Changing Tax Capacity and Tax Effort of Indian States in the Era of High Economic Growth
2001-2014

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Abstract

Growing demand for public expenditures, limitations in expanding fiscal space and limited scope to deviate from common harmonized tax system under the proposed Goods and Services Tax (GST) regime may induce the states to look for opportunities to expand revenue mobilization through alternative channels (e.g. non-tax revenue mobilization). An assessment of the existing tax efficiency (or tax effort) and strengthening tax administration could be one of such alternatives available for states to pursue. Tax administration is as important as tax base to augment revenues of a state. Efficiency of tax administration helps a state to achieve a stable tax regime which is conducive for introduction of tax reforms measures like GST. Buoyancy of tax revenues of a state is not only dependent on growth in tax base and structure of taxes but also on the state of tax administration. Many papers have been written to estimate tax effort of Indian states. Taking this exercise to the next level, this paper focuses on measuring tax effort and identifying factors that explain variations in the tax effort across states. In measuring tax potential, an attempt has been made to differentiate between factors that determine the tax base and factors that constrain the state from utilizing the available base. The exercise looks at comprehensive revenue collection under Value Added Tax of general category states for the period 2001-02 to 2013-14.

Key Words: Tax capacity, Tax efficiency, Value Added Tax (VAT), Stochastic Frontier Approach, Panel Data Analysis, States of India.

JEL Classification Codes: H21, H71, H77

1. Introduction

Demand for public expenditure is growing across Indian states with the rise in population, urbanization and aspirations of the people. Annual revenue mobilization is not always at par with the expenditures, as a result many states face revenue as well as fiscal deficits.[1] There are deficits in public infrastructure investment across all Indian states and any investment in infrastructure is expected to boost economic growth and facilitate job creations in the long run. Given the constitutionally assigned taxation power, states have limited scope to expand tax base, and given the endowment of natural resources like forests, fossil fuels and minerals, states have limitations to expand non-tax revenue mobilization as well. It is expected that with the introduction of harmonized Goods and Services Tax (GST) system, states will have limited scope to deviate from common agreed tax structure. Therefore, it is imperative for the states to look for alternative avenues to expand revenue mobilization to keep in pace with the growing demand for public expenditures. Some alternatives could be strengthening of state tax administration and also initiating tax reforms in taxes which will not be subsumed under the proposed GST system (e.g., State Excise, Passenger and Goods Tax, Taxes on Vehicles).

Tax collection differs across States depending on their tax base (known as taxable capacity) and tax efforts (also known as tax efficiency). Chelliah (1971) defines tax capacity as the ability of a government to raise tax revenues based on structural factors including the level of economic development, the number of 'tax handles' available, and the ability of the population to pay taxes. Bahl (1971) defines tax effort as a measure of how well a country is using its taxable capacity, that is, tax effort is the ratio of actual tax revenue to taxable capacity. Indices of tax effort provide a tool for measuring differences between countries/ sub-national governments in how effectively they are using their potential tax bases. These indices may indicate the appropriate policy for dealing with budget deficits. For example, countries with a high tax effort index may need to look at reducing expenditure rather than raising taxes (Stotsky and WoldeMariam, 1997).

Apart from differences in the size of the economy (scale of economic activities), states differ in structural composition of the economy, and socio-economic status of the populace which not only defines tax base but also taxpayers' compliance behavior (tax morale and compliance behavior).[2] The existing literature on the subject is sparse and do not capture the states' tax effort effectively. Apart from the quality of institutions and tax rules and regulations, tax effort is a function of administrative strength and availability of infrastructure of the tax departments. The objective of the present exercise is to capture comprehensive Value Added Tax (VAT) capacity of Indian states and estimate VAT efficiencies. Understanding revenue potential of the states is important for proper planning of long run

[1] Though many states have contained their revenue deficits after enactment of Fiscal Responsibility Budget Management (FRBM) Act, occasional occurrence of revenue deficit is common across all states due to shocks like increase in salary due to implementation of pay commission recommendations.

[2] "Raising tax revenue, however, poses many challenges for developing countries. Specific challenges that loom especially large include weak tax administrations, low taxpayer morale and compliance, corruption and poor governance, prevalence of "hard-to-tax" sectors, a small tax base and the missing reciprocal link between tax and public and social expenditures." (OECD, 2016)

expenditure commitments and to achieve fiscal prudence. Fiscal capacities or disparities in revenue mobilization may not always depend on their capacity to mobilize resources but also on tax efforts (tax efficiency) which are largely institutional and administrative in nature. Understanding likely scope for improvement in tax collection for states is very important to set the tax targets and also to achieve fiscal sustainability.

Earlier studies on the issue look at states' own tax revenue (OTR) which is composed of various taxes where tax bases are not uniform and therefore it is difficult to capture the tax base perfectly in a single framework of analysis. The present study looks into comprehensive VAT (including central sales tax and entry tax) where tax base is relatively well-defined and more or less states have uniform system of taxation since 1999-2000 (Comptroller and Auditor General of India, 2010). Tax base of VAT mostly depends on consumption base of a state and tax collection on inputs which is not settled (due input tax credit is not paid). VAT is the most important source of revenue for state governments and contributes a significant part of OTR.

There are several methods for estimation of tax efficiency or effectiveness of tax administration. The alternatives are C-efficiency (Keen, 2013), Stochastic Frontier Approach and Tax Administration Measure of Effectiveness or TAME (Das-Gupta et al., 2016). These macro approaches/ measures are effective to identify states where revenue gain through increasing tax administration efficiency is substantial and therefore it could be used as a tool to pursue governments to initiate tax administration reforms. However, these approaches may not be sufficient to identify areas of strengths and weaknesses in tax administration where major reforms are required. There are several alternative methods for in-depth assessment of tax administration, as for example Tax Administration Diagnostic Assessment Tool (TADAT),[3] Revenue Administration Fiscal Information Tool (RA-FIT) (Lemgruber et al., 2015) and Tax-Ray developed by IBFD.[4]

The objective of this paper is to estimate VAT efficiencies of the states for the period 2001-14 and understand the factors which influence VAT efficiency. The present study captures temporal and cross-section variations of VAT efficiency and the factors thereof (e.g., state assembly elections).

Being the major source of own tax revenue for states, taxes on sales and trades of commodities is the focus of the present paper. State sales tax/ VAT is the major source of revenue for state governments and contributing more than half of own tax revenue collection. Tax base of sales tax/ VAT depends on consumption base of the State. Consumption base of a State depends on size of the population, level of urbanization, per capita income, level of poverty and inequality, level of education of the people, and physical location of the State, etc. Apart from domestic consumption, inter-state sales and purchases also influence tax mobilization of the States.

[3] http://www.tadat.org/ (last accessed on 26 March, 2017).
[4] https://www.ibfd.org/Consultancy-Research/TAx-Ray-Assessment (last accessed on 26 March, 2017).

In the next section, a brief discussion on state taxation of goods is presented and is followed by a discussion on importance of Value Added Tax in state finances in section 3. In section 4, a comprehensive review of literature is provided. We describe methodology of the study in section 5 and it is followed by description of sources of data and basic statistics in section 6. We discuss the results in section 7 and draw conclusions in section 8.

2. Taxation of Goods

Depending on the stage of value addition (production or distribution), the Constitution of India assigns taxation power on goods to Centre as well as State Governments. The CENVAT is a manufacturing level VAT and it is levied on manufactured goods whereas state VAT is levied on sales of goods (Rao and Rao, 2005).

Input tax credit on intra-state purchases is adjusted against state VAT and/or Central Sales Tax (CST) liability. A few commodities (e.g., diesel, petrol, ATF, natural gas, crude petroleum, and alcohol for human consumption) are kept outside the VAT system and sales tax is levied on them. No input tax credit is allowed against sales tax and it results in cascading of taxes (Mukherjee and Rao, 2015a). Inter-state sales attract CST and inter-state purchases attract entry tax (Mukherjee, 2015). Since CST is a tax collected by the origin state, the destination (importing) state does not allow input tax credit against CST. Therefore, CST remains a stranded cost for inter-state dealers and manufacturers using goods procured from other states. For the majority of states, entry tax (in lieu of Octroi) is commodity-specific (e.g. Bihar, Himachal Pradesh, Gujarat) tax and some states do not allow an input tax credit against entry tax (e.g. Assam, Karnataka, Odisha). These three taxes (VAT including sales tax, CST and Entry Tax) together referred here as comprehensive VAT.

Tax base for comprehensive VAT cannot be easily mapped with the economic activities (scale and composition of the economy) and/or consumption base of a state due to various reasons – tax exemptions, VAT registration thresholds, turn-over based exemptions, abatement and/or special provisions. Since tax base is not easily observable, a set of macro variables are used to estimate the tax base/ capacity. Inadequate data capturing and reporting (e.g., consumption data, inter-state sales/ purchases) is another area which restricts to estimate the size of the tax base.

In addition to own tax revenue mobilization, depending on their endowment of natural resources (e.g. forest, fossil fuels, minerals), past investments in state PSUs and loans disbursed to various government departments and local bodies, states collect non-tax revenue in terms of royalties, dividends, interests etc. In addition to their own revenue (tax and non-tax) mobilization, states also receive share in taxes levied and collected by the central government[5] and grants-in-aid from the central government. It is expected that states where a substantial part of budgeted

[5] Urban Local Bodies (ULBs) receive grants-in-aid from Government of India (GoI) under various Centrally Sponsored Schemes (CSS) and under award of successive Central Finance Commissions (CFCs). In addition, both Rural and Urban Local Bodies receive grants-in-aid from the State Government as per the recommendations of the State Finance Commissions.

expenditure (revenue as well as capital) is financed by these transfers, they will put little effort to mobilize their own revenue. In other words, own tax revenue mobilization of a state is contingent upon availability of central transfers to finance its expenditures.

3. Importance of Value Added Tax in State Finances

The importance of state sales tax/ VAT collection in overall revenue mobilization of state governments is presented in Table 1. VAT is introduced across Indian states since 2003 and majority of Indian States adopted VAT in April 2005 (Rao, 2016).[6]

Ideally, the tax base of comprehensive VAT is the size of aggregate consumption expenditure of the state and any input tax credit which is non-admissible due to inter-jurisdiction nature of taxes and state-specific provisions. In addition, the presence of substantial informal entities in manufacturing and service sectors (Mukherjee and Rao, 2015b),[7] substantial presence of cash-based transactions and inability of our national income accounting system to capture unaccounted income (Mukherjee and Rao, 2017) make it difficult to estimate the tax base. Availability of representative consumption expenditure data at state level with a gap of five years and considerable time lag between data collection and dissemination, restrict us to use any consumption expenditure data for our analysis. In the absence of reliable estimate of tax base for comprehensive VAT, a combination of structural composition of the State economy, level of GSDP and consumption expenditure mostly used for estimation of tax base for state VAT in earlier studies on state-level tax efficiency estimation.

During 2001-02 to 2012-13, for general category states, VAT generates on an average 64.5 percent own tax revenue and 32.45 percent of total revenue receipts of the states. On an average, VAT revenue finances 26.79 percent of total expenditure of the states. Therefore, VAT is the most important source of tax for state governments and understanding the efficiency in collection of VAT revenue is very important. It is expected that such study could initiate measures to strengthen tax administration as well as simplification of the processes and procedures related to tax administration to encourage voluntary compliance.

[6] For state-wise details on adoption of VAT see Nepram (2011).
[7] Input taxes (if any) remained stranded costs for informal sectors, as they cannot claim it for being unregistered for taxes.

Table 1: Importance of VAT* in State Finances for General Category States

(2001-02 to 2013-14)

Description	Pre-VAT	Post-VAT	All
Average revenue from VAT as Percentage of GSDP (%)	4.08	4.47	4.34
Average share of VAT in Own Tax Revenue (%)	63.42	65.06	64.50
Average share of VAT in Total Revenue Receipts (%)	31.62	32.88	32.45
Average share of VAT in Total Expenditure (%)**	24.35	28.07	26.79

Note: *-includes Central Sales Tax (CST) and Entry Tax
**-excludes loans and advances
Source: Finance Accounts, various years

4. Literature Review

Estimation of tax efficiency (or tax effort) has been attempted by many scholars both in cross-country framework and within countries across sub-national governments. There are several methods for estimation of tax capacity and tax efforts – e.g. income approach, representative tax system (RTS) approach, regression approach, and stochastic frontier approach. *Income approach* assumes national (or sub-national) income as tax base and the ratio of tax collection and national (or sub-national) income is considered as tax effort. This approach assumes that national income perfectly captures the tax base. Being a consumption-based tax; sub-national income (or Gross State Domestic Product) is not the right representative of tax base of VAT. Therefore, income approach is not the right approach for our analysis. Purohit (2006) ranks the states according to their tax effort based on this approach. Condoo et al. (2001) use a modified income approach where ordinal position of the states in tax-GSDP ratio is captured through quintile regression.

In *representative tax system (RTS) approach*, "[T]axable capacity is defined … as the total tax amount that would be collected if each country applied an identical set of effective rates to the selected tax bases, that is, as the yield of a representative tax system" (Bahl, 1972).However, universal effective tax rate across commodities is a very strong assumption. In addition, tax base may also vary for a representative tax across states. In this approach, ratio of actual tax collection and yield of representative tax system is taken as tax effort. Given the difficulties involved in the estimation of effective tax rate and tax base, this approach is not suitable for our analysis. Rao (1993) used a modified RTS approach for estimation of tax effort across Indian states.

In *regression approach*, actual tax revenue-to-income ratio is regressed on a set of independent variables, to capture the tax base, and the residual of the regression model, which is the difference between actual tax revenue-income ratio and estimated tax revenue-income ratio, is considered as tax effort. In this method, the regression error (or disturbance), which may contain a random component, is considered as tax effort. There are many studies specific to Indian states where this method is adopted (Sen, 1997; Rao, 1993; Oomen, 1987 and Thimmaiah, 1979).

Stochastic Frontier Approach (SFA) is an extension of regression approach and it simultaneously estimates tax capacity and tax inefficiency. Since tax capacity is not observable, SFA estimates a production frontier based on observable variables having significant influence on tax capacity (or tax base). Given the cross-sectional and time-series variations in the observed data and their relationship with the observed output (say, tax revenue), SFA estimates a frontier (maximum achievable output or tax revenue) of tax capacity and the difference between these estimates could be due to tax inefficiency and other factors which are stochastic in nature. There are several variants of SFA model (Belotti et al., 2012).

According to our information, there are three studies based on SFA approach which estimate tax capacity and tax efficiency for Indian states. These studies vary in features such as – a) methodology adopted for estimation, b) in capturing indicators for estimation of tax capacity and tax effort, c) time period for analysis, d) in selecting the states and d) in selecting taxes.

Jha et al. (1999) identified that for the period 1980-81 to 1992-93, State Domestic Product (SDP) or Gross State Domestic Product (GSDP), proportion of agricultural income to total SDP (AGY), and time-series trend (captured through year or time variable) are the major factors determining own tax capacity of 17 major Indian States. They found a positive relationship between SDP and own tax revenue and a negative relationship between share of agriculture in GSDP and own tax revenue. The study adopts time-variant stochastic frontier approach as developed by Battese and Coelli (1995) and considers some factors influencing tax effort (Central Government Grants in Total State Government Expenditure (GTOE), interaction term of GTOE and SDP (GTOE*SDP), interaction term of GTOE and AGY (GTOE*AGY), household consumption expenditure).

Garg et al. (2014) found that for the period 1992-93 to 2010-11, per capita real GSDP, share of agriculture in GSDP, literacy rate, labour force, road density and urban Gini (a measure of consumption inequality) influence own tax revenue (as percentage of GSDP) capacity for 14 major Indian states. Except square of per capita real GSDP and share of agriculture in GSDP, all other independent variables have positive and significant relationship with own tax revenue collection of the states. This study uses Battese and Coelli (1995) methodology for simultaneous estimation of tax capacity and tax efficiency across Indian states.

Karnik and Raju (2015) found that for the period 2000-01 to 2010-11, sectoral share of manufacturing in GSDP and annual per capita consumption expenditure are the major determinants for sales tax (as percentage of GSDP) capacity for 17 major Indian states. Both the variables have positive and significant relationship with state's sales tax collection. This study estimates time invariant SFA models and also do not incorporate efficiency factors in the model.

Identification of factors influencing tax inefficiency is important for making policy suggestions. However, identifying a suitable set of indicators of tax effort, given information on tax administration available in the public domain, is a challenging task. Though some tax administration related information is available from secondary sources (e.g. Comptroller and Auditor General of India's revenue audit reports), the information is not available over time and for all states (Das-Gupta and Andrade, 2013).[8]

Tax administration also depends on relative dependence of a state on own revenue sources vis-à-vis revenue receivable from the central government – share in central taxes and grants-in-aid. States where a substantial share of government expenditure is financed through central transfers, are expected to put little effort to mobilize own resources. Similarly, States where substantial revenue is generated from own non-tax revenue sources, are expected to have lower tax effort. However, increasing tax mobilization by increasing tax effort may not be possible for a state where tax effort is already very high. Moreover, in a federal system with overlapping taxation power, tax capacity and tax effort of a provincial (or sub-national) government is also contingent upon taxation decisions of the federal government. Tax decisions taken by the central government influence tax capacity of the states. Though it is expected that the effects will be same across all the states, different states realize the effect differently depending on their tax base.

Jha et al. (1999) found that the share of central government grants in total state government expenditure (GTOE), interaction term of GTOE and SDP (GTOE*SDP), interaction term of GTOE and AGY (GTOE*AGY), per capita real rural household consumption expenditure (CO) and time are significant factors influencing tax inefficiency. Except CO all other factors have positive and significant impact on tax inefficiency. Alternatively, except CO all other factors influence tax efficiency negatively.

Garg et al. (2014) found that one year lag value of 'ratio of transfers net of loan to revenue receipts', 'ratio of total expenditure to GSDP', 'ratio of outstanding liabilities to GSDP', 'ratio of debt repayment to total revenue', 'governance index', significantly influence tax inefficiency. In addition, implementation year of FRBM Act (FRBMA dummy) and Effective Number of Parties at the State level (ENP) influence tax inefficiency significantly. Except ratio of transfers net of loan to revenue receipts', all other factors influence tax inefficiency negatively.

The present study looks into comprehensive VAT, instead of own tax revenue or sales tax as earlier focused on, for estimation of capacity and efficiency of VAT across all general category states for the period 2001-14.

[8] Understanding efficiency in VAT collection is an area of interest for State Commercial Tax Department as that helps them to make plan for their reform in tax administration (tax effort). Since data (indicators) on various aspects of tax administration is not available in the public domain for States, it is difficult to use any tax administration specific indicator for estimation of tax effort (Das-Gupta and Andrade, 2013). Tax administration not only depends on issues related to tax policies (Tax Acts & Rules) but also on procedural details of their implementation and compliance facilitation. Tax enforcement to minimize compliance risks is function of various aspects of tax administration, e.g. availability of manpower and their distribution, availability of infrastructure (physical and digital). In the absence of any objective assessment of tax administration across States, long time-series data on various aspects of tax administration is not available.

5. Methodology

Following Battese and Coelli (1995), stochastic production function for panel data can be written as:

$$Y_{it}=\exp(x_{it}\beta+V_{it}-U_{it}) \qquad (1)$$

Where,

Y_{it} denotes the production of the i^th^ firm (i= 1,2,3,…, N) for the t^th^ year (t=1,2, …, T);

x_{it} is a (1 x k) vector of values of known function of inputs of production and other explanatory variables associated with the i^{th}firm at the t^{th}year;

β is a (k x 1) vector of unknown parameters to be estimated;

the V_{it}s are assumed to be iid $N(0,\sigma_v^2)$ random errors, independently distributed of the U_{it}s;

the U_{it}s are non-negative random variables, associated with technical inefficiency of production, which are assumed to be independently distributed, such that U_{it} is obtained by truncation (at zero) of the normal distribution with mean, $z_{it}\delta$, and variance, σ_u^2;

Equation (1) specifies the stochastic frontier function in terms of the original production values. However, the technical inefficiency effects, the U_{it}s are assumed to be a function of a set of explanatory variables, the z_{it}s and an unknown vector of coefficients, δ. The explanatory variables in the inefficiency model may include some input variables in the stochastic frontier, provided the inefficiency effects are stochastic.

The technical inefficiency effect, U_{it}, in the stochastic frontier model (1) could be specified in equation (2),

$$U_{it}=z_{it}\delta+W_{it} \qquad (2)$$

Where,

z_{it} is a (1xm) vector of explanatory variables associated with technical inefficiency of production of firms over time; and

δ is an (m x1) vector of unknown coefficients.

Where the random variable, W_{it}, is defined by the truncation of the normal distribution with zero mean and variance, σ_u^2, such that the point of truncation is $-z_{it}\delta$, i.e., $W_{it}\geq -z_{it}\delta$.

These assumptions are consistent with U_{it} being a non-negative truncation of the $N(z_{it}\delta,\ \sigma_u^2)$ distribution. W-random variables are identically distributed and non-negative. The mean, $z_{it}\delta$, of the normal distribution, which is truncated at zero to obtain the distribution of U_{it}, is not required to be positive for each observation.

The method of maximum likelihood is proposed for simultaneous estimation of the parameters of the stochastic frontier and the model for the technical inefficiency effects. The likelihood function and its partial derivatives with respect to the parameters of the model are presented in Battaese and Coelli (1993). The likelihood function is expressed in terms of the variance parameters, $\sigma_s^2 \equiv \sigma_v^2 + \sigma_u^2$ and $\gamma \equiv \frac{\sigma_u^2}{\sigma_s^2}$.

The technical efficiency of production for the i^{th} firm at the t^{th}year is defined by equation (3) (where all variables are taken in natural logarithm), [9]

$$TE_{it}=E[\exp(-U_{it}|\varepsilon_i)]$$

ε_i is the composite error term

The prediction of the technical efficiencies is based on its conditional expectation, given the model assumptions.

Following the above methodology, equation (1) is tax capacity estimates and equation (2) is tax inefficiency estimates.

VAT Capacity Estimation:

$$lnvat = \beta_0 + \beta_1 lngsdp + \beta_2 mining/agriagri + \beta_3 lnmfg/agri + \beta_4 lnservice/agri + \beta_5 lnfoodsgca + \beta_6 lnwpimo + \beta_7 port + \beta_8 petroref + V_{it} - U_{it}$$

Where,

lnvat	*Natural logarithm of sales tax/ VAT (including CST & entry tax) collection (in Rs. Crore)(current prices)*
lngsdp	*Natural logarithm of Gross State Domestic Product (in factor cost, current prices, 2004-05 series) (in Rs. Crore)*
mining/agri	*Share of mining vis-à-vis agriculture (excludes contribution of forestry and fisheries in GSDP) in GSDP*
mfg/agri	*Share of manufacturing vis-à-vis agriculture in GSDP*
service/agri	*Share of services vis-à-vis agriculture in GSDP*
lnfoodgca	*Natural logarithm of share of area under foodgrains in gross (total) cropped area (%)*
lnwpimo	*Natural logarithm of wholesale price index of mineral oil*
port	*Sea port dummy, 1 if any sea port is located in the state, 0 otherwise*
petroref	*petroleum refinery dummy, 1 if any petroleum refinery is located in the state, 0 otherwise*

[9] See Mastromarco (2008) for details of derivation of the Technical Efficiency term.

VAT Inefficiency Estimation:

$$U_{it}=\delta_0+ \delta_1 lnpcgsdp + \delta_2 lnpcgsdp^2+ \delta_2 lngrantstotex+ \delta_3 lnshcenttotex +\delta_4 lnroyaltytotex+\delta_5 vatdum+\delta_6 antiincumbency+W_{it}$$

Where,

lnpcgsdp	*Natural logarithm of Per Capita Gross State Domestic Product (in factor cost, current prices) (in Rs.)*
lnpcgsdp^2	Square of *Natural logarithm of Per Capita Gross State Domestic Product (in factor cost, current prices) (in Rs.)*
lngrantstotex	*Natural logarithm of Central Grants-in-aid to a state as percentage of total expenditure (revenue & capital) of the state*
lnshcenttotex	*Natural logarithm of State's share in Central Taxes as percentage of total expenditure of the state*
lnroyaltytotex	*Natural logarithm of a state's collection of royalty from petroleum, coal and lignite, and non-ferrous mining and metallurgical industries as percentage of total expenditure (revenue and capital)of the state*
vatdum	*VAT Dummy, 1 for years after introduction of VAT in the State, 0 otherwise*[10]
anti-incumbency	*Anti-incumbency dummy, 1 for the election year if new political party (or alliance of parties) forms the government, 0 otherwise*

Within Panel data models for SFA, there are a few models which estimate time-varying random effect models (e.g. Battese and Coelli, 1995; Green, 2005) (Belotti et al., 2012, page no. 9). For our estimation of inefficiency models, we have adopted Battese and Coelli (1995) model. Battese and Coelli (1995) estimates parameters of the stochastic frontier and the inefficiency model simultaneously to avoid bias (Wang and Schmidt, 2002). This method captures time-varying inefficiency that reflects observable heterogeneity using maximum likelihood estimation technique.

After estimating the models, we estimate time-variant tax efficiency across states by using methodology developed by Battese and Coelli (1988) using *predict* command developed by Belotti et al. (2012).

[10] In majority of general category states, VAT was introduced in April, 2005. However, in Haryana VAT was introduced in April, 2003. In Chhattisgarh, Gujarat, Rajasthan, Jharkhand, and Madhya Pradesh VAT was introduced in April, 2006. In TN VAT was introduced in January, 2007 and UP in January, 2008 (Nepram, 2011).

6. Data and Basic Statistics

Since tax base of VAT largely depends on level of economic activities of a State, we have taken GSDP to capture scale of economic activity. In addition to scale, composition of the economy also influences VAT collection. Relative share of mining and quarrying, manufacturing and services (including construction and electricity) vis-à-vis agriculture (excluding share of fisheries and forestry) are included in the tax capacity estimation.[11] Since a large part of sales tax is collected from mineral oils (e.g. petrol, diesel, ATF) and price of majority of these oils are volatile (depending on international price of crude oil and exchange rate volatility), we have taken Wholesale Price Index (WPI) of mineral oils (in 2004-05 base) as independent variable in the tax capacity estimation. Since state-wise WPI for mineral oils is not available, we have used the same data for all the states. The presence of petroleum refinery in a State also influences sales tax/ VAT collection, as inter-state sales (refinery products and crude petroleum) and purchases (crude petroleum) attract central sales tax and entry tax (Mukherjee and Rao, 2015a). Though a majority of agricultural commodities do not attract VAT, some states collect purchase tax on some agricultural crops (e.g. paddy, wheat, cotton and sugarcane in states like Punjab, Haryana, and Andhra Pradesh). We have taken share of area under foodgrains in total cropped (or gross cropped) area in the model of estimation of tax capacity. It is expected that in a state where a larger area is devoted for foodgrains cultivation will leave little area for commercial crop cultivation and therefore it constrains state's capacity to raise tax revenue by capturing value addition in later stage of agro-based manufacturing.

In tax effort estimation, we have taken level of per capita income as a measure of relative level of development of the states. In addition, we are taking share of central grants-in-aid in total expenditure of the state (revenue as well as capital) (excluding loans and advances) and the state's share in central taxes as percentage of total expenditure. It is expected that if a significant part of state's budgeted expenditure is financed through central transfers (grants-in-aid and tax shares) there will be little effort to mobilize own resources to finance budgeted expenditures. For all states, volatility in central grants-in-aid transfer (as measured by coefficient of variation for the period 2001-14) is higher than volatility in state's share in central taxes. To capture the difference in impact of these transfers when compared to shared taxes on VAT efficiency, we have taken them separately in the inefficiency model estimation.

To explore possibility of having any impact of state election (State Legislative Assembly elections) cycle on tax effort, we have taken election dummies (three dummies corresponding to election year - one year prior to election, one year post election and election year) and anti-incumbency dummy for the election year (takes value 1 if new political party or alliance elected, 0 otherwise). Detailed information on state elections is collected from the website of Election Commission of India. To avoid the problem of multicollinearity, we introduce the dummies selectively in our model estimation.

[11] Rationale for taking relative share is to avoid multicollinearity between GSDP and sectoral shares in GSDP.

For state level public finance statistics, we have relied on Finance Accounts of respective state governments. Finance Accounts are audited statement of accounts of state governments by the Comptroller and Auditor General of India. Data on Gross State Domestic Product (GSDP) at factor cost by industry of origin (at current prices, 2004-05 series) and annual average Wholesale Price Index (WPI) for Mineral Oils (in 2004-05 base) are taken from *EPWRF India Time Series* database. EPWRF compiles data of GSDP from publications of Central Statistical office (CSO), Ministry of Statistics and Programme Implementation (MOSP&I) and WPI data from publications of Ministry of Commerce and Industry, Government of India. For data on state-wise Gross Cropped Area (or Total Cropped Area) and Area under Foodgrains, we have relied on Statistical Year Book, India (various years) published by MOSP&I, Government of India. State-wise names of petroleum refineries and their year of establishment are taken from *Indian Petroleum and Natural Gas Statistics 2014-15* published by Ministry of Petroleum and Natural Gas, Government of India. State-wise list of ports are taken from Indian Ports Association's Website.[12]

Table 2: Basic Statistics (17 General Category States, Period: 2001-02 to 2013-14)

Description	Mean	Std. Dev.	Minimum	Maximum
Value Added Tax (VAT)*(Rs. Crore)	12,104	11,766	433	63,771
Gross State Domestic Product (GSDP) (Rs. Crore)	268,054	239,064	7,859	1,476,233
Share of Agriculture in GSDP (AGRI)	18.14	6.81	2.91	34.43
Share of Area under Foodgrains in Gross (Total) Cropped Area (FOODSGCA) (%)	62.29	21.40	7.68	99.53
Share of Mining and Quarrying in GSDP (MINING)	3.50	4.30	0.005	19.87
Share of Manufacturing in GSDP (MFG) (%)	15.82	6.68	3.71	34.87
Share of Services in GSDP (SERVICE)** (%)	59.66	7.34	40.48	79.27
Share of Mining vis-à-vis Agriculture in GSDP (MINING/AGRI)	0.33	0.78	0.0002	6.43
Share of Manufacturing vis-à-vis Agriculture in GSDP (MFG/AGRI)	1.29	1.62	0.16	10.93
Share of Services vis-à-vis Agriculture (SERVICE/AGRI)	4.15	2.82	1.51	17.26
Annual Average Wholesale Price Index of Mineral Oils (WPIMO)	135.42	45.11	75.54	225.95
Per Capita GSDP (PCGSDP) (Rs. Crore)	52,570	45,441	7,174	327,629
Share of Central Grants in Total Expenditure (GRANTSTOTEX) (%)	10.48	4.55	2.40	22.78
Share of State's Share in Central Taxes in Total Expenditure (SHCENTTOTEX)	19.62	11.88	4.26	57.55
Share of Royalty** in Total Expenditure (ROYALTYTOTEX)	2.96	3.61	0.01	16.38

Note: * includes Central Sales Tax (CST) and Entry Tax
** includes construction and electricity
*** royalty from petroleum, coal and lignite, and non-ferrous mining and metallurgical industries

[12] http://ipa.nic.in/state_ports.htm (last accessed on 22 November, 2016)

We have considered 17 general category states for our analysis and period of our analysis is 2001-02 to 2013-14. The dependence on VAT as a source of revenue differs across states and on an average VAT contributes 65 percent of Own Tax Revenue and finances more than one quarter of total expenditure (Table 1).

The basic statistics of all the variables included in our analysis is presented in Table 2.

7. Results and Discussion

We estimate maximum likelihood (ML) random-effects time-varying inefficiency effects model as developed by Battese and Coelli (1995) using *sfpanel* command developed by Belotti et al. (2012) in Stata (version 13.1). We have estimated alternative specifications of tax capacity and tax inefficiency models, and reporting the best model in Table 3. The estimated results (in Table 3) show that apart from scale of economic activity of a state (as measured by *lngsdp*), structural composition of the economy (as measured by ratio of mining, manufacturing and services vis-à-vis agriculture in GSDP) is an important factor in determining the capacity of VAT collection of states. We found that structure of the economy significantly influences scale of economic activity of the states and therefore, to avoid the problem of multicollinearity, we have taken share of mining, manufacturing and services vis-à-vis agriculture in GSDP in the regression model.

Since VAT is a consumption-based tax, the tax capacity is influenced by the sectoral composition of the economy. Sectors where share of Compensation to Employees (CE) and Operating Surplus (OS)/ Mixed Income (MI) constitute a significant share in value addition vis-à-vis that of agriculture, influence VAT capacity positively. According to National Account Statistics (NAS) 2014, the share of CE + (OS/MI) in GDP is 92.4 percent for agriculture, 77.8 percent for mining, 76.4 percent for manufacturing and 91.4 percent for services. It shows that a large share of value addition in agriculture and services goes back to employees and farmers/ entrepreneurs as income available for consumption. Therefore, states where share of agriculture and services in GSDP is higher are likely to have larger VAT base as compared to states where mining and manufacturing activities are located. Being an exempt sector, agriculture cannot claim input taxes paid on taxed inputs. States having strong agricultural base are also expected to have larger base in agro-industries and therefore larger tax base under the present origin-based tax system. Apart from a few agricultural produce and for a few specific states, agricultural produces do not attract sales tax/ VAT. We also found that states that have larger share of foodgrains in gross (total) cropped area have lower tax capacity. This is in line with our expectation, as states where a large percentage of agricultural area is devoted for foodgrains, lesser area for other crops remain. This results in restricted agro-based manufacturing value addition. To our surprise, we found that share of services (including electricity and construction) vis-à-vis agriculture is also an important factor influencing state's VAT capacity. Apart from trade and hotels and restaurants, other services do not attract sales tax / VAT directly. However, except trade, other services cannot claim input tax credit against their purchase of taxed inputs. On the other hand, states having larger share in services also have larger share of urban population which drives consumption demand for goods as well as services.

Since almost one-third of VAT/ sales tax collection is from petroleum products, the price of mineral oils influences VAT collection (Mukherjee and Rao, 2015a). States having petroleum refinery have larger capacity to collect sales tax (including CST and entry tax). As compared to land-locked states, states having sea port are expected to see trade (export and import) related value addition which helps the state to expand the tax base. We also introduced square term of *lngsdp* in one of the alternative models to understand non-linearity of the capacity function. We did not find any significant result for $lngsdp^2$. Similarly, we also introduced VAT dummy in the capacity equation, but did not find any significant result.

We found that per capita income is one of the significant factors influencing tax efficiency of the states. An inverted U-shaped relationship between per capita income and tax efficiency can be observed from table 3. With rise in per capita income tax, efficiency improves and reaches a maximum and then it falls further. It is expected that, with rise in per capita income states' infrastructure for tax administration improves, as a result tax efficiency rises. However, with further rise in per capita income, state tax administration reduces tax effort.

It is expected that states where a larger share of total expenditure (revenue as well as capital)[13] is financed through central grants-in-aid and state's share in central taxes, tax administrations put little effort in tax collection. Our results support this hypothesis.

States where royalty from petroleum, coal and lignite, and non-ferrous mining and metallurgical industries finances a significant share of total expenditures have larger efficiency in tax collection. Minerals are inputs for industries (e.g., petroleum refineries, metallurgical industries) and therefore, extracted minerals either could be used in the state where minerals are extracted or in other states, where industries are located. When minerals are sold to other states it attracts CST. Since, state government authorities (either state commercial tax department or geology and mining department) closely monitor the activities of miners and often collect taxes at the exit points (e.g. in Rajasthan, Commercial Tax Department collect taxes on marbles at the exit points), it is unlikely that further value addition in the production chain will not be monitored (captured) by the state tax authorities. This result shows that capturing of information at the input stage is important for efficient tax administration. Therefore, monitoring of upstream sector(s) is important for capturing value addition in the downstream sector(s). We cannot claim that introduction of VAT has resulted in increase in tax effort across states unequivocally as VAT dummy is not significant. Tax efficiency is not dependent on election cycle; as we do not find any significant relationship of any of the three election dummies (election year, one year preceding the election and one year following the election) that we introduce in alternative model specifications. However, we found that tax efficiency depends on

[13] Capital expenditure excludes loans and advances

anti-incumbency dummy. States where anti-incumbency is observed in the State Assembly Election, tax efficiency improves in the year of election. The influence of election and political outcome of state on tax efficiency is a new finding of the present paper. Though earlier studies introduced some election specific variables in tax inefficiency estimation they did not find any significant relationship (e.g. Garg et al., 2014).

We have estimated different alternative models to capture variables influencing tax capacity and inefficiency of the states. Among the models, we have selected the best model and presented the same in table 3 (selection is based on estimated mean tax efficiency and values of gamma and lambda). We have estimated the technical efficiency using Battese and Coelli (1988) as described by Belotti et al. (2012). The output from frontier includes estimates of the standard deviations of the two error components, σ_v and σ_u, which are labeled sigma_v and sigma_u in Table 3, respectively. The estimated total error variance is $\sigma_s^2 = \sigma_v^2 + \sigma_u^2$ and the ratio of the standard deviation of the inefficiency component to the standard deviation of the idiosyncratic component is labelled as lambda $\left(\lambda \equiv \frac{\sigma_u}{\sigma_v}\right)$. Value of gamma ($\gamma \equiv \sigma_u^2/\sigma_s^2$) must lie between zero and one with values of 0 indicating the deviations from the frontier are entirely due to noise, and values of 1 indicating that all deviations are due to technical inefficiencies. The estimated λ is non-negative and significant.[14]

As compared to 2001-05, we observe substantial improvement in VAT efficiency during 2005-11 for Rajasthan, Chhattisgarh, Andhra Pradesh, Gujarat and Karnataka (Table 4). During the same time, we observe substantial fall in VAT efficiency for Haryana, Maharashtra and Punjab. Relative VAT efficiency remains unchanged during the period of our analysis for Bihar, West Bengal, Uttar Pradesh and Kerala. From 2005-11 to 2011-14, we observe a dramatic fall in VAT efficiency for Goa and Haryana. Commendable improvement in VAT efficiency is observed for Rajasthan and Odisha during 2005-11 to 2011-14. Improvement in VAT efficiency of Tamil Nadu during third phase (2011-14) helped the state to improve the ranking. There is no sign of convergence in VAT efficiency across states.[15] This analysis shows that VAT efficiency changes over time and some states put consistent effort to improve VAT efficiency and that is reflected in their relative rankings.

[14] If the value of λ term is above one, it indicates that output variations due to inefficiency are higher than that due to random factors. A zero value of γ indicates that the deviations from the frontier are due entirely to the noise

[15] We conducted beta convergence test (for standard deviation of Tax Efficiency) and except constant term, year and $year^2$ terms are insignificant.

Table 3: Estimated Results of VAT Capacity and VAT Efficiency

	Dependent variable	lnvat		
	Description	Coefficient		Std. Error
Stochastic Frontier	*constant*	-3.217	***	0.163
	lngsdp	0.84	***	0.016
	mining/agri	-0.056	***	0.016
	mfg/agri	-0.072	***	0.014
	service/agri	0.041	***	0.008
	lnfoodsgca	-0.041	*	0.021
	lnwpimo	0.42	***	0.044
	port	0.045	*	0.025
	petroref	0.273	***	0.024
Inefficiency function	*Constant*	-5.163	***	0.678
	lnpcgsdp	-3.033	***	0.497
	lnpcgsdp^2	0.145	***	0.024
	lngrantstotex	0.316	***	0.082
	lnshcenttotex	0.232	***	0.049
	lnroyaltytotex	-0.141	***	0.013
	vatdum	-0.075		0.056
	antiincumbency	-0.127	**	0.049
Diagnostic Stat.	*sigma_u*	0.076	***	0.026
	sigma_v	0.088	***	0.009
	lambda	0.862	***	0.033
	gamma	0.427		
Basic Information	*Number of Observations*	221		
	Number of Groups	17		
	Wald chi2 (8)	20573.29		
	prov>chi2	0.000		
	Log likelihood	196.677		
	Mean Efficiency	0.894		

Notes: ***, ** and * imply estimated z-statistics are significant at 0.01, 0.05 and 0.10 level respectively

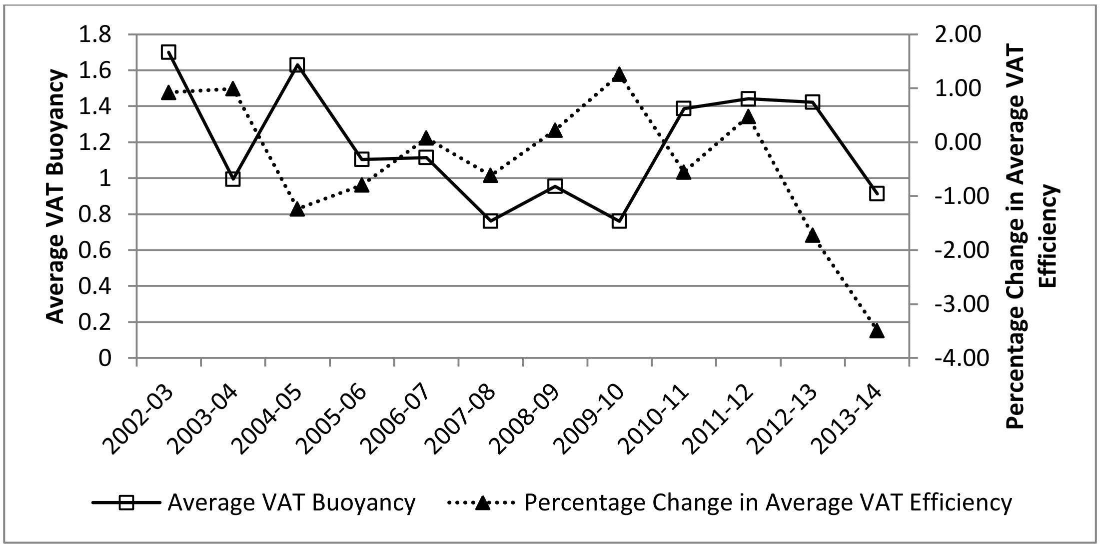
Table 4 shows that out of 17 States, average tax efficiency of 12 States is above 90 percent and those are Andhra Pradesh (undivided), Chhattisgarh, Goa, Gujarat, Haryana, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan and Tamil Nadu. Three states have average tax efficiency above 80 percent (but below 90%) and they are Kerala, Odisha, and Uttar Pradesh. Two states have average tax efficiency above 50 percent (but below 60%), those are Bihar and West Bengal. Performance of relatively low per capita income states (like Chhattisgarh, Jharkhand and Madhya Pradesh) is commendable. Performance of Odisha is also commendable. Bihar and West Bengal are laggards.

Table 4: Average VAT Efficiency Scores and Ranks

State	2001-02 to 2004-05		2005-06 to 2010-11		2011-12 to 2013-14	
Andhra Pradesh*	0.974	(7)	0.975	(3)	0.972	(5)
Bihar	0.492	(17)	0.546	(16)	0.637	(16)
Chhattisgarh	0.968	(9)	0.973	(4)	0.973	(3)
Goa	**0.990**	**(1)**	**0.981**	**(2)**	**0.863**	**(11)**
Gujarat	0.987	(4)	0.985	(1)	0.979	(2)
Haryana	**0.989**	**(3)**	**0.956**	**(9)**	**0.830**	**(13)**
Jharkhand	0.968	(10)	0.952	(11)	0.950	(8)
Karnataka	0.973	(8)	0.970	(6)	0.968	(6)
Kerala	0.913	(13)	0.839	(14)	0.826	(14)
Madhya Pradesh	0.949	(12)	0.952	(10)	0.905	(10)
Maharashtra	**0.989**	**(2)**	**0.966**	**(8)**	**0.933**	**(9)**
Odisha	0.837	(14)	0.899	(13)	0.956	(7)
Punjab	**0.979**	**(6)**	**0.935**	**(12)**	**0.825**	**(15)**
Rajasthan	0.957	(11)	0.972	(5)	0.982	(1)
Tamil Nadu	0.985	(5)	0.969	(7)	0.972	(4)
Uttar Pradesh	0.806	(15)	0.802	(15)	0.854	(12)
West Bengal	0.587	(16)	0.534	(17)	0.543	(17)

Note: * undivided.
Figures in the parenthesis show the state rankings. States highlighted in grey have improved performance. States where performance deteriorated are highlighted in bold.

Figure 1: Average VAT Buoyancy and Change in Average VAT Efficiency



The relationship between change in average VAT efficiency and average VAT buoyancy is presented in Figure 1.[16] It shows that there is no specific pattern

[16] VAT Buoyancy is the ratio of annual growth rate in VAT Collection and annual growth rate in GSDP.

between them. However, for some years there is an inverse relationship between them (e.g., 2003-06, 2009-11).

Figure 2: Relationship between per capita income and tax efficiency

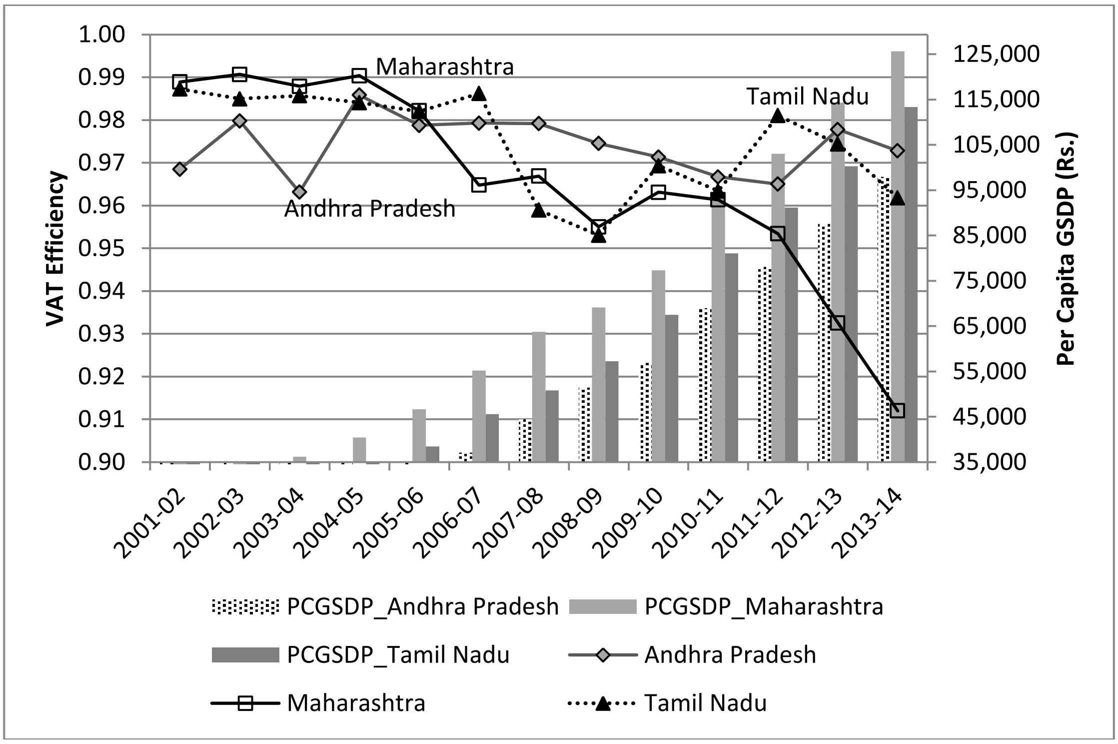
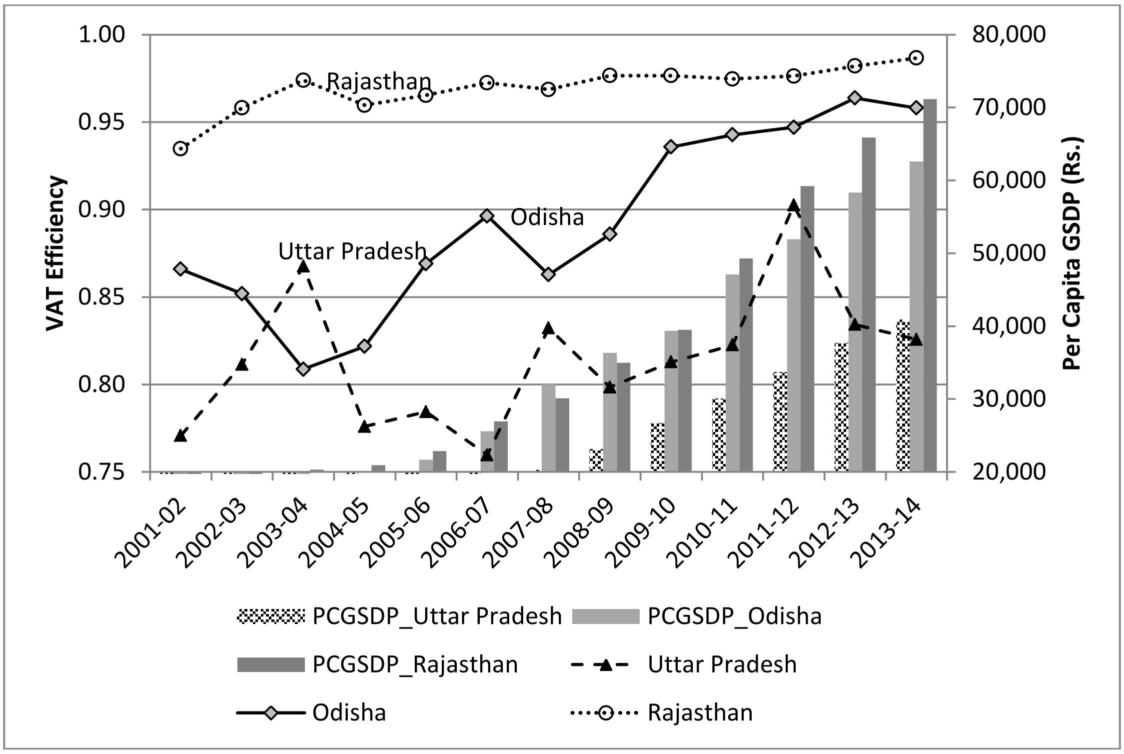


Figure 2 confirms that owing to falling relationship between per capita income and tax efficiency. For three relatively high income and high tax efficient states, fall in tax efficiency is observed with the rise in per capita income beyond a threshold. The phenomenon is much more prominent for Maharashtra. Tax efficiency in Maharashtra started falling since 2005-06 and it reached to 91 percent in 2013-14. Almost eight percentage point fall in tax effort in Maharashtra is observed during 2004-05 to 2013-14, whereas the per capita income has gone up by more than three times during the period. Similar fall in tax efficiency is also observed for Tamil Nadu up to 2008-09. Since 2009-10, tax efficiency in Tamil Nadu started improving, except fall in the last two consecutive years (2012-14). With rise in per capita income, fall in tax efficiency is also observed for Andhra Pradesh. However, as compared to Maharashtra and Tamil Nadu, fall in tax efficiency in Andhra Pradesh was not dramatic. We observe similar trends for Karnataka and Uttar Pradesh.

The tax effort of relatively low-income state (Odisha) and middle-income state (Rajasthan) is worthy to report here. Both in Odisha and Rajasthan, with rising per capita income, the tax efficiency has improved. Tax efficiency in Odisha has improved by 14 percentage points during 2004-05 to 2013-14 and for the same period per capita income has tripled in Odisha. During the same period, tax efficiency improved in Rajasthan by three percentage points and per capita income increased by 3.4 times. However, the experience of Uttar Pradesh follows the similar pattern like high income state, Maharashtra, and tax efficiency falls after per capita income reaches Rs. 33,724 in 2011-12.

Figure 3: VAT Efficiency Gains in Low Income States



The analysis raises two major questions – a) what causes tax administrations in high and middle income states to reduce their tax effort with rise in per capita income?, and b) what kinds of reforms (e.g. administrative, institutional, infrastructural) in tax administration are required to raise tax effort with rise in per capita income?

7.1 Estimation of VAT Gap

Based on the estimated tax effort for each state and for each of the years of our analysis an attempt is made to estimate the potential VAT-GSDP ratio that a state could achieve by raising tax efficiency to a level which is the maximum tax efficiency that has been achieved by a sample state in a year. VAT Gap is estimated as follows:

$$PVAT_i = \frac{1}{n}\sum_{j|i}\left[VAT_{ij} + (VATE_{mj} - VATE_{ij}) * (\frac{VAT_{ij}}{VATE_{ij}})\right] / GSDP_{ij}$$

Where,

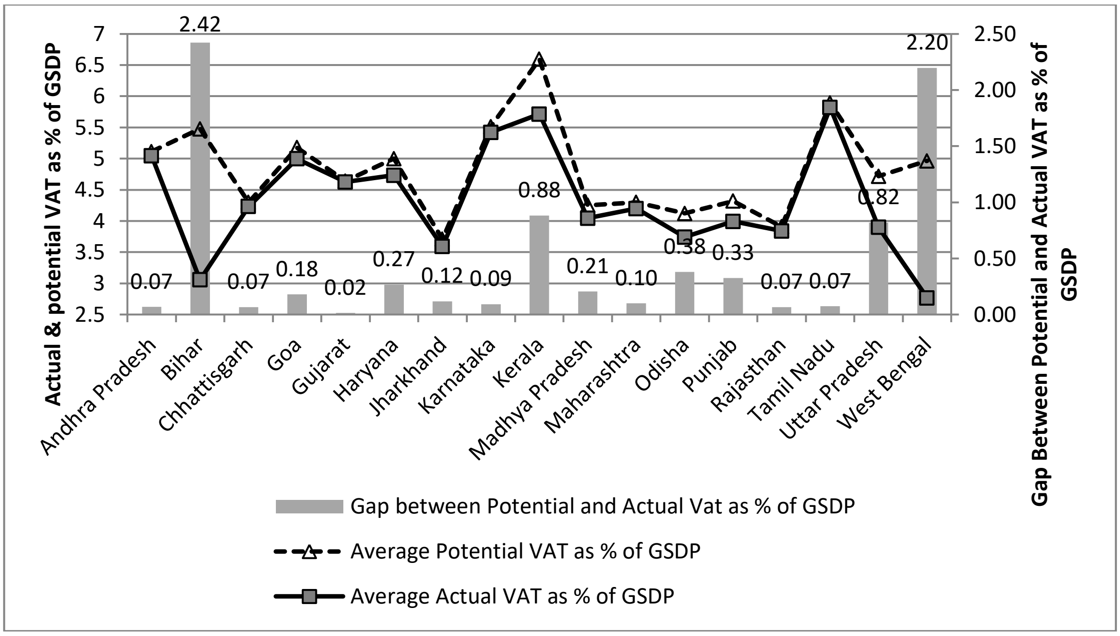
$VATE_{ij}$ is the VAT efficiency of the i^{th} state in the j^{th} year

$VATE_{mj}$ is the maximum VAT efficiency that has achieved by a state (among the sample states) in the j^{th} year

VAT_{ij} is the collection of comprehensive VAT in the i^{th} state for the j^{th} year
$GSDP_{ij}$ is the gross state domestic product (at factor cost, current prices, 2004-05 series) for the i^{th} state and j^{th} year
$PVAT_i$ is the average potential VAT – GSDP ratio for the i^{th} state, if the state achieves tax efficiency to the level equivalent to maximum tax efficiency that has achieved by a state (among the sample states) for a year
n is the number of years of our analysis (n=13)

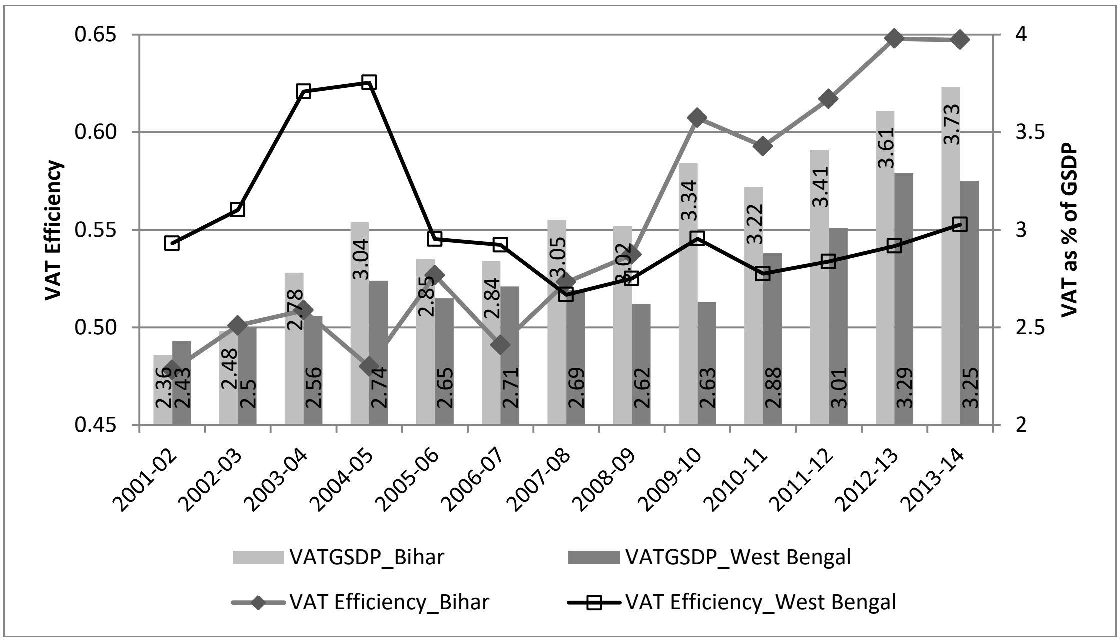
Figure 4 shows that Bihar and West Bengal have potential to increase VAT (as % of GSDP) by more than 2 percent of GSDP by increasing tax efficiency. Among other states, potential gains from increasing tax efficiency could be more than 80 percentage points for Kerala, Uttar Pradesh, and more than around 30 percentage points for Odisha, Punjab and Haryana.

Figure 4: State-wise Potential and Actual VAT Collection (averaged over 2001-14)



Temporal variations in tax efficiencies of Bihar and West Bengal are presented in Figure 5. The figure shows that since 2005-06, the tax efficiency of Bihar is growing continuously, except a few occasions (2010-11 and 2013-14). Prior to 2008-09, tax efficiency in West Bengal was higher than Bihar. Tax efficiency in West Bengal is growing since 2008-09, but at a slower pace than Bihar. Since 2009-10, growth rate in VAT collection is higher than growth rate in GSDP in West Bengal. This resulted in increasing share of VAT collection of GSDP from 2.62 percent in 2008-09 to 3.25 percent in 2013-14. A continuous effort is required to increase the VAT efficiency in the state to achieve the potential VAT-GSDP ratio. In Bihar during 2006-07 to 2013-14, average rate of growth of GSDP was 16.3 percent and average rate of growth of VAT collection was 23.7 percent, as a result VAT-GSDP ratio went up from 2.84 percent in 2006-07 to 3.73 percent in 2013-14. This was possible due to a sustained increase in VAT efficiency since 2007-08. In West Bengal during the same period, average rate of growth in GSDP was 13.1 percent and average rate of growth in VAT collection was 18.1 percent, as a result VAT-GSDP ratio increased from 2.71 percent in 2006-07 to 3.25 percent in 2013-14. Though improvement in VAT efficiency is observed since 2008-09, there is a need for accelerating the tax efficiency through sustained measures to strengthen tax administration.

Figure 5: VAT Efficiency in Bihar and West Bengal



8. Conclusions

This study shows that tax capacity is function of scale and composition of economic activity of a state. States where share of agriculture and services in GSDP is higher are likely to have larger VAT base as compared to states where mining and manufacturing activities are located. A large share of value addition in agriculture and services goes back to employees as compensation and farmers/ entrepreneurs as operating surplus (or mixed income) which facilitate consumption and therefore expand the tax base. Tax base is contingent upon availability of resources for further value addition and therefore states having larger area under foodgrains have lower tax capacity. Similarly, states having petroleum refineries and sea ports have larger tax capacity as compared to states which are land-locked or deprived of petroleum refining infrastructure. Volatility in prices of mineral oils influence tax capacity as a substantial share of state's revenue comes from these fuels (e.g. petrol, diesel, ATF).

Tax efficiency is function of per capita income and an inverted U-shaped relationship between per capita income and tax efficiency is observed. This implies that with rise in per capita income tax efficiency improves and reaches a plateau and then starts falling. It is expected that, with the rise in per capita income states' infrastructure for tax administration improves, as a result tax efficiency rises. However, with further rise in per capita income state tax administration reduces tax effort.

States where a substantial part of expenditure is financed through central grants-in-aid and state's share in central taxes put lesser tax effort.

States where royalty from petroleum, coal and lignite, and non-ferrous mining and metallurgical industries finances a significant share of total expenditures have larger efficiency in tax collection. This result shows that capturing of information at the input stage is important for efficient tax administration. Therefore, monitoring of upstream sector(s) is important for capturing value addition in the downstream sector(s).

Increasing tax efficiency in the face of anti-incumbency is a new finding of the present study. In other words, tax efficiency goes up in the year of election when new government is formed by a different political party or alliance.

An attempt is being made to estimate the potential gap in VAT collection across States. There is scope for improving VAT collection through strengthening tax administration. The largest gain from VAT efficiency improvement would be for states like Bihar and West Bengal. Other gainers would be Uttar Pradesh, Kerala, Odisha, Punjab and Haryana. An effort to strengthen tax administration and increasing tax efficiency could help these states to mobilize more resources under VAT, given other aspects of taxation (e.g., compliance, policy environment).

Successive Finance Commissions aimed to reach harmonization in tax effort across Indian states. However, we have not seen any sign of convergence of tax efficiency across Indian states during 2001-14. Therefore, to strengthen tax administration across Indian states a state specific in-depth objective assessment of tax administration is required. Even for high income – high tax efficient states like Maharashtra and Tamil Nadu, an objective assessment of tax administration could help to understand the reasons for fall in tax efficiency in recent years.

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