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**Measuring Tax Administration Effectiveness  
and its Impact on Tax Revenue**

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**Abstract:** *This paper proposes a method for constructing a tax administration measure of effectiveness or TAME, and describes its desirable properties. TAME was empirically constructed using data from external audits of value-added tax administrations of India's state governments. TAME was used to quantitatively assess the impact of tax administration effectiveness on tax revenues. The impact was found to be both statistically significant and large. The causes of tax administration effectiveness in the poorly performing states were then identified. Finally, this paper suggests guidelines for constructing TAMEs for other jurisdictions and time periods.*

**Keywords:** effectiveness, India, tame, tax administration, tax revenues, value-added tax

**JEL Classification:** H21, H25

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## 1. Motivation and Scope

There have been studies of tax administration (TA) effectiveness in the past. A number of studies examined the impact of TA on tax revenue and other dimensions of tax performance. What is lacking in the literature is a tax administration measure of effectiveness (TAME) that will permit comparison of the impact of TA effectiveness on tax performance across jurisdictions and time periods.<sup>1</sup>

Such a standardised measure, provided it is relatively easy to construct, will be of great use to policymakers in comparing TA effectiveness across time and jurisdictions, and in tracking the implementation of TA reform programmes.

For example, the Government of India has proposed to implement a nationwide goods and services tax by April 2016 at both the central and state levels.<sup>2</sup> As part of the reform package, the central government has committed to compensate states for any revenue shortfall that may arise during the transition from the current (goods only) value-added tax (VAT) regime. The compensation may create a potential moral hazard and, thus, jeopardize the reform process if it causes states to slow down the process of reforming their TAs.

In this paper, we propose a TAME and empirically construct it, using data from external audits of VAT administrations of India's state governments. We then use the measure to quantitatively assess the impact of TA on tax revenues. We next examine the causes of limited effectiveness in different states to identify specific weaknesses in tax administration. We also suggest guidelines for empirically constructing the TAMEs for other jurisdictions and time periods. Our approach differs from earlier studies in that we use data available from external audits and, thus, do not have to rely on expensive special surveys. At most, a relatively small increase in the cost of audits will be needed. Our analysis revolves around the features of TA itself rather than the TA environment.<sup>3</sup> While the environment almost surely impacts TA effectiveness, we treat it as a factor affecting the taxable base rather than TA itself.

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<sup>1</sup> Collections of indicators of TA Effectiveness (but not a composite TAME) are in Barbone, Das-Gupta, de Wulf and Hansson (1999); de Wulf (2000); Gill (2000); Klun (2004); Crandall (2010); World Bank (2011); and Das-Gupta (2013). See also Hasseldine (2010) and Alink, van Arendonk, van Kommer, and Kogels (2011).

<sup>2</sup> See, for example, *The Times of India* (10 December 2014).

<sup>3</sup> For an extensive discussion see Bagchi, Bird, and Das-Gupta (1995).

## **2. Tax Administration Effectiveness and Tax Revenue Mobilisation**

Despite the large literature on TA and compliance and their impact on tax revenue, there have been few attempts to quantify this impact, perhaps due to the non-availability of a suitable TAME. Das-Gupta, Lahiri, and Mookherjee (1995) used macro data on India's income tax to examine the impact of a handful of TA enforcement variables on tax revenue. Results show that improving assessment efficiency contributed 25.5 percent of additional revenue on average (maximum of 43.5 percent), compared to the sample year with the worst assessment efficiency.<sup>4</sup> Other enforcement indicators, such as search and seizure activity, had insignificant effects on tax revenue. In an extensive study of the impact of a variety of TA activities in the United States, Plumley (1996) looks primarily at return filing and taxpayer compliance with the income tax rather than tax revenue.

Rarely are there studies that quantify the impact of administrative measures on tax revenues at the subnational levels. One study that captured the impact of administrative reform on growth in VAT revenues at the state level is that by Pinhanez (2008). Her study covered 27 states of Brazil over the years 1997–2004. Administrative reform in the study refers to 14 policy variables that measure administrative efficiency, computerization, and training. Most policy variables were found to be significant in affecting VAT revenue growth. The impacts of policy measures were also assessed in terms of the state's level of development. The study found that policy reform affected all states equally, regardless of their level of economic development.

Before proceeding, we must mention the World Bank Group's 'Doing Business' annual surveys, which have been carried out since 2004.<sup>5</sup> Its 'Paying Taxes' survey 'records the taxes and mandatory contributions that a medium-sized company must pay in a given year as well as measures of the administrative burden of paying taxes and contributions'.<sup>6</sup> While these surveys provide useful information on the compliance burden of the hypothetical representative company, these are silent about TA itself. The surveys provide no information, for example, on non-business taxpayers, taxpayer

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<sup>4</sup> Assessment efficiency was measured by the 'work disposal rate' (WDR) or the ratio of assessments of filed tax returns completed during the year to assessments for disposal during the year.

<sup>5</sup>World Bank Group (2015a).

<sup>6</sup>World Bank Group (2015b).

services provided by TA, or tax enforcement. Alm (1999) and Epstein and Gang (2010) survey other studies that delve into other relevant aspects of tax compliance.<sup>7</sup>

### ***Conceptual framework***

A simple conceptual framework that relates TA effectiveness to tax revenue is presented below. The basic equation is from Das-Gupta, Lahiri and Mookherjee (1995):

$$R_j = t_j \cdot B_j \cdot C_j \quad (1)$$

where  $R_j$  is tax revenue for the chosen period in the  $j$ th jurisdiction

(or, alternatively, in the  $j$ th year),

$t_j$  is the effective tax rate in  $j$ ,

$B_j$  represents the potential tax base in  $j$ , and

$C_j$  (“compliance”) is the proportion of the potential tax base that is actually taxed in  $j$ .

For broad-based taxes like the VAT,  $B_j$  can be taken to be related to some measure of national income  $Y_j$  and, possibly, a variable seeking to capture how concentrated the tax base is in terms of the number of taxpayers,  $N_j$ . Higher concentration improves the ability of TA to collect taxes, other things equal, as discussed in Bagchi, Bird, and Das-Gupta (1995). Other factors include the complexity of the tax code, the extent of the cash economy, the duration of tax disputes, and burdensome procedures or record-keeping requirements that increase taxpayer compliance costs. Fortunately, in our empirical analysis, we can take these factors as similar across jurisdictions or relatively stable over short time periods. Therefore, the constant term of the regression equation will reflect them. Thus, for the tax base, assuming a log linear functional form, there is

$$B_j = b_0 Y_j^{b_1} N_j^{b_2} \quad (2)$$

where  $b_0$ ,  $b_1$  and  $b_2$  are positive constants.

Taxpayer compliance will depend on taxpayer compliance attitudes,  $E_j$  and TA effectiveness,  $T_j$ :

$$C_j = c_0 E_j^{c_1} T_j^{c_2} \quad (3)$$

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<sup>7</sup> An article by Abiola and Asiwah (2012) uses an online opinion survey to assess the effectiveness of Nigeria’s tax administration.

where  $c_0$ ,  $c_1$  and  $c_2$  are positive constants.

Assuming taxpayer compliance attitudes as given during the short run or across relatively similar jurisdictions implies  $E_j = E_k$ ,  $j \neq k$ . So the term  $E_j^{c_1}$  can be merged with the constant term  $c_0$ .

Substituting (2) and (3) into (1) and collecting terms gives

$$R_j = a_2 t_j Y_j^{b_1} N_j^{b_2} T_j^{c_2} \quad (4)$$

where  $a_2 = b_0 c_0 E_j^{c_1}$ .

A final modification that is applicable in our empirical implementation is to take advantage of the uniformity of VAT rates in India's states, which implies that  $t_j = t_k$ ,  $j \neq k$ . Defining  $a_1 = a_2 t_j$  gives the final equation relating the TAME to tax revenue after controlling for the tax base:

$$R_j = a_1 Y_j^{b_1} N_j^{b_2} T_j^{c_2}. \quad (5)$$

### 3. Factors Contributing to Tax Administration Effectiveness

As noted earlier, the TA environment can affect the size of the tax base. One potential determinant of the tax base—the concentration of taxpayers—will be incorporated into the empirically testable equation (5).

The factors that should ideally be incorporated into a TAME can be divided into five groups, as follows:

- a. ***Tax administration powers and their exercise.*** The powers of TA inspectors on assessment, detailed tax audits, inspection of taxpayer business premises, imposition of penalties, tax prosecutions, and other relevant issues should be adequate as laid down in the tax law or tax administration law. TA procedural manuals and rules, forms for taxpayers, and related online or off-line supporting documents should also be more or less complete and easily accessed by both the tax administrators and taxpayers.
- b. ***Tax administration inputs.*** These broadly include capital, technology, labour, and especially tax inspectors and senior supervisors, as reflected in the extent of deployment of information technology in different functional areas. Since most

governments, particularly in Asia, have yet to move to full-scale accrual accounting, including asset and liability accounting, balance sheets that enable the estimation of net capital employed may not be available.<sup>8</sup> An admittedly inferior alternative to this may be information on the TA's annual budget or expenditure other than its wages and salary bill.<sup>9</sup>

- c. ***Tax administration input allocation.*** A general principle of efficient and effective resource allocation is that the returns for each activity (here, in terms of their contribution to revenue) should be equal at the margin. If information exists on input allocations—or only manpower allocations—these can be compared to best practice benchmarks based on the existing literature. Activities can be classified into 10 or so functional areas: (i) taxpayer identification or surveys to identify unregistered potential taxpayers, (ii) registration of taxpayers and taxpayer numbering, (iii) tax return receipt and processing, (iv) tax audits, (v) post-audit appeals, (vi) sanctions and prosecutions, (vii) normal and delinquent tax collection, (viii) taxpayer assistance and services, (ix) internal audit, and (x) training and housekeeping services—like posting and transfers across functions or regions, building upkeep, and so on.
- d. ***Tax administration output—quantity.*** Measures of workload disposal can be constructed for most functional areas and compared to existing best practice benchmarks, previous periods, or an average across jurisdictions. In particular, output per tax inspector enables comparison of productivity across TAs or time periods.
- e. ***Tax administration output—quality.*** This can be assessed by carefully selecting variables relating to duration, arrears, or revenue loss for each functional area. Examples include (i) duration taken to complete assessments; (ii) appeals or penalty proceedings; (iii) tax collection or workload arrears, including records that have not been updated; and (iv) quality of tax return assessments and taxpayer audits as reflected in external auditor's findings of unrecovered revenue when TA is audited.

While all TA dimensions described above are essential for effective TA, not all of them need to be included in a TAME. Several items may be highly correlated. For example, input availability will likely be correlated with some indicators of the quantity of TA output. Second, some quality indicators, such as those for tax return receipt (for example, the proportion of stopfilers), may require effectiveness at earlier

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<sup>8</sup>See for example PwC (2013).

<sup>9</sup>While the focus here is on TA *effectiveness*, the budgetary cost to tax revenue ratio is widely used as a basic measure of TA *efficiency*.

stages of TA dealings with taxpayers, such as taxpayer numbering and registration. Hence, we can omit either the former or the latter from the TAME. The indicators that should or need not be included can be ascertained empirically. We now present the construction details of our empirical TAME.

#### **4. Construction of an Empirical Tax Administration Measure of Effectiveness**

This section describes how we constructed a tax administration measure of effectiveness (TAME) that can be used for empirical analysis.

##### ***Data source and limitations***

The TAME constructed here is for states' VAT tax administration in India. The basic information for the study comes from state-by-state reviews by the Comptroller and Auditor General (CAG). Most states of India adopted a goods only VAT in the fiscal year (FY)2005–2006, although a few had done so earlier and others delayed adoption by a year or two.<sup>10</sup>A blueprint for effective VAT administration had been provided in 2005 by the government of India.<sup>11</sup>Reviews by the CAG were carried out to assess the extent to which states had implemented reforms to make their TAs effective. The government blueprint was used as a benchmark by the CAG reviews. As such, the main data source for this paper's TAME is the special 2009 reviews by the CAG of 23 states of India to assess their success in implementing the government blueprint. The annual audits by the CAG of state VAT (or commercial tax) departments for India's FY2008–2009, FY2009–2010, and FY2010–2011 were also used.<sup>12</sup>

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<sup>10</sup>For the exact dates, see Table 2 in Das-Gupta (2012).

<sup>11</sup>See Government of India (2005). Also see Government of India (2006).

<sup>12</sup>A full list of the 57 CAG audit reports used is available in Das-Gupta (2013). Only the overview report, Government of India (2010) is cited here. Reports are available online by searching for specific states and years using the phrase "revenue receipts", Report type: Compliance, Sector: Taxes and duties on the <http://www.cag.gov.in/audit-reports>. For example, the 2009 report for the state of Andhra Pradesh which is available at <http://www.cag.gov.in/content/report-2009-compliance-audit-revenue-government-andhra-pradesh>, can be found by searching for "revenue receipts" for State: Andhra Pradesh, year: 2–9, sector: taxes and duties; report type: compliance.

These information sources were used by Das-Gupta (2013) to construct quantitative indices for 12 different aspects of TA functions and infrastructure. Given non-uniform coverage across states, Das-Gupta (2013) ultimately constructed indices for 16 states.<sup>13</sup> Even for this smaller sample, indices pertaining to 7 of the 12 areas alluded to could not be used due to missing data for many states.

A limitation of the CAG special reviews was the non-random sample selection. In each state, ‘a few’ units were selected in addition to the state VAT headquarters. For its regular audits, the CAG randomly selects a fraction of units in the state then examines all returns filed in those units. Unfortunately, no definition of the term ‘unit’ is given by the CAG, which means that this may vary across states.<sup>14</sup>

### ***Variables and sources***

Data and sources are reported in Appendix Table A1 and Table A2. In particular, the data transformation used to facilitate TAME construction is reported in the notes below Appendix Table A1. The four TAME candidates are reported in Appendix Table A3. Variable definitions are found in Appendix Table A4.

***VAT revenues:*** ‘Taxes on Commodities and Services, i) Sales Tax, a) State Sales Tax/VAT’ are taken from the Reserve Bank of India’s annual ‘State Finances: A Study of Budgets’.<sup>15</sup> Data were collected for four fiscal years—FY2007–2008, FY2008–2009, FY2009–2010, and FY2010–2011—for reasons explained below.

***Base variable Y:*** Gross state domestic product (GSDP) from the Planning Commission, Government of India (2015) for FY2008–2009, FY2009–2010, and FY2010–2011.

***Base variable N:*** Since the information needed to construct a concentration index was not available, VAT-revenue-per-dealer was taken as the indicator.<sup>16</sup> However, to avoid the problem of an endogenous independent variable, we used lagged VAT revenue as an instrument. Therefore, the concentration instrument for FY2008–2009 uses VAT revenue for FY2007–2008.

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<sup>13</sup>These states are Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, and West Bengal.

<sup>14</sup>The information in this paragraph was obtained from a CAG official in an exchange of e-mail messages dated-1 and 3 January 2013.

<sup>15</sup> Reserve Bank of India (various years).

<sup>16</sup> Registered VAT taxpayers in India are called dealers.



Since data for only 16 states are available, we decided to repeat the TAME data for three years using the revenue and GSDP data and VAT per dealer data of the relevant years. The rationale for this was, first, to increase the number of observations for the empirical analysis. Second, despite the likely limited additional cost of constructing a TAME, it is unlikely that a TAME will be constructed every year. Furthermore, in the absence of a major TA reform, it is unlikely that the TAME will vary greatly. For these reasons, TAME was repeated three times for the three different years. This strategy appeared to work well for each of the three years.<sup>17</sup>

### ***TAME components***

The TA components are listed, along with the category to which they belong, in Appendix Table A4. Of the 14 indicators, two pertain to TA powers, two to inputs, one to output quantity, and the remaining nine to output quality. The output indicator that all quality and quantity indicators address is assessment of returns filed. Indicators numbered 7–12 are actually indicators of ineffectiveness and, thus, needed to be transformed as explained in the notes to Table A1. Also, Indicator 12 is a weighted average of indicators 11a to 11c and so should not figure simultaneously in a TAME. Therefore, the number of indicators available for TAME construction is either 13 or 11.

TAMEs based on these data will, therefore, largely reflect output quality, as evident in mistakes made in assessing filed tax returns. Unfortunately, there is no indicator for organisation structure or other input allocation indicators. In particular, the dealer profile, including large taxpayer units and simplified regime dealers, was reported for only some states. Similarly, while data were available from Das-Gupta (2013) on the number of officers and offices, there were too many missing observations on the number of officers. Missing data also prevented the inclusion of indicators of taxpayer numbering and registration control, return stop-filing or late-filing and follow up, and in-depth tax audits. TA budget data or other data on capital employed was not reported by the CAG. On the other hand, all state TAs studied by the CAG neglected an available network<sup>18</sup> to match information across states and

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<sup>17</sup> TAME slope and intercept dummy variables for the three years were small and very insignificant, supporting our hypothesis of an unchanged TAME impact across the three years.

<sup>18</sup> Tinxsys or tax information exchange system.

dealers, contributing to widespread fake documentation and over-claiming of input tax credits even in the best administered states.

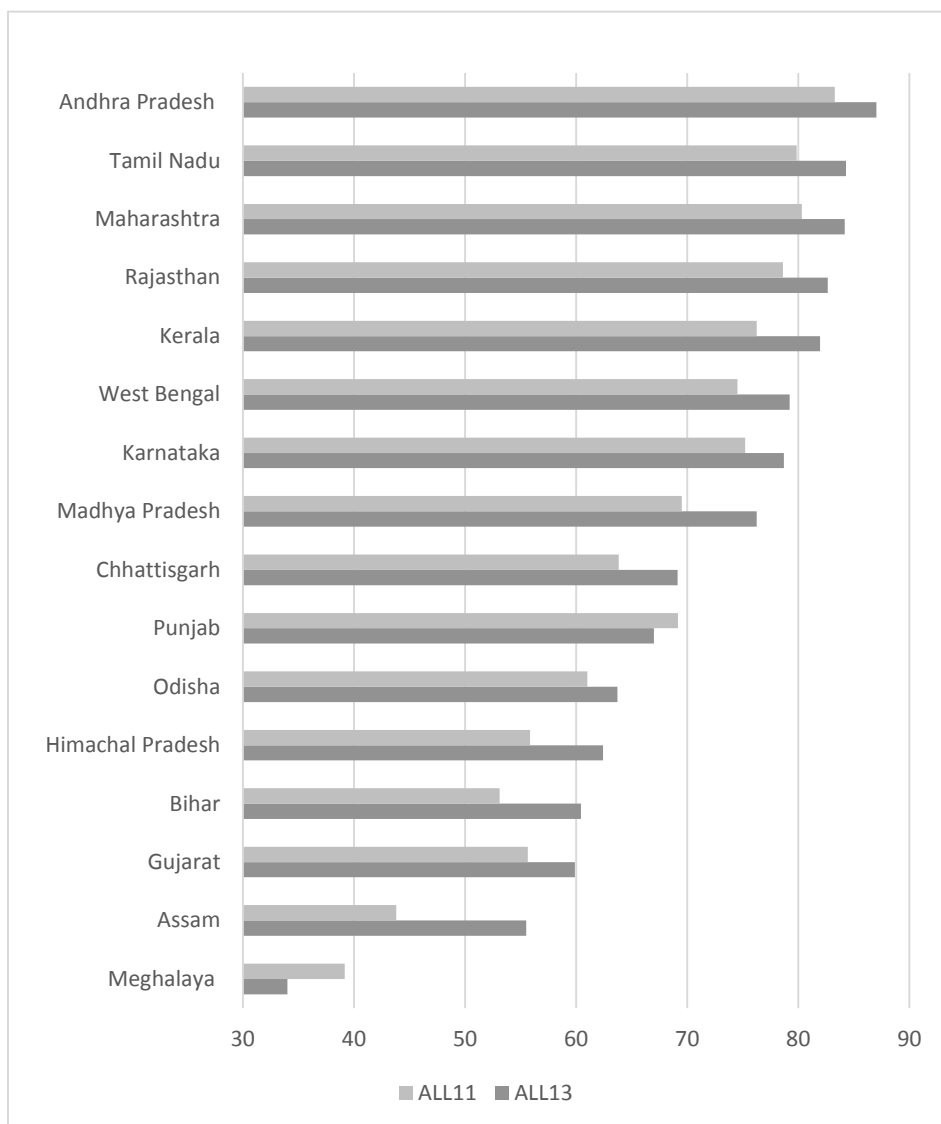
Appendix Table A3 lists the four TAMEs constructed. The first two (ALL13 and ALL11) are averages over available observations of all available indices, including either indicator 11 or 12. The other two TAMEs—FULL9 and FULL7—drop four indicators with missing values in some states (auditpc, CAGrecoverypc, dealer\_office and stopfilerpc) from ALL13 and ALL11, respectively. Three of the excluded indicators refer to quality of TA outputs percent of cases selected for tax audits (auditpc), recoveries as percent of accepted CAG objections (CAGrecoverypc), and percent of returns due that are either not received or received late (stopfilerpc). The other excluded indicator pertains to a TA input—the number of dealers or taxpayers per office (dealer\_office).

Figure 1 shows TAME indices by state for the first two types—ALL13 and ALL11—and states are arranged in terms of their ranking on ALL13. The ranking among states is broadly similar between the two types of indices, at least on the highest and lowest scores. Andhra Pradesh and Tamil Nadu are the top two, while Meghalaya and Assam are the two lowest in both indices. In Figure 2, we show the ranking when four sub-indicators with missing values in some states are excluded. Dropping these sub-indicators changed the ranking among states. This time, Maharashtra and Rajasthan ranked highest in both FULL9 and FULL7, and moved two notches up compared to the previous two indices, while Andhra Pradesh and Tamil Nadu are now somewhere in the middle. However, states that seemed least effective in the broad indices remained so in the more limited measures. Meghalaya has the least effective TA in terms of all four TAMEs, followed by Assam, according to three out of four TAMEs. As the empirical results show, even incomplete TAMEs point to large and statistically significant revenue gains from improving TA effectiveness.

In Figures 3 and 4, we examine likely correlations between VAT and each of the TAME indices for all three years. We find that the correlation with value-added tax is stronger for ALL13 or the index with the most sub-indicators, at 0.88, compared to the other three TAME indices. The correlation is slightly higher compared to that between VAT and ALL11, at 0.83. Correlation between VAT and FULL9 is 0.82, while the correlation between VAT and FULL7 is 0.78. Indeed, the fitted lines are steeper when

VAT is placed alongside ALL13 compared to the other three. This seems to show that incorporating more indicators can provide a better measure of effectiveness.

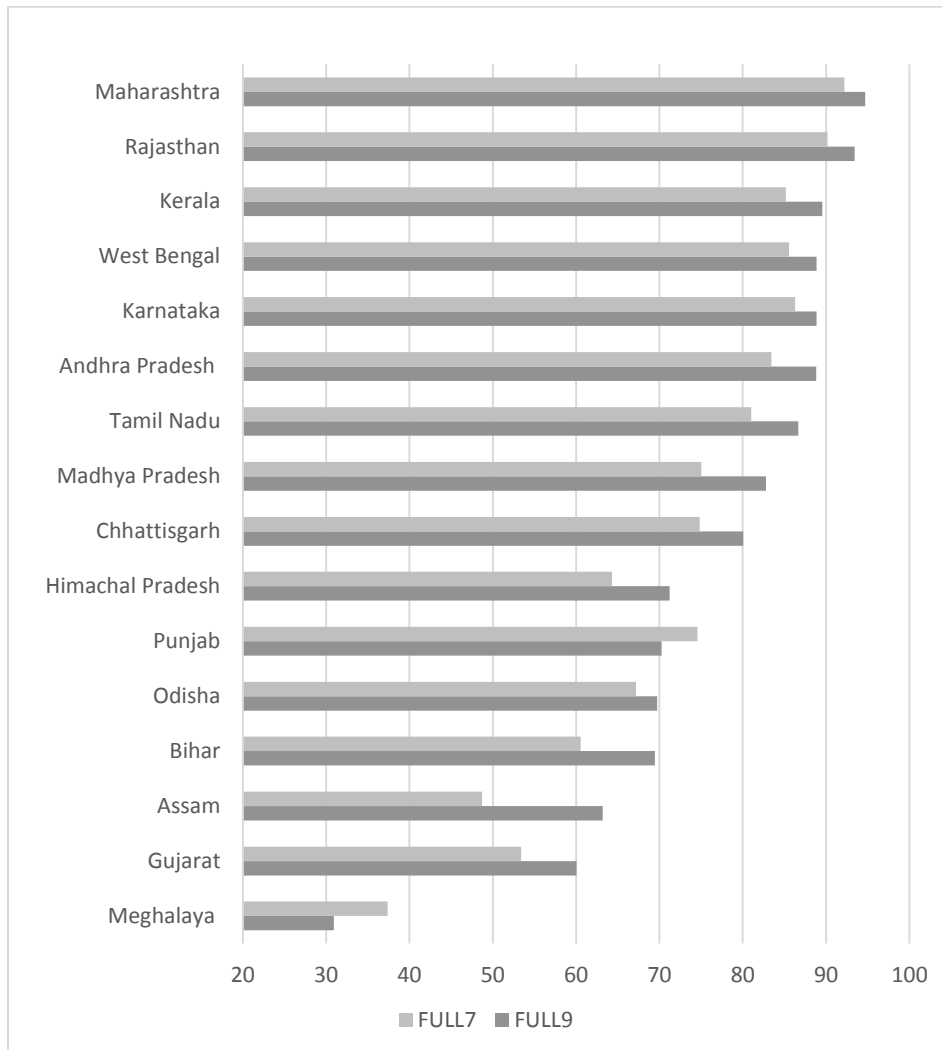
**Figure 1: TAME Indices with Complete Sub-Indicators, by State (ALL13 and ALL11)**



*Note:* TAME = tax administration measure of effectiveness.

*Source:* Authors' calculations.

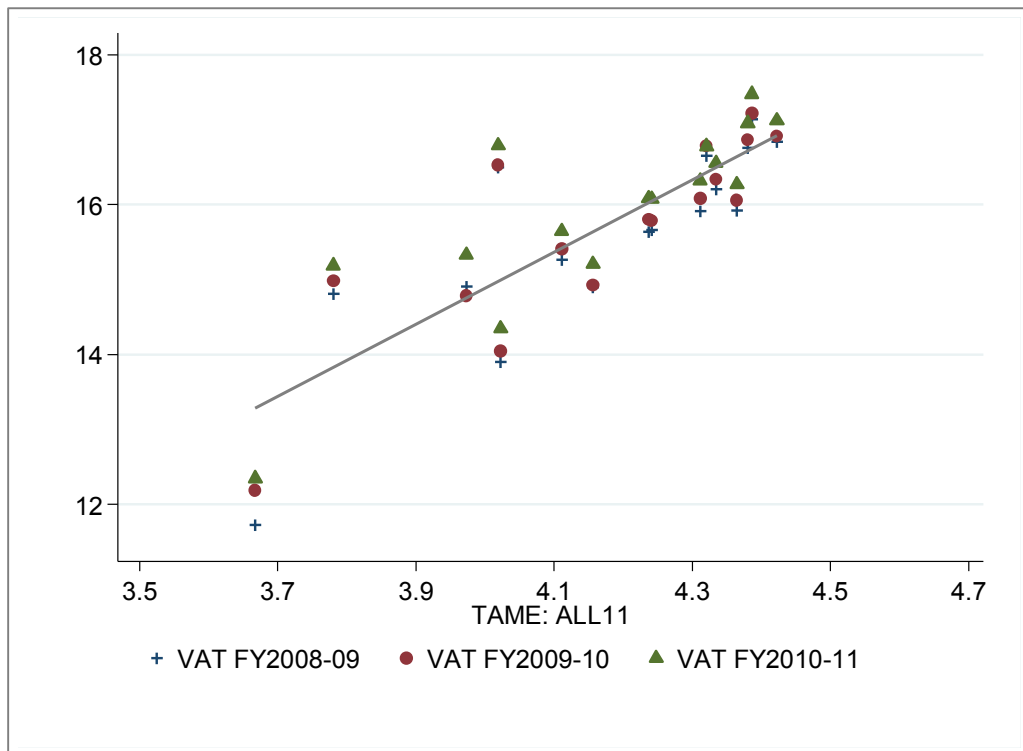
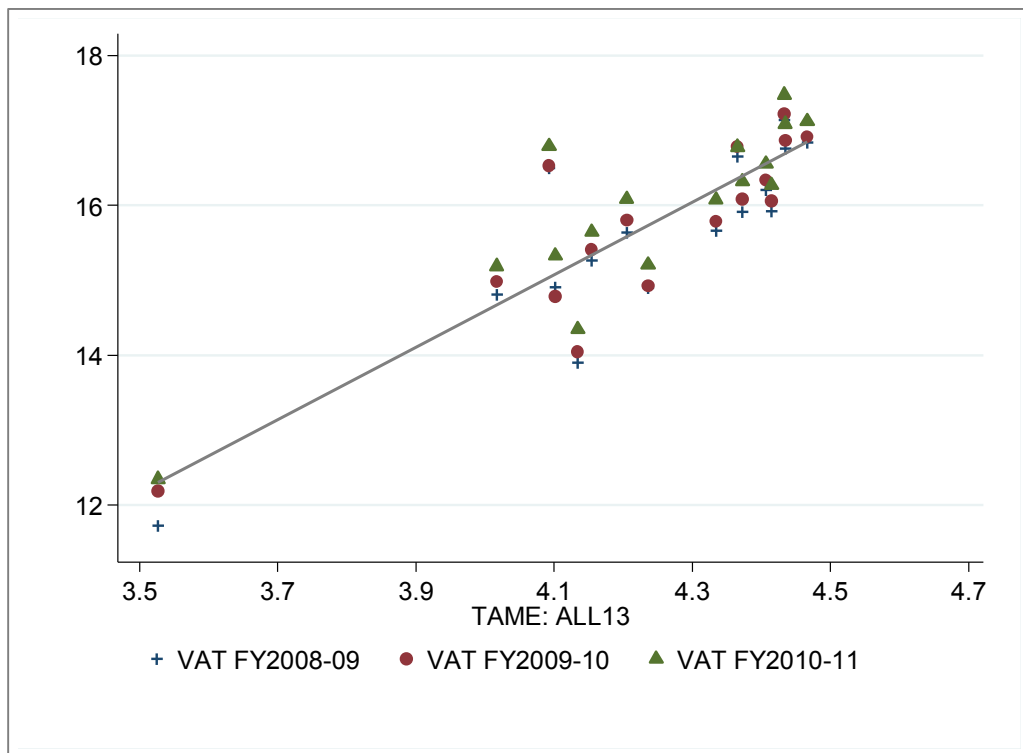
**Figure 2: TAME Indices with Selected Sub-Indicators, by State (FULL9 and FULL7)**



*Note:* TAME = tax administration measure of effectiveness.

*Source:* Authors' calculations.

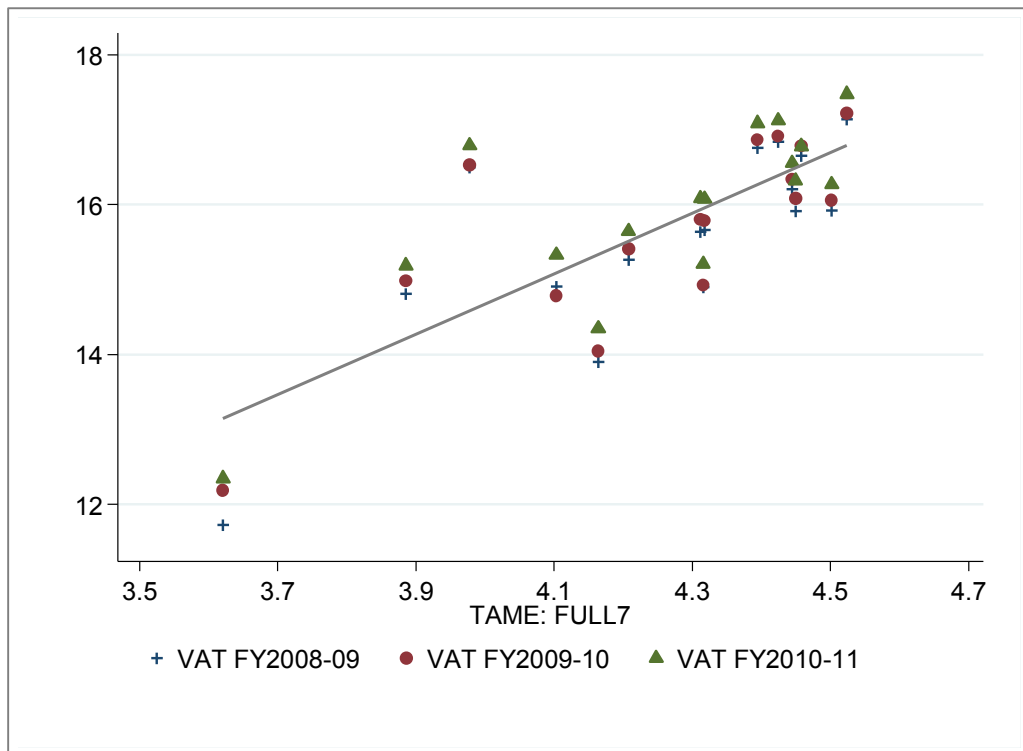
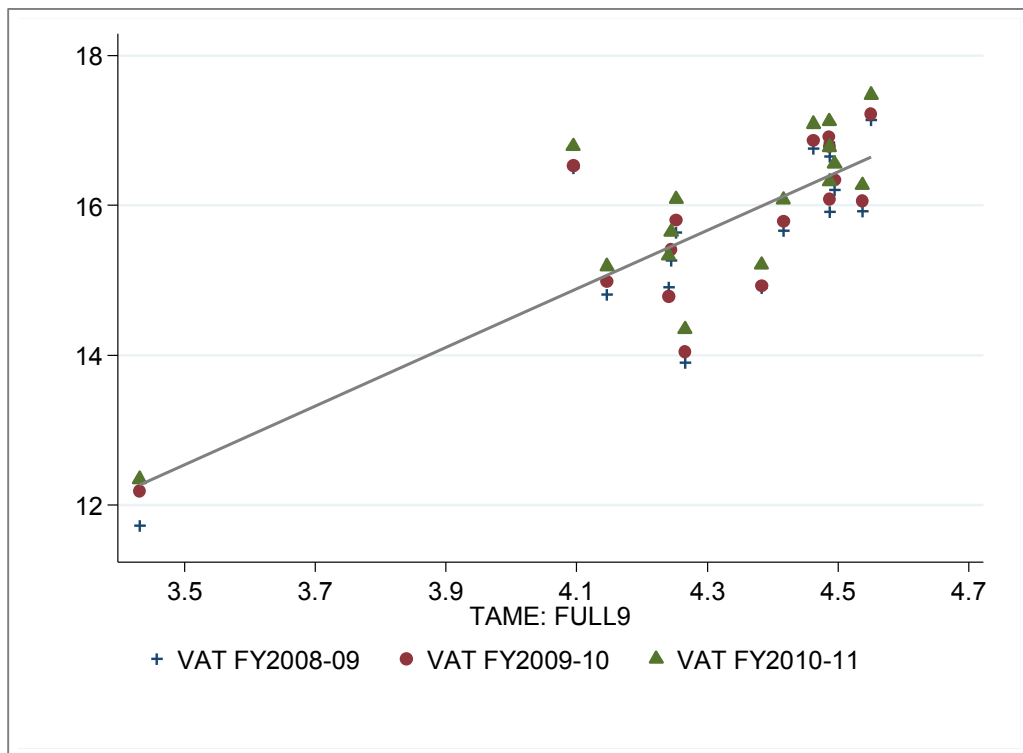
**Figure 3: Value-Added Tax and TAME Indices with Complete Sub-Indicators (ALL13 and ALL11)**



*Note:* FY = fiscal year, TAME = tax administration measure of effectiveness, VAT = value-added tax.

*Source:* Authors' calculations.

**Figure 4: Value-Added Tax and TAME Indices with Selected Sub-Indicators (FULL9 and FULL7)**



*Note:* FY = fiscal year, TAME = tax administration measure of effectiveness, VAT = value-added tax.

*Source:* Authors' calculations.

## Empirical Results

The main results of our empirical analysis are reported and discussed in this section. Equation 5 (see p. 5) estimates the relationship among VAT revenue, the TAME, and tax base. The equation was estimated in double log form using ordinary least squares. Initially, four equations were estimated in light of the four TAMEs that were defined. However, in all four equations, as reported in Table 1, VAT-per-dealer proved to be insignificant, so the equations were reestimated without VAT-per-dealer. This improved the adjusted-R-squared in all four cases.<sup>19</sup>

Since we used data for three years, FY2008–2009 to FY2010–2011, we re-estimated all eight equations with both GSDP and TAME slope and intercept dummies for FY2009–2010 and FY2010–2011. The dummies proved to be insignificant. These also failed to raise the significance of VAT-per-dealer, and did not affect the significance of the aggregate income variable and the TAMEs. In an alternative specification, TAME was entered as a level rather than a log variable with the other variables still in log form. However, this specification did not fit the data and that of equation 5.

**Table 1: Impact of TAME on VAT Revenue in the States of India**

<b>Dependent variable: VAT Revenues FY2008–2009 to FY2010–2011</b>									
<b>Sample: 16 states, 3 years</b>									
<b>Double Log Ordinary Least Squares Regression</b>									
Equation No.	TAME	Intercept	Elasticities			p-values			R-bar-sq.
			GSDP	VAT_dealer	TAME	GSDP	VAT_dealer	TAME	
a	ALL13	-3.466	1.040	0.035	0.958	0.000	0.643	0.0017	0.9638
b	ALL11	-2.657	1.068	0.065	0.677	0.000	0.404	0.0051	0.9621
c	FULL9	-2.634	1.107	0.011	0.586	0.000	0.894	0.0170	0.9601
d	FULL7	-2.619	1.129	0.056	0.481	0.000	0.491	0.0460	0.9585
<b>e</b>	<b>ALL13</b>	<b>-3.524</b>	<b>1.051</b>		<b>0.968</b>	<b>0.000</b>		<b>0.0013</b>	<b>0.9644</b>
f	ALL11	-2.715	1.095		0.667	0.000		0.0054	0.9623
g	FULL9	-2.657	1.109		0.593	0.000		0.0127	0.9610
h	FULL7	-2.677	1.151		0.479	0.000		0.0455	0.9590

*Note:* FY = fiscal year, GSDP = gross state domestic product, TAME = tax administration measure of effectiveness, VAT = value-added tax.

*Source:* Authors' calculations.

<sup>19</sup>It also improved the Akaike's Information Criterion statistic in all four cases. These are not reported here.

As Table 1 shows, the revenue elasticities of the TAMEs lie between 0.48 and 0.97. The upper end of these TAME elasticities comes close to the income (GSDP) elasticities, which are between 1.04 and 1.15.<sup>20</sup> This suggests that improving TA effectiveness deserves more attention than it generally does.

Next, we quantified the revenue impact of effective administration in the most effective state relative to the least effective state and conversely, the scope for increasing revenue by improving TAME in the least effective state relative to such scope in the most effective state. For this exercise, we used the best-fitting equation in Table 1 (judging by both the adjusted R squared and the TAME's p-value), which is equation e.

The revenue gain from effective TA in state  $x$  relative to the state with the least effective TA (Meghalaya) can be estimated from equation 5 above as  $(R_x - R_{xm})/R_x$ , where  $R_x$  is the revenue in state  $x$ , and  $R_{xm} = R_x(T_m/T_x)^{0.968}$  is the revenue in state  $x$  if its TA effectiveness as measured by the TAME ( $T_x$ ) was no better than that of the least effective state, Meghalaya, ( $T_m$ ) and 0.968 is the elasticity of TAME in equation e of Table 1.

Conversely, the potential revenue gain to state  $x$  from improving its TA effectiveness to that of Andhra Pradesh can be calculated as  $(R_{xa} - R_x)/R_x$  where  $R_{xa} = R_x(T^M/T_x)^{0.968}$  where  $T^M$  is the TAME of the state with the most effective TA, Andhra Pradesh.

Table 2 shows the estimated revenue gains for FY2008–2009. The revenue gain from effective TA in Andhra Pradesh is estimated to be 60 percent of revenue collected. The extra revenue Meghalaya could have collected if its TA was as effective as Andhra Pradesh is estimated to be even more substantial, a staggering 148 percent of current revenue. In fact, even if we use the lowest TAME elasticity estimate in Table 1 (in equation h)—which is less than half the elasticity used in Table 2—the gain of

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<sup>20</sup>When VAT and GSDP data for only FY2008–09 are used in regression exercises, TAME coefficients are more or less similar to those in Table 1, lying between 1.02 and 0.42. However, the p-value for ALL13 falls to 0.078 and all other TAMEs are not even significant at the 10 percent level. On the other hand, GSDP elasticities, which remain significant at better than 1 percent, increase by around 0.05 to between 1.10 and 1.22.



Andhra Pradesh is 36 percent and the potential gain to Meghalaya is 57 percent.<sup>21</sup> The gains from improving TA are large indeed.

**Table 2: The TA Effectiveness Bonus in the States of India—1**  
(Using best-fitting equation in Table 1:  $LVAT = f(LGSDP, LALL13)$ )

State	VAT FY2008–2009 (Rs '00,000)	VAT Gain (%)	VAT Gain (Rs '00,000)
Gain from effective TA compared to the state with least effective TA			
Andhra Pradesh	2,053,230	59.7	1,226,124
Assam	269,612	37.8	775,193
Bihar	297,728	42.7	876,115
Chhattisgarh	294,367	49.7	1,019,477
Gujarat	1,458,677	42.2	865,607
Himachal Pradesh	108,746	44.4	912,347
Karnataka	1,702,038	55.6	1,141,398
Kerala	1,091,715	57.3	1,176,747
Madhya Pradesh	632,322	54.2	1,113,284
Maharashtra	2,783,516	58.4	1,199,061
Meghalaya	12,375	0.0	0
Odisha	426,873	45.5	934,490
Punjab	616,642	48.1	987,905
Rajasthan	820,690	57.6	1,183,644
Tamil Nadu	1,902,904	58.5	1,200,147
West Bengal	812,210	55.9	1,147,430
<b>AVERAGE</b>	<b>955,228</b>	<b>48.0</b>	<b>520,931</b>

*Note:* TA = tax administration, VAT = value-added tax.

*Source:* Authors' calculations.

What factors contributed the most to the ineffectiveness of TA in Meghalaya and Assam, the second worst-performing states, and thus, are the highest priorities for reform? To answer this, we looked at the scores and ranks of individual indicators in Table A2.<sup>22</sup>

<sup>21</sup> The revenue improvements estimated to be possible here are larger than the estimates of the 'compliance gap' found by Keen (2013) for Organisation for Economic Co-operation and Development countries. He estimates that revenue losses from the 'policy gap' stemming from rate differentiation and exemptions are much larger in these countries. So controlling for these factors will be needed when estimating the impact of TAMEs in less uniform samples.

<sup>22</sup> Narrative assessments are also available in the individual CAG audit reports. These are summarised in Das-Gupta (2013).

**Table 3: The TA Effectiveness Bonus in the States of India— 2**  
(Using best-fitting equation in Table 1:  $LVAT = f(LGSDP, LALL13)$ )

State	VAT 2008–2009 (Rs '00,000)	VAT GAIN (%)	VAT GAIN (Rs '00,000)
Potential gain to states if their TA effectiveness improves to that of the best state (or revenue loss due to relatively ineffective TA)			
Andhra Pradesh	2,053,230	0.0	0
Assam	269,612	54.5	146,990
Bihar	297,728	42.3	125,990
Chhattisgarh	294,367	25.0	73,546
Gujarat	1,458,677	43.6	635,805
Himachal Pradesh	108,746	37.9	41,255
Karnataka	1,702,038	10.2	174,351
Kerala	1,091,715	6.0	65,174
Madhya Pradesh	632,322	13.6	86,266
Maharashtra	2,783,516	3.3	91,077
Meghalaya	12,375	148.2	18,345
Odisha	426,873	35.3	150,514
Punjab	616,642	28.8	177,602
Rajasthan	820,690	5.1	42,150
Tamil Nadu	1,902,904	3.1	59,763
West Bengal	812,210	9.5	77,277
<b>AVERAGE</b>	<b>955,228</b>	<b>29.2</b>	<b>122,881</b>

Note: TA = tax administration, VAT = value-added tax.

Source: Authors' calculations.

Meghalaya ranks bottom or second bottom in 7 indicators among the 16 states of India. These indicators include Laws, Threshold, Disposalpc, auditpc, CAGrecoverypc, DefectRs\_case, and ShortTax\_case.<sup>23</sup> Therefore, Meghalaya needs to strengthen its TA powers, pay greater attention to larger dealers by possibly raising the VAT threshold, raise the percentage of assessments it disposes during the year and increase their quality, introduce tax audits, and improve its follow-up rate on assessments found to be defective by the CAG.

Assam ranks bottom or second bottom in Laws, Infotech, Threshold, Auditpc, and CAGrecoverypc. Assessment disposal and quality are, thus, not as urgent as in Meghalaya. Better information technology deployment is prominent in the reform priority list. In both jurisdictions, there was no information on stopfilers in the CAG reports.

One interesting implication for our analysis is that external audit reports can shed light on the effectiveness of TA and the magnitude of the revenue loss from an

<sup>23</sup> See Appendix Table A4 for the full description of these indicators.

ineffective TA. This is an additional benefit, apart from the usual benefits of an independent watchdog for jurisdictions with relatively underdeveloped external audit institutions.

## **5. Guidelines for Constructing TAMEs in Other Jurisdictions or Years**

In this study, we suggest that periodic data collection for a TAME be institutionalised by having this ‘piggy-backed’ with external audits by a jurisdiction’s supreme audit institution. Depending on the cost of the exercise, this could be done every few years, including years following extensive reforms. In our empirical exercise, we implicitly suggested a three-year period. Our statistical analysis suggests that the impact of TA effectiveness on tax revenue is relatively stable during this time period.

To facilitate the construction of a TAME, TA should ideally maintain an annual (or higher frequency) database on its activities and organisation units. Such a database is required, in any case, for effective management and control. Indicators for both of these management and control dimensions are summarised in the discussion of TA inputs and input allocations in section 3 of this paper.

If such a database exists, then the complementary role of the external audit in the construction of the TAME is to look primarily at indicators of the quality of outputs and to verify the correctness of reported quantity indicators—which are, in any case, the main objectives of external audits. The external auditors would also evaluate if TA powers and procedures are adequate and permit effective administration. To ensure comparability of TAMEs across jurisdictions or time periods, it is important that a uniform study design be prescribed and adhered to. A second requirement is for a common random sampling frame to be used across units.

The TAME proposed here ideally covers, as discussed in section 3, five areas that contribute to TA effectiveness: TA powers and procedures, TA inputs, TA input allocation, quantity of TA outputs, and quality of TA outputs. Environmental factors that influence TA effectiveness but are beyond the control of TA exist, as discussed earlier. We argued that these factors will be relatively slow to change and so can be

ignored when comparing relatively similar jurisdictions or time periods that are not too far apart.

One advantage of our empirical examination of the relationship between the TAME and tax revenues was that tax rates are identical across India's states. In general, this will not be the case. Therefore, to study the impact of TA effectiveness on tax revenues, we will need to include the effective tax rate as an additional determinant of tax revenues besides base variables and the TAME.<sup>24</sup>

## 6. Concluding Observations

In this paper, we propose a quantifiable TAME, which quantitatively measures the effectiveness of TA. Although a number of studies have attempted to identify the determinants of TA effectiveness and efficiency, most have stopped short of proposing a quantifiable measure that can be used to compare TAs across time or jurisdiction, and to examine the impact of TA on tax revenues. Our study suggests that the construction of a quantifiable TAME is both feasible and potentially useful for policymakers. The TAME that we constructed can be used to compare the effectiveness of different TAs—for example, different countries or different states or provinces. It can also be used to assess how the effectiveness of a given TA has changed over time.

While TAME is useful in and by itself for the purpose of comparing TAs across time and countries, it has an especially important application, which relates to empirically assessing the determinants of tax revenue collection. While it is widely recognized that the effectiveness of TA is a potentially significant determinant of tax revenues, it has relatively scant attention in the literature. The underlying reason is the lack of a quantifiable measure of TA effectiveness, which has hampered its incorporation into the empirical analysis. We hope that our construction of TAME and its incorporation into the empirical analysis of tax revenue collection will allow for a

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<sup>24</sup> Most studies of tax evasion and tax compliance have done this since the pioneering work of Clotfelter (1983) and so several measures of effective taxes are to be found in the literature. Das-Gupta, Lahiri, and Mookherjee (1995) describe the construction and use of an Average Effective Tax Rate (AETR) and a Marginal Effective Tax Rate (METR). See also the discussion of the compliance gap versus the policy gap in Keen (2013).

more accurate analysis. After all, there are good reasons to believe that TA effectiveness will have a significant effect on tax revenue collection, especially in developing countries.

Our empirical evidence from India's states suggests that TA effectiveness can indeed have a sizable impact on tax revenue collection. In the best-performing state, for example, effective administration accounted for as much as 60 percent of current tax revenues and, in the worst-performing state, improving effectiveness can increase revenues by as much as 148 percent of current tax revenues. Even under more conservative assumptions, the corresponding figures are 36 percent and 57 percent of current tax revenues. Our empirical evidence, thus, provides resounding empirical support to the widely assumed but seldom tested notion that effective TA matters, and matters a lot, for tax revenue collection. Therefore, the returns to improving the effectiveness of TA are high, especially in developing countries with underdeveloped TAs and limited fiscal resources.

At a broader level, our analysis underlines the potential usefulness of quantifiable measures of TA effectiveness for policymakers—i.e., tax authorities. Such measures help tax authorities benchmark themselves against other TAs, assess their own progress over time, and get some idea of the magnitude of the gains from improved performance. Nevertheless, our study marks only a rough, first stab at constructing a quantifiable measure of TA, due to serious data limitations. On the other hand, the fact that we were able to construct a quantifiable measure despite such data limitations holds promise for constructing such measures for other tax jurisdictions. In fact, we hope that our study will stimulate other researchers to construct such measures for other jurisdictions—countries and regions—based on available data.

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**Appendix Table A1: Revenue, GSDP, and VAT per Dealer**  
(Revenue and GSDP data are in Rs ‘000,000)

State	VAT07-08	VAT08-09	VAT09-10	VAT10-11	GSDP08-09	GSDP09-10	GSDP10-11	VAT per Dealer Index(lagged)
Andhra Pradesh	1,753,789	2,053,230	2,216,315	2,731,419	426,765	476,835	583,762	110.00
Assam	228,212	269,612	321,052	394,271	81,074	95,975	112,688	21.57
Bihar	249,126	297,728	263,705	453,146	142,279	162,923	203,555	66.66
Chhattisgarh	244,827	294,367	303,115	403,150	96,972	99,364	119,420	44.66
Gujarat	1,271,838	1,458,677	1,511,600	1,953,915	367,912	431,262	521,519	39.80
Himachal Pradesh	96,223	108,746	126,005	169,577	41,483	48,189	57,452	15.66
Karnataka	1,263,190	1,702,038	1,937,599	1,936,059	310,312	337,559	410,703	32.61
Kerala	834,976	1,091,715	1,244,818	1,549,922	202,783	231,999	263,773	71.37
Madhya Pradesh	548,814	632,322	715,383	957,404	197,276	227,557	263,396	25.19
Maharashtra	2,436,199	2,783,516	3,004,758	3,884,711	753,969	855,751	1,049,150	54.36
Meghalaya	8,661	12,375	19,614	22,974	11,617	12,709	14,583	10.00
Odisha	356,716	426,873	491,500	621,885	148,491	162,946	197,530	29.47
Punjab	491,985	616,642	726,431	964,242	174,039	197,500	226,204	26.68
Rajasthan	712,637	820,690	943,629	1,163,874	230,949	265,825	338,348	15.64
Tamil Nadu	1,643,412	1,902,904	2,098,574	2,636,356	401,336	479,733	584,896	32.21
West Bengal	724,863	812,210	963,848	1,221,416	341,942	398,880	460,959	30.75

GSDP = gross state domestic product, VAT = value-added tax.

*Notes:* For VAT per dealer and all indices used to construct TAMEs, raw data  $x_j$  were first transformed into indices by the linear transformation  $I_j' = 100[x_j - \min(x_j)]/[\max(x_j) - \min(x_j)]$ . In addition, for eight variables that were ineffectiveness rather than effectiveness indicators, the variables were reversed by the transformation  $I_j'' = 100 - I_j'$ . Finally, to permit logarithms to be taken, 10 was added to all variables so that index values ranged between 10 and 110. All TAMEs are simple averages of subsets of variables as explained in the text.

*Sources:* Revenue data: Reserve Bank of India (various years). GSDP data: Planning Commission, Government of India (2015). Dealer data for the construction of VAT per dealer and all indicators in Table 2 for the construction of TAMEs: Comptroller and Auditor General, Government of India (2009, 2010). Audit reports on Individual states are as reported in Das-Gupta (2013).

**Appendix Table A2: Data Used for TAME Construction**

<b>State</b>	<b>Laws</b>	<b>Infotech</b>	<b>Threshold</b>	<b>Disposalpc</b>	<b>Auditpc</b>	<b>CAGrecoverypc</b>	<b>Pop-perdealer</b>	<b>Dealer_office</b>
Andhra Pradesh	30.69	63.57	87.78	95.36	110.00	12.84	26.82	104
Assam	10.00	18.93	21.11	46.98	10.00	11.68	19.02	76
Bihar	82.41	10.00	87.78	34.66	12.10	10.38	110.00	102
Chhattisgarh	41.03	54.64	21.11	86.04	10.00	10.00	22.37	85
Gujarat	61.72	54.64	10.00	46.36	76.00	18.47	11.70	69
Himachal Pradesh	10.00	10.00	54.44	62.67	10.00	69.22	11.01	NA
Karnataka	110.00	103.75	32.22	40.68	12.46	50.71	11.18	94
Kerala	92.76	110.00	110.00	59.07	NA	13.93	15.27	NA
Madhya Pradesh	30.69	72.50	43.33	66.29	NA	14.76	21.56	80
Maharashtra	61.72	93.33	110.00	70.91	39.10	12.67	14.08	NA
Meghalaya	10.00	54.64	10.00	10.00	10.00	10.00	25.97	110
Odisha	51.38	63.57	21.11	65.24	22.20	35.14	20.42	87
Punjab	61.72	18.93	110.00	30.55	10.57	110.00	11.19	10
Rajasthan	30.69	51.67	110.00	110.00	10.00	13.48	13.17	100
Tamil Nadu	20.34	81.43	110.00	35.87	NA	37.37	10.00	93
West Bengal	41.03	93.93	110.00	67.86	NA	NA	20.36	62
<b>State</b>	<b>Stopfilerpc</b>	<b>DefectRs_case</b>	<b>CAGdefectpc</b>	<b>ShortTax_case</b>	<b>ExcessITC_case</b>	<b>ShortFine_case</b>	<b>AveShort_case</b>	
Andhra Pradesh	106	109	106	103	98	106	92	
Assam	NA	107	103	82	110	69	33	
Bihar	36	90	109	79	110	23	10	
Chhattisgarh	73	109	110	108	96	94	102	
Gujarat	75	10	110	102	72	74	81	
Himachal Pradesh	29	108	110	101	106	78	95	
Karnataka	66	107	108	107	84	106	102	
Kerala	NA	109	10	107	108	99	105	
Madhya Pradesh	75	110	107	105	102	107	95	
Maharashtra	106	90	109	110	103	104	110	
Meghalaya	NA	28	109	10	10	37	40	
Odisha	56	96	92	108	105	25	81	

Punjab	108	106	107	104	83	10	87
Rajasthan	110	110	110	109	99	110	109
Tamil Nadu	101	108	106	107	106	105	105
West Bengal	10	108	109	82	106	82	69

NA = data not available, TAME = tax administration measure of effectiveness.

*Note:* See Table A1 for source information and index construction.

*Source:* See Table A1.

**Appendix Table A3: Alternative TAME Indices**

State	ALL13	ALL11	FULL9	FULL7
Andhra Pradesh	87.03	83.28	88.83	83.44
Assam	55.52	43.82	63.21	48.69
Bihar	60.45	53.13	69.46	60.53
Chhattisgarh	69.12	63.83	80.05	74.85
Gujarat	59.89	55.64	60.04	53.40
Himachal Pradesh	62.43	55.85	71.21	64.32
Karnataka	78.69	75.22	88.84	86.28
Kerala	81.97	76.26	89.53	85.16
Madhya Pradesh	76.26	69.51	82.80	75.02
Maharashtra	84.19	80.31	94.71	92.18
Meghalaya	34.02	39.16	30.92	37.37
Odisha	63.71	61.01	69.72	67.20
Punjab	67.01	69.16	70.27	74.58
Rajasthan	82.65	78.61	93.44	90.18
Tamil Nadu	84.30	79.85	86.68	81.01
West Bengal	79.23	74.54	88.86	85.56

TAME = tax administration measure of effectiveness.

*Source:* Author's calculations.

**Appendix Table A4: VAT per Dealer and TAME Components, Definitions**

<b>Serial No.</b>	<b>Brief Name</b>	<b>Definition</b>	<b>Category</b>
Base	VAT-dealer	Lagged VAT per dealer: ave. FY2008–2009 and FY2009–2010. Rs '000	
1	Laws	Weaknesses of law, rules, and administrative manuals identified in CAG 2010 study: Average score of 7 sub- Sub-indicators for Laws: Registration/survey powers, Registration penalties, Filing requirements, Filing	TA Powers
2	Infotech	Automation and usage, 2010: Average score of 7 sub-indicators Sub-indicators for automation: Functioning IT system for VAT (Y,I = incomplete, N). If Y or I: Taxpayer	TA Inputs
3	Threshold	VAT dealer threshold FY2009–2010 (Rs '000)	TA Powers
4	Disposalpc	Average disposal rate FY2007–2010 or FY2009–2010 (%)	TA Output -
5	Auditpc	Percentage of cases selected for tax audits FY2009–2010	TA Output -
6	CAGrecoveryp	Recoveries as a % of accepted CAG objections (% of value)	TA Output -
7	Dealer_office	Dealers per office, FY2009–2010	TA Inputs
8	Stopfilerpc	Returns due and not received or received late: Stopfiler percentage (FY2009–2010 or latest year)	TA Output -
9	DefectRs_case	Assessment quality in CAG test checks: Monetary value per case (Rs '000)	TA Output -
10	CAGdefectpc	Assessment quality in CAG test checks: Number of cases with deficiency as a % of assessments disposed	TA Output -
11a	ShortTax_case	CAG: Shortfall in tax collection Rs '000 per case	TA Output -
11b	ExcessITC_cas	CAG: Excess input tax credit or set-off Rs '000 per case	TA Output -
11c	ShortFine_case	CAG Non-levy of penalty/Interest Rs '000 per case	TA Output -
12	AveShort_case	CAG: Weighted average shortfall: Rs '000 per case	TA Output -

CAG = Comptroller and Auditor General, FY = fiscal year, TA = tax administration, TAME = tax administration measure of effectiveness, VAT = value-added tax.  
*Source:* Authors' compilation.

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