

Relative Tax Performances: Analysis for Selected States in India¹

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Abstract

In a federal form of government structure like that of India, the state-level governments receive supplementary budgetary resources from the central government as support for the formers' public expenditure activities. The devolution of funds from the centre to the states takes the form of share of the revenue raised by central taxes and grants-in-aid. An individual state's tax revenue collection, relative to its taxable capacity, is a major determinant of the amount of funds to be allocated for the state. This paper examines the relative tax performances of some selected states based on annual data on state tax revenue for the period 1986-87 to 1996-97 using the technique of Quantile Regression.

Keywords: Relative tax performance, Quantile regression.

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1. Introduction

Formulation of an objective policy of devolution of central resources to the states involves questions of both equity and efficiency. In other words, such a policy should ensure that states/regions in greater need of funds are given priority, on the one hand, and are given adequate incentive to make fuller utilization of their revenue-raising potentials, on the other. Assessment of relative tax performances of the states becomes a major issue when one tries to evolve an objective policy of devolution of central funds to the constituent states of a country with a federal structure.

A common measure of tax performance of an economy is the tax-GDP ratio (which essentially measures the proportion of the income generated in the economy that is taxed). In a country like India with a federal structure of governance the constituent states have their own tax jurisdiction defined by the Constitution and the states can decide on their own how much of their taxable capacity they will exploit. Given the taxable capacity, a state's actual tax revenue collection will depend, among other things, on the tax effort made, efficiency of the tax collection machinery and the performance of the state economy. To compare the tax performances of the states in India, one often makes use of the tax-SDP ratio as the summary measure of the states' tax performance (although it is recognised that SDP is an inadequate proxy for a state's aggregate tax base as it excludes interstate income transfers). To judge the relative tax performance of states, normally one would order the states in terms of their observed tax-SDP ratios and to analyse inter-temporal variations in relative performance of states, one would examine how the relative position of individual states changed over the period of time under consideration. However, such an examination of the state-wise tax-SDP ratio may not reveal much unless the level of per capita real SDP (PCSDP) of the states concerned remain unchanged over the period under consideration.

In a dynamic perspective thus one should track the *ordinal* position of individual states in respect of the tax-SDP ratio along with the change in the level of PCSDP, if any. A convenient econometric tool for doing so on the basis of a panel data set on tax performance is the technique of *Quantile regression*. This technique can help examine

whether and how, given the level of PCSDP, the ordinal position of individual states in terms of tax-SDP ratio changes over time. It can also indicate whether the rate of change of the tax-SDP ratio with respect to real PCSDP is different across ordinal groups of states. In this paper we report some results of an analysis of tax performance of a group of 16 states of India (which covers the 15 *non-priority*² states and Assam) during the eleven year period from 1986-87 to 1996-97 based on the *Quantile regression* technique.

The paper is organised as follows. Section 2 describes the data and discusses the econometric method used. Section 3 presents the results of the empirical analysis of the relative tax performances of the individual states as revealed by the annual data on state tax revenue for the period 1986-87 to 1996-97. Finally, some concluding observations are made in section 4.

2. Data and estimation procedure

Data:

Time series data on state-specific yearly tax revenue at current prices separately for individual state taxes (viz., state taxes on income, taxes on property and capital transactions, land revenue, sales tax, state excise duty, tax on vehicles, entertainment tax etc.) were provided by the Eleventh Finance Commission. By adding together the data for individual state taxes we formed the time series data on state-specific aggregate tax revenue (ATR)³. This set of data covered the period 1986-87 to 1996-97 and was compiled by the Office of the Accountant General, Government of India. The sample period of the available tax revenue data delimited the reference period of the present study. State-specific data on net state domestic product (NSDP) and the corresponding data on per capita net state domestic product at constant (1980-81) prices (*PCSDPC*) were obtained from EPW Research Foundation (1998). Using these, the state-specific data on tax-SDP ratio (*TSR*) were formed (i.e., $TSR=ATR/NSDP$). The group of states considered in this study were Andhra Pradesh (AP), Bihar (BI), Goa (GO), Gujrat (GU),

Haryana (HA), Karnataka (KA), Kerala (KE), Madhya Pradesh (MP), Maharashtra (MH), Orissa (OR), Punjab (PU), Rajasthan (RA), Tamil Nadu (TN), Uttar Pradesh (UP) and West Bengal (WB) and Assam.(AS).

Econometric method:

As already mentioned, in this study we used the Quantile Regression Analysis (Koenker and Bassett, 1978; and Koenker and D’Orey, 1987) to compare the relative tax performances of the States. In what follows, we shall briefly explain the Quantile Regression technique.

Quantile Regression Analysis : The p^{th} quantile regression function is defined as the p^{th} quantile value of the conditional distribution of a response variable Y , given the value $X=x$ of a vector of its covariates. It has the advantage, over the commonly used mean regression, that by setting different values of p (say, 0.1, 0.25, 0.5, etc.) one may use these regression functions to measure the effect of the covariates on the response variable not only at the centre of the population, but also at the upper and the lower tails. This is important and useful in situations where the effect of a covariate may be very different for different levels of the response variable.

Suppose $\{y_t : t = 1, 2, \dots, T\}$ is a random sample of observations on the response variable and $\{x_t : t = 1, 2, \dots, T\}$ is a sequence of K (row) vectors of a design matrix of covariates. Let $F(.)$ be the distribution function of the regression $u_t = y_t - x_t\beta$. The p^{th} ($0 \leq p \leq 1$) regression quantile is defined to be any solution to the minimization problem

$$\min_b \left[\sum_{t \in \{t: y_t \geq x_t b\}} p |y_t - x_t b| + \sum_{t \in \{t: y_t < x_t b\}} (1 - p) |y_t - x_t b| \right]$$

In our case $Y : TSR$ and $X : (1, PCSDPC)$.

3. States' Relative Tax Performances

Let us first have a preliminary examination of the observed pattern of tax performance of the states under consideration. Table 1 presents the year-wise observed values of TSR for individual states for the period 1986-87 to 1996-97. The observed TSR values range between 3.94 per cent for Assam in 1986-87 to 13.69 per cent for Kerala in 1996-97. On the whole, Assam, Bihar, Uttar Pradesh, West Bengal and Orissa are the low TSR states, the states of south and west (viz., Karnataka, Kerala, Tamil Nadu, Goa, Gujrat and Maharashtra) constitute the group of high TSR states and the remaining states fall in the medium TSR category. As regards the time trend in TSR, Goa, Kerala and Karnataka show a rising trend while Andhra Pradesh shows a clear declining trend over the sample period. No perceptible trend is observed for the remaining states.

As mentioned at the outset, to analyze the relative tax performances of the states, we employed the method of Quantile regression analysis. Briefly, given the panel data on *PCSDPC* and *TSR*, the estimated p^{th} Quantile regression equation is a linear equation of the form $TSR_p = a + b \log PCSDPC$, where TSR_p is the estimate of the p^{th} Quantile of the conditional distribution of *TSR*, given the value of *PCSDPC*. Thus, if a state's observed *TSR* value for year t is closest to the value of TSR_p corresponding to the state's observed *PCSDPC* value for that year, we conclude that in year t the state's relative tax performance was in the ordinal p^{th} quantile group. By examining the over time movement of the states' quantile positions, one should get a clear picture of the time pattern of relative tax performances of the states.

For the present analysis, we estimated five quantile regression equations for the given panel data on *TSR* and *PCSDPC* corresponding to the bottom 10th percentile, the bottom 25th percentile, the median, the top 25th percentile and the top 10th percentile levels. The estimated quantile regression results are presented in Table 2. These results clearly indicate the following points: First, for all the quantile groups the slope parameters (b's in Table 2) are positive and significant implying thereby that *TSR* increases with *PCSDPC*. It may also be noted that the magnitude of b is lowest for the

top 10th percentile group, highest for the median group and that for the bottom 10th percentile group is close to the highest value. This means that the estimated rate of increase in TSR with respect to PCSDPC is lowest for the top 10th percentile group, as is to be expected, and the high values for the median and the bottom 10th percentile groups perhaps suggest a greater tax effort on part of the states belonging to these groups.

Table 3 presents the ordinal ranking of the states in respect of their relative tax performances over time, as derived using the five estimated quantile regression equations. These results show that the *TSR* of Assam consistently remained in the bottom 10th percentile range during the sample period. Similar is the case of West Bengal, *TSR* of which moved mostly in the range of bottom 25th percentile. A roughly similar performance is noted for Orissa, *TSR* of which moved up to the median level only twice during the years 1990-91 and 1996-97. The *TSR* for Uttar Pradesh and Haryana moved between the bottom 25th percentile and the median range of values corresponding to their *PCSDPC* levels. The performance of Bihar was also in the same range except for the fact that during 1994-95 and 1995-96 the state's *TSR* moved up to the median level corresponding to its *PCSDPC* level. Madhya Pradesh maintained the median level performance for all the years except 1990-91 when it moved down to the bottom 25th percentile range. A declining trend in relative performance, on the other hand, may be noticed in case of Maharashtra and Punjab, as the states moved from the median range to the bottom 25th percentile/10th percentile range over years. Andhra Pradesh showed a clearer declining trend in performances. The state's ordinal position systematically declined from the top 10th percentile range to the bottom 25th percentile range over the sample period.

The remaining states -viz., Goa, Gujrat, Karnataka, Kerala, Rajasthan and Tamil Nadu – turned out to be the relatively better performing states during the period of study. Of these, Rajasthan's position varied between the median and the top 25th percentile range. Gujrat maintained its position in the top 25th percentile range all through except during the last three years when its position slid down to the median range. Goa's position fluctuated between the median and the top 10th percentile range. Finally, the three southern states managed to maintain their *Tax-SDP* ratio between the top 25th and the top 10th percentile range through out the sample period.

4. Conclusion

In this paper we have examined the relative tax performances, as measured by the *Tax*-SDP ratio, for some selected states of India over the period 1986-87 to 1996-97. The analysis reveals that the performances can be classified broadly into four categories. First, the best performing states are the South-Western states, viz., Goa, Gujrat, Karnataka, Kerala, Rajasthan and Tamil Nadu and have remained so over the sample period. The next category of states, the worst performing states and which have remained so over the sample period are the Eastern states of Assam, Orissa and West Bengal. The third category of states with medium level performance throughout the sample period are the states of Bihar, Haryana, Madhya Pradesh and Uttar Pradesh. The final category of states which start out at the medium/ top level in terms of performance and show a declining trend in performance over the sample period are the states of Andhra Pradesh, Maharashtra and Punjab.

As is well known, member states' tax performance in a federal structure of governance like that of India is an extremely interesting and important issue so far as the fiscal management of the Indian economy is concerned. Our results clearly show the states in south and west India display a superior tax performance compared to the remaining states of the country. This may be due to a number of reasons – viz., relatively larger taxable capacity of these states, relatively greater tax effort made by these states or some deep-seated political-economic characteristics that these states may share. It would, therefore, be a challenging research issue to find an answer to the question as to why some states do better so far as tax performance is concerned. Taking a purely economic standpoint, one may argue that the observed tax performance of a state gets factorized into taxable capacity and tax raising efforts made. One may then try to identify economic, demographic and socio-political determinants of these two factors that explain the differential tax performances of the states.

References

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End Notes

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² The *non-priority* states are those states which do not receive any special consideration (such as relative economic backwardness or strategic location etc.) in the matter of allocation of central budgetary resource assistance. Assam is one of the *priority* states. However, in the present study we have included Assam simply because despite being a *priority* state, its economy shares many features of the economy of the *non-priority* states.

³ We considered the state-specific aggregate tax revenue data net of Central sales tax revenue (*CST*) collected by the states, as it was felt that the determinants of *CST* would be very different from those of states' own taxes.

Tables

Table 1: Observed *TAX-SDP* ratio for different states during 1986-87 to 1996-97

State	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97
Andhra Pradesh	10.95	10.47	9.61	9.38	8.49	8.18	8.66	7.98	7.57	6.40	6.76
Assam	4.52	3.94	4.11	4.13	4.42	4.82	4.49	4.68	4.34	4.52	4.56
Bihar	5.01	5.41	4.89	5.23	4.97	5.23	5.35	5.33	5.63	6.70	6.03
Goa	10.25	9.20	8.96	9.21	11.08	11.35	12.16	11.98	12.96	12.46	11.76
Gujrat	9.89	10.97	9.60	10.08	9.92	11.10	9.87	10.18	9.23	9.92	9.55
Haryana	9.31	9.85	8.96	9.18	8.74	8.88	9.55	8.66	8.63	8.83	7.14
Karnataka	10.28	10.53	10.84	10.86	11.35	10.85	10.62	11.28	10.85	11.65	11.48
Kerala	11.07	11.20	11.60	11.55	11.01	11.08	10.99	11.91	12.05	13.11	13.69
Madhya Pradesh	7.80	6.92	7.04	7.47	6.62	7.60	7.51	6.97	6.83	7.45	7.47
Maharashtra	9.82	9.53	9.45	8.78	8.81	9.05	7.99	7.85	8.46	8.20	7.70
Orissa	5.01	5.64	5.10	5.29	6.92	5.39	5.68	5.55	5.08	5.29	5.97
Punjab	8.75	8.47	8.33	8.15	7.72	7.62	7.55	7.80	8.24	7.47	6.66
Rajasthan	7.86	8.19	6.93	7.75	6.65	7.72	7.33	7.89	7.58	8.10	7.46
Tamil Nadu	11.48	9.70	9.76	10.40	11.30	11.47	10.99	10.42	10.98	12.40	12.07
Uttar Pradesh	5.61	6.52	5.64	5.88	6.39	6.11	6.26	5.93	6.17	6.18	6.11
West Bengal	6.43	6.29	7.03	6.97	6.77	6.72	6.73	6.55	6.93	6.68	6.04

Table 2: Estimated parameters of Quantile Regression

Percentile	Intercept (a)	t-ratio(a)	Slope (b)	t-ratio(b)
Bottom 10 th	3.137	5.53	0.000903	4.20
Bottom 25 th	4.236	12.91	0.000785	6.28
Median	4.598	9.66	0.001020	5.74
Top 25 th	7.282	8.55	0.000726	2.28
Top 10 th	9.659	18.14	0.000350	1.85

Table 3. Quantile position of states in respect of observed *TAX-SDP* ratio based on the results of Quantile Regression analysis

State	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	1993 -94	1994 -95	1995 -96	1996 -97
Andhra Pradesh	5	5	4	4	4	3	4	3	3	2	2
Assam	1	1	1	1	1	1	1	1	1	1	1
Bihar	1	2	2	2	2	2	1	2	3	3	2
Goa	5	4	3	3	4	4	5	4	5	5	3
Gujrat	4	4	4	4	4	4	4	4	3	3	3
Haryana	3	3	3	3	2	2	3	2	2	2	1
Karnataka	4	5	5	5	5	5	4	5	4	5	5
Kerala	5	5	5	5	5	5	5	5	5	5	5
Madhya Pradesh	3	3	3	3	2	3	3	3	3	3	3
Maharashtra	4	3	3	3	3	3	2	1	2	1	1
Orissa	1	2	1	2	3	1	2	2	2	2	3
Punjab	3	3	2	2	1	1	1	1	2	1	1
Rajasthan	4	4	3	4	3	3	3	4	3	4	3
Tamil Nadu	5	4	4	4	5	5	5	4	4	5	5
Uttar Pradesh	2	3	2	2	3	2	3	2	3	3	3
West Bengal	2	2	2	2	2	2	1	2	2	2	1

Note: Here 1, 2, 3, 4 and 5 denote the bottom 10, 25, 50, 75 and 90 per cent Quantiles, respectively.