ANALYSIS OF INTER-STATE TAX BUOYANCY

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ABSTRACT

Tax buoyancy estimates, which measure the percentage response of tax revenue to a one percent change in the tax base, usually proxied by gross domestic product, are a routine requirement for fiscal projection purposes. The elasticity of tax revenue is more stringently defined, as the underlying revenue response holding constant all parameters of tax policy. The aims to measure the inter-state tax buoyancy for the period from 2005 to 2016. At the aggregate level, the tax buoyancy of SOTR is estimated for the 27 states of India. The buoyancy coefficients of SOTR of all of the states are found statistically significant and considerably high. However, the buoyancy coefficient varies from state to state.

Keywords: Indian States, tax buoyancy

1. INTRODUCTION

Every country in the process of formulating its budget undertakes revenue projections. When the revenues turn out to be smaller than the budget expenditures, countries end up with deficit financing. Since underdeveloped countries have few possibilities for prolonged external financing of budget deficits, without causing too much disruption in the macroeconomic environment, each country must decide how best to increase its internal tax revenues to meet its expenditure needs. One way that countries raise additional revenue is by making discretionary tax measure changes. The best outcome expected from such changes is that the tax system will automatically yield corresponding tax revenues as income or GDP grows, on a sustainable basis. The response of tax revenues to changes in the GDP is measured by tax elasticity and tax buoyancy. These concepts help to explain the overall structure of a tax system and serve as valuable analytical tools for designing tax policy.

Tax buoyancy estimates, which measure the percentage response of tax revenue to a one percent change in the tax base, usually proxied by gross domestic product, are a routine requirement for fiscal projection purposes. The elasticity of tax revenue is more stringently defined, as the

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underlying revenue response holding constant all parameters of tax policy. In developing countries, where tax policy parameters are changed every year and sometimes in the course of the year, the elasticity of tax revenue is virtually impossible to estimate with any appreciable degree of accuracy. In such a fiscal context, where tax policy parameters are in a state of constant flux, the buoyancy coefficient may provide the only feasible alternative to estimating the underlying revenue-generating properties of the system. If estimated over a sufficiently long period of time, the buoyancy coefficient essentially estimates the revenue response with indigenized tax policy. This paper estimates buoyancies for Indian states with respect to their own tax revenues for the period, 2005 to 2016. Buoyancy estimates for tax revenues of states are estimated with respect to the domestic product at state-level, called the GSDP. GSDP estimates for states in India are available only at factor cost, not at market prices.

The rest of the paper is divided into following sections: Section 5.2 highlights the methodological aspects for estimating the inter-state tax buoyancy. Section 5.3 presents the inter-state analysis of tax buoyancies at aggregate and disaggregate level. At disaggregate level; we have estimated the tax buoyancies of the various components of state's own tax revenues (SOTR) in order to explain the inter-state variations in tax buoyancy of SOTR. Finally, section 5.4 concludes the overall findings of this paper.

2. DATA AND METHODOLOGY

In order to estimate the tax buoyancy of states own tax revenues (SOTR) and its various components, we have used ordinary least square method (OLS). OLS is applied on the following double log specification of the type given in equation (1) to equation (11):

$$\log(TTR_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (1)$$

$$\log(SOTR_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (2)$$

$$\log(TOI_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (3)$$

$$\log(TPCT_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (4)$$

$$\log(TCS_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (5)$$

$$\log(SALES_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (6)$$

$$\log(EXCISE_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (7)$$

$$\log(TOV_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (8)$$

$$\log(TGP_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (9)$$

$$\log(TDE_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (10)$$

$$\log(EOT_t) = \beta_0 + \beta_1 \log(GSDP_t) + u_t \qquad (11)$$

Where B_2 = buoyancy coefficients, GSDP= gross state domestic product, TTR=total tax revenues, SOTR=state's own tax revenues, TOI=taxes on income, TPCT= taxes on property & capital transaction, TCS= taxes on commodities and services, SALES= sales tax, Excise= state excise tax, TOV= taxes on vehicles, TGP= taxes on goods & passengers, TDE= taxes & duties on electricity, and EOT= entertainment & other taxes.

The data of the various tax revenues of states has been taken from Handbook of statistics of Indian States published by Reserve Bank of India (RBI). The study covers the period of 12 years from 2005 to 2016.

3. ANALYSIS OF INTER-STATE TAX BUOYANCY

Table 1 shows the inter-state tax buoyancy measured in terms of total tax revenues of the state governments. Total tax revenues of the state government of India includes states own tax revenues and share in central taxes. Therefore, tax buoyancy in terms of total tax revenues is a gross approximation of state tax revenues to the changes in tax base i.e. gross state domestic product (GSDP). As demonstrated by Table 1, Arunachal Pradesh has received the highest rank in terms of tax buoyancy based on total tax revenues. The buoyancy coefficient of Arunachal Pradesh is 6.736 which is found statistically significant at 1% level. It means that if the GSDP of Arunachal Pradesh rises by one percent, its total tax revenues will rise by 6.736 percent. Sikkim is reported with minimum tax buoyancy coefficient. (1.246) which is greater than unity and it reflects the high responsiveness of the total tax revenues of Sikkim to the changes in its GSDP. It is evident from table 1 that for all of 27 states, the tax buoyancy coefficient greater than unity as far as total tax revenues are concerned. (The tax buoyancy coefficients of all 27 states listed in table 1 are found statistically significant at 1% level of significance.) It implies that the tax system of all of the states under consideration is highly buoyant, that is, a small increase in the tax base will cause a relatively large increase in the tax revenues. In other words, it reflects the underlying revenue generating properties of the system with indigenized tax policy. One serious drawback associated with the buoyancy estimate based on total tax revenue is that it includes the revenues from states share in central taxes. This part of total tax revenues of Indian states does not depend on state's own tax efforts rather it depends on the recommendations of the Finance Commission of India. In distributing the tax revenues from the central taxes among the states, more weight has been given to poor states (i.e. less weight has been given to the rich states) in order to achieve the horizontal equity and to bridge the gaps in the economic development of various states. Therefore, it is possible that the revenues from the central taxes may decrease

with increase in the per capita income of the state. Therefore, in order to calculate the precise estimate of tax buoyancy of the state governments, we have estimated the tax buoyancy coefficient based on state's own tax revenues. The buoyancy coefficient of state's own tax revenues is an accurate measure of the revenue-generating ability of the tax system of the state. The results of tax buoyancy (based on SOTR) are almost similar to that of the results demonstrated in table 1. Arunachal Pradesh is again ranked first with 5.839 percent tax buoyancy and Sikkim is ranked last with 1.027 percent tax buoyancy as far as state's own tax revenues are concerned. The buoyancy coefficients (based on SOTR) of all states are greater than unity and also found statistically significant.

Table 1: State-wise Buoyancy of Total Tax revenues, 2005 to 2016

State	Rank	Buoyancy coefficient
ARUNACHAL PRADESH	1	6.736***
MANIPUR	2	5.909***
JAMMU & KASHMIR	3	4.736***
ASSAM	4	3.540***
UTTAR PRADESH	5	3.497***
CHHATISGARH	6	3.064***
ORISSA	7	3.015***
HIMACHAL PRADESH	8	2.992***
MEGHAYA	9	2.926***
PUNJAB	10	2.840***
WEST BENGAL	11	2.827***
RAJASTHAN	12	2.673***
KARNATAKA	13	2.620***
KERALA	14	2.436***
MAHARASHTRA	15	2.399***
MADHYA PRADESH	16	2.395***
GOA	17	2.298***
JHARKHAND	18	2.295***
HARYANA	19	2.279***
NAGALAND	20	2.234***
GUJARAT	21	2.220***
TRIPURA	22	2.140***
BIHAR	23	1.969***
TAMIL NADU	24	1.939***

UTTRAKHAND	25	1.816***
AP	26	1.548***
SIKKIM	27	1.246***

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Table 2: State-wise Buoyancy of State's Own Tax revenues, 2005 to 2016

State	Rank	Buoyancy coefficient
ARUNACHAL PRADESH	1	5.839***
MANIPUR	2	5.434***
JAMMU & KASHMIR	3	4.601***
UTTAR PRADESH	4	3.437***
ASSAM	5	3.215***
ORISSA	6	3.030***
CHHATISGARH	7	2.957***
WEST BENGAL	8	2.746***
HIMACHAL PRADESH	9	2.724***
PUNJAB	10	2.680***
RAJASTHAN	11	2.672***
KARNATAKA	12	2.531***
KERALA	13	2.430***
BIHAR	14	2.414***
MEGHAYA	15	2.409***
MAHARASHTRA	16	2.330***
JHARKHAND	17	2.328***
MADHYA PRADESH	18	2.274***
HARYANA	19	2.249***
GUJARAT	20	2.224***
GOA	21	2.156***
TAMIL NADU	22	1.943***
UTTRAKHAND	23	1.806***
TRIPURA	24	1.799***
NAGALAND	25	1.720***
AP	26	1.437***
SIKKIM	27	1.027***

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

State's own tax revenues can be further decomposed into three components: Taxes on income (TOI), taxes on property & capital transaction (TPCT), and taxes on commodities & services (TCS). Therefore, it is worthy to measure the tax buoyancy of these three components of SOTR separately. The task has been accomplished in table 3 to table 5. Table 3 shows the tax-buoyancy of various states (based on TOI) for the period from 2005 to 2016. As per table 3, Jharkhand is reported with highest tax buoyancy (16.387) followed by Bihar (12.223), Uttar Pradesh (4.233) and Meghalaya (3.997). Further 10 states viz. Assam (2.403), Manipur (2.231), Uttarakhand (2.141), Orissa (1.936), Karnataka (1.86), West Bengal (1.362), Maharashtra (1.169), Madhya Pradesh (1.155), Gujarat (1.132), and Nagaland (1.051) are reported highly buoyant in terms of TOI. The tax buoyancy coefficients of all of these states are greater than unity and found statistically significant. There are two states (viz. Tripura and Madhya Pradesh) which have the value of buoyancy coefficient less than unity. Therefore, tax system of these two states show relatively low tax revenue generating capacity from the income tax on agriculture. Further, there are 9 states (viz. Kerala, Arunachal Pradesh, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, and Sikkim) which have either zero tax buoyancy (based on TOI) or their tax buoyancy coefficients are found statistically insignificant. It implies that in all of these states, the revenue generating capacity of the system from the income tax on agriculture is zero. There are two possible reasons which are responsible for the occurrence of the above-mentioned phenomenon. First, in most of these states agriculture income is tax exempted. Second, it may due to the high degree of tax evasion in the agriculture sector. In the agriculture sector-tax evasion is easier as compared to that in other sectors of the economy. Further, Tamil Nadu and Chhattisgarh are the states which are reported with negative and also statistically significant buoyancy coefficient. It indicates that with the increase in GSDP, revenues from income tax have been falling over the period of time in these two states. It may be due to the fact that with the increase in GSDP the share of agriculture sector in GSDP has declined significantly which further accompanied with tax exemption and tax evasion has reduced the revenues from TOI over the period of time.

Table 3: State-wise Buoyancy of Tax revenues from Taxes on Income, 2005 to 2016

State	Rank	Buoyancy coefficient
JHARKHAND	1	16.387***
BIHAR	2	12.223***
UTTAR PRADESH	3	4.233***
MEGHAYA	4	3.997*
ASSAM	5	2.403***
MANIPUR	6	2.231***
UTTRAKHAND	7	2.141***

ORISSA	8	1.936***
KARNATAKA	9	1.862***
WEST BENGAL	10	1.362***
MAHARASHTRA	11	1.169***
MADHYA PRADESH	12	1.155***
GUJARAT	13	1.132***
NAGALAND	14	1.051***
TRIPURA	15	0.644***
AP	16	0.492**
KERALA	17	1.261
ARUNACHAL PRADESH	18	0
GOA	18	0
HARYANA	18	0
HIMACHAL PRADESH	18	0
JAMMU & KASHMIR	18	0
PUNJAB	18	0
RAJASTHAN	19	-0.376
SIKKIM	20	-0.952
TAMIL NADU	21	-1.579*
CHHATISGARH	22	-2.214***

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

The second important component of SOTR is revenue from taxes on property & capital transaction (TPCT). Table 4 presents tax buoyancy estimates of the various states of India based on TPCT. Jammu & Kashmir (6.362), Arunachal Pradesh (5.92), Goa (3.874), Orissa (3.317), Manipur (3.230), and Chhattisgarh (3.075) are observed with highest tax buoyancy in terms of TPCT. As the GSDP of these states rises, the tax revenues from TPCT rise greater than proportionately. The tax coefficients of Gujarat, Jharkhand, Assam, Maharashtra, Madhya Pradesh, Bihar, Rajasthan, Karnataka, and Tamil Nadu vary between 3 and 2. The tax system of these states is also highly buoyant as far as TPCT is concerned. Further Himachal Pradesh, Kerala, Haryana, Meghalaya, Tripura, Andhra Pradesh, Sikkim, Punjab and Uttarakhand are the states whose tax buoyancy coefficient (based on TPCT) varies between 2 and 1. Therefore, the tax system of these states exhibits a considerable flexibility. It indicates that as the GSDP of these states rises, the revenues from TPCT either rises proportionately or greater than proportionately. In case of Nagaland, the buoyancy estimate is found less than unity (0.826) which indicates that the revenues from TPCT increases less proportionately with the increase in

tax base. In case of west Bengal and Uttar Pradesh, the tax buoyancy estimates are negative. However, they are statistically insignificant. A negative tax buoyancy coefficient indicates that tax revenues fall with the rise in tax base. It indicates the failure of the system in raising the tax revenues even in the situation of rising tax base.

Table 4: State-wise Buoyancy of Tax revenues from Taxes on Property & Capital Transaction, 2005 to 2016

State	Rank	Buoyancy coefficient
JAMMU & KASHMIR	1	6.362***
ARUNACHAL PRADESH	2	5.920***
GOA	3	3.874***
ORISSA	4	3.317***
MANIPUR	5	3.230***
CHHATISGARH	6	3.075***
GUJARAT	7	2.879***
JHARKHAND	8	2.830***
ASSAM	9	2.649***
MAHARASHTRA	10	2.456***
MADHYA PRADESH	11	2.359***
BIHAR	12	2.288***
RAJASTHAN	13	2.232***
KARNATAKA	14	2.097***
TAMIL NADU	15	2.096***
HIMACHAL PRADESH	16	1.873***
KERALA	17	1.824***
HARYANA	18	1.758***
MEGHAYA	19	1.750***
TRIPURA	20	1.476***
AP	21	1.217***
SIKKIM	22	1.206***
PUNJAB	23	1.091***
UTTRAKHAND	24	1.042***
NAGALAND	25	0.826***
WEST BENGAL	26	-4.53
UTTAR PRADESH	27	-7.604

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

The third and most important part of the SOTR is the revenues from taxes on commodities & services (TCS) which accounts for approximately 70 percent share or above of the state's own tax revenues. Therefore, it is important to study the revenues from TCS separately. Table 5 shows the tax buoyancy estimates of various states based on TCS for the period of time. Five states viz. Manipur (5.766), Jammu & Kashmir (4.535), Arunachal Pradesh (4.160), Assam (3.267), and Orissa (3.013) are reported with highest tax buoyancy among the sampled states over the period of time. The revenues from TCS are highly responsive to the changes in tax base in these five states. The tax buoyancy coefficients of the rest of the states vary between 3 and 1.26 which reflect a considerably high degree of responsiveness of the tax system to the changes in GSDP. Therefore, in terms of size and buoyancy, TCS is the important source of the states own tax revenues. However, in case of West Bengal and Uttar Pradesh, the tax buoyancy coefficient is found negative though statistically insignificant. It indicates that there is a strong need to improve the tax system of these two states in order to make the tax revenues highly responsive to the changes in tax base so that the tax revenues of these states can automatically rise with increasing GSDP at the given tax rates or policy.

Table 5: State-wise Buoyancy of Tax revenues from Taxes on Commodities & Services, 2005 to 2016

State	Rank	Buoyancy coefficient
MANIPUR	1	5.766***
JAMMU & KASHMIR	2	4.535***
ARUNACHAL PRADESH	3	4.160***
ASSAM	4	3.267***
ORISSA	5	3.013***
CHHATISGARH	6	2.956***
PUNJAB	7	2.944***
HIMACHAL PRADESH	8	2.764***
RAJASTHAN	9	2.722***
KARNATAKA	10	2.607***
KERALA	11	2.499***
BIHAR	12	2.433***
MEGHAYA	13	2.414***
MAHARASHTRA	14	2.338***
HARYANA	15	2.315***
JHARKHAND	16	2.285***
MADHYA PRADESH	17	2.275***

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GUJARAT	18	2.149***
UTTRAKHAND	19	1922***
GOA	20	1.947***
TAMIL NADU	21	1.925***
TRIPURA	22	1.876***
NAGALAND	23	1.804***
AP	24	1.471***
SIKKIM	25	1.265***
WEST BENGAL	26	-4.146
UTTAR PRADESH	27	-8.953

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Since TCS constitutes a major part of the SOTR, It is important to study the buoyancy of the different components TCS. Revenues from TCS can be decomposed in to six parts. Further, by measuring the tax buoyancy of the different components, we can identify the areas of weakness and strength in order to formulate the appropriate policy measure. For this purpose, we have estimated the tax buoyancy of the different components of TCS. The results are presented by table 6 to table 11. Table 6 presents the tax buoyancy of sales tax. Sales tax is an important component of TCS in the sense that it constitutes approximately 70 percent of the revenues from TCS. The table shows that Arunachal Pradesh is reported with highest tax buoyancy coefficient (6.074) followed by Manipur (5.685) and Jammu & Kashmir (5.023) whereas Sikkim is reported with lowest tax buoyancy coefficient (1.257). However, the tax buoyancy of Sikkim is still greater than unity. Therefore, the tax system of Sikkim exhibits enough flexibility in raising the tax revenues from the sales tax with rising income. The buoyancy of all states is very high. However, they exhibit some variance in their tax buoyancy coefficients. For example, there are three states whose tax buoyancy coefficients are greater than 5. These are six states having the value of their buoyancy estimates between 3.6 and 3. Further, there are 11 states whose tax buoyancy coefficients may vary between 3 and 2. Rests of 6 states are reported with the value of buoyancy estimates between 2 and 1.26. Therefore, it can be said that the tax system of all of the 27 states is highly buoyant as far as revenue from the sales tax are concerned.

Table 6: State-wise Buoyancy of Tax revenues from Taxes on Income, 2005 to 2016

State	Rank	Buoyancy coefficient
ARUNACHAL PRADESH	1	6.074***
MANIPUR	2	5.685***
JAMMU & KASHMIR	3	5.023***
UTTAR PRADESH	4	3.574***
ASSAM	5	3.180***
HIMACHAL PRADESH	6	3.080***
ORISSA	7	3.023***
CHHATISGARH	8	3.018***
PUNJAB	9	3.001***
WEST BENGAL	10	2.968***
RAJASTHAN	11	2.840***
KARNATAKA	12	2.586***
KERALA	13	2.555***
MEGHAYA	14	2.529***
HARYANA	15	2.408***
JHARKHAND	16	2.332***
MAHARASHTRA	17	2.281***
GUJARAT	18	2.271***
MADHYA PRADESH	19	2.235***
BIHAR	20	2.234***
TAMIL NADU	21	2.039***
TRIPURA	22	1.955***
UTTRAKHAND	23	1.945***
NAGALAND	24	1.733***
GOA	25	1.704***
AP	26	1.597***
SIKKIM	27	1.257***

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Table 7 shows the tax buoyancy of the various states of India in terms of excise tax over the period of time. Excise tax is the second most important component of TCS. The table shows that there are huge variations in the buoyancy coefficients of different states in case of excise tax. The excise tax buoyancy coefficient of Arunachal Pradesh, Assam, Manipur, Orissa, and

Chhattisgarh may vary between 5.32 and 3.37. These are the top 5 states in terms of the tax buoyancy based on excise tax. Further the tax buoyancy coefficients of Tripura, Uttarakhand, Kerala, Gujarat, Tamil Nadu, Sikkim and Andhra Pradesh vary between 1.94 and 1. Nagaland is reported with lowest tax buoyancy coefficient (0.854) whereas, the buoyancy estimates of Uttar Pradesh and West Bengal are found statistically insignificant. Even in case of West Bengal, the buoyancy coefficient is found negative which is responsible for the negative tax buoyancy coefficient measured in terms TCS. Therefore, West Bengal should modify its excise tax system or policy in order to make it more responsive to the changes in aggregate income.

Table 7: State-wise Buoyancy of Tax revenues from Excise Tax, 2005 to 2016

State	Rank	Buoyancy coefficient
ARUNACHAL PRADESH	1	5.319***
ASSAM	2	4.269***
MANIPUR	3	4.021***
ORISSA	4	3.791***
CHHATISGARH	5	3.365***
JAMMU & KASHMIR	6	2.816***
BIHAR	7	2.801***
JHARKHAND	8	2.780***
MAHARASHTRA	9	2.778***
KARNATAKA	10	2.771***
PUNJAB	11	2.739***
GOA	12	2.707***
MADHYA PRADESH	13	2.634***
RAJASTHAN	14	2.574***
HARYANA	15	2.483***
HIMACHAL PRADESH	16	2.349***
MEGHAYA	17	2.069***
TRIPURA	18	1.935***
UTTRAKHAND	19	1.896***
KERALA	20	1.706***
GUJARAT	21	1.661***
TAMIL NADU	22	1.156**
SIKKIM	23	1.131***
AP	24	1.012*
NAGALAND	25	0.854***

| UTTAR PRADESH | 26 | 0.518 |
| WEST BENGAL | 27 | -1.716 |

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Taxes on vehicles (TOV) is another component of TCS. Table 8 measures the tax buoyancy of the 27 Indian states based on TOV. The table shows that the tax buoyancy coefficient of Arunachal Pradesh is highest (24.93) among the sampled states as far as TOV is concerned. It implies that with a small increase in GSDP the revenues from TOV demonstrates extraordinary jump in case of Arunachal Pradesh. Manipur (6.086) and Uttar Pradesh (5.303) are the two states which have the highest tax buoyancy coefficient after Arunachal Pradesh. Tripura is reported with lowest tax buoyancy estimate (0.839). In case of West Bengal, the buoyancy coefficient is found statistically insignificant which implies that there is no relation between revenues from TOV and GSDP in West Bengal. The buoyancy coefficient of the remaining states ranges from 3 to 1.164. Therefore, excluding Tripura and West Bengal, all of the states are highly buoyant as far as revenues from TOV are concerned.

Table 8: State-wise Buoyancy of Tax revenues from Taxes on Vehicles, 2005 to 2016

State	Rank	Buoyancy coefficient
ARUNACHAL PRADESH	1	24.932***
MANIPUR	2	6.086***
UTTAR PRADESH	3	5.303***
JAMMU & KASHMIR	4	3.424***
HARYANA	5	3.338***
PUNJAB	6	2.901***
MEGHAYA	7	2.843***
ASSAM	8	2.756***
CHHATISGARH	9	2.726***
KARNATAKA	10	2.653***
KERALA	11	2.647***
MAHARASHTRA	12	2.478***
NAGALAND	13	2.385***
RAJASTHAN	14	2.346***
JHARKHAND	15	2.185***
TAMIL NADU	16	2.101***
MADHYA PRADESH	17	1.964***
ORISSA	18	1.937***

BIHAR	19	1.788***
HIMACHAL PRADESH	20	1.764***
GOA	21	1.657***
GUJARAT	22	1.554***
UTTRAKHAND	23	1.440***
SIKKIM	24	1.395***
AP	25	1.164***
TRIPURA	26	0.839***
WEST BENGAL	27	2.663

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Taxes on Goods & Passengers (TPG) is another source of TCS. Table 9 demonstrates the tax buoyancy of the various states in relation to TGP over the period of study. Out of 27 states, there are only 13 states which are reported with statistically significant and relatively high tax buoyancy in case of TGP. Assam (3.93), Orissa (3.079), Jammu & Kashmir (2.893), Bihar (2.753), Madhya Pradesh (2.504), Nagaland (2.487), Goa (2.364), Chhattisgarh (2.342), Himachal Pradesh (2.103), Manipur (2.037), Rajasthan (1.976), Tamil Nadu (1.264) and Maharashtra (1.061) are among these 13 states. The tax buoyancy coefficient of Meghalaya is found positive and statistically significant. However, its value is less than unity. Therefore, revenues from TGP are relatively less buoyant in Meghalaya as compared to that in above 13 states. There are 10 states (viz. West Bengal, Karnataka, Gujarat, Arunachal Pradesh, Kerala, Punjab, Sikkim, Tripura, Uttrakhand, and Haryana) whose tax buoyancy estimates are either zero or statistically insignificant. It means that in these states tax revenues from TGP are independent of the changes in GSDP. In case of Andhra Pradesh, Jharkhand, and Uttar Pradesh the tax buoyancy coefficients (based on TGP) are found negative and statistically significant. It means that in these states, revenues from TGP are falling over the period of time with rise in GSDP. In case of Uttar Pradesh the magnitude of this decline is extremely high, which is the possible reason for its negative tax buoyancy (based on TCS). Since tax buoyancy of TCS is the weighted sum of the tax buoyancies of its components. The magnitude of tax buoyancy of TGP exceeds the tax buoyancy of other components of TCS, which as a result makes overall tax buoyancy of TCS negative in case of Uttar Pradesh. Therefore, negative buoyancy of TGP is a matter of great concern for Uttar Pradesh.

**Table 9: State-wise Buoyancy of Tax revenues from Taxes on
Goods & Passengers, 2005 to 2016**

States	Rank	Buoyancy Coefficient
ASSAM	1	3.932***
ORISSA	2	3.079***
JAMMU & KASHMIR	3	2.893***
BIHAR	4	2.753***
MADHYA PRADESH	5	2.504***
NAGALAND	6	2.487***
GOA	7	2.364***
CHHATISGARH	8	2.342***
HIMACHAL PRADESH	9	2.103***
MANIPUR	10	2.037**
RAJASTHAN	11	1.976***
TAMIL NADU	12	1.264***
MAHARASHTRA	13	1.061***
MEGHAYA	14	0.788**
WEST BENGAL	15	17.85
KARNATAKA	16	4.629
GUJARAT	17	0.037
ARUNACHAL PRADESH	18	0
KERALA	18	0
PUNJAB	18	0
SIKKIM	18	0
TRIPURA	18	0
UTTRAKHAND	18	0
HARYANA	19	-0.45
AP	20	-2.354***
JHARKHAND	21	-5.825***
UTTAR PRADESH	22	-17.144*

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Further, taxes & duties on electricity (TDE) is one of the important components of TCS. Table 10 shows the inter-state tax buoyancy of TDE for the entire period of the study. The table shows that Orissa (5.097), and Jammu & Kashmir (4.792) are reported with high tax buoyancy as far as

TDE is concerned. The tax buoyancy coefficients of most of the states range between 3.721 and 1.747 which indicates sufficiently high tax buoyancy of TDE in these states. In case of Gujarat, Jharkhand, Uttarakhand, West Bengal, and Karnataka, the tax buoyancy coefficients are either zero or statistically insignificant. Therefore, these states have zero potential of raising revenues from TDE with the increase GSDP. In case of Haryana and Assam, the tax buoyancy coefficients are negative. However, in case of Haryana it is found statistically insignificant. The negative coefficients imply that in these two states, the revenues from TDE are continuously declining with the increase in GSDP.

Table 10: State-wise Buoyancy of Tax revenues from Taxes &
Duties on Electricity, 2005 to 2016

State	Rank	Buoyancy coefficient
ORISSA	1	5.097***
JAMMU & KASHMIR	2	4.792***
BIHAR	3	3.721***
MADHYA PRADESH	4	3.405***
NAGALAND	5	3.379***
GOA	6	2.961***
AP	7	2.846***
CHHATISGARH	8	2.661***
HIMACHAL PRADESH	9	2.628***
MANIPUR	10	2.602***
UTTAR PRADESH	11	2.530***
RAJASTHAN	12	2.458***
TAMIL NADU	13	2.432*
MAHARASHTRA	14	2.203***
MEGHAYA	15	2.189***
ARUNACHAL PRADESH	16	2.128***
KERALA	17	1926***
PUNJAB	18	13.866***
SIKKIM	19	1.839***
TRIPURA	20	1.747***
GUJARAT	21	2.186
JHARKHAND	22	0.527
UTTRAKHAND	23	0
WEST BENGAL	23	0

KARNATAKA	23	0
HARYANA	24	-3.747
ASSAM	25	-5.910**

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Table 11 shows the inter-state tax buoyancy of entertainment & other taxes (EOT) for the period 2005 to 2016. Manipur has the highest tax buoyancy (19.234) followed by Assam (6.323), Punjab (6.035), Nagaland (5.762) and Uttar Pradesh (4.658). Tax buoyancy coefficients of five states viz. Jammu and Kashmir, Meghalaya, Arunachal Pradesh, Andhra Pradesh and Jharkhand are found statistically insignificant, which indicates the zero responsiveness of the revenues from EOT to the rising GSDP of these states. In case of Tripura, the tax buoyancy coefficient of EOT is found negative and statistically significant which implies that revenues from EOT decline as GSDP rises in Tripura. Therefore, the tax system of Tripura is inefficient in raising the revenues from EOT with rising tax base. The tax buoyancy of the rests of the states is considerably high which ranges from 3.968 to 1.075. It means that these states have sufficient revenue generating capacity from the entertainment & other taxes.

Table 11: State-wise Buoyancy of Tax revenues from Entertainment & Other Taxes, 2005 to 2016

State	Rank	Buoyancy coefficient
MANIPUR	1	19.234***
ASSAM	2	6.323***
PUNJAB	3	6.035***
NAGALAND	4	5.762**
UTTAR PRADESH	5	4.658***
MADHYA PRADESH	6	3.968***
CHHATISGARH	7	3.518***
UTTRAKHAND	8	3.443***
KERALA	9	3.304***
GOA	10	3.144***
ORISSA	11	3.103*
KARNATAKA	12	2.996***
HARYANA	13	2.690***
HIMACHAL PRADESH	14	2.301***
TAMIL NADU	15	2.108***
RAJASTHAN	16	2.059***

BIHAR	17	2.015***
SIKKIM	18	1.730***
WEST BENGAL	19	1.693**
MAHARASHTRA	20	1.622***
GUJARAT	21	1.075***
JAMMU & KASHMIR	22	11.942
MEGHAYA	23	0.868
ARUNACHAL PRADESH	24	-
AP	25	-0.157
JHARKHAND	26	-0.452
TRIPURA	27	-1.097*

Source: Author's calculation based on RBI data

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

4. CONCLUSION

In this paper, we have analyzed the inter-state tax buoyancy of states own tax revenues at aggregate and disaggregate level for the period from 2005 to 2016. The buoyancy coefficient has been estimated by applying Ordinary Least Square (OLS) method. The buoyancy coefficient essentially estimates the underlying revenue generating properties of the system with indigenized tax policy. At the aggregate level, the tax buoyancy of SOTR is estimated for the 27 states of India. The buoyancy coefficients of SOTR of all of the states are found statistically significant and considerably high. However, the buoyancy coefficient varies from state to state. For example, Arunachal Pradesh has the highest tax buoyancy in terms of SOTR (5.389) and Sikkim has lowest tax buoyancy (1.027). In order to explain the inter-state variations in the tax buoyancy of SOTR, we have decomposed the SOTR in to its various sources: Taxes on Income (TOI), Taxes on Property & Capital Transaction (TPCT), and Taxes on Commodities & Services (TCS). The tax buoyancy of SOTR is the weighted sum of the tax buoyancies of TOI, TPCT and TCS. Therefore, at the disaggregate level; we have estimated the tax buoyancies of the different components of SOTR. It is found that all of the states have different tax buoyancies in terms of the various components of SOTR. The analysis of tax buoyancy at disaggregate level may help the policy makers to identify the inflexibility or irresponsiveness of the various taxes levied by the state governments in order to formulate appropriate tax policy.

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