

Measuring Tax Administration Effectiveness and its Impact on Tax Revenue

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Abstract

We propose a method for constructing a tax administration measure of effectiveness or TAME, and describe its desirable properties. We then empirically construct a TAME using data from external audits of VAT administrations of Indian state governments. We then use the TAME to quantitatively assess the impact of tax administration effectiveness on tax revenues. The impact is found to be both statistically significant and large. We then identify causes of tax administration effectiveness in the poorly performing states. We then suggest guidelines for constructing our TAMEs for other jurisdictions and time periods.

Keywords

tax administration, tax revenues, value-added tax

JEL Codes

H21, H25

1 Motivation and scope

There have been studies of tax administration (TA) effectiveness in the past. In addition, a number of studies examine the impact of tax administration 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.¹

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

For example, the Indian government has proposed to implement a nation-wide goods and services tax by April 2016 at both the central and state levels.² 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) 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 tax administrations.

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

2 Tax administration effectiveness and tax revenue mobilisation

Despite the large literature on tax administration 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) use macro-data on the Indian income tax to examine the impact of a handful of tax administration enforcement variables on tax revenue. They find that improving assessment efficiency contributed 25.5 percent of additional revenue on average (maximum 43.5 percent), compared to the sample year with the worst assessment efficiency.⁴ Other enforcement indicators, such as search and seizure

¹ 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).

² See, for example, The Times of India (December 10, 2014).

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

⁴ 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.

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. A 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 Brazilian states 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 2004.⁵ Its "Paying Taxes" survey "records the taxes and mandatory contributions that a medium-size company must pay in a given year as well as measures of the administrative burden of paying taxes and contributions".⁶ While these surveys provide useful information about the compliance burden of the hypothetical representative company, they are silent about tax administration itself. The surveys provides no information on, for example, non-business taxpayers, taxpayer services provided by tax administration, or tax enforcement. Alm (1999) and Epstein and Gang (2010) survey other studies which delve into other relevant aspects of tax compliance.⁷

Conceptual framework

Here a simple conceptual framework that relates tax administration effectiveness to tax revenue. 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 the tax administration 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. Therefore, for the tax base, assuming a log linear functional form, we have

⁵ World Bank Group (2015a).

⁶ World Bank Group (2015b).

⁷ A recent article Abiola and Asiweh (2012), uses an online opinion survey to assess the effectiveness of Nigeria's tax administration.

$$B_j = b_0 Y_j^{b1} N_j^{b2} \quad (2)$$

where b_0 , b_1 and b_2 are positive constants.

Taxpayer compliance will depend on taxpayer compliance attitudes E_j and tax administration effectiveness, T_j :

$$C_j = c_0 E_j^{c1} T_j^{c2} \quad (3)$$

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^{c1} can be merged with the constant term c_0 .

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

$$R_j = a_2 t_j Y_j^{b1} N_j^{b2} T_j^{c2} \quad (4)$$

where $a_2 = b_0 c_0 E_j^{c1}$.

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

$$R_j = a_1 Y_j^{b1} N_j^{b2} T_j^{c2}. \quad (5)$$

3 Factors contributing to tax administration effectiveness

As alluded to earlier, the tax administration environment can affect the size of the tax base. One potential determinant of the tax base, 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 5 groups.

a. *Tax administration powers and their exercise*: The powers of TA inspectors with regard to 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 or tax administration law. Tax administration procedural manuals and rules, forms for taxpayers, and related on or off-line supporting documentation should also be more or less complete and easily accessed by the tax administration and taxpayers.

b. *Tax administration inputs*: These broadly include capital, labour, especially tax inspectors and senior supervisors, and technology, 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.⁸ An admittedly inferior alternative to this

⁸ See for example PwC (2013).

may be information on the tax administration's annual budget or expenditure other than its wages and salary bill.⁹

c. *Tax administration input allocation*: A general principle of efficient and effective resource allocation is that the returns to 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: taxpayer identification or surveys to identify unregistered potential taxpayers, registration of taxpayers and taxpayer numbering, tax return receipt and processing, tax audits, post-audit appeals, sanctions, and prosecutions, normal and delinquent tax collection, taxpayer assistance and services, internal audit, training and housekeeping services – like posting and transfers across functions or regions, building upkeep, and so on.

4. *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 tax administrations or time periods.

5. *Tax administration output – quality*: This can be assessed by carefully selected variables relating to duration, arrears, or revenue loss for each functional area. Examples include: duration taken to complete assessments, appeals or penalty proceedings; tax collection or workload arrears including records that have not been updated; quality of tax return assessments and taxpayer audits as reflected in external auditor's findings of unrecovered revenue when the tax administration is audited.

While all tax administration dimensions described above are essential for effective tax administration, not all of them need to be included in a TAME. Several items may be highly correlated. For example, it is likely that input availability will be correlated with some indicators of the quantity of tax administration output. Second, some quality indicators such as those for tax return receipt (for example, the proportion of stopfilers) may require effectiveness at earlier stages of tax administration's dealings with taxpayers, such as taxpayer numbering and registration. So we can omit either the former or the latter from the TAME. The indicators to be included or not can only be ascertained empirically. We now report the construction of our empirical TAME.

⁹ 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*.

4 Construction of an empirical Tax Administration Measure of Effectiveness (TAME)

In this section, we describe how we construct a tax administration measure of effectiveness (TAME) that can be used for empirical analysis.

Data source and limitations

The TAME constructed here is for state value-added tax (VAT) tax administrations in India. The basic information for the study comes from state-by-state reviews by the Comptroller and Auditor General (CAG). Most Indian states adopted a goods only VAT in the fiscal year 2005-06, although a few had done so earlier and others delayed adoption by a year or two.¹⁰ A blueprint for effective VAT administration had been provided in 2005 by the Indian Government.¹¹ The 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 our TAME here is the special reviews by the CAG in 2009 of 23 states to assess their success in implementing the government blueprint. The annual audits by the CAG of state VAT (or commercial tax) departments for Indian fiscal years 2008–09, 2009–10, and 2010–11 were also used.¹²

These information sources were used by Das-Gupta (2013) to construct quantitative indices for 12 different aspects of tax administration functions and infrastructure. Given non-uniform coverage across states, Das-Gupta (2013) ultimately constructed indices for 16 states.¹³ 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 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, meaning that this may vary across states.¹⁴

Variables and sources

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

¹⁰ For the exact dates see Table 2 in Das-Gupta (2012).

¹¹ See Government of India (2005). Also see Government of India (2006).

¹² 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 from http://saiindia.gov.in/english/home/Our_Products/Audit_Report/Year_Wise/State_Wise%20Audit_Reports/.

¹³ Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, and West Bengal.

¹⁴ The information in this paragraph was obtained from a CAG official in an exchange of e-mail messages.

Study of Budgets”.¹⁵ Data were collected for 4 fiscal years, 2007-08, 2008-09, 2009-10, and 2010-11 for reasons explained below.

Base variable Y: Gross State Domestic Product (GSDP) from Planning Commission, Government of India (2015) for 2008-09, 2009-10, and 2010-11.

Base variable N: Since the information needed to construct a concentration index was not available, VAT-revenue-per-dealer was taken as the indicator.¹⁶ However, to avoid the problem of an endogenous independent variable, we used lagged VAT revenue as an instrument. Therefore, the concentration instrument for 2008-09 uses VAT revenue for 2007-08.

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 tax administration reform, it is unlikely that the TAME will vary greatly. For these reasons, TAME was repeated 3 times for the 3 different years. This strategy appeared to work well for each of the three years.¹⁷

TAME Components

The tax administration components are listed, along with the category to which they belong, in Table A4. Of the 14 indicators, two pertain to tax administration 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 to 12 are actually indicators of ineffectiveness and thus needed to be transformed, as explained in the notes to Table 2. 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 thirteen or eleven.

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 inclusion of indicators of taxpayer numbering and registration control, return stop-filing or late-filing and follow up, and in-depth tax audits. Tax administration budget data or other data on capital employed was not reported by the CAG. On the other hand, all state tax administrations studied by the CAG neglected an available network¹⁸ to match information across states and dealers, contributing to widespread fake documentation and over-claiming of input tax credits even in the best administered states.

¹⁵ Reserve Bank of India (various years).

¹⁶ Registered VAT taxpayers in India are called dealers.

¹⁷ 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 3 years.

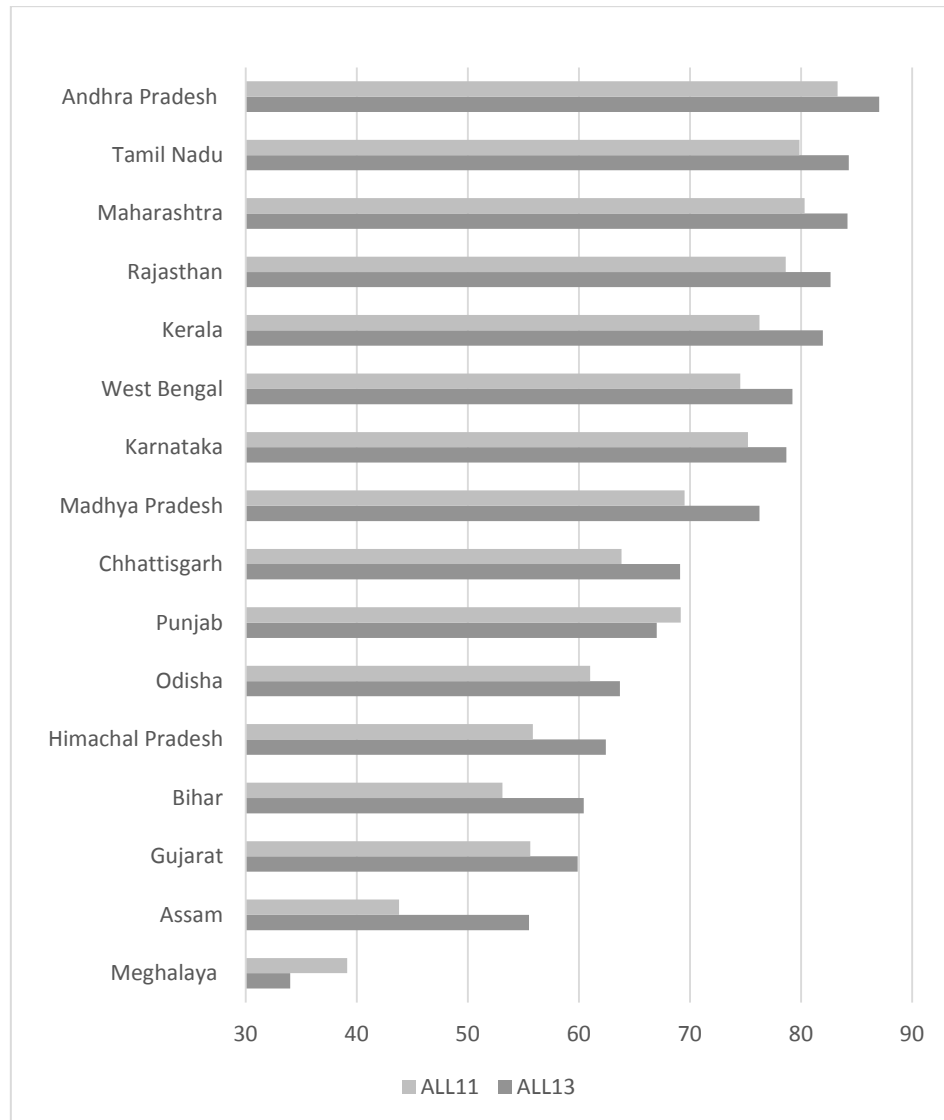
¹⁸ Tinxsys or tax information exchange system.

Appendix Table A3 lists the 4 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 4 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 tax administration 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 tax administration input, in particular, 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 with respect to 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 4 subindicators with missing values in some states are excluded. Dropping these subindicators 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 tax administration in terms of all 4 TAMEs, followed by Assam, according to 3 out of 4 TAMEs. As the empirical results show, even incomplete TAMEs point to large and statistically significant revenue gains from improving tax administration effectiveness.

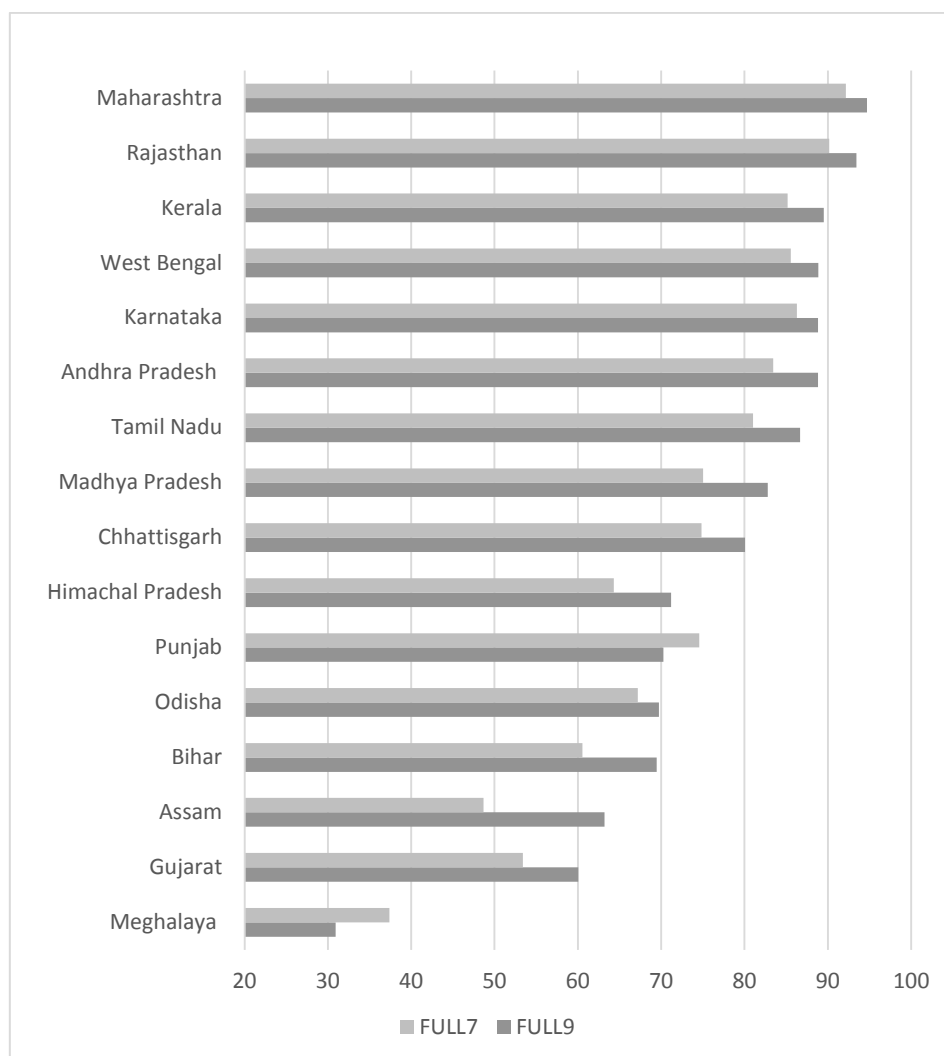
In Figures 3 and 4, we examine likely correlations between value-added tax and each of the TAME indices for all three years. We find that the correlation with value-added tax is stronger for ALL13 or the index with the most subindicators, at 0.88, compared to the other three TAME indices. The correlation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



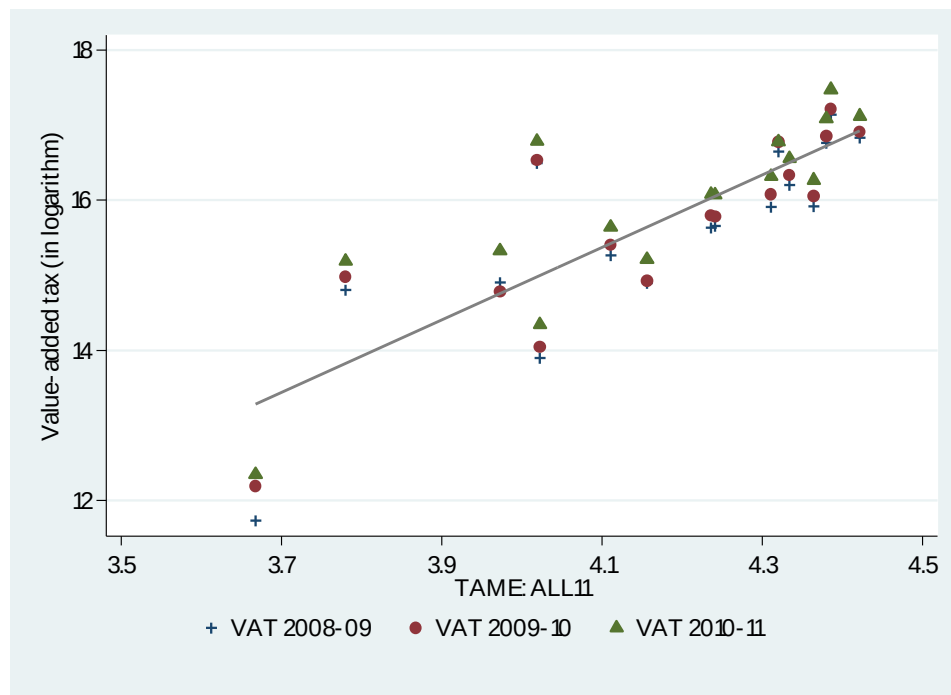
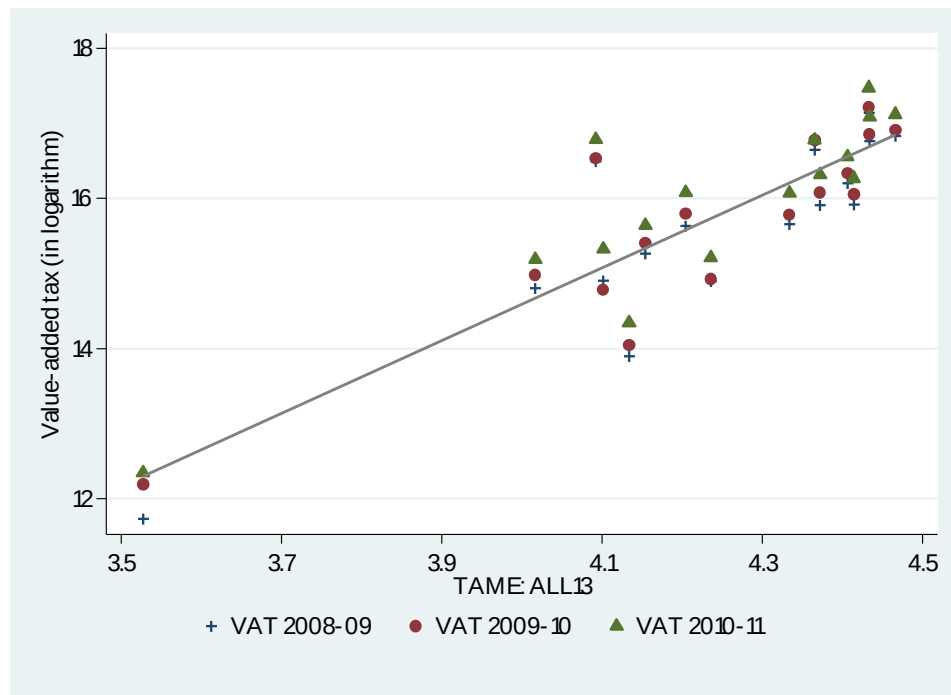
Source: Authors' calculations.

Figure 2 TAME Indices with Selected Subindicators (FULL9 and FULL7), by State



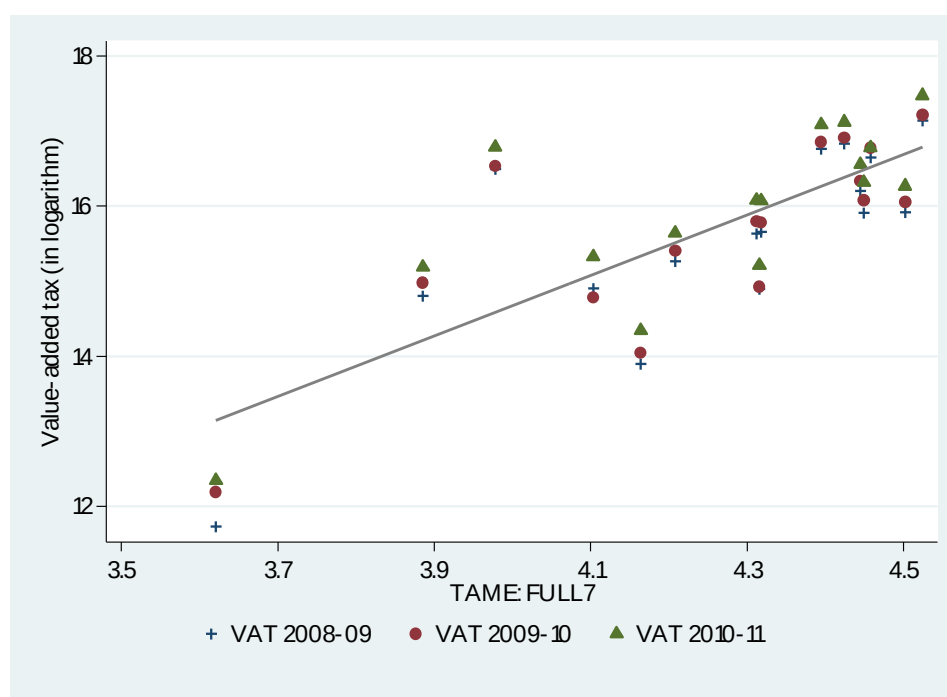
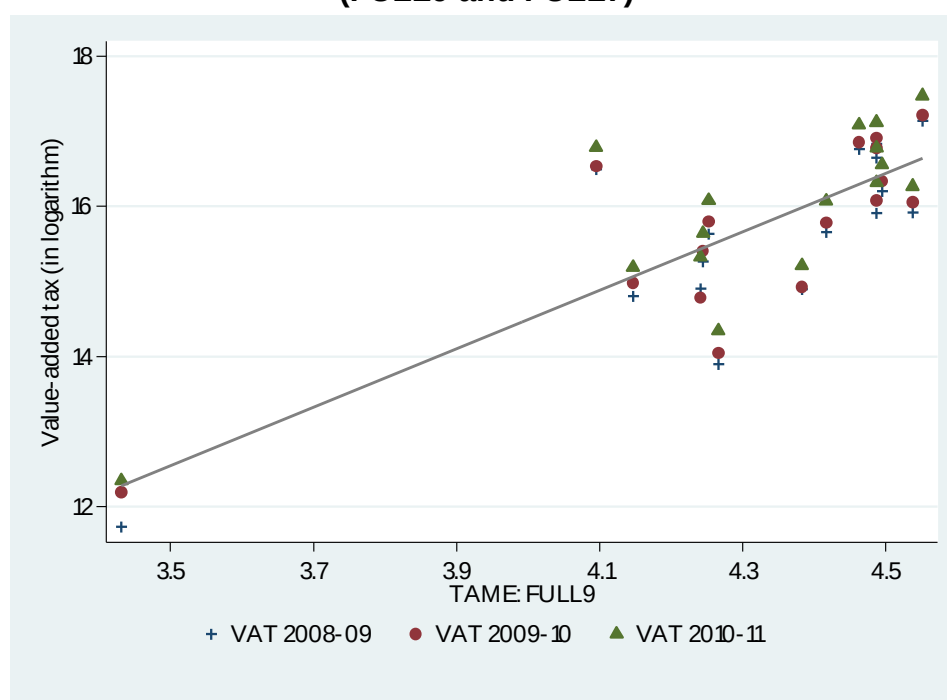
Source: Authors' calculations.

Figure 3. Value-added Tax and TAME Indices with Complete Subindicators (ALL13 and ALL11)



Source: Authors' calculations.

Figure 4. Value-added Tax and TAME Indices with Selected Subindicators (FULL9 and FULL7)



Source: Authors' calculations.

5 Empirical results

In this section, we report and discuss the main results of our empirical analysis. Equation (5) above estimates the relationship between VAT revenue and the TAME and tax base. The equation was estimated in double log form using ordinary least squares. Initially 4 equations were estimated in light of the 4 TAMEs that were defined. However, in all 4 equations, reported below in Table 1, VAT-per-dealer proved to be insignificant, so the equations were re-estimated without VAT-per-dealer. This improved the adjusted-R-squared in all four cases.¹⁹

Since we used data for 3 years, 2008-09 to 2010-11, we re-estimated all 8 equations with both GSDP and TAME slope and intercept dummies for 2009-10 and 2010-11. The dummies proved to be insignificant. They 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. But this specification did not fit the data as well as equation 5.

Table 1: Impact of TAME on VAT Revenue in Indian States

Dependent variable: VAT Revenues 2008-09 to 2010-11									
Sample: 16 states, 3 years									
Double Log Ordinary Least Squares Regression									
Eqn 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
e	ALL13	-3.524	1.051		0.968	0.000		0.0013	0.9644
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

Source: Authors' calculations.

As Table 1 shows, the revenue elasticities of the TAMEs lie between 0.48 and 0.97. The upper end of these TAME elasticities come close to the income (GSDP) elasticities, which are between 1.04 and 1.15.²⁰ This suggests that improving tax administration effectiveness deserves more attention than it generally does.

Next, we quantify 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 use the best fitting equation in Table 1 (judging by both the adjusted R squared and the TAME's p-value), which is equation e.

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

²⁰ When VAT and GSDP data for only 2008-09 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.

The revenue gain from effective tax administration in state x relative to the state with the least effective tax administration (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 tax administration 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 tax administration, Andhra Pradesh..

Table 2 shows the estimated revenue gains for 2008-09. The revenue gain from effective tax administration in Andhra Pradesh is estimated to be 60% of revenue collected. The extra revenue Meghalaya could have collected if its tax administration was as effective as Andhra Pradesh is estimated to be even more substantial, a staggering 148% 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 to Andhra Pradesh is 36% and the potential gain to Meghalaya is 57%.²¹ The gains from improving tax administration are large indeed.

²¹ The revenue improvements estimated to be possible here are larger than the estimates of the “compliance gap” found by Keen (2013) for OECD 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.

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

	VAT 2008-09 (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
AVERAGE	955,228	48.0	520,931

Source: Authors' calculations.

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

State	VAT 2008-09 (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
AVERAGE	955,228	29.2	122,881

Source: Authors' calculations.

What factors contributed the most to the ineffectiveness of tax administration in Meghalaya and Assam, the second-worst performing state, and are thus the highest priorities for reform? To answer this, we look at the scores and ranks of individual indicators in Table A2.²²

Meghalaya ranks bottom or second bottom in 7 indicators among the 16 Indian states. These include Laws, Threshold, Disposalpc, auditpc, CAGrecoverypc, DefectRs_case, ShortTax_case.²³ Therefore, Meghalaya needs to strengthen tax administration 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 tax administration and the magnitude of the revenue loss from an ineffective tax administration. This is an additional benefit apart from the usual benefits of an independent watchdog for jurisdictions with relatively underdeveloped external audit institutions.

6 Guidelines for constructing TAMEs in other jurisdictions or years

We suggest institutionalising periodic data collection for a TAME by “piggy-back”-ing on 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 suggest a three year period. Our statistical analysis suggests that impact of tax administration effectiveness on tax revenue is relatively stable during this time period.

To facilitate the construction of a TAME, the tax administration should ideally maintain an annual (or higher frequency) data base on its activities and organisation units. Such a data base 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 tax administration inputs and input allocations in Section 3 above.

If such a data base 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 whether tax administration 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

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

²³ See Appendix Table A4 for the full description of these indicators.

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 contributing to tax administration effectiveness: tax administration powers and procedures, tax administration inputs, tax administration input allocation, quantity of tax administration outputs, and quality of tax administration outputs. Environmental factors which influence TA effectiveness but which are beyond the control of the tax administration exist and are discussed above. 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 relation between the TAME and tax revenues was that tax rates are identical across Indian states. In general, this will not be the case. Therefore, to study the impact of tax administration 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.²⁴

7 Concluding observations

In this paper, we propose a quantifiable tax administration measure of effectiveness, or TAME, which quantitatively measures the effectiveness of tax administration. Although a number of studies have attempted to identify the determinants of tax administration effectiveness and efficiency, most have stopped short of proposing a quantifiable measure that can be used to compare tax administrations across time or jurisdiction, and to examine the impact of tax administration 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 tax administrations – for example, different countries or different states or provinces. It can also be used to assess how the effectiveness of a given tax administration has changed over time.

While TAME is useful in and of itself for the purpose of comparing tax administrations 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 tax administration 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 tax administration 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 more accurate analysis. After all, there are good reasons to believe that tax administration effectiveness will have a significant effect on tax revenue collection, especially in developing countries.

Our empirical evidence from Indian states suggests that tax administration effectiveness can indeed have a sizable impact on tax revenue collection. In the best-performing state, for example, effective administration accounted for as much

²⁴ 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).

as 60% of current tax revenues and, in the worst-performing state, improving effectiveness can increase revenues by as much as 148% of current tax revenues. Even under more conservative assumptions, the corresponding figures are 36% and 57% of current tax revenues. Our empirical evidence thus provides resounding empirical support to the widely assumed but seldom tested notion that effective tax administration matters, and matters a lot, for tax revenue collection. Therefore, the returns to improving the effectiveness of tax administration are high, especially in developing countries with underdeveloped tax administration and limited fiscal resources.

At a broader level, our analysis underlines the potential usefulness of quantifiable measures of tax administration effectiveness for policymakers – i.e. tax authorities. Such measures help tax authorities benchmark themselves against other tax administrations, 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 tax administration, 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 hundreds of thousand Indian rupees)

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

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

Appendix Table A2: Data Used for TAME Construction

State	Laws	Infotech	Threshold	Disposalpc	Auditpc	CAGrecoverypc	Pop-perdealer	Dealer_office
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
State	Stopfilerpc	DefectRs_case	CAGdefectpc	ShortTax_case	ExcessITC_case	ShortFine_case	AveShort_case	
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.

Note: See Table A1 for source information and index construction

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

Source: Author's calculations.

Appendix Table A4: VAT per dealer and TAME Components, Definitions

Serial No	Brief name	Definition	Category
Base variable	VAT-dealer	Lagged VAT per dealer: ave 2008-09 and 2009-10. Rs '000	
1	Laws	Weaknesses of law, rules and administrative manuals identified in CAG 2010 study: Average score of 7 subindicators	TA Powers
		Subindicators for Laws: Registration/survey powers, Registration penalties, Filing requirements, Filing penalties, Assessment, Audit Manual/ Procedures, Non-compliance penalties. Scoring: 1: Adequate or no comment; 0: major weaknesses; 0.5 some weaknesses.	
2	Infotech	Automation and usage, 2010: Average score of 7 subindicators	TA Inputs
		Subindicators for automation: Functioning IT system for VAT (Y,I = incomplete,N). If Y or I: Taxpayer numbers, Registration, Filing tracking and notices, Tax audit selection, Up to date risky dealers list and declaration form details, Availability of trained staff, Other features.	
3	Threshold	VAT dealer threshold 2009-10 (Rupees '000)	TA Powers
4	Disposalpc	Average disposal rate 2007-10 or 2009-10 (%)	TA Output - Quantity
5	Auditpc	% of cases selected for tax audits 2009-10	TA Output - Quality
6	CAGrecoverypc	Recoveries as a % of accepted CAG objections (% of value)	TA Output - Quality
7	Dealer_office	Dealers per office, 2009-10	TA Inputs
8	Stopfilerpc	Returns due and not received or received late: stop-filer percentage (2009-10 or latest year)	TA Output - Quality
9	DefectRs_case	Assessment quality in CAG test checks: Monetary value per case (Rs '000)	TA Output - Quality
10	CAGdefectpc	Assessment quality in CAG test checks: Number of cases with deficiency as a % of assessments disposed	TA Output - Quality
11a	ShortTax_case	CAG: Shortfall in tax collection Rs '000 per case	TA Output - Quality
11b	ExcessITC_case	CAG: Excess Input Tax Credit or set-off Rs '000 per case	TA Output - Quality
11c	ShortFine_case	CAG Non-Levy of Penalty / Interest Rs '000 per case	TA Output - Quality
12	AveShort_case	CAG: Weighted average shortfall: Rs '000 per case	TA Output - Quality

Source: Authors' compilation.