a matter of a structurally inelastic base than of a systematic decline in effort.

6.2 Policy implications

Broaden the base and raise elasticity. Since the marginal yield of SOTR (4.96 per cent of incremental GSDP) is well below the average ratio, a stable tax-GSDP ratio requires measures that raise the responsiveness of tax revenue to income. These include better capture of the growing services sector in the State GST, the use of invoice-matching and analytics to reduce evasion, a review of the exemptions and concessions in the State's own taxes, and the periodic updating of the valuation of property for stamps and registration.

Strengthen administration and compliance. The index suggests there is little systematic over- or under-collection against the State's own historical relationship, so the gains should be sought through improvement in the relationship itself, that is, a higher marginal yield, by better enforcement, simpler procedures and more effective use of data.

Build a revenue stabilisation mechanism. The shortfalls in 2015-16, 2020-21 and 2024-25 were each of the order of Rs. 2,400 to Rs. 3,500 crore. A budget stabilisation fund that is built up in surplus years such as 2021-22 and 2023-24, and drawn down in shortfall years, could limit the need to cut expenditure or borrow in a downturn, particularly now that GST compensation is no longer available.

Plan for dependence on transfers. With more than a third of tax revenue coming from the divisible pool, the State's fiscal plans need to be robust to changes in the horizontal distribution and in the aggregate share under successive Finance Commissions, including the cycle that begins in 2026-27, and to fluctuations in central tax collections.

Monitor tax effort regularly. The State's Finance Department could institutionalise an annual tax effort assessment, using a richer capacity model than the one used here, and tracking the effort and buoyancy of individual taxes, so that departures from capacity are identified early.

6.3 Limitations and scope for further research

Several limitations should be borne in mind. (i) GSDP is the sole determinant of capacity, and other determinants such as the sectoral composition of output, per capita income, urbanisation, consumption patterns and the tax-policy regime are not controlled for. (ii) The estimation is a within-sample fit to 11 observations of a single State, so the index is relative to the State's own average experience; a persistent underperformance in all years would not show up as a low index. It also cannot identify a shift in the revenue-income relationship caused by the reorganisation, GST or policy changes without a structural-break test, which is not feasible with so few observations. (iii) GSDP and tax revenue are in current prices, and the effects of price changes on revenue have not been separated from real growth. (iv) 2014-15 reflects the first, incomplete year of the new State and the most recent year may include provisional figures. (v) The study analyses SOTR as a whole and does not separate individual taxes. Future research could extend the analysis to a panel of States with a stochastic frontier model, so that Andhra Pradesh's effort can be compared with that of comparable States, and could estimate the tax-wise buoyancy and the effects of GST and the Finance Commission awards.

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