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Sacchidananda Mukherjee

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Sacchidananda Mukherjee*

**-Associate Professor, National Institute of Public Finance and Policy (NIPFP), 18/2, Satsang Vihar Marg, Special Institutional Area, New Delhi110067, India. Tel: +91 9953978287, Fax: +91 11 26852548. E-mail: sachs.mse@gmail.com*

Abstract

Achieving harmonisation in design, structure and administration of taxes on goods and services was the major driving force behind the introduction of Goods and Services Tax (GST) in India. GST subsumes many taxes from both Union and State tax bases. Achieving tax harmonisation in a federal system curtails fiscal autonomy of both the Union and sub-national governments and therefore faces steep resistance. Revenue uncertainty associated with any tax reform is a major cause for concern for all governments and therefore the assurance of revenue protection given by the Union government to States helped to achieve broad consensus in favour of GST. On average State taxes subsumed under the GST used to contribute two-third of own tax revenue and finance one-third of total expenditure for general category States. Unlike the Union government, States have limited taxation power (tax handles) to generate additional revenue to cope up with any major revenue shortfall on account of GST collection. Therefore the revenue protection enshrined under the GST Compensation Act has played an important role behind introduction of GST in India. This has also helped the GST Council to experiment with design, structure and administration of GST during the GST compensation period (first five years of GST implementation) to moderate the impact of GST on Indian economy as well as facilitate ease of tax compliance.

Given the ongoing shortfall in GST collection, many scholars believe that liberal GST revenue protection granted under the GST Compensation Act to states is unjustifiable. The GST compensation period will be over by June 2022 and thereafter GST collection of individual States is expected to depend on their tax capacity as well as tax effort. It is worthy to investigate whether states have tax capacity to sustain 14 percent growth rate in tax collection, as projected in the GST Compensation Act. The objective of this paper is to estimate tax capacity of the states with reference to major tax revenue subsumed under GST and see whether states could sustain 14 percent growth in their GST collection during the GST compensation period if they put adequate tax effort.

Key Words: Sales Tax, Value Added Tax (VAT), Goods and Services Tax (GST), Revenue Projection, Stochastic Frontier Approach (SFA), Fiscal Autonomy.

1. Introduction

The impact of goods and service tax (GST) on State and Union finances is yet to be analysed with more information available in the public domain (Mukherjee 2019a, Mukherjee and Rao 2019). During the first five years of GST implementation (i.e., till June 2022), GST revenues of the states are protected under the *Goods and Services Tax (Compensation to States) Act 2017*. States will receive GST compensation if their GST collection falls short of projected GST collection. The projection of GST revenue is based on annual growth rate of 14 percent with reference to net collection of taxes subsumed under GST in 2015-16. So far the experience of overall GST collection is not very encouraging and there is shortfall in GST collection (Mukherjee 2019a). Given the shortfall in GST collection, many scholars believe that liberal GST revenue protection granted under the GST Compensation Act to states is unjustifiable. In the absence of data on State level GST collection and revenue needs to be protected with reference to actual revenue collection in 2015-16, it is difficult to support or refute the argument in favour/ against of 14 percent growth projection proposed under the GST Compensation Act. However, the GST compensation period will be over by June 2022 and thereafter GST collection of individual States is expected to depend on their tax (GST) capacity as well as tax effort. It is worthy to investigate whether states have tax capacity to sustain 14 percent growth rate in GST collection, as projected in the GST Compensation Act. The objective of this paper is to estimate tax capacity of the states with reference to major tax revenue subsumed under the GST and see whether states have capacity to sustain 14 percent growth rate in tax collection during the GST compensation period, if they put adequate tax effort.

The analysis is based on 17 major Indian states for the period 2001-02 to 2015-16.[1] The study forecasts tax collection on account of comprehensive State Value Added Tax (including Sales Tax, VAT, Central Sales Tax, and Entry Tax) for four major states of India, namely, Bihar, Gujarat, Rajasthan and Tamil Nadu. The selection of the States is based on their per capita GSDP, where Bihar is relatively low income state, Rajasthan is a middle income State and Gujarat and Tamil Nadu are high income States. In addition, Bihar has relatively low industrial activities (average share of industries in GSDP during 2001-16 is 15.9%), Rajasthan and Tamil Nadu have medium industrial activities (having shares of 29.1% and 29.9% respectively) and Gujarat has high industrial activities (39.3%).

1.1 Importance of Sales Tax / VAT in State Finances

Sales tax/value added tax has always been the most important source of revenue for state governments. This head of tax includes broadly two types of taxes: those collected through the Value Added Tax Act (VAT) and those collected through the sales tax act. The former are on commodities, in the supply of which the supplier can claim credit for any input taxes paid. There are another bunch of commodities which have been kept out of the purview of VAT, like for example, petrol and diesel. On these commodities, states have been levying

[1] For 2014-15 and 2015-16, we have included the information of Telangana into Andhra Pradesh to get matching series of undivided Andhra Pradesh.

and collecting sales tax. The Table 1 provides a brief overview of the importance of this bundle of revenues for the state exchequer. In India, State level VAT was introduced in 2003; most states adopted the VAT in April 2005 (the Economic Survey 2016–17 [GoI 2017] lists the year each state adopted the VAT). For 17 major Indian States, from 2001–02 to 2015–16, the VAT generated on average 65 percent own tax revenue (OTR) and 33 percent of total revenue receipts. Revenue from the VAT finances 27% of the states' total expenditure (revenue and capital expenditure - excluding loans and advances) on average. The importance of VAT as a revenue source in state finances has been increasing (Table 1).

Table 1: Importance of VAT* in State Finances for 17 Major Indian States: 2001–02 to 2015–16

Description	Pre-VAT	Post-VAT	All	2001–02 to 2005–2006	2006–07 to 2010–11	2011–12 to 2015–16
Average Revenue from VAT as Percentage of GSDP (%)*	4.05	4.55	4.40	4.12	4.31	4.78
Average Share of VAT in Own Tax Revenue (%)	63.40	65.12	64.62	63.55	64.91	65.40
Average Share of VAT in Total Revenue Receipts (%)	31.55	32.82	32.45	32.10	31.41	33.86
Average Share of VAT in Total Expenditure (%)**	24.18	27.87	26.80	25.03	26.79	28.58

Note: *includes sales tax, central sales tax (CST) and entry tax
**revenue and capital (excluding loans and advances) expenditures
Source: Compiled from Finance Accounts of Respective State Governments, various years

Unlike other taxes in the bouquet of taxes levied and collected by the State governments, sales tax/Value Added Tax is a difficult tax to forecast for two reasons. First, as discussed above, the revenue collections from this head are not bifurcated into revenues from commodities subject to VAT and revenue from sales of non-VAT goods. Second and more important, the tax regime underwent a substantial change with the replacement of a variety of indirect taxes by a more comprehensive Goods and Services Tax (GST) from 1 July 2017. This change in the tax regime means a number of radical changes in the components that contribute revenue to the state exchequer.

1. Central sales tax, a tax on inter-state trade accruing to the exporting state has been eliminated and replaced with a destination based tax – Integrated GST (IGST). This implies that revenues accruing from inter-state exports of goods do no longer exist in the GST system.
2. IGST also replaces Tax on Entry of Goods into Local Area (also known as Entry Tax) which used to be collected on goods imported from other states. Being a destination based consumption-type tax, in the GST regime, taxes will be accrued to where final consumption is taken place.
3. The tax base for taxation has shifted from sale of goods to supply of goods and services: this component results in an expansion in the tax base and depending on the

tax rates for goods and services, could result in an increase in revenue collections in the new regime.[2]

In addition to the above, there is a change in larger macro-economic change in the economy – the Reserve Bank of India (RBI) has been mandated to follow inflation targeting as a driving force for monetary policy interventions in the economy, with inflation targeted at 4 percent per annum. This change, if effectively implemented by the RBI, would result in lower rates of growth of nominal incomes and with unaltered buoyancies, lower rates of growth of revenues under sales tax.

Keeping all these factors in mind and with a view to cushion the revenues from shortfall in revenues during the transition to a comprehensive goods and services tax, the Union government has assured the states a 14 percent growth in revenues year on year, with the benchmark year being 2015-16 for the first five years of implementation of GST.

Given all these changes, a straightforward application of the frontier approach to determine potential revenue for states would be misleading. At the same time, the data available in the public domain on state revenue collections from GST would not be adequate to undertake a comprehensive and reliable forecast of revenues under the new regime. Therefore, this study is taking the middle path. The approach being adopted is described in the following section. This is followed by a brief description of the model being used and the results therefrom. Section 3 provides an estimate of the frontiers for comprehensive VAT revenue for the states under study in this paper. In section 4, we draw our conclusions.

2. Methodology

Using the information on tax collections under sales tax – including sales tax, VAT, CST and entry tax, we have estimated a revenue frontier using the stochastic frontier approach (SFA). The estimates of efficiency are extended forward with two alternative sets of assumptions. These along with forecasts of the revenue frontier for individual states provide a range of estimates for the revenue collections under this tax. Going forward into the GST regime, states would expect to do at least as well as they were performing within the earlier regime. Using this assumption, the estimates of revenue from this exercise are adopted for the new regime as well with one caveat: the states have been assured of a 14 percent year on year growth in revenue, from the revenue collection for the year 2015-16. This alternative series is used to correct the revenue forecast, if the estimate from the frontier approach falls short. The methodology adopted for estimating the revenue frontier is presented below.

Since potential tax revenue is not observable, SFA is used to estimate a revenue 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 and the actual

[2] Earlier inter-state consignment / branch transfers were exempted from CST. However, in the GST regime these transactions will attract IGST.

revenue collected 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). Battese and Coelli (1995) estimate the parameters of the stochastic frontier and the inefficiency model simultaneously to avoid bias. Using the maximum likelihood estimation technique, this method captures time-varying inefficiency that reflects observable heterogeneity. In this study time-variant tax efficiency is estimated across states by using methodology developed by Battese and Coelli (1988).

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 ith firm (i= 1,2,3,…, N) for the tth 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 ith firm at the tth 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. The model allows for explaining the behaviour of the technical inefficiency effects, the U_{it}s, as a function of a set of explanatory variables, the z_{it}s and an unknown vector of coefficients, δ. For the purposes of the present exercise, however, we refrain from exploring this component since the objective is to identify only the extent of inefficiency and therefore determine the level of potential revenue the state can achieve. We assume that U_{it} is having constant mean and variance.[3]

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$\left(\lambda \equiv \frac{\sigma_u}{\sigma_v}\right)$. The estimated λ needs to be non-negative and significant. 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 (idiosyncratic), and values of 1 indicating that all deviations are due to technical inefficiencies.

[3] Using the similar dataset, Mukherjee (2019b) estimates the inefficiency function by using some explanatory variables.

The technical efficiency of production for the ith firm at the t-th year is defined as follows (where all variables are taken in natural logarithm),[4]

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

ε_i is the composite error term

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

Given the estimated equation for the frontier, we have generated an out-of-sample forecast for the following five years, namely, 2016-17 to 2022-23 by using linear forecasts for the explanatory variables. The details used are discussed in a later section.[5] These estimated efficiencies for the individual states are then used to generate a measure of the realisable revenue in the forecast period.

2.1 The Estimated Model

For identifying the variables that influence the trends in revenue performance of the states under the VAT regime, it is useful to review the literature on the subject. There are four published studies based on SFA approach which estimate tax capacity and tax efficiency for Indian states. These studies vary in many features – a) methodology adopted, 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), 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 explores some variables influencing tax effort as well.

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 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

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

[5] Also see Appendix for detailed process of projections/ forecasting.

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.

Mukherjee (2019b) found that for the period 2001-02 to 2015-16, tax (comprehensive VAT) capacity of states is a function of the scale of economic activity (measured by GSDP) and of the structural composition of the economy. Tax capacity is lower in states that have a larger share of manufacturing and mining or industry vis-à-vis agriculture in GSDP and larger in states that have a larger share of services in GSDP vis-à-vis agriculture. The change in prices of mineral oils as measured by the WPI of mineral oils has a positive and significant impact on tax capacity. Tax capacity is larger in states that have sea ports and petroleum refineries. This study uses Battese and Coelli (1995) methodology for simultaneous estimation of tax capacity and tax efficiency across Indian states.

In principle, VAT replaces state sales tax system though it continues for some items (e.g., petrol, diesel, aviation turbine fuel, crude petroleum, natural gas and alcoholic beverages for human consumption). Given the data constraints, it is beyond the scope of the present study to differentiate the state tax revenues on account of taxes on sales, trade etc. into two separate baskets – VAT and non-VAT. We have considered state sales tax, central sales tax and entry tax for pre-VAT period and state VAT, state sales tax (for out of VAT items), central sales tax and entry tax for post-VAT periods to bring parity in the tax base for the period of our analysis. We have considered 2001-02 to 2015-16 as the period of our analysis which covers both pre- and post-VAT periods. We consider 2001-02 as a starting year of our analysis as three new states viz., Chhattisgarh, Jharkhand and Uttarakhand, were formed in 2000 from Madhya Pradesh, Bihar and Uttar Pradesh respectively and for them full financial year data on state finances is available only from 2001-02.

Drawing from the available literature, we identify the following variables for analysing the behaviour of revenue performance of VAT/sales tax collections of major states. Being consumption based tax, tax base of comprehensive VAT (including CST and Entry Tax) is dependent on consumption base of the state. In absence of representative annual consumption data for states, we have taken GSDP (at factor costs, current prices) as a proxy for consumption base. Collection of VAT decreases with rising share of export in GSDP. Though inter-state sales attract CST and due input tax credit (ITC) is adjusted against CST liability, states having comparatively larger share of out-of-state sales or CST sales (as compared to domestic sales) are expected to collect lower VAT revenue, as applicable tax rates for VAT and CST sales differ. The shift from origin to destination based tax system under the GST system will result in larger erosion of tax base for exporting states. States having larger share of mining, manufacturing or industry in GSDP are expected to have larger share of export as compared to domestic sales. Not being under VAT, the share of services in export is not important in eroding the tax base. However, it will be an issue in the GST regime. Agricultural commodities do not attract VAT. Except a few states where purchase tax is levied on foodgrains, erosion of tax base due to export of agricultural produces is very limited. In

absence of state-wise figures of exports (both inter-state and international), we have taken relative share of mining, manufacturing (or industry) vis-à-vis agriculture (excluding livestock, forestry and logging, and fishing and aquaculture) in Gross State Domestic Product (GSDP at factor cost, current prices, 2004-05 series) to capture the state's potential to export.

We can present the framework as follows:

$$\begin{aligned} \text{VAT Revenue} &= \text{tC} - \text{t}_1\text{X} \\ &= t(GSDP - I - G - X + M) - t_1 X \\ &= tGSDP - tA - X(t - t_1) \\ &= tGSDP - tA - f(\cdot)(t - t_1) \end{aligned}$$

Where,
C is the Private Final Consumption Expenditure (PFCE)
X is export
t and t_1 are tax rates on consumption and export respectively
I is the investment
G is the Government Final Consumption Expenditure (GFCE)
M is the import

We expect that export (X) potential of a state will depend on the following the function:

$$X = f\left(\underset{+}{\frac{mining}{agri}}, \underset{+}{\frac{mfg}{agri}}, \underset{-}{\frac{service}{agri}}\right) = f(\cdot)$$

$$A = I + G - M$$

Apart from the level and composition of GSDP, since the states earn considerable amount of revenue from petroleum products, the price of these products too would influence the revenue performance positively. Another factor that could influence the revenue performance of state is the presence of ports and/or petroleum refineries. Since the structure of the taxation regime is somewhat origin based, ports and refineries help states garner additional revenues. Using these variables, we have estimated the revenue frontier for the major states of India. The estimated model is reported below.

The exercise looks at comprehensive revenue collection under Value Added Tax (VAT) (including Sales Tax, Central Sales Tax and Entry Tax) of 17 general category states for the period 2001-16.

VAT Capacity Estimation:

$$lnvat = \beta_0 + \beta_1 lngsdp + \beta_2 ind/agri + \beta_3 serv/agri + \beta_4 lnmowpi + \beta_5 port + \beta_6 refinery + V_{it} - U_{it}$$

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. Lakh)*
ind/agri	*Share of industry vis-à-vis agriculture in GSDP (industry includes mining and quarrying, manufacturing, construction, electricity, gas and water supply)*
serve/agri	*Share of services vis-à-vis agriculture in GSDP*
lnmowpi	*Natural logarithm of wholesale price index (wpi) of mineral oil*
port	*Sea port dummy, 1 if any sea port is located in the state, 0 otherwise*
refinery	*petroleum refinery dummy, 1 if any petroleum refinery is located in the state, 0 otherwise*

We estimate maximum likelihood random- effects time-varying inefficiency effects model as developed by Battese and Coelli (1995) using *sfpanel* command in STATA (version 13.1) (as developed by Belotti et al 2012). The estimated result is presented in Table 2.

3. Results

The coefficients of the variables in the estimated model have the expected signs. As expected, higher GSDP is associated with higher revenues, as does higher relative share of services and a lower relative share of industry vis-a-vis agriculture. Higher prices of petroleum products as well as the presence of a port or petroleum refinery too contribute to higher revenue performance. The value of lambda in the model shows that the inefficacies are non-trivial and non-random.

Before discussing on result of forecasts, it would be appropriate to check the present status of four selected states in VAT collection and VAT efficiency. Table 3 shows that among other states VAT collection (as % of GSDP) as well as VAT efficiency is lower in Bihar. Being a low per capita income (as measured by Per Capita GSDP) state, lower VAT collection in Bihar may be due to lower tax capacity and/or lower tax efficiency. Reading the projection results provided in Table 4 along with Table 3, reveals that tax capacity in Bihar is not less than other states, but due to lower tax efficiency the state is not able to realise the potential VAT collection. Bihar is the only state where expected VAT collection with 14 percent growth rate is lower than potential VAT collection. Though a middle per capita income state, VAT efficiency in Rajasthan is higher than Gujarat, a high per capita income state. This shows that revenue profile may not be only dependent on their tax capacity but also on tax efficiency. Given tax base, improving tax efficiency may help states to mobilise larger public resources for social sector expenditures. VAT efficiency in Tamil Nadu is relatively higher than other three policy states and it is in expected line. The maximum gain from assured 14 percent growth in VAT collection will be for Rajasthan.

Table 2: Estimated Results of VAT Potential Revenue Frontier

Components	Dependent Variable:	lnvat		
	Description	Coefficient		Std. Error
Stochastic Frontier	constant	-7.365	*	0.183
	lngsdp	0.890	*	0.019
	ind/agri	-0.037	*	0.011
	serv/agri	0.036	*	0.010
	lnmowpi	0.291	*	0.043
	port	0.127	*	0.032
	refinery	0.182	*	0.026
Inefficiency Function	constant	-20.753		29.235
Diagnostic Stat.	sigma_u	2.001		1.379
	sigma_v	0.055	*	0.01
	lambda	36.489	*	1.378
	gamma	1.00		
Basic Information	Number of Observations	255		
	Number of Groups	17		
	Wald chi2 (df: 6)	20592		
	prob>chi2	0.000		
	Log Likelihood	107.509		
	Mean Efficiency	0.841		

Notes: * implies estimated z-statistics are significant at 0.01 level

Table 3: VAT Collection and VAT Efficiency of Selected Indian States

State	Description	2001-02	2005-06	2010-11	2015-16	Average 2001-16
Bihar	VAT Collection (Rs. Crore)	1,438.77	2,346.97	6,562.49	16,690.40	6,259.36
	As % of GSDP	2.36	2.85	3.22	4.16	3.21
	Per Capita GSDP (Rs.)	7,215.37	9,149.11	20,943.60	35,834.30	17,963.22
	Tax Efficiency	0.48	0.52	0.60	0.76	0.59
Gujarat	VAT Collection (Rs. Crore)	5,857.40	10,561.30	24,893.40	44,091.10	21,723.63
	As % of GSDP	4.41	4.32	4.77	4.71	4.63
	Per Capita GSDP (Rs.)	25,879.30	44,789.00	88,841.80	145,970.00	75,712.31
	Tax Efficiency	0.87	0.82	0.90	0.91	0.87
Rajasthan	VAT Collection (Rs. Crore)	3,092.13	5,830.35	12,860.30	27,192.50	11,824.95
	As % of GSDP	3.09	4.10	3.80	5.06	4.07
	Per Capita GSDP (Rs.)	17,424.60	23,008.90	50,199.30	73,426.30	40,644.57
	Tax Efficiency	0.81	0.95	0.91	0.96	0.92
Tamil Nadu	VAT Collection (Rs. Crore)	8,668.25	16,539.60	30,239.40	59,672.80	28,891.93
	As % of GSDP	5.38	6.41	5.17	5.65	5.82
	Per Capita GSDP (Rs.)	25,675.60	39,707.60	86,943.70	140,333.00	71,947.06
	Tax Efficiency	0.96	0.98	0.92	0.95	0.96

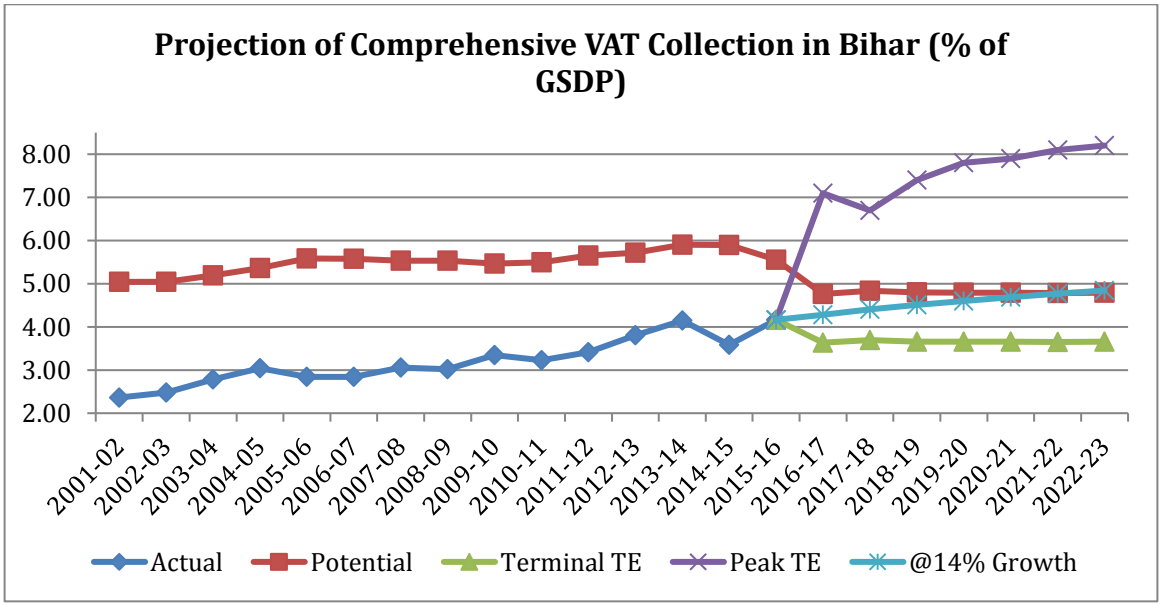
Using the above model we have forecasted the frontier for the selected states for a period of five years using the following assumptions:

Assumptions on the exogenous variables are presented in the Appendix.

1. Assumptions regarding inefficiency: The estimation of realisable revenue would require some estimate of inefficiency. As a baseline, one assumes that the inefficiency remains constant at the level achieved in the terminal year of the sample period, i.e., 2015-16. The two alternative scenarios presented are: one, an increase in efficiency to peak level achieved in the sample period (2001-16) and second, a growth of 14 percent year on year from 2015-16, following the commitment of the Union government to compensate state for any revenue loss on account of implementation of GST.[6]

   The estimated revenue figures are presented in the Table 4 for the selected states. As is evident from the Table 3, except Bihar a 14 percent growth in revenue seems the best performance scenario for other states,[7] when compared to the revenues from the frontier estimates suggesting that at least in the short run, the states stand to gain from the shift to the GST regime. For Bihar, potential revenue from VAT is higher than revenue expected with 14 percent growth rate (Figure 1). In other words, Bihar has tax capacity to sustain 14 percent growth rate in tax collection during the GST compensation period and for that Bihar needs to improve tax effort. Strengthening tax administration could help Bihar to improve tax effort and therefore mobilise revenue to sustain 14 percent growth rate.

Figure 1: Projection of Comprehensive VAT Collection in Bihar (as % of GSDP)

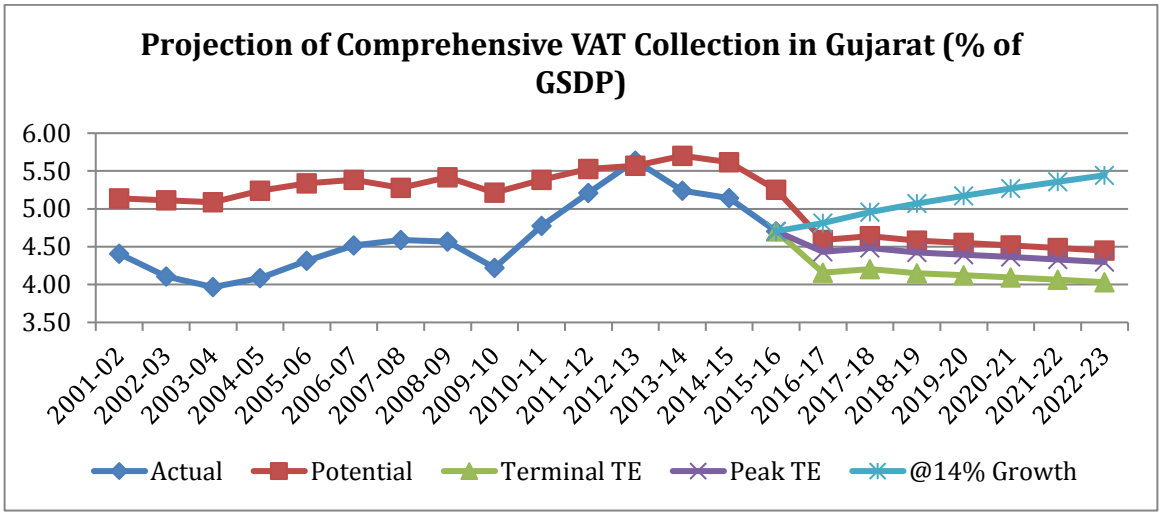


[6] Please note that GST Compensation will be based on net revenue collection with reference taxes subsumed under GST.

[7] However for Bihar, potential revenue from VAT is higher than revenue expected with 14 percent growth rate.

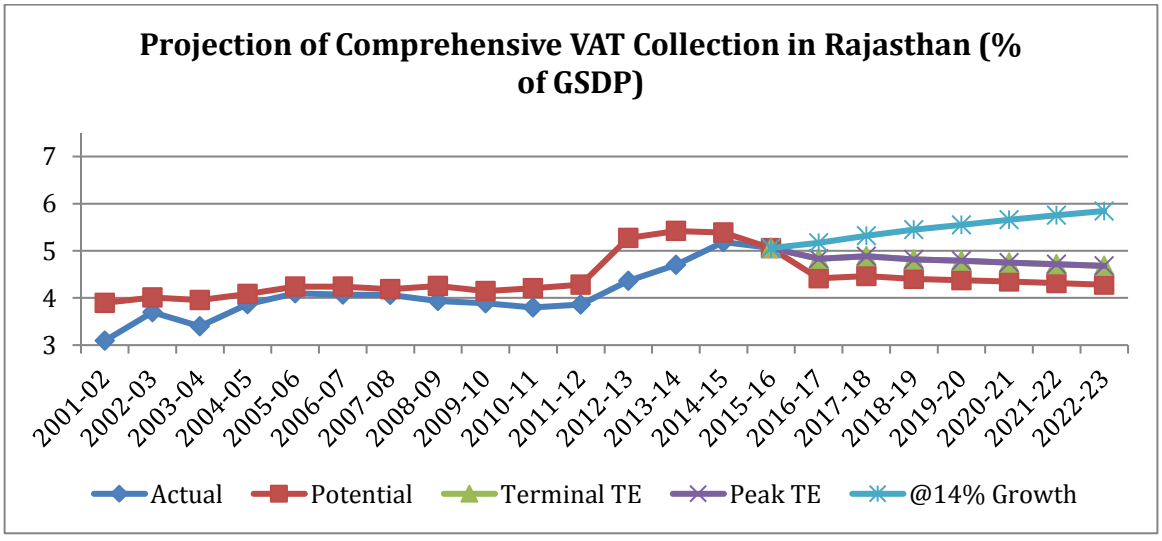
Figure 2 shows that Gujarat is going to gain from the GST compensation if GST collection falls short of 14 percent annual growth rate. The state has improved tax effort substantially since 2010-11 but a falling trend in tax capacity is observed since 2014-15. The state's tax capacity is falling short of 14 percent growth rate with reference to actual tax collection in 2015-16.

Figure 2: Projection of Comprehensive VAT Collection in Bihar (as % of GSDP)



Rajasthan is going to gain from 14 percent growth rate in tax collection with reference to actual collection of taxes subsumed under GST in 2015-16 (Figure 3). Similar result also holds for Tamil Nadu.

Figure 3: Projection of Comprehensive VAT Collection in Rajasthan (as % of GSDP)



The analysis shows that tax capacity is falling since 2014-15 for all the four states analysed here. The reason for such a fall could be attributed to falling growth rate in GSDP, as observed since 2014-15.

4. Conclusions

The analysis shows that tax capacity (in comprehensive VAT collection) is function of size (GSDP) and structural composition (share of agriculture, industries and services) of the state's economy. In addition, tax capacity depends on prices of petroleum products, existence of sea port and petroleum refineries in the state. The analysis is based on projections of expected growth rate in GSDP and sectoral composition thereof. Improvements in economic growth and shifting of sectoral share in favour of agriculture and services are expected to improve tax capacity. Being a destination based tax, in the GST regime existence of sea port and petroleum refineries may not add to tax capacity, except that it will support employment and therefore expand the consumption base. Domestic prices of petroleum products depend on international crude oil price, exchange rate and union and state tax rates. Given the projection of global crude oil price remaining low and contemporary policy stance of the union government to increase tax rates (and not to pass on the benefits of lower crude oil price to consumers), it is expected that landed price of petroleum products for States will either increase or remain stagnant in the coming years. Therefore, there will be scope for States to expand tax base by increasing tax rates on petroleum products, however they need to accommodate political costs associated with increasing prices of petroleum products as a result of increasing tax rates.

The analysis shows that relatively low income state (Bihar) has tax capacity to sustain 14 percent growth rate in tax collection whereas middle income (Rajasthan) and high income (Gujarat and Tamil Nadu) States do not have tax capacity to sustain 14 percent growth rate during the GST compensation period. With availability of state level GST collection information in the public domain, future studies may consider exploring States' capacity to sustain 14 percent growth rate beyond GST compensation period.

If the GST compensation period is not extended beyond June 2022, it is expected that there will be substantial revenue shock for majority of Indian States and the duration of the shock will vary across States depending on their economic growth rate and structural composition of the economy. It will be desirable for States to explore possibilities to moderate the impact of revenue shock by increasing collection of non-GST taxes and non-tax revenues. In the face of revenue uncertainty, containing expenditures is another dimension which States may consider exploring. In 2015-16 for all 17 major states, together salaries, subsidies and pensions accounts for 36 percent of revenue receipts, 55 percent of own (tax and non-tax) revenue, 36 percent of revenue expenditure and 86.5 percent of Central transfers. Therefore, it will be important to contain expenditures on account of these heads and give more importance to delivery of public goods and services.

Table 4: Projection of VAT Collection across Selected Indian States

State	Description	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Bihar	Potential VAT Collection (Rs. Crore) (VAT Capacity)	21,160.80	23,793.39	26,287.76	29,366.22	32,829.55	36,789.09	41,300.28
	As % of GSDP	4.76	4.84	4.80	4.79	4.79	4.79	4.79
	Estimated VAT Collection with Terminal Year (i.e., 2015-16) Tax Efficiency (Rs. Crore) (Base Line)	16,149.34	18,158.46	20,062.10	22,411.49	25,054.61	28,076.43	31,519.25
	As % of GSDP	3.63	3.69	3.66	3.66	3.65	3.65	3.66
	Estimated VAT Collection with Peak Tax Efficiency* (Rs. Crore)	16,149.34	18,158.46	20,062.10	22,411.49	25,054.61	28,076.43	31,519.25
	As % of GSDP	3.63	3.69	3.66	3.66	3.65	3.65	3.66
	Estimated VAT Collection with 14% Growth Rate** (Rs. Crore)	19,027.06	21,690.84	24,727.56	28,189.42	32,135.94	36,634.97	41,763.87
	As % of GSDP	4.28	4.41	4.51	4.60	4.69	4.77	4.84
	Projected GSDP (at factor cost, current prices, 2004-05 Series) (Rs. Lakh)	44,440,000	49,195,080	54,803,319	61,270,111	68,561,254	76,857,166	86,233,740
Gujarat	Potential VAT Collection (Rs. Crore) (VAT Capacity)	47,932.56	53,656.02	58,986.82	65,527.42	72,794.05	80,988.12	90,168.55
	As % of GSDP	4.59	4.64	4.58	4.55	4.52	4.48	4.45
	Estimated VAT Collection with Terminal Year (i.e., 2015-16) Tax Efficiency (Rs. Crore) (Base Line)	43,427.79	48,613.35	53,443.16	59,369.06	65,952.76	73,376.75	81,694.38
	As % of GSDP	4.16	4.21	4.15	4.12	4.09	4.06	4.03
	Estimated VAT Collection with Peak Tax Efficiency* (Rs. Crore)	46,295.32	51,823.28	56,971.99	63,289.18	70,307.61	78,221.80	87,088.64
	As % of GSDP	4.43	4.48	4.42	4.40	4.36	4.33	4.30
	Estimated VAT Collection with 14% Growth Rate** (Rs. Crore)	50,263.85	57,300.79	65,322.90	74,468.11	84,893.65	96,778.76	110,327.78
	As % of GSDP	4.81	4.96	5.07	5.17	5.27	5.36	5.44
	Projected GSDP (at factor cost, current prices, 2004-05 Series) (Rs. Lakh)	104,434,000	115,608,438	128,787,800	143,984,760	161,118,947	180,614,339	202,649,289

Rajasthan	Potential VAT Collection (Rs. Crore)	30,082.22	33,674.23	37,019.81	41,124.65	45,685.15	50,827.71	56,589.29
	As % of GSDP	5.01	5.07	5.00	4.97	4.94	4.90	4.86
	Estimated VAT Collection with Terminal Year (i.e., 2015-16) Tax Efficiency (Rs. Crore) (Base Line)	28,965.43	32,424.09	35,645.47	39,597.92	43,989.11	48,940.76	54,488.44
	As % of GSDP	4.83	4.88	4.82	4.79	4.75	4.72	4.68
	Estimated VAT Collection with Peak Tax Efficiency* (Rs. Crore)	28,965.43	32,424.09	35,645.47	39,597.92	43,989.11	48,940.76	54,488.44
	As % of GSDP	4.83	4.88	4.82	4.79	4.75	4.72	4.68
	Estimated VAT Collection with 14% Growth Rate** (Rs. Crore)	30,999.45	35,339.37	40,286.89	45,927.05	52,356.84	59,686.79	68,042.94
	As % of GSDP	5.17	5.32	5.45	5.55	5.66	5.75	5.84
	Projected GSDP (at factor cost, current prices, 2004-05 Series) (Rs. Lakh)	59,994,000	66,413,358	73,984,481	82,714,650	92,557,693	103,757,174	116,415,549
Tamil Nadu	Potential VAT Collection (Rs. Crore)	61,768.59	69,144.16	76,013.73	84,442.32	93,806.50	104,365.85	116,196.26
	As % of GSDP	5.05	5.11	5.04	5.01	4.98	4.94	4.90
	Estimated VAT Collection with Terminal Year (i.e., 2015-16) Tax Efficiency (Rs. Crore) (Base Line)	58,883.83	65,914.94	72,463.69	80,498.63	89,425.49	99,491.69	110,769.58
	As % of GSDP	4.82	4.87	4.81	4.78	4.74	4.71	4.67
	Estimated VAT Collection with Peak Tax Efficiency* (Rs. Crore)	60,613.00	67,850.58	74,591.63	82,862.53	92,051.52	102,413.32	114,022.41
	As % of GSDP	4.96	5.02	4.95	4.92	4.88	4.85	4.81
	Estimated VAT Collection with 14% Growth Rate** (Rs. Crore)	68,026.99	77,550.77	88,407.88	100,784.98	114,894.88	130,980.16	149,317.39
	As % of GSDP	5.57	5.73	5.87	5.98	6.09	6.20	6.30
	Projected GSDP (at factor cost, current prices, 2004-05 Series) (Rs. Lakh)	122,210,000	135,286,470	150,709,128	168,492,805	188,543,448	211,357,206	237,142,785

Note: *- Peak tax efficiency implies maximum tax efficiency achieved by the State during 2001-02 to 2015-16, **- in this scenario we have assumed 14% growth rate (Year-to-Year) in VAT Collection with reference to actual VAT collection in 2015-16.

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Appendix: Note on Data Projection

GSDP Projection: For projection of GSDP growth rate for the period 2016-17 to 2022-23, we have relied on India's Real GDP Growth projection of International Monetary Fund (IMF)[1]. IMF's World Economic Outlook 2018 projects India's GDP growth rate upto 2023. For nominal GDP growth rate, we have marked up real GDP growth rate by 4 percent. This is in line RBI's inflation targeting framework. We also assumed that States will grow at the same rate like all India.

Sectoral Share of GSDP Projection: For Bihar and Gujarat, we have projected sectoral share of GSDP for Agriculture (excluding livestock, forestry and logging, fishing and aquaculture in GSDP), Industries and Services for the period 2016-17 to 2022-23. We found significant relationship between sectoral share of GSDP and time (or year) for Bihar. For other states we assume terminal year's of agriculture, industries and services in GSDP will persist for the period 2016-17 to 2022-23.

Projection of Wholesale Price Index (WPI) of Mineral Oil: First, we have estimated linear regression between WPI of Mineral Oil (WPIMO), data retrieved from EPWRF India Time Series Database, for the period of our analysis 2001-02 to 2015-16 on International Crude Oil Price (Indian Basket) (USD / BBL), data available from Petroleum Policy Analysis (PPAC) Website. Secondly, using IMF's Medium Term Commodity Price Baseline for Spot Crude[2,3], we have estimated annual growth rate of Global Oil Price. Thirdly, using the growth rate, we have estimated the International Crude Oil Price (Indian Basket) from 2016-17. Fourthly, based on estimated relationship between WPIMO and International Crude Oil price (WPIMO = 52.76 + 1.36 Crude Oil Price, R^2=0.69), we have estimated WPIMO for the period 2016-22.

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[1]http://www.imf.org/external/datamapper/NGDP_RPCH@WEO/IND

[2]Petroleum price is average of spot prices for U.K. Brent, Dubai and West Texas Intermediate.

[3]http://www.imf.org/external/np/res/commod/data/data0717.xls

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Sacchidananda Mukherjee, is Associate Professor, NIPFP
Email: sacchidananda.mukherjee@nipfp.org.in

National Institute of Public Finance and Policy,
18/2, Satsang Vihar Marg,
Special Institutional Area (Near JNU),
New Delhi 110067
Tel. No. 26569303, 26569780, 26569784
Fax: 91-11-26852548
www.nipfp.org.in