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Taxable capacity, Tax efforts and Structural break: Do the child-states follow their respective parents?

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Abstract:

The present paper makes an attempt to test the hypothesis whether smaller states have better fiscal efficiency in terms of own tax revenue collections or not. This has been tested by taking the case of three states Uttar Pradesh, Madhya Pradesh and Bihar with their child states Uttarakhand, Chhattisgarh and Jharkhand respectively. For this purpose, tax buoyancy, tax capacity and efforts, and structural break models – Chow test (with known break points) and QLR test (with unknown break points), to see the impact of value added tax (VAT) on OTR, have been estimated. Log-log regression model was adopted for both calculating tax buoyancies and taxable capacity of each parent and child state. However, we did not find any conclusive evidence that child states have better tax buoyancy or tax efforts. On the basis of our observations, we conclude that the size of the state is not a major determinant affecting revenue efficiency of the state. Other supplementary policies like efficient tax administration, developed industrial sector, reduced exemptions and concessions, broad base and effective tax rates are equally important.

Key Words: Fiscal Efficiency, OTR, Tax Efforts, Small States, Structural Break.
JEL Code: H11, H21, H71, R50.

Introduction

If diversity makes the Indian federation unique it also has been a paramount source of conflicts and disputes for this democratic country. Popular unrest, ethnic differences, regional demands and struggles witnessed by the Indian state have been contributing in changing the political geography of the country since the time of independence. Linguistic states were the first to be constructed so and remain to be the first such example of reorganisation. For decades, attributable to a myriad of reasons, consecutive Indian governments did not concede to the demands of the groups seeking separate statehood or creation of smaller states. However with the advent of twenty first century, conception of three new states viz. Chhattisgarh, Uttaranchal (now Uttarakhand) and Jharkhand, on the political map of India led to further decentralisation of the nation. The factors which persuaded the authorities for creating smaller states are manifold and shall not be discussed here in detail but what is pertinent regarding this is the marked change in the federal ideology of the country. The arguments of "small is beautiful" and smaller geographical dimensions facilitate better governance, fiscal efficiency and growth found greater reverberation in the new millennium as compared to the earlier grounds of language, religion or ethnicity. Separate statehood movements are no longer being stigmatized as parochial, chauvinist and even anti-national as was done in the past (Kumar, 2010).

Furthermore, the increasing predominance of the arguments of economic growth and better governance in the renewed demand of reorganization of states is another visible shift in the ideology. Recent political debate cum controversy on the carving out of Telangana state in 2014 from Andhra Pradesh went beyond the age old cultural principle, except a certain few groups which tried to paint the issue with 'sentiment' and 'ethnic' colours. The pressing and violent movement for creation of Telangana state evidently appeared to be driven by factors of economic backwardness, inequitable distribution of resources and opportunities and hostility in terms of development.

The present paper intentionally makes itself scarce in terms of discussion on

'pros and cons' or 'for and against' debate on creation of small states. Rather it is the fiscal aspect of these new state governments which the paper targets upon. It revolves around the idea, which public economists favouring creation of smaller states often put forth, that the fiscal affairs, especially, own revenue collections can be better managed by the smaller states.

The expenditure functions of central and state governments are given in Union List and State List of the Constitution of India respectively. National level functions like defence, macroeconomic stability, foreign trade, currency and banking, etc. are allotted to the central government in the Union List and public health, law and order, agriculture, sanitation, and water supply etc. are the functions assigned to state governments in State List (Garg, Goyal and Pal, 2014). Common issues are specified in the Concurrent List like education, transportation, etc. Similarly, the revenue resources to meet the expenditure are also divided between central and state governments. The power to impose and collect major and broad base taxes viz. taxes on income, corporation tax, custom duties, wealth tax, etc. are with the central government. On the other hand, taxes like sales tax, excise duties, tax on agricultural income, etc. are in the hands of state governments. Along with this, state governments get additional revenue in the form of share in centrally levied taxes through Finance Commission recommendations and grants from the Consolidated Fund of India (Garg, Goyal and Pal, 2014).

Among others, own tax revenue is the important source of financing expenditure responsibilities of state governments. It is evident that state governments are generally delegated with more functions but with lesser sources to generate revenues. This is the main reason behind the prevalence of chronic vertical and horizontal fiscal imbalances-which remain to be a bone of contention-between the centre and the states (Srivastava and Rao, 2009). Also, looking at the other side of the picture, this is also one of the factors responsible for pushing the state governments to find more possible ways of increasing their public revenue to finance their public expenditures and minimize their deficits without compromising growth.

Revenue of a state is intrinsically linked to its taxable capacity which mainly depends upon the economic, demographic and structural factors of a country or state. However, higher taxable capacity is of no use if it is not mobilized and converted into actual revenue. Therefore, tax effort is a more important concept. It is worth quoting Chelliah (as quoted in Radian, 1980) who clarifies distinction between taxable capacity and effort as

'The ability of the government to collect taxes is determined partly by objective, structural factors, and partly by such "volitional" factors as efficiency in administration and the nature of political leadership. The former taken together with the ability of the population to pay taxes may be said to constitute the total "capacity" factors affecting the tax ratio'.

Musgrave (1987) also said that revenues are determined not only by what could be extracted from the state's economy but also by the commitment of the government to tax its resources.

Tax effort also plays an important role in determining the devolution of funds from the centre to the states which takes the form of share of the revenue raised by central taxes and grants-in-aid (Condoo and Neogi, 2001; Garg, Goyal and Pal, 2014). An individual state's tax revenue collection, relative to its taxable capacity, is a major determinant of the amount of funds to be allocated for the state. Most of the Finance Commissions have included tax efforts in overall formulae of devolution of funds to the states'. Transfer of Plan grants through Planning Commission (Now Niti Ayog) is based on famous Gadgil formulae. This formula includes several factors like population, per-capita income of a state, tax effort, special problems of specific states, fiscal discipline, deviation of income from mean income, distance of income from highest income, etc. Here also tax effort is included as one component for determining the amount of grant. Thus, tax efforts of state decides not only own tax revenue collections but it also facilitates the transfer of funds through Finance Commission and Planning Commission (Now Niti Ayog).

The beginning of the 2000 decade coincided with the time of creation of

three 'daughter states' viz. Chhattisgarh, Uttarakhand and Jharkhand. Among others, the main economic argument for creating new state was that smaller states tend to grow faster and easier to manage administratively and fiscally. As Musgrave (1987) and Chelliah (as quoted in Radian, 1980) emphasized that government's commitment and administrative machinery is more important in increasing tax efforts, it was argued that smaller states may have higher tax efforts owing to better administrative efficiency than large states.

In view of the above, this paper aims at estimating tax efforts, tax buoyancy and tax capacity of the carved out states of Chhattisgarh, Uttarakhand and Jharkhand and comparing these aspects with their respective parent states viz. Madhya Pradesh, Uttar Pradesh and Bihar. The objective is to capture the fiscal management trajectory of the aforementioned parent and daughter states and to make an inter-state comparison between both set of states. Penetrating a little deeper the paper also goes on to test the fiscal repercussions of the structural break provided by the implementation of VAT in these states. The central argument of the study is that prudent fiscal management which is a prerequisite for growth is more realizable when it comes to 'smaller' states.

Data and Methodology

The basic data for the present study is taken from the following sources- Reserve Bank of India's annual report State Finances : A Study of Budgets, Budget Documents of the State Government and Comptroller and Auditor General Report on State Finances. GSDP data is taken from Central Statistical Organization (CSO). The analysis covers a time period from 2001-02 to 2013-14. Data of fiscal variables for the years 2012-13 and 2013-14 are revised and budget estimates respectively.

To measure the responsiveness of tax revenue collections to GSDP growth, tax buoyancy of each state has been calculated. Tax efforts put forth by the select states have also been estimated. And, whether VAT has made any significant impact on OTR collections of the state are tested by applying structural break models – Chow test and QLR test. The detailed discussion of each is given below.

Tax Buoyancy

Tax buoyancy is an indicator to measure efficiency and responsiveness of revenue mobilization to growth in GSDP or national income. A tax is said to be buoyant if the increase in tax revenue is more than proportionate in response to a rise in national or sub national income. Tax buoyancy is estimated by the method of double log regression given in equation (1)

$$Ln(OTR) = \alpha_1 + \beta_1(Ln\,GSDP) + u \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, Ln (OTR) = Log of own tax revenue

Ln (GSDP) = Log of GSDP

The α_1 is intercept and β_1 is the buoyancy coefficient yielded from the equation (1). Tax buoyancy of parent states and new states has been estimated for the period 2001-02 to 2013-14.

Tax Efforts

The study defines tax effort as the ratio of actual tax revenue of a government to its total taxable capacity. Taxable capacity refers to the predicted tax-to-gross domestic product ratio which is estimated taking into account the states' demographic and institutional features varying with time. In general there are two major approaches- the regression approach and the representative tax system approach- of estimating tax capacity.

Under regression approach, the regression equation attempts to capture the variation across different variables. The regression model is used to compute the tax effort indices for the states. Revenue potential is generated from the predicted values based on the regression. And then the comparison of estimates with the actual is made which provides the extent of tax effort by the states. The framing of the model and variables used as predictors for the estimation depend upon the purpose and the nature of the dependent variable. Taxable capacity of the state government had been estimated by the researchers using the variables like ratio of state's OTR to GSDP, share of agriculture, share of industry, share of services and

per capita NSDP at current prices (Minh Le et al., 2012; Purohit, 2006; Rajaraman et al., 2005; Raju, 2012; Sen, 1997). Another form of this approach, quantile regression approach, has also been used by many researchers (Lotz and Morse, 1967; Reddy, 1975; Oommen, 1987). The use of quantile regression approach allows the impact of conditioning variables to differ across the distribution of tax efficiency scores.

Another approach to determine the relative tax effort of a state is to estimate the representative tax system approach. In this approach instead of taking proxies for potential tax bases such as degree of urbanization, share of agriculture in GSDP, etc., the attempt is made to select potential tax bases of individual taxes (Purohit, 2006). For each tax an appropriate base is identified and a representative set of tax rate is generated. This representative rate can be regarded as the average of the effective rate of the tax. The average effective rate so obtained is multiplied with the potential base for each tax and the revenue yielding capacity of that tax is derived. The relative taxable capacity of each state can be obtained by summing up the revenue yielding capacity of the individual taxes. Using this approach, Purohit has estimated state-wise the actual and potential tax yield of individual taxes for the year 2002-03.

In this study, we have estimated the taxable capacity and tax efforts of the subject states. This incorporates an inter-state study done on a sample of six states during 2001-02 to 2013-14. This study adopts the regression approach to estimate potential taxable capacity of the state which has been replicated from the methodology applied by Purohit (2006).

Estimating tax capacity of individual taxes

In order to estimate the tax effort, first potential tax revenues from selective and major state taxes have been calculated. Table 1 gives a synoptic picture of the computation method used in estimation of potential tax revenues of each tax taken into consideration.

Table 1: Estimated Equations to Calculate Taxable Capacity of Major Taxes

S.No.	Dependant Variables	Independent variables taken as potential base	log-linear Equations
1	Land revenue	GSDPa (GDP from agriculture)	log (LR)= $\alpha + \beta$ log (GSDPa)
2.	Profession tax	GSDP by all sectors except for agriculture (GSDPa)	log (PT)= $\alpha + \beta$ log (GSDP - GSDPa)
3	Stamp duty and Registration fee	GSDP	log (SD_RF)= $\alpha + \beta$ log (GSDP)
3	Sales tax	GSDP	log (STax)= $\alpha + \beta$ log (GSDP)
4	Motor Vehicle and Passenger tax	Number of two wheelers and number of other vehicles in the state	log (MV_PT)= $\alpha + \beta_1$ log (N2W)+ β_2 log (NOTW)
5	Excise duty	Quantity of beer, IMFL and country liquor consumed in the state (differs from state to state)	log (ST_E XCISE)= $\alpha + \beta_1$ log (Beer)+ β_2 log (IMFL)
6	Electricity duty	Consumption of electricity in the state	log (EDuty)= $\alpha + \beta$ log (ECons)

Where,

LR = Land revenue; PT = Professional Tax; SD_RF= Stamp duty and Registration fee; STax= Sales tax; MV_PT= Motor Vehicle and Passenger tax; N2W = Number of two wheelers; NOTV = Number of other vehicles; EDuty= Electricity duty; Econs = Electricity consumption; α= Constant; $\beta 1$=Coefficient of the independent variable; GSDP = Gross state Domestic Product.

Land revenue (land tax) has been estimated as a function of GSDP originating from the agricultural sector i.e. GSDPa. Profession tax which is paid by individuals engaged in gainful employment has been taken as a function of GSDP produced by sectors other than agriculture (GSDP-GSDPa). Considering that states do no levy any taxes on the employees of agriculture sector, it has been excluded from the base of profession tax. The base for Stamp duty and registration fee is usually the value of the purchased/sold property but due to lack of data related to property transactions this study has taken GSDP as a proxy base for stamp duty and registration fee. Sales tax i.e. revenue from total sales in the state excluding central sales covers broad range of consumer and producer goods and

raw materials. However, attributing to non-availability of information on turnover of various commodities and inputs and other details for all the states, the study takes GSDP as the potential base for sales tax.

The next tax taken into account is Motor vehicles and passenger tax together. In the six states under this study, these two taxes are levied independently – motor vehicles and passenger and goods tax and not as a single tax. While the former is levied as per the different category of vehicles, the latter considers volume of passenger traffic, fare rates, freight charges and gross revenues of transport companies (can differ from state to state). As a matter of fact, such data is not available especially as private transport companies too are included (Purohit, 2006). Therefore, the study for taxable capacity estimation of this tax takes number of two wheelers and number of other vehicles which includes taxis, buses, trucks, etc. in the state into consideration. Further, state excise duty which is levied on production price, has been related to the production/consumption (depending upon the availability of data) of beer or spirit or malt or Indian made foreign liquor or country liquor to fit its regression equation. Given the data availability limitations, the paper takes quantities of Beer and IMFL produced for Bihar (2007-14), Quantities of CL, Spirit and Malt consumed for Madhya Pradesh and Chhattisgarh (2002-14), and lastly quantities of Beer and IMFL produced for Uttar Pradesh (2002-14) as tax base. Despite several attempts, information regarding this could not be collected for states of Jharkhand and Uttarakhand.

For estimating taxable capacity in case of Electricity duty-which is a tax collected by the state governments on electricity consumption-the study takes total consumption of electricity as the potential tax base. Therefore, except Motor vehicles tax and Passengers and goods tax and State excise duty all other taxes taken under the study have only one dependent variable in their corresponding regression equations.

After estimating taxable capacity of each tax for every year for each of the states, we have computed the tax efforts by taking actual revenue collected as percent of taxable capacity. Further, average tax efforts for each for the entire

period of analysis have also been estimated.

Structural Break Model

Breaks are by definition sudden events which change the structure of the econometric model under consideration. Their occurrence is taken as given and not viewed as part of model specification (Kapetanios and Tzavalis, 2004). In the present paper we have tested whether the adoption of VAT- which is the structural event in this case- in the relevant states has brought any significant changes in their OTR trends during the given time period. For this purpose we have applied the structural break model using two techniques viz. first, with a known breakpoint by applying the Chow test and second, with an unknown breakpoint by applying QLR Test (Quandt, 1960).

Considering the fact that adoption of VAT system had a great impact on tax collection in subsequent years of its adoption, the year following in which the VAT system was adopted forms the break year for the study. This can be depicted with the equation below:

$$\text{Ln (OTR)} = \alpha_1 + (\alpha_2 - \alpha_1)D + \beta_1(\text{Ln GSDP}) + \{(\beta_2 - \beta_1)D*(\text{Ln GSDP})\} + u \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This structural break equation is generated by using a dummy variable (D) which is zero for pre structural break point and one for post structural break point. β_2 is the value of tax buoyancy in the post structural break years. Further, we apply the Chow test to this, which allows testing whether or not a particular year causes a break in the regression coefficients. Then, if the p value is < 0.05, null hypothesis is rejected against the alternate one indicating that there exists a structural break.

However, different states have different years of VAT enactment and thus there is variability in the break years of each. In Chhattisgarh, Madhya Pradesh and Jharkhand, VAT was adopted in year 2006. Bihar and Uttarakhand implemented it in 2005 whereas Uttar Pradesh in 2008.

However, in a series there could be other structural breaks which Chow test (with known test) may not capture. To explore such structural breaks, study adopts

the Quandt Likelihood Ratio (QLR) test. The QLR test is a modified version of the Chow test used to identify the break year. The QLR statistics is the maximum of all the Chow F statistics over a range of time (shown in equation 3). In this QLR statistics 70% of the sample is used and the remaining first and last 15% is excluded. We have also applied QLR test for structural breaks in OTR series.

$$QLR = \max[F(\tau 0), F(\tau 0+1), \ldots, F(\tau 1-1), F(\tau 1)] \ldots\ldots\ldots\ldots (3)$$

The above equation was estimated for each of the six states for the period of 2001-02 to 2013-14.

Results

The economic growth brings about not only an increased demand for public expenditure (Tanzi, 1987) but also cause a larger supply of taxable capacity to meet such demands (Musgrave, 1969). Thus, growth movements of an economy also give an idea about the taxable capacity and tax efforts of an economy.

Growth Trends

To examine the growth movement of the three sets of states, namely Bihar-Jharkhand, Madhya Pradesh-Chhattisgarh and Uttar Pradesh-Uttarakhand, post 2005-06 we estimated year on year growth rate of GSDP at factor cost at 2004-05 prices. These growth trends give a very mixed picture as they do not show any particular movement and appear inconclusive. The growth trend lines of Bihar-Jharkhand (Figure 1) show that the former has been better off than its child state in terms of growth. However the two show a converging trend in 2011-12 onwards. Growth rates of Chhattisgarh too, except initially, fall below its parent state Madhya Pradesh (Figure 2) and the trend can be seen continuing up till 2013-14. Uttarakhand is the only child state which has outperformed its mother state i.e. Uttar Pradesh (Figure 3) consistently till 2012-13 after which its growth rate lingers close around the growth rate of Uttar Pradesh.

Figure 1: Trends in Growth rate (Bihar and Jharkhand)

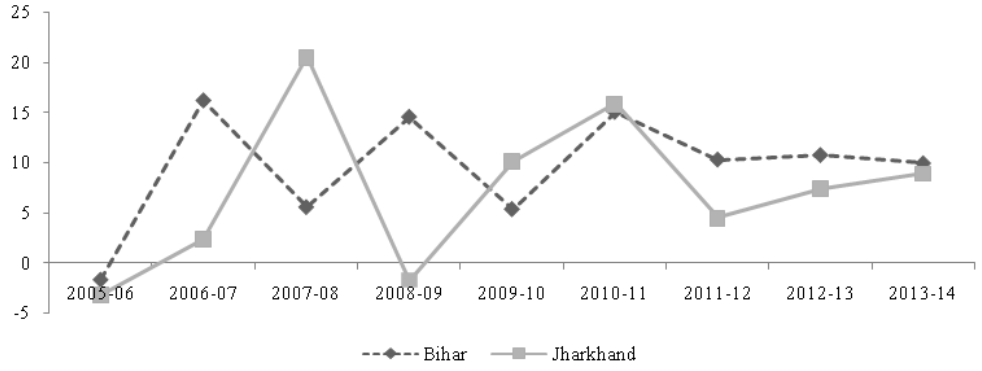

Figure 2: Trends in Growth rate (MP and Chhattisgarh)

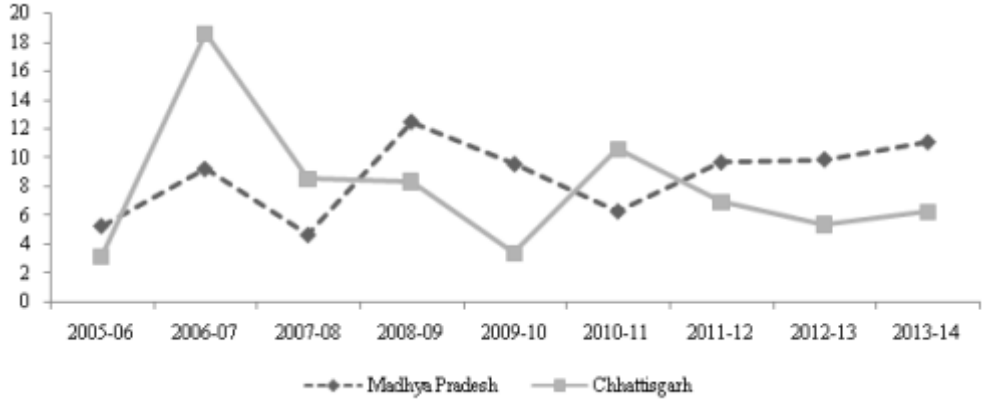

Figure 3: Trends in Growth rate (UP and Uttarakhand)

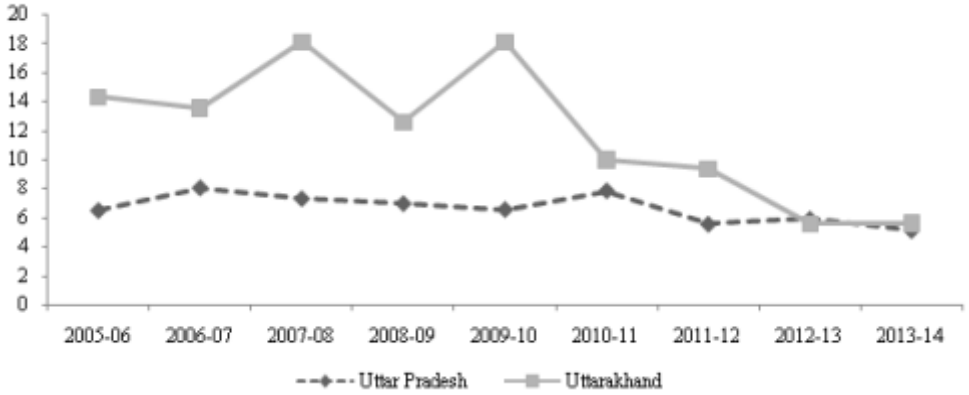

Table 2 gives the CAGR of States' OTR categorised in three periods of time viz. 2001-02 to 2006-07, 2007-08 to 2013-14 and the last 2001-02 to 2013-14 which includes all the years under study. On analysing the CAGR of first five years we get a very interesting picture which reveals that Chhattisgarh (20.41) and Uttarakhand (22.95) are ahead of their respective parent states while Jharkhand (8.55) not only is the laggard among all but is behind its parent state Bihar (10.55) too. In the next six years while the parent states have managed to attain a greater CAGR with Bihar (26.62) strikingly showing more than double increase, the CAGR of offspring states have declined except that of Jharkhand (19.14) which shows a commendable increase. However, taking into account the whole period under study it is found that except Bihar-Jharkhand (19.62, 14.14), the other two sets of states show CAGRs higher for the child states than their respective parent states. The difference between the two is quite marginal albeit. Over the twelve years, CAGR of Bihar's OTR is the maximum (19.62) while that of its child Jharkhand (14.14) is the minimum among all.

Table 2: CAGR of OTR

States	2001-02 to 2006-07	2007-08 to 2013-14	2001-02 to 2013-14
Bihar	10.55	26.62	19.62
Jharkhand	8.55	19.14	14.14
Madhya Pradesh	17.37	18.56	17.74
Chhattisgarh	20.41	18.17	18.51
Uttar Pradesh	17.36	19.37	17.59
Uttarakhand	22.95	17.24	18.86

Source: Authors' calculations.

Tax/GSDP ratio

Tax effort is generally measured by the tax-GDP ratio (Shome, 2012). The implicit assumption involved in using such ratios for the purpose of comparing tax performance is that GDP (or SDP) is an indicator of taxable capacity and thus suitable for normalizing the tax collection for comparisons across governmental units (Sen, 1997). Table 3 shows the tax/GSDP ratio of all six states for all the years from 2001-02 to 2013-14. Evidently, the ratios are inconsistent over the years and do not bring forth any particular image. On making an inter-state comparison on the basis of tax/GSDP ratio we find that Bihar (4.99) and

Jharkhand (5.29) have the lowest ratios in comparison to others. Chronologically there is no clear trend in the ratios of any of the states except Uttarakhand. Share of tax revenue in GSDP of Uttarakhand sticks to the value of around 5% in almost all the years which is not the case with other states.

The mean tax/GSDP ratio of Madhya Pradesh i.e. 7.35 percent is the highest of all with its child state Chhattisgarh giving a quite close value of 7.30 percent. Again, in terms of share of tax receipts to GSDP, Bihar doesn't show an encouraging picture with the lowest mean tax/GSDP ratio of 4.99 percent. Jharkhand, its child state is comparatively better with the value of 5.29 percent which is the second lowest. This is the only case in which child state is better than the parent state. Mean tax/GSDP ratio of Uttar Pradesh is 6.67 percent which is higher than 5.74 percent of Uttarakhand. The mean deviations are very low- a feature which is quite pervasive among all the states-showing insignificant differences in the ratios. Quite expectedly lowest deviation is reflected in the ratios of Uttarakhand (0.436). Anyhow, this analysis appears sketchy and does not bring forth any sufficiently concrete and clear understanding of tax efforts by these states. To overcome this, the study moves forward with Tax buoyancy estimation through Double log regression method.

Table 3: Tax-GSDP Ratio (%)

Year	Bihar	Jharkhand	Madhya Pradesh	Chhattisgarh	Uttar Pradesh	Uttarakhand
2001-02	5.19	6.35	5.55	6.75	5.43	5.65
2002-03	5.20	6.25	7.57	7.37	6.17	5.53
2003-04	6.43	5.73	6.92	6.70	5.99	6.00
2004-05	4.30	4.02	6.88	6.74	6.02	5.83
2005-06	4.32	4.74	7.33	7.59	6.43	5.95
2006-07	4.00	4.67	7.24	7.55	6.84	6.83
2007-08	4.47	4.23	7.44	7.00	6.52	5.97
2008-09	4.34	5.79	6.90	6.80	6.44	5.43
2009-10	4.97	5.53	7.59	7.17	6.47	5.03
2010-11	4.75	4.69	8.13	7.54	6.89	5.25
2011-12	5.18	5.13	8.65	7.42	7.68	5.74
2012-13	5.56	5.72	7.95	8.05	7.73	5.61
2013-14	6.11	5.88	7.40	8.27	8.11	5.81
Average	4.99	5.29	7.35	7.30	6.67	5.74
S.D.	0.731	0.757	0.743	0.504	0.771	0.436

Source: Author's calculations.

Tax buoyancy

Table 4 gives the estimated results of double log regression model applied in the study. Tax buoyancy of various states is expressed through β values. As a practical matter, measures of tax buoyancy tend to vary a lot from year to year. Thus, it is more useful to measure buoyancy over a longer period - perhaps five or ten years at a time (Haughton, 1998). Hence keeping this in mind we have computed tax buoyancy for the period of twelve consecutive years i.e. 2001-02 to 2013-14. The β values are statistically significant (at $p<0.01$) for all the given states. It's only in case of Madhya Pradesh (1.117) and Chhattisgarh (1.071) that both parent and child states show a more than 1 value of tax buoyancy. The other two sets of states, though give higher tax buoyancy for the parent states but lesser for their respective offspring states. It implies that the responsiveness of tax revenues to increase in GSDP is comparatively higher for the parent states than their respective child states. Also, another valid point regarding this could be the already established and working Tax-machinery of the parent states whereas their respective children do not have this benefit as their separation puts them in a transition stage of tax administration. R2 is sufficiently high for all the states implying that the model suitably fits our data and that more than 90% of the variance is explained by it for all the states.

Table 4: Results of Double Log Regression Model (2001-02 to 2013-14)

States	Beta	R^2	DW Value
Bihar	1.031***	0.960	1.146
Jharkhand	0.957***	0.929	1.194
Madhya Pradesh	1.117***	0.983	1.875
Chhattisgarh	1.071***	0.994	1.592
Uttar Pradesh	1.200***	0.995	1.360
Uttarakhand	0.970***	0.990	1.175

***$p<0.01$ (at 1% level of significance). Source: Authors' calculations.

Structural Break

However, the Durbin Watson statistic exhibits the problem of serial correlation in our data. To overcome this problem we have used the method of Structural break as mentioned under methodology section in the study. Regression results to test structural break with known break points are given in

Table 5. R2 is quite high for all the states and more than 97% of the variance is explained. The F values obtained from Chow statistics for Bihar (12.94) and its child state Jharkhand (7.90) are high and significant (p<0.01). Thus, the VAT system appears to have had significant impact on tax revenue in both of these states. Chow statistics of Bihar reflect the maximum value, hence implying that there exists a considerable difference between the two groups of data i.e. pre VAT adoption period and post VAT adoption period. This difference in revenue collection between the said periods shall also be seen in the light of change in the state government of Bihar. The Lalu Prasad (Rashtriya Janata Dal) regime-which was hugely criticized for its lawlessness and corruption and even termed as *'Jungle Raj'*- was replaced by a more transparent and governance oriented Nitish Kumar led (Janata Dal United) regime in the year 2005. Thus, improvements in terms of tax collection can be attributed to this political shift in the state as well. However the results give a totally different scenario for Madhya Pradesh (F=0.17) and Chhattisgarh (F=0.57) revealing that there isn't any consequential difference between their tax revenues of pre and post VAT. For the Uttar Pradesh and Uttarakhand set of states, the test generates mixed results i.e. while test statistics for the parent state is high (F=4.17) and statistically significant (p<0.10), it is low (F=0.98) and insignificant for the daughter. Therefore, we can conclude that considerable impact of VAT on tax revenue is evident in case of Uttar Pradesh but is absent in Uttarakhand's case.

Table 5: Results of Structural Break Model

States	Constant	LogGSDP	Dummy V	D*GSDP	R Square	Chow Statistics F value	No. of Obs.	Break year
Bihar	2.849	0.469*	-8.92***	0.782***	0.9897	12.94***	13	2004-05
Jharkhand	3.938*	0.358*	-9.18***	0.838***	0.9743	7.90***	13	2005-06
Madhya Pradesh	-5.276	1.225***	1.66	-0.141	0.9836	0.17	13	2005-06
Chhattisgarh	-3.368**	1.067***	-0.733	0.062	0.9946	0.57	13	2005-06
Uttar Pradesh	-5.799***	1.241***	-1.778	0.128	0.9971	4.17*	13	2007-08
Uttarakhand	-3.865	1.102***	1.971	-0.189	0.9914	0.98	13	2004-05

Note: *p<0.1; **p<0.05; ***p< 0.01. Source: Authors' calculations.

Structural Break with unknown break point

Along with testing the structural break with a known break point we also applied Quandt Likelihood Ratio test to our data to identify the unknown break

year if it exists at all. However the results of QLR statistics were not found significant for any of the associated states implying that there is no structural tax break. Anyhow this result can also be attributed to the small sample size of the study as the QLR test is appropriate for large sample size studies.

Tax Capacity and Tax Efforts

This section discusses the results obtained regarding taxable capacity and tax efforts of the six states. Table 6, 7 and 8 presents log-log regression results of taxable capacity and Table 9, 10 and 11 present estimates of tax efforts for Bihar-Jharkhand, Madhya Pradesh-Chhattisgarh and Uttar Pradesh-Uttarakhand respectively.

The regression results of taxable capacity of Bihar and Jharkhand are presented in table 6. Results of Bihar indicate that t-ratios are statistically significant for all the predictors except in the case of Excise duty. t-ratio is highly significant ($p<0.01$) for number of two wheelers and indicating a positive relationship with motor vehicles tax with a satisfactory adjusted R_2 (0.90) but the other predictor i.e. number of other vehicles showed perverse association although statistically insignificant. The results of Jharkhand indicate similar pattern to the results obtained for Bihar—the parent state, except in case of Electricity duty. And, in the case of land revenue, t-value is highly significant ($p<0.01$) but with a low adjusted R_2 (0.39).

The log-log regression results for Madhya Pradesh and Chhattisgarh are given in table 7. In the case of Madhya Pradesh, coefficients are statistically significant for all the taxes except number of two wheelers with perverse sign (t=-1.092) in case of Motor Vehicles tax and consumption of Malt (t=0.992) in case of Excise duty do not show any significant relationship. On the other hand, for Jharkhand too almost all the potential bases give a statistically significant relationship with their respective taxes, the only exceptions being number of other vehicles in case of Motor Vehicles tax and consumption of Malt and Spirit in case of state Excise Duty. However, t-ratio for Consumption of country liquor is highly significant ($p<0.01$) with a high adjusted R_2 (0.98).

Results of taxable capacity estimates for Uttar Pradesh and Uttarakhand are given in table 8. t-ratios for all the predictors of the individual taxes are statistically significant ($p<0.10$) in case of Uttar Pradesh. The only predictors which do not show a significant relationship are number of two wheelers (t=-0.119) and number of other vehicles (t=1.114) for Motor Vehicle and Professional Tax and Consumption of Beer (t=1.759) under Excise Duty. Unlike Uttar Pradesh, not all the t-ratios are significant in case of Uttarakhand—the child state. None of the t-ratios under Land Revenue and Electricity duty are statistically significant with very low adjusted R_2 values. Neither of the potential bases taken for Motor Vehicles Tax show significant relationship with the same. Adjusted R_2 is maximum and considerably high (0.99) for Sales tax only.

On an average, all these states exhibit more or less similar levels of tax efforts (See table 9, 10 and 11). Madhya Pradesh which shows the maximum average tax effort is the only parent-state in the list which is ahead of its child-state i.e. Chhattisgarh. Whereas UP and Bihar fall behind their respective child-states in this case. Moreover, its only two states viz. Madhya Pradesh and Uttarakhand which indicate above 100 percent tax effort level. UP and Jharkhand appear very close to the 100 percent measure. Although the differences are not very high, but it certainly means that the child-states have performed better from their respective parent-states in terms of raising taxes from their resources. Looking at the changes in tax efforts over the years, no definite trend could be traced. Tax effort has been erratic for all the taxes and each of the states across the years.

In case of Bihar (Table 9), except Land revenue, all other taxes indicate higher actual revenue than taxable capacity in average terms. Maximum tax effort in terms of average is claimed by Excise duty (119.18). Seven consecutive years from 2005-06 onwards show an above 100 percent level of tax efforts, but this is not the case with the previous or the following years. The average tax effort is above 100 per cent for all the taxes in the child-state Jharkhand. Highest tax effort of the state reflects in Stamp duty and Registration Fee (107.54). The state has made above 100 per cent tax effort during four consecutive years beginning from 2004-05.

Table 6: Estimated Log- Log Model for Taxable Capacity of State Government in Bihar and Jharkhand.

Dependent variable	Land Revenue	SD_RF	Sales Tax	MV_PT	Excise Duty	Electricity Duty
			Bihar			
Intercept	-6.515(-4.4)*	-4.251(-4.34)*	4.391(5.55)*	-8.149(-3.08)**	1.171(0.832)	-16.806(-1.940)***
GSDPa	1.048(7.431)*					
GSDP		0.929(11.12)*	0.909(9.28)*			
2W				2.546(2.04)***		
NO_OT_W				-1.709(-1.06)		
Beer					0.241(0.377)	
IMFL					0.806(1.243)	
E_Consum						0.891(2.362)**
R-Square	0.834	0.918	0.887	0.909	0.828	0.337
DW- value	2.541	1.339	0.897	2.941	1.24	1.124
Total Observation	13	13	13	13	7	13
			Jharkhand			
Intercept	-11.426(-2.052)***	-7.967(-4.12)*	3.672(6.53)*	-9.459(-3)**		-1.070(-0.195)
GSDPa	1.537(2.668)***					
GSDP		1.174(6.846)*	0.946(13.52)*			
2W				1.08(3.433)*		
NO_OT_W				0.008(0.07)		
E_Consum						0.267(0.986)
R-Square	0.393	0.81	0.943	0.897		0.081
DW- value	0.468	1.678	1.205	1.75		0.726
Total Observation	13	13	13	13		13

Note: t-values are given in the parenthesis. *** p<0.01, ** p<0.05 & * p<0.10. Source: Authors' calculations.

Table 7: Estimated Log- Log Model for Taxable Capacity of State Government in MP and Chhattisgarh.

Dependent variable	Land Revenue	Profession Tax	SD_RF	Sales Tax	MV_PT	Excise Duty	Electricity Duty
			Madhya Pradesh				
Intercept	-12.339(-4.989)*	2.431(3.256)*	-8.307(-10.4)*	4.262*	-15.912(-9.915)*	-2.856(-1.462)	-20.609(-2.217)**
GSDPa	1.6(7.01)*						
GSDP(Total-agri)		0.246(3.861)*					
GSDP			1.288(19.54)*	0.893(28.9)*			
2W					-1.952(-1.092)		
NO_OT_W					4.186(1.929)***		
Country Liquor						1.175(1.912)***	
Spirit						0.297(1.892)***	
Malt						0.226(0.992)	
E_Consum							1.124(2.943)**
R-Square	0.817	0.575	0.972	0.987	0.955	0.989	0.441
DW- value	1.535	0.83	0.942	1.786	1.851	1.482	2.058
Total Observation	13	13	13	13	13	13	13
			Chhattisgarh				
Intercept	-23.807(-3.945)**	16.054(14.5)*	-6.947(-13.982)*	4.411(27.94)*	-9.129(-6.521)*	-4.675(-2.027)***	-13.250(-4.78)*
GSDPa	2.868(4.651)*						
GSDP(Total-agri)		-1.222(-12.1)*					
GSDP			1.155(26.14)*	0.856(43.34)*			
2W					1.427(3.799)*		
NO_OT_W					-0.386(-0.752)		
Country Liqour						1.637(2.235)***	
Spirit						0.790(0.757)	
Malt						-0.379(-0.636)	
E_Consum							0.810(6.953)*
R-Square	0.663	0.93	0.984	0.994	0.955	0.981	0.815
DW- value	1.404	2.235	2.235	1.177	1.306	1.762	1.261
Total Observation	13	13	13	13	13	13	13

Note: t-values are given in the parenthesis. *** p<0.01, ** p<0.05 & * p<0.10. Source: Authors' calculations.

Table 8: Estimated Log- Log Model for Taxable Capacity of State Government in UP and Uttarakhand.

Dependent variable	Land Revenue	Profession Tax	SD_RF	Sales Tax	MV_PT	Excise Duty	Electricity Duty
Uttar Pradesh							
Intercept	-17.083(-5.13)*	10.732(-5.5)*	-6.386(-6.792)*	5.266(36.35)*	-10.36(-4.425)*	-10.708(-3.301)*	-55.664(-4.094)*
GSDPa	1.944(6.817)*						
GSDP(Total-agri)		1.079(6.95)*					
GSDP			1.140(15.65)*	0.789(52.73)*			
2W					-0.147(-0.119)		
NO_OT_W					1.55(1.114)		
Beer						0.725(1.759)	
IMFL						2.332(2.942)**	
E_Consum							2.456(4.490)*
R-Square	0.809	0.815	0.957	0.996	0.922	0.838	0.647
DW- value	1.084	1.723	1.389	2.248	1.882	0.861	2.195
Total Observation	13	13	13	13	13	13	13
Uttarakhand							
Intercept	-1.768(-0.551)	-9.29(-13.9)*	-2.528(-1.9)***	4.035(30.06)*	-11.479(-3.85)*		-16.234(-0.869)
GSDPa	0.448(1.257)						
GSDP(Total-agri)		1.044(16.4)*					
GSDP			0.774(6.26)*	0.910(50.03)*			
2W					1.246(1.522)		
NO_OT_W					0.005(0.006)		
E_Consum							0.854(1.041)
R-Square	0.126	0.961	0.781	0.996	0.944		0.09
DW- value	1.141	0.988	0.599	1.155	1.248		1.779
Total Observation	13	13	13	13	13		13

Note: t-values are given in the parenthesis. *** p<0.01, ** p<0.05 & * p<0.10. Source: Authors' calculations.

Table 9: Tax Efforts of Bihar and Jharkhand

Year	Bihar							Jharkhand					
	LR	SD_RF	STax	MV_PT	Excise Duty	EDuty	Total	LR	SD_RF	STax	MV_PT	EDuty	Total
2001-02	77.38	146.54	202.07	156.68	-	210.11	55.65	22.90	167.68	142.03	97.32	134.21	74.54
2002-03	107.06	145.88	177.61	107.14	-	48.58	65.94	23.56	151.44	131.68	106.83	133.55	78.66
2003-04	158.49	178.96	224.72	89.24	-	54.35	58.40	23.48	149.81	121.40	104.93	120.80	84.40
2004-05	54.09	96.39	109.85	93.16	-	29.36	98.30	109.51	88.63	78.62	105.03	85.40	121.86
2005-06	88.19	105.72	92.46	104.74	-	48.15	103.08	163.44	86.22	92.76	113.54	103.85	104.86
2006-07	93.79	75.25	84.21	82.60	-	155.75	119.94	116.08	57.45	95.07	82.46	75.65	109.32
2007-08	103.04	94.18	87.56	92.83	268.91	141.19	102.82	127.35	48.16	83.51	84.82	85.52	121.90
2008-09	95.41	80.18	64.21	88.36	80.55	138.20	134.92	140.96	156.71	101.44	117.97	87.10	94.18
2009-10	119.30	96.26	85.22	117.34	64.98	122.55	111.97	165.65	97.49	102.93	95.17	57.89	98.52
2010-11	103.22	83.30	78.12	123.26	60.85	108.61	120.34	133.52	80.88	85.56	91.99	57.96	116.54
2011-12	101.91	92.81	104.83	63.28	120.10	84.62	102.04	77.71	99.60	98.03	82.11	74.58	103.81
2012-13	90.76	97.14	91.08	143.98	114.30	90.45	96.82	103.36	106.97	104.81	102.12	140.38	95.05
2013-14	106.92	114.86	118.56	77.35	124.56	92.89	88.42	101.22	106.98	108.14	119.73	153.17	91.46
Average	**99.97**	**108.27**	**116.96**	**103.07**	**119.18**	**101.91**	**96.82**	**100.67**	**107.54**	**103.54**	**100.31**	**100.77**	**99.62**
SD	23.84	30.65	51.02	26.54	71.07	51.40	24.27	50.32	38.16	18.67	12.74	32.35	15.37

Source: Authors' calculations.

Table 10: Tax Efforts of Madhya Pradesh and Chhattisgarh

	Madhya Pradesh								Chhattisgarh							
Year	**LR**	**PTax**	**SD_RF**	**STax**	**MV_PT**	**Excise Duty**	**E Duty**	**Total**	**LR**	**PTax**	**SD_RF**	**STax**	**MV_PT**	**Excise Duty**	**E Duty**	**Total**
2001-02	57.5	108.3	76.8	82.4	164.7	117.8	76.9	108.1	36.1	124.4	89.1	114.2	168.0	238.5	122.6	78.1
2002-03	74.1	118.8	93.1	106.0	121.2	94.3	184.7	91.6	18.4	151.1	114.0	114.6	117.9	127.7	84.3	89.4
2003-04	38.2	112.9	86.0	97.1	87.1	100.6	84.0	107.4	5.1	119.6	88.1	104.1	95.3	135.7	89.7	99.2
2004-05	50.9	86.4	91.3	98.5	76.0	100.4	93.4	107.1	106.3	86.2	98.0	99.6	90.5	93.8	100.3	102.9
2005-06	72.2	86.7	103.2	102.1	91.2	95.7	97.5	101.4	49.9	67.9	108.7	107.8	100.6	105.3	115.2	94.5
2006-07	106.3	88.9	105.8	100.9	81.5	100.1	69.8	105.0	87.1	62.4	104.2	110.7	85.2	84.7	111.1	98.1
2007-08	96.5	98.4	113.2	102.8	82.2	106.4	59.5	102.7	74.8	51.0	100.9	94.7	109.3	81.6	97.4	106.1
2008-09	194.7	87.8	103.0	102.7	137.9	105.2	29.3	98.5	290.1	45.1	87.7	90.6	94.6	85.4	64.2	109.9
2009-10	82.1	100.0	88.3	91.2	98.9	96.0	193.5	100.8	99.3	51.5	100.5	90.8	95.4	89.8	94.1	108.3
2010-11	143.9	102.3	105.6	103.8	108.0	90.5	121.4	96.6	102.0	71.8	111.0	96.3	86.4	100.3	93.0	103.5
2011-12	83.7	110.8	114.6	106.3	95.8	89.8	128.7	96.6	94.8	232.3	97.6	97.0	92.8	90.1	99.0	104.7
2012-13	121.4	102.0	99.2	102.5	101.6	101.9	91.7	98.4	95.8	3868.6	96.2	103.2	100.8	99.2	119.3	97.7
2013-14	87.3	98.0	93.7	95.7	104.0	113.0	100.7	100.8	95.2	-64.1	102.2	104.2	116.1	120.2	118.0	92.3
Average	**93.0**	**100.1**	**98.0**	**99.4**	**103.8**	**100.9**	**102.4**	**101.1**	**88.8**	**374.5**	**99.9**	**102.1**	**104.1**	**111.7**	**100.6**	**98.8**
SD	41.8	10.6	11.0	6.6	24.9	8.2	46.2	4.9	66.6	1010.8	8.1	7.8	20.9	40.1	15.9	8.4

Source: Authors' calculations .

Table 11: Tax Efforts of U ttar Pradesh and Uttarakhand

	Uttar Pradesh								Uttarakhand							
Year	**LR**	**PTax**	**SD_RF**	**STax**	**MV_PT**	**Excise Duty**	**E Duty**	**Total**	**LR**	**PTax**	**SD_RF**	**STax**	**MV_PT**	**Excise Duty**	**E Duty**	**Total**
2001-02	53.6	198.6	83.4	114.5	190.8	275.7	29.1	81.0	30.2	256.2	43.6	113.3	124.2	-	-121.5	105.7
2002-03	33.1	59.1	99.6	109.7	125.2	160.4	447.2	86.2	24.0	144.5	58.7	105.1	101.8	-	204.5	107.5
2003-04	67.4	69.8	106.6	104.8	99.8	72.2	80.9	104.1	115.7	144.0	75.3	108.5	89.3	-	41.0	103.7
2004-05	53.1	83.0	104.8	97.4	87.0	62.0	175.4	111.7	70.5	116.8	85.8	101.7	84.2	-	140.3	102.8
2005-06	48.3	94.5	101.7	104.1	89.6	70.8	81.5	105.7	83.4	112.2	126.5	103.1	84.1	-	43.9	95.9
2006-07	74.1	100.8	130.3	101.2	82.8	69.8	81.8	102.9	139.2	108.4	187.4	108.8	92.3	-	196.7	81.7
2007-08	131.3	111.1	98.9	96.3	79.2	95.0	71.3	104.6	210.8	89.1	129.0	101.3	92.6	-	114.0	94.7
2008-09	135.5	108.0	100.8	100.9	144.5	133.7	70.4	93.3	160.0	81.5	96.4	95.3	127.7	-	92.2	102.8
2009-10	137.5	90.4	80.0	90.4	87.8	114.3	75.8	108.3	77.7	72.2	92.4	87.0	104.6	-	3.6	114.8
2010-11	201.5	94.8	90.2	91.6	86.8	98.6	90.4	106.8	159.8	80.8	90.5	94.8	103.4	-	2.7	107.5
2011-12	71.1	100.6	100.7	104.7	84.9	90.2	102.3	99.9	87.5	99.3	96.5	99.9	117.0	-	250.1	96.6
2012-13	82.7	101.5	102.5	99.6	107.4	97.3	114.4	100.1	72.6	96.0	98.2	101.2	89.6	-	65.1	100.6
2013-14	83.7	101.9	104.5	103.4	118.9	128.6	117.0	92.8	68.2	122.9	99.4	105.1	97.5	-	99.6	96.2
Average	**90.2**	**101.1**	**100.3**	**101.4**	**106.5**	**113.0**	**118.3**	**99.8**	**100.0**	**117.2**	**98.4**	**101.9**	**100.6**	**-**	**87.1**	**100.8**
SD	47.7	32.8	12.2	6.7	32.0	56.7	104.4	9.0	54.4	47.5	35.4	6.9	14.5	-	99.2	8.1

Source: Authors' calculations.

In case of Madhya Pradesh (Table 10), except Land revenue (93.0), Stamp duty and Registration Fee (98.0) & Sales tax (99.4), all other taxes indicate higher actual revenue than taxable capacity in average terms. Five consecutive years i.e. 2003-04 to 2007-08 show an above 100 per cent level of tax efforts. The overall average tax effort across all the years for Madhya Pradesh (101.1) too is slightly above 100 per cent which means the actual revenues are higher than the tax potential. However its child-state Chhattisgarh (98.8) exhibits a less than 100 tax effort percentage. The period of five consecutive years during which the latter's tax effort was above 100 per cent are 2007-08 to 2011-12. Her maximum tax effort is reflected in Profession tax (374.5). Except Land revenue (88.8) and Stamp duty and Registration Fee (99.9) all other taxes show an above 100 per cent average tax effort. Hence both the states indicate a low realisation in Land revenue and Stamp duty and Registration Fee taxes.

In the case of UP (Table 11), Land revenue (90.2) again is the lowest average tax-effort tax with a value far less than 100 which means that the state is not realising the full revenue of this tax. All other taxes give a tax effort above this level, highest being Electricity duty (118.3). The state's maximum tax effort was realised during five consecutive years between 2003-04 and 2007-08. The overall average tax effort of the state shows lesser efforts (99.8) but is quite close to the 100 per cent level. However, its child-state Uttarakhand exhibits a higher average effort (100.8) and is on the brink of the 100 per cent measure. Maximum tax effort of the state is made under Profession tax (117.2). To mention here, we could not get data pertaining to Excise duty for Uttarakhand. Only in case of Stamp duty and Registration Fee (98.4) the average tax effort reveals a lesser actual revenue than taxable capacity. Average tax efforts of rest of the taxes show actual revenues equal to or higher than the state's capacity. Overall tax effort of the state from all the taxes was consecutively above 100 per cent level from 2001-02 to 2004-05 i.e. the initial four years of its creation.

Discussion

The popular belief that smaller states have better tax efficiency is being tested in the present paper. Tax buoyancy and regression approach have been

applied to measure tax efficiency of the parent and child states. However, efforts to measure relative tax efficiency have always been encountered by many conceptual and empirical difficulties (Ghosh, 1989). Nonetheless, given the limitations, we have attempted to measure tax capacity on the basis of most proximate indicators of individual taxes and then calculated tax capacity of each state.

Growth trends of parent and child states gave a mixed picture. There are not clear evidences that smaller states grow faster than their respective parents except in case of Uttarakhand. Even, growth rates are converging in each case. Thus, long term growth trends do not provide strong evidences in favour of small states.

Taking overall period i.e. 2001-02 to 2013-14, trends in OTR suggest that Chhattisgarh and Uttarakhand have registered higher rise than their parents but the difference nowhere can be termed as significant. On the other hand in the case of Jharkhand it is significantly behind its parent state. Newly created states enjoyed rapid growth in revenue collection in the initial few years only which is evident from the growth in OTR in first sub-period (2001-02 to 2006-07). This initial gain can be ascribed to the fact that the untapped areas under the united regime were possibly explored once the division of the state took place. Except Jharkhand, there is an absolute as well as relative decline in OTR growth rates between two sub-periods in the new states. This indicates that no concrete measures were taken by the new states to strengthen the administrative and executive machinery of taxation and revenue system.

Results for tax efforts also indicate mixed picture. Mean values of tax-GSDP ratio (2001-02 to 2013-14) for Madhya Pradesh and Chhattisgarh are almost same for the entire period. On the other hand, whereas Uttar Pradesh shows higher tax-GSDP ratio than Uttarakhand, the ratio for Jharkhand is less than Bihar across the whole period of analysis. Thus, we have all three possibilities i.e. equal, lesser and greater which indicate the fact that other things being the same, size of state does not matter for tax efforts and, infact, other factors have greater bearing upon the same.

OTR collections largely depend upon its responsiveness to GSDP i.e. tax buoyancy. Our estimates of tax buoyancy suggested higher degree of responsiveness for the parent states than their child states. Except Chhattisgarh (1.067), tax buoyancy of child states is less than one. On the other hand that of their parents is more than one. As changes in tax buoyancy is the result of changes in actual tax revenues due to the changes in income as well as due to the changes in discretionary measures such as tax rates and tax bases (Mukul, 1977), low values of tax for child states reflect poor working of automatic stabilizers (first kind of change) and negligible discretionary changes in the states (second kind of change) (Timsina, 2007).

Introduction of VAT was considered a major step in tax reform measures which we considered as a measure of discretionary change by the state authorities to enhance OTR collections. We found structural break in tax buoyancy in pre and post VAT period in the case of Bihar, Jharkhand and Uttar Pradesh only. Bihar's case in this context, as discussed earlier too, is more about the major political party change during the period. Other states did not exhibit any significant changes in tax buoyancy during pre and post VAT period. Hence, our result suggests that VAT failed to bring significant improvement in OTR in the case of small states during the period of analysis. In the case of parent states too, the impact of VAT on OTR is mixed. Bihar and Uttar Pradesh experienced a spurt in OTR growth after the introduction of VAT but not in Madhya Pradesh. That means size of a state is not as important as tax administration, coverage of productive sectors and other related factors. OTR series was also tested to find if there is any structural break in the series to identify the related discretionary change but we failed to get any significant structural break neither for parent states nor for child states. This has two implications- one sample size may be small for running QRL test, second, there may not have actually been any significant structure breaks. However, in both cases it is clear that states under consideration failed to take necessary discretionary steps to increase own tax revenue collections, and were even not able to implement VAT successfully.

Although, newly created states show high degree of tax efforts but this is not

very significant. Year on year trend too does not suggest any clear cut division. Ups and downs were evident in both parent and child states. Again, here our results suggest non-significance of size of state as a factor in determining tax efforts. Tax efforts of individual taxes suggest that there is unexploited tax capacity in land revenue in almost all states. However, in other individual taxes actual realization is about 100 percent or more. Given the limitations with the availability of data regarding independent variables for determining taxable capacity of individual taxes, it is acceptable that our tax effort estimates suffer from specification problem. However, given the limitation of availability of data related with respect to individual taxes and their predictors, our estimates are based on closest most predictors.

Conclusion

Whether small states have greater tax buoyancy and tax efforts as compared to large states in general and whether child states have greater tax efficiency as compared to their parents were the main questions which we tried to answer in this paper. The hypothesis was tested by taking different estimates related to own tax revenue of the parent states i.e. Uttar Pradesh, Madhya Pradesh, Bihar and child states i.e. Uttarakhand, Chhattisgarh, Jharkhand. These include tax buoyancy by double log regression method, estimation of structural break (with known and unknown point) and estimation of degree of tax efforts.

However, we did not find any conclusive evidence that child states have better tax buoyancy or tax efforts. We can conclude on the basis of our observations that size of the state is not a major determinant affecting tax revenue of state. Other supplementary policies like efficient tax administration, developed industrial sector, reduced exemptions and concessions, broad base and effective tax rates are equally important. However, it is yet to be tested empirically that other factors remaining same whether size of a state have significant impact on the states' revenue efforts and buoyancy or not?

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