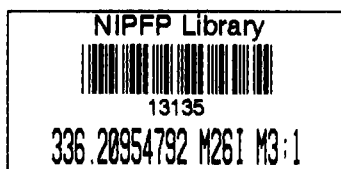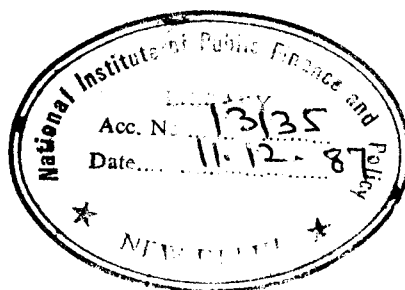# THE INCOME RESPONSIVENESS OF STATE TAXES
IN MAHARASHTRA

BY

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SUBMITTED TO THE GOVERNMENT OF MAHARASHTRA

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FOREWORD

This study was sponsored by the Government of Maharashtra, Finance Department, vide Resolution No. TCS-1081/CR-29/RES-11 dated October 23, 1982 in connection with the work of the Resource Mobilisation Committee (constituted by the Government of Maharashtra). We would like to thank Dr M Q Dalvi, the Chairman of the Resource Mobilisation Committee and the officials of the Finance Department, Government of Maharashtra for their cooperation at every stage of the study.

(R J Chelliah)

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Contents

THE INCOME RESPONSIVENESS OF STATE TAXES
IN MAHARASHTRA

1. Introduction

The objective of the present study is to analyse the
income responsiveness of the State tax revenues in Maharashtra
for the period from 1961-62 to 1978-79 and compare it with
that of a few other States. More specifically, it attempts
to quantify the variations in State tax revenues that occur
concurrent with a given change in the State domestic product
(SDP) of Maharashtra. Broadly speaking, such a study helps us
to know the extent of resource transfer through taxation from
the private sector to the government consequent on a given
change in the SDP. Moreover, to the extent the relationship
between tax revenues and SDP remains stable over time and
given the future course of SDP, a knowledge of the quantitative
magnitude of such a relationship can be fruitfully utilised to
forecast tax revenues.

Two statistical measures are generally used to judge
the relationship between growth of income and that of taxes.
They are: (i) the buoyancy coefficient and (ii) the elasticity
coefficient. The former is defined as the percentage change
in the actual tax revenue (revenue from a single tax or from
a group of taxes, as the case may be) concurrent with a 1
per cent change in income and the latter as the percentage
change in the tax revenue under a given tax structure
concurrent with a 1 per cent change in income. Thus the
basic difference between the two measures is that the
elasticity reflects the responsiveness of the tax system to
changes in income whereas the buoyancy captures the responsive-

ness of the tax system to changes in income and changes in the
tax structure taken together. It follows that the elasticity
is equal to the buoyancy if the tax rate structure does not
undergo any change during the period under consideration.

In the present study, we analyse the income responsive-
ness of State tax revenues in terms of both these measures.
Analytically, given the policy-determined tax rate structure
of individual taxes, the income responsiveness of revenue
from a tax system is a product of the responsiveness of the
tax revenue to the aggregate tax base and the responsiveness
of the aggregate tax base to income. The aggregate tax base
is made up of several individual tax-bases. Thus, the
composition of the tax system in terms of the relative impor-
tance of the individual taxes is of crucial importance in
determining the income responsiveness of a tax system. For
example, a tax system which consists mainly of those taxes the
bases of which are highly income inelastic could be expected
to exhibit lower income responsiveness than one which is made
up of taxes having highly income elastic bases. Accordingly,
in Section 2, we present the trends in the composition of the
tax system in Maharashtra for the period from 1961-62 to
1980-81. In Section 3 we present the estimates of buoyancy
coefficient for the major State taxes in Maharashtra and
compare them with buoyancy coefficients of State taxes in a
few other States. In Section 4 we present the corresponding
estimates of elasticity. In Section 5 we summarize the
major conclusions of the study. The detailed regression
results and a discussion of the sources of data used for
the regressions are given in the Annexure.

2. The Composition of State Tax Revenue in Maharashtra

Table 2.1 presents the composition of State tax revenue in Maharashtra. It is noticeable from the table that the general sales tax has been the most important single source of tax revenue in Maharashtra. On an average, it has accounted for around 40 per cent of the yearly State tax revenue during the period from 1961-62 to 1980-81. Next to the general sales tax, the Central sales tax has been the important source of tax revenue. Whereas the proportion of tax revenue accounted for by the general sales tax has remained more or less stable around 40 per cent, that accounted for by the Central Sales Tax has approximately doubled from around 8 per cent in 1961-62 to around 17 per cent in 1980-81.

Put together, these two taxes contributed around 50 per cent and 60 per cent of the total tax revenue in the '60s and '70s, respectively. Except in a few years, the rest of the tax revenue has been almost evenly distributed among the following taxes: the State excise duty, the motor spirit tax, the motor vehicles tax, the purchase tax, the passenger and goods tax, the entertainment tax, the electricity duty, stamps and registration fees and land revenue. These figures speak in no uncertain words of the very high concentration of the sources of tax revenue in Maharashtra.

The general sales tax in Maharashtra, the most important single source of tax revenue, is basically a tax on the sales within the State of almost all types of industrial and several agricultural goods. The Central sales tax is a tax on the exports of goods from Maharashtra to

TABLE 2.1

Composition of State Tax Revenue in Maharashtra

(per cent of total)

Year	General sales tax	Central sales tax	Motor spirit tax	State excise duty	Elec- tricity duty	Motor vehicles tax	Enter- tain- ment tax	Stamps and regis- tration fees	Passen- ger and goods tax	Pur- chase tax	Land revenue
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1961-62	39.31	8.64	4.49	1.89	5.86	8.78	4.22	9.06	2.52	-	2.26
1962-63	38.20	8.52	5.25	1.88	6.62	7.71	5.18	9.17	2.96	1.73	9.34
1963-64	38.43	11.41	4.85	1.71	7.17	6.45	4.87	8.40	4.31	1.52	8.10
1964-65	38.18	12.54	4.69	2.71	6.96	6.55	4.42	7.71	4.37	1.63	6.46
1965-66	40.20	12.53	4.93	2.66	7.25	6.34	5.01	7.42	4.51	1.87	4.56
1966-67	40.56	12.76	4.08	2.48	7.48	6.29	5.16	6.49	4.32	2.26	4.77
1967-68	38.68	14.37	4.05	2.47	6.86	6.19	4.58	6.69	5.55	1.52	5.20
1968-69	39.09	13.56	4.08	2.93	6.56	6.31	4.79	6.31	5.53	1.75	4.70
1969-70	40.12	14.04	3.72	3.35	5.97	6.03	5.08	5.12	5.29	1.92	3.68
1970-71	42.62	14.65	3.61	2.67	6.60	5.45	5.06	5.23	4.77	1.73	3.87
1971-72	38.72	14.41	4.05	2.87	5.23	5.61	5.32	5.58	6.13	1.89	4.38
1972-73	39.75	14.78	4.15	3.34	6.77	5.39	5.80	5.88	5.91	2.53	3.39
1973-74	39.44	14.63	4.46	6.58	5.26	5.16	5.96	4.68	5.64	1.94	4.01
1974-75	41.67	14.26	4.43	5.89	5.02	4.09	5.35	3.82	5.96	1.64	4.28
1975-76	41.48	14.67	3.80	5.96	4.74	3.96	5.36	3.45	5.19	3.20	2.87
1976-77	41.78	16.49	3.68	6.03	4.70	3.80	5.10	3.30	4.28	2.61	2.73
1977-78	42.36	15.62	3.36	6.72	4.87	3.74	4.99	3.88	4.40	2.81	1.99
1978-79	41.81	16.27	3.41	6.32	5.41	3.68	4.98	4.40	4.29	1.65	2.45
1979-80	41.78	15.11	3.68	7.16	5.62	3.88	4.59	3.49	4.26	2.26	2.00
1980-81	43.56	16.87	4.22	7.58	5.48	4.45	4.41	3.79	1.54	1.35	1.85

tho other States. As such, it stands to reason that the sales
tax base forms a sizeable proportion of the domestic product
of Maharashtra and moves very closely with it.

It is difficult to make similar a priori judgements
about the relationship between the bases of the other taxes
and SDP since each of these is basically a tax on a particular
type of commodity or service or transaction. However, a fairly
obvious point could be made and that is with respect to land
revenue. A priori, there is no strong reason why land revenue,
which is basically a tax on 'land holdings' should have a stable
and significant correlation with the domestic income of the
State. Thus, it would be reasonable to expect a rather insigni-
ficant income responsiveness of land revenue. The overall
income responsiveness of the tax system atleast in terms of
buoyancy could, however, be expected to be fairly high since
the ratio of State tax revenue to SDP shows a rising trend as
is shown in Graph 2.1. The rates of growth of State tax
revenue presented in Table 2.2 lend further support to the
above observation. Except in a few years, the period under
the present study has witnessed a steep upward trend in the
ratio of State tax revenue to SDP. In terms of magnitude,
the ratio has more than doubled from around 4 per cent in
1961-62 to slightly less than 9 per cent in 1979-80.

From Table 2.2 it can be seen that among the indivi-
dual taxes, the State excise revenue and the purchase tax
revenue have grown at more than twice the rate of growth
of SDP during the period under consideration. Hence, the
buoyancy of revenue from these taxes can be expected to
be substantially higher than that of revenues from the
other taxes.

The compound rate of growth in sales tax revenue at around 17 per cent is also fairly high compared to the growth rate of SDP. Among the components of the sales tax, revenue from the Central sales tax has grown faster than the revenues from the general sales tax and the sales tax on motor spirit. Thus, it is reasonable to expect that the buoyancy of the sales tax revenue in general and that of the Central sales tax in particular would be relatively high.

TABLE 2.2

Rates of Growth of Tax Revenue and SDP
in Maharashtra
(1961-62 to 1980-81)

(Per cent)

Item	Compound growth rate	Average annual growth rate
1. SDP*	11.5	11.5
2. State tax revenue	15.9	15.5
3. Sales tax (total)	17.0	17.2
4. General sales tax	16.5	16.4
5. Central sales tax	19.1	20.8
6. Motor spirit tax	14.8	15.6
7. State excise duty	25.6	24.3
8. Motor vehicle tax	11.2	10.5
9. Electricity duty	13.6	16.2
10. Entertainment tax	16.2	16.1
11. Stamps and registration fees	9.8	10.8
12. Passenger and goods tax	15.7	16.6
13. Purchase tax	24.3	19.4
14. Land revenue	7.2	7.1

* For the period 1961-62 to 1979-80.

GRAPH 2.1

STATE TAX REVENUE AS PERCENTAGE OF NET DOMESTIC PRODUCT

MAHARASHTRA

PERCENTAGES

YEARS

1961/2 62/3 63/4 64/5 65/6 66/7 67/8 68/9 69/70 70/1 71/2 72/3 73/4 74/5 75/6 76/7 77/8 78/9 79/80
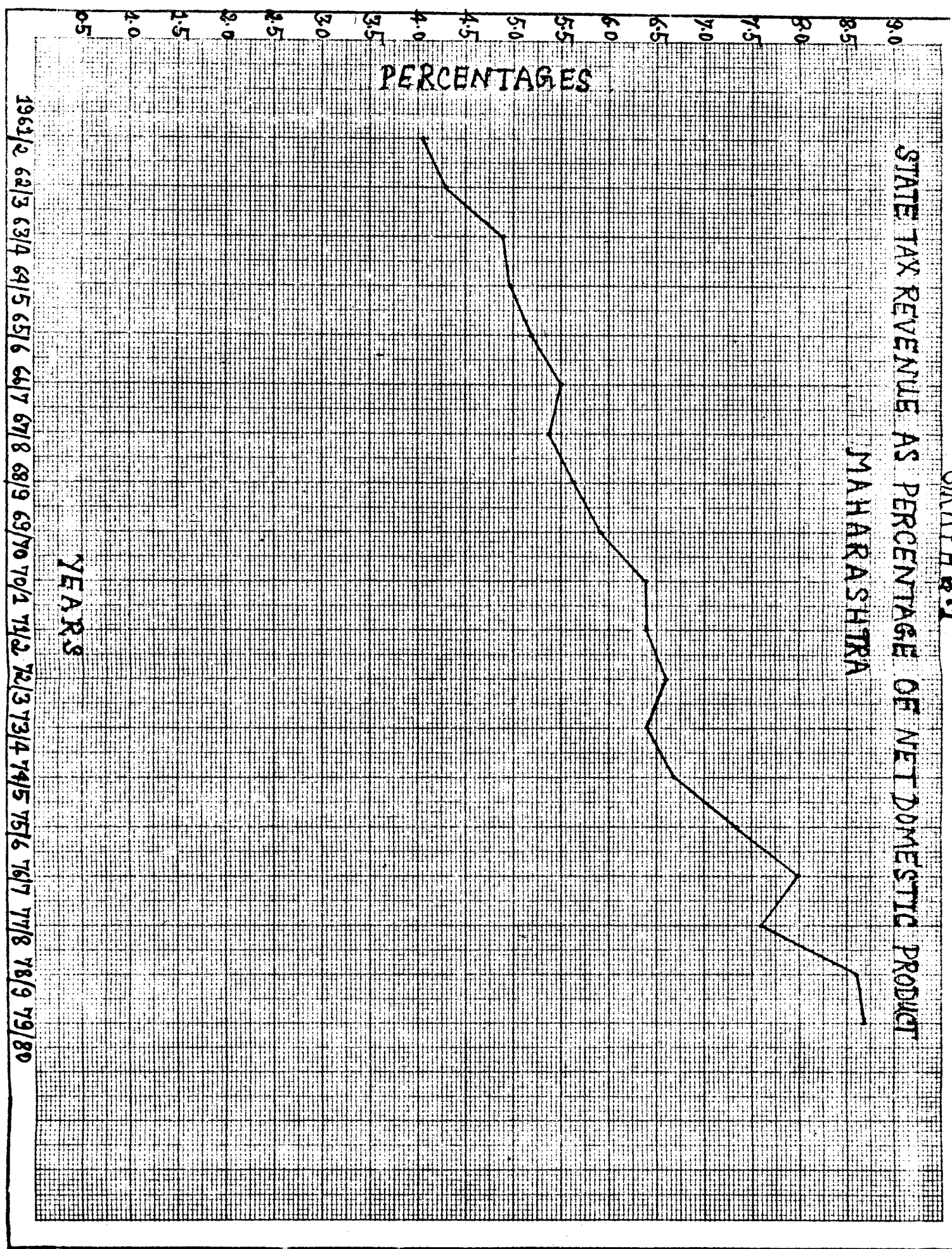
Among the other taxes, revenue from the entertainment
tax, the passenger and goods tax and the electricity duty have
grown faster than SDP, revenue from the motor vehicles tax
has grown at almost the same rate as SDP and revenue from
stamps and registration fees and land revenue have grown at
a lower rate than SDP.

Thus, the profile of the composition of State tax
revenue and the growth of individual tax revenues relative
to that of SDP seem to suggest that the overall income
responsiveness of the tax revenue in terms of buoyancy and
perhaps in terms of elasticity as well could be expected to
be fairly high in Maharashtra. In terms of the income
responsiveness of individual tax revenues, the State excise
and the purchase tax could be expected to be at the top of
the list with stamps and registration fees and land revenue
at the bottom, the sales tax, the electricity duty and the
motor vehicles tax figuring in between.

3. Estimates of Buoyancy

Buoyancy has already been defined as a measure of the
percentage change in the tax revenue concurrent with a per-
centage change in income. The exact formula in discrete
terms for buoyancy is,

$$\frac{\Delta T}{\Delta T} \Big/ \frac{\Delta Y}{\Delta Y}$$

where

T refers to the revenue from the tax and

Y refers to the income variable (specified as
State Domestic Product in the context of a
State tax).

Assuming a continuous tax-income relationship, the above formula can easily be put in a differential form as,

$$\frac{dT}{T} \Big/ \frac{dy}{y}$$

The function that is assumed to exist between revenue from a tax (or taxes) and income is:

$$T = Ay^b$$

Where A is a constant and b is generally hypothesised to be a positive constant.

The log-linear form of the above equation reduces to:

$$\text{Log } T = \text{Log } A + b \text{ Log } Y.$$

It can easily be checked that b in the above equation is the buoyancy coefficient since;

$$b = \frac{dT}{T} \Big/ \frac{dY}{Y}$$

The function being log-linear, b can easily be estimated through a regression of log T on log Y using the well known ordinary least squares (OLS) method. The buoyancy coefficients so estimated for the major State taxes in Maharashtra are given in Table 3.1.

However, before we discuss these results it would be worth mentioning here that the SDP figures that we have used for computing the buoyancies presented in Table 3.1 are in nominal terms. As is well known, it is a product of two

components, namely, a kind of general price index and real
State Domestic Product. Hence, using nominal SDP in the tax
revenue function involves the assumption that the
response of tax revenues to changes in real SDP and the
general price index are the same. In our preliminary exer-
cises, we dropped this assumption and estimated the tax
revenue equations/by using the two components of nominal SDP
as separate explanatory variables. Except for minor differ-
ences, the coefficients of the two components were not signi-
ficantly different from the buoyancy estimates obtained by
using nominal SDP. Thus, it was decided that the experiment
does not yield any additional insight worth reporting.

We have seen that in the structure of State taxation,
the sales tax occupies the pride of place in terms of revenue.
Naturally, its buoyancy should be the most important. Accor-
ding to our estimates, the buoyancy of the general sales tax
works out to be fairly high at 1.39, and that of sales tax
(total)* works out to be still higher at 1.43. The other
important taxes in the recent years have been the State
excise, the electricity duty, the motor vehicles tax, the
entertainment tax, and stamps and registration fees. The
respective buoyancies are 2.11, 1.01, 0.91, 1.42 and 0.8.
Obviously, the first is very high; in fact, the State
excise has been the most buoyant source of revenue for
Maharashtra. Since three taxes accounting for more than
75 per cent of the total tax revenue (the total of sales
taxes, the State excise and the electricity duty) have a
buoyancy coefficient above unity, it comes as no surprise
that the total tax revenue in Maharashtra has a buoyancy
of 1.34.

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*   Comprising the general sales tax, the Central Sales Tax,
    and the sales tax on motor spirit.

TABLE 3.1

Buoyancy of Major Taxes in Maharashtra
(1961-62 to 1978-79)

Item	Estimate of buoyancy
1. General sales tax	1.3903
2. Central sales tax	1.4832[@]
3. Sales tax on motor spirit	1.2027[@]
4. Sales tax (total 1+2+3)	1.4331
5. State excise duty	2.1110
6. Electricity duty	1.0095[@]
7. Motor vehicles tax	0.9129[@]
8. Entertainment tax	1.4153
9. Stamps and registration fees	0.7987[@]
10. Passenger and goods tax	1.2069[@]
11. Purchase tax	1.5346
12. Land revenue	0.6662
Total State tax revenue	1.3443

[@] The regression using OLS in case of these taxes showed significant first-order autocorrelation. The regressions were reestimated using two-step procedure to correct for autocorrelation. The method is explained in Annexure A.I.2.

Among the significant estimates of buoyancy, only
three show estimate less than unity - motor vehicles tax,
stamps and registration fees and land revenue. The first
has a buoyancy not very much less than unity (0.91), whereas
the second has a buoyancy of 0.67. With most of the taxes
having buoyancy values above one, no wonder land revenue is
becoming less and less significant as a source of revenue.

The comparable figures of buoyancy of the major taxes
of eight other States are given in Table 3.2. In the case
of four States, Andhra Pradesh, Karnataka, Kerala and Madhya
Pradesh, general sales tax is defined inclusive of sales tax
on motor spirit and therefore not strictly comparable with
similar estimates of buoyancy of the other States. This was
done because these four States merged the sales tax on motor
spirit with the general sales tax at some point within our
period of observation. For the other States, namely, Maha-
rashtra, Gujarat, Tamil Nadu, Uttar Pradesh and West Bengal
Table 3.2 presents the buoyancy coefficients for the general
sales tax and motor spirit tax separately. For these States,
we also computed the buoyancy coefficient for the combined tax
receipts of general sales tax and motor spirit tax. The
relative position of Maharashtra vis-a-vis other States in
terms of this buoyancy coefficient, however, remain the same
as the one depicted in Table 3.2. Similarly, in two States,
Andhra Pradesh and Tamil Nadu, the passenger and goods tax
was included in the motor vehicles tax for the same reason.

Comparing the overall buoyancy (i.e., of the total
tax revenue) of the eight States with that of Maharashtra,
we find that only Gujarat, Karnataka and Tamil Nadu score

TABLE 3.2

Buoyancy Estimates of Major State Taxes
(1961-62 to 1978-79)

Item	Andhra Pradesh	Gujarat[b]	Karna-taka	Kerala[b]	Madhya Pradesh	Mahara-shtra	Tamil Nadu	Uttar Pradesh	West Bengal
1. Total state tax revenue	1.2971[@]	1.3680	1.4779	1.1981[@]	1.3273	1.3443	1.3714	1.3166[@]	1.1732
2. Sales tax (total)	1.5313[@]	1.5643[@]	1.6876	1.3611[@]	1.5946	1.4331	1.6784	1.7158	1.3887
3. General sales tax	1.4313[@]	1.4884[@]	1.5818	1.3734[@]	1.5596	1.3903	1.6596	1.8267	1.4951
4. Central sales tax	2.2090	1.8852	2.3455	1.3217	1.5147[@]	1.4832[@]	1.8428	1.9720	1.1546[@]
5. Motor spirit tax	NC	1.5908	NC	NC	NC	1.1588	1.6103	1.6853	1.2053
6. State excise duty	1.5993[@]	1.0049[@]	2.0393[@]	1.4092[@]	1.2178	2.1110	2.3948[@]	1.2744	0.9142
7. Electricity duty	2.0044[@]	1.3321	1.0956	2.3139	1.3915	1.0095[@]	-0.2439[@]	1.6723	0.7654
8. Motor vehicles tax	1.3041	0.8931	0.8714[@]	0.8617[@]	1.0257[@]	0.9129[@]	1.2384	1.1735[@]	0.7997[@]
9. Entertainment tax	1.7909	1.5470	1.7670[@]	0.7484[@]	1.3901	1.4153	1.3540[@]	1.6762	1.4397[@]
10. Stamps and registration fees	1.0934	1.0646	1.0346	1.0389[@]	1.1938	0.7987[@]	0.6597[@]	1.5065[@]	0.8794[@]
11. Passenger and goods tax	NC	1.5202	1.3434	0.1572	1.4968[@]	1.2069[@]	NC	2.0197	2.1148[@]
12. Land revenue	0.5297	0.2073	-0.0017	0.5383	0.5689	0.6662	-0.3557	0.0021	0.2370

[@] Corrected for autocorrelation.

b Relate to the years 1961-62 to 1977-78, because SDP figure for 1978-79 is not available.

N.C. Not computed because the tax concerned was not levied throughout the period examined or merged with other tax.

over Maharashtra. The overall buoyancies of Gujarat and Tamil
Nadu are only marginally greater whereas that of Karnataka is
greater by about 0.105.

The differences are predictably explained by the diff-
erences in the buoyancy of the sales tax. In Gujarat, Karnataka
and Tamil Nadu, the buoyancies of total sales taxes are 1.56,
1.69 and 1.88 as compared to Maharashtra's 1.43. In fact,
among the States considered, only Kerala and West Bengal have
buoyancies of total sales taxes lower than that of Maharashtra.
The pattern is more or less the same for the major component of
the total sales tax, the general sales tax. The difference is
that Maharashtra has the lowest buoyancy with respect to the
general sales tax among all the States considered except Kerala.
For the Central sales tax also, Maharashtra has a very low
buoyancy as compared to the other States, the only two States
having buoyancies less than Maharashtra being Kerala and West
Bengal.

The tax which is next in importance to sales tax with
respect to revenue in Maharashtra, however, is far more
buoyant. This is the State excise. The buoyancy of State
excise in Maharashtra is the highest among all the States
considered except for Tamil Nadu. However, that of electri-
city duty, almost equally important, is less than in most of
the States considered, only Tamil Nadu (negative but insigni-
ficant) and West Bengal exhibiting lower buoyancies. The
motor vehicles tax is a comparatively less buoyant tax in most
of the States concerned. Maharashtra comes fifth among the
total of nine States in this regard. The four States with
buoyancy values less than Maharashtra are Gujarat, Karnataka,
Kerala and West Bengal. The highest buoyancy of this tax is
in Andhra Pradesh, 1.30 as against 0.91 of Maharashtra, and
0.8 of West Bengal, the lowest.

The buoyancy estimates of the entertainment tax are
fairly high for all the States considered except Kerala, where
it is a small 0.75. Excluding Kerala, the range of buoyancy
estimates is from 1.35 (Tamil Nadu) to 1.79 (Andhra Pradesh)
with the value for Maharashtra estimated at 1.42, higher than
for Kerala and Madhya Pradesh and Tamil Nadu only.

Stamps and registration fees show a buoyancy coeffi-
cient greater than unity in all the States considered except
three including Maharashtra, where it is only 0.8. Excluding
Maharashtra the range of buoyancy estimated is from 0.66 (Tamil
Nadu) to 1.5 (Uttar Pradesh).

Land revenue is obviously a non-starter. Every State
considered records a very low buoyancy for land revenue, two
States showing even negative buoyancy. However, just for the
record, Maharashtra exhibits the highest buoyancy with respect
to this tax.

The passenger and goods tax was not in operation
throughout the period considered in two States, Andhra Pradesh
and Tamil Nadu, and so the buoyancy of this tax for the two
States has not been separately computed. Among the rest only
Kerala, exhibiting a woeful buoyancy of 0.16 has a buoyancy
value less than Maharashtra, which has a buoyancy estimate
of 1.21. Two States, Uttar Pradesh and West Bengal record
buoyancy estimates of a little above 2.

To sum up, the overall buoyancy of the State taxes
in Maharashtra is fairly high compared to the other States.
Among the States that we have considered only Karnataka,Tamil
have
Nadu and Gujarat/marginally more buoyant tax systems than that of
                        individual
Maharashtra. Coming to/taxes, we find that the buoyancies of

State excise revenue and land revenue are substantially higher in Maharashtra than in almost all the other States. Among the remaining taxes, revenue from the sales tax, the entertainment tax and the passenger and goods tax are fairly buoyant in Maharashtra compared to the other States. The taxes which had substantially lower buoyancy as compared to the other States are the motor vehicles tax, the electricity duty and stamps and registration fees.

4. Estimates of Elasticity

The estimates of buoyancy indicate the percentage change in the actual tax revenue that has accompanied a one per cent change in income during the period under observation. It, however, does not show the automatic response of the tax revenue to variations in income. In other words, it does not give us the percentage change in tax revenue that would have accompanied a percentage change in income had there been no discretionary variations in the tax rate structure. To know the automatic income responsiveness of the tax revenue, we need to adjust the tax revenue-income relationship for variations in the tax rate structure. The elasticity coefficient provides such an adjusted measure of income responsiveness.

For empirical work, the methods of adjusting the income responsiveness of tax revenue to variations in the tax rate structure fall into three broad categories:[1]

    i)   The Divisia Index Method
   ii)   The Dummy Variable Method
  iii)   The Data Adjustment Method

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[1] For a detailed discussion of the various methods see Rao (1979) and Sarma (1980).

Among the three methods, the divisia index method is
of comparatively recent origin. Essentially, this method
views the effects of variations in the tax rate structure on
tax revenue as being analogous to the effects of technological
changes on production function. Accordingly, it employs a
'divisia index' - a familiar mathematical tool - for quantifying
the effects of variations in the tax rate structure on tax
revenue. The dummy variable method views the effects of tax
rate variations on tax revenue as a shift in the relationship
between tax revenue and income and hence proposes to use
dummy variables as proxies for discretionary tax rate variations
in the tax revenue function. Hence, the coefficient of income
estimated from such a function would be independent of the tax
rate structure. The data adjustment method has two variants:
the constant rate structure method and the proportional adjust-
ment method. Under the former method, the tax base is decom-
posed and reclassified to correspond to the tax rate structure
existing in a reference year and then by applying the tax rate
structure of the reference year to the reconstructed base
hypothetical revenue series are generated. The income elas-
ticity of this hypothetical series is independent of the rate
structure variations. The proportional adjustment method
involves eliminating the estimated revenue effects of a
given year's discretionary variations in the tax rate stru-
cture from the actual tax revenue and further adjusting the
tax revenue so obtained for the cumulative revenue effects
of the tax rate variations made in the years since the
reference year. The revenue series so adjusted are then
regressed on income to obtain the income elasticity of
tax revenue.

In selecting one among these methods for computing the income elasticity of tax revenue, one has to keep in mind the analytical assumptions underlying these methods and their data requirements. From the point of view of data requirements, the divisia index method and the dummy variable method are certainly the most preferable since they require no more than data on tax revenues and income. The divisia index method, however, is based on quite a restrictive assumption that the revenue effects of the rate structure changes are continuous through time and small in size. Should either of these assumptions not be satisfied in practice, the method fails to separate the revenue effects of discretionary tax policy measures from the automatic income responsiveness of tax revenue. When the discretionary variations in the tax rate structure are made only in a few years during the period under consideration, the dummy variable method can be fruitfully employed to estimate the income elasticity of tax revenue with a fair degree of accuracy. However, the method fails when the discretionary tax rate changes are frequent. Relative to the divisia index method and the dummy variable method, the data requirements of the data adjustment method are formidable. This is more so in the case of the constant rate structure variant. Besides the implicit assumption that the tax revenue is unitary elastic with respect to the tax rate, it demands highly disaggregated data on the legal bases and the rate structures of individual taxes over the reference period. Though the proportional adjustment method does not require such disaggregated data, it requires fairly reliable esti-mates of the revenue effects of the discretionary tax policies of the government.

For the present study, the application of the constant
rate structure method is completely ruled out since the type
of disaggregated data on the rates and bases of individual
taxes are not available. Since the revenue effects of most
of the discretionary tax rate structure changes during the
period of the present study were found to be discontinuous
through time and quite large in size we have not employed the
divisia index method too. On a balance of considerations,
we have used (except in very few cases) the proportional
adjustment method to compute the income elasticity of tax
revenues.

Table 4.1 presents the elasticity estimates for the
major State taxes in Maharashtra. The overall elasticity
of the tax system works out to be well above unity at 1.19.
A noticeable feature of the elasticities presented in the
table is that, as in the case of buoyancy, the elasticities
of individual taxes vary a great deal among themselves.
Revenue from the State excise has the highest elasticity of
1.83 and land revenue has the lowest of 0.46. Besides land
revenue, four other taxes, namely, the motor vehicles tax,
the electricity duty, the purchase tax and stamps and
registration fees show elasticities below unity.

Another feature worth mentioning is that like the
buoyancy coefficient, the income elasticity of total tax
revenue in Maharashtra is very close to the income elasticity
of the sales tax revenue. Given that the revenue from the
sales tax has accounted for around 60 per cent of the yearly
tax revenue in Maharashtra, it follows that the sales
tax accounts for approximately 60 per cent of the overall
income elasticity of the tax system. Hence, all the other

TABLE 4.1

Income Elasticity of Major Taxes in Maharashtra
(1961-62 to 1978-79)

Item	Estimate of elasticity
1. General sales tax	1.3118
2. Motor spirit tax	1.1589
3. State excise duty	1.8326[@]
4. Electricity duty	0.8565[@]
5. Motor vehicles tax	0.8447
6. Entertainment tax	1.3207
7. Stamps and registration fees	0.6901[@]
8. Passenger and goods tax	1.1393
9. Purchase tax	0.9653[@]
10. Land revenue	0.4579
11. Total state tax revenue (excluding central sales tax revenue)	1.1905

[@] Corrected for autocorrelation.

taxes put together account for the remaining 40 per cent of the overall income elasticity of the tax system.

For a comparative picture of the elasticities of major State taxes in Maharashtra on the one hand and in some of the other States on the other, let us turn to Table 4.2.

TABLE 4.2

Elasticity Estimates of Major State Taxes
(1961-62 to 1978-79)

	Andhra Pradesh	Gujarat[d]	Karnataka[b]	Kerala[d]	Madhya Pradesh	Maharashtra	Uttar Pradesh[b]	West Bengal[c]
1. Total state tax revenue (excluding central sales tax	1.2204[@]	1.1836	1.1663	0.9911	0.7436[@]	1.1905	1.1392	0.8440
2. General sales tax	1.4552[@]	1.3721[@]	1.2789	1.2454	1.2615	1.3118	1.7923	1.2696
3. Motor spirit tax	NC	1.2712	NC	NC	NC	1.1589	1.7481	1.2221
4. State excise duty	1.5993	1.0049	1.8264[@]	1.3436[@]	1.1491	1.8326[@]	0.7692	0.1762
5. Electricity duty	2.0044	1.1833	0.7195	2.2673	0.7134[@]	0.8565[@]	1.4755	0.5441
6. Motor vehicles tax	0.8790[@]	0.7691	1.1317[@]	0.7477[@]	0.5506[@]	0.8447	1.3506[@]	0.4938
7. Entertainment tax	1.6769[@]	1.3683	1.7715	0.5519	1.1600	1.3207	1.5124	1.0488
8. Stamps and registration fees	0.9227	1.0510	0.8651	0.9644[@]	0.7473	0.6901[@]	1.4420	0.4272
9. Land revenue	0.5149	0.1417	-0.2565	-0.1096	-0.9002	0.4579	-5.3552	0.0535

[@] Corrected for autocorrelation.

b The sample period is from 1963-64 to 1978-79.

c The sample period is from 1961-62 to 1976-77.

d The sample period is from 1961-62 to 1977-78.

We have not presented the elasticities of the passenger
and goods tax and the purchase tax for States other than Maha-
rashtra since these taxes formed a very small proportion of
total tax revenue in many of the States. However, revenue
from the passenger and goods tax is added to revenue from the
motor vehicles tax in the case of Andhra Pradesh since the
former was merged with the latter in the mid-sixties. Simi-
larly, some of the States (namely, Andhra Pradesh, Tamil Nadu,
Karnataka, Kerala and Madhya Pradesh) have merged the sales
tax on motor spirit with the general sales tax. Accordingly,
for these States we have defined the General sales tax as
inclusive of the motor spirit tax. For the other States we
have computed the elasticities of general sales tax and motor
spirit tax separately as well as clubbing them together. In
Table 4.2 we, however, report the results of only the former
exercise. Also, we have not computed the elasticities of the
Central sales tax for any of the States since we could not get
data on the revenue effects of the discretionary policy
changes for the individual States. Consequently, the elasti-
cities of the total State tax revenue reported here refer to
the State tax revenue exclusive of the Central sales tax
revenue.

In terms of the elasticity of total tax revenue,
Maharashtra tops the list along with Andhra Pradesh and Gujarat,
all these three States having elasticities of around 1.21.
This is in comparison to a substantially less than unitary
elasticity in Madhya Pradesh and West Bengal.

Coming to the elasticities of individual taxes, we
find that in terms of the elasticity of the General sales
tax — the most important single source of tax revenue in
the Indian States — Maharashtra comes fourth with Uttar
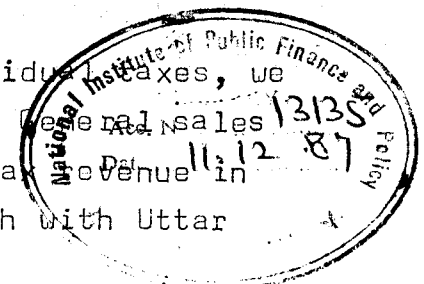
Pradesh, Andhra Pradesh, and Gujarat leading it. Thus, Kerala, Karnataka, Madhya Pradesh and West Bengal have sales tax elasticities lower than that in Maharashtra. In terms of the elasticity of motor spirit tax also, Maharashtra figures fourth with Uttar Pradesh, Gujarat and West Bengal leading it.

In terms of the elasticity of revenue from the State excise, the second most important source of tax revenue in many Indian States, Maharashtra tops the list along with Karnataka - both the States having elasticities of around 1.83. In comparison, it is much less than unity in Uttar Pradesh and is not significantly different from zero in West Bengal.

As regards the elasticity of revenue from the entertainment tax, Maharashtra occupies the fifth place, ahead of only three States, namely, Kerala, Madhya Pradesh and West Bengal. It is also interesting to observe that land revenue a tax which is generally considered not to have a significant relationship with SDP - has the highest elasticity of around 0.5 in Maharashtra and Andhra Pradesh. In view of the negative income elasticity of land revenue in many of the States that we have considered, this is an interesting result.

Revenues from the remaining three taxes, namely, the electricity duty, the motor vehicles tax and stamps and registration fees show comparatively low income elasticities in Maharashtra. The elasticity of revenue from the electricity duty in Maharashtra at 0.86 makes a poor comparison with 2.27 in Kerala and 2 in Andhra Pradesh. Only the States of Karnataka, Madhya Pradesh and West Bengal register a lower elasticity of revenue from the electricity duty than

Maharashtra. The relative position of Maharashtra is more or less similar in the case of stamps and registration fees. The elasticity of revenue from stamps and registration fees in Maharashtra at 0.69 is less than half of the corresponding elasticity of 1.44 in Uttar Pradesh. As regards the motor vehicles tax, Maharashtra figures fourth with an elasticity of around 0.85, Uttar Pradesh topping the list with an elasticity of 1.35.

5. Conclusions

To sum up the major conclusions of the present study:

i) The overall income responsiveness of the State tax revenue in Maharashtra is found to be fairly high both by itself and when compared to that of the other States that we have considered - a result which was largely suggested by the review of the trends and composition of the State tax revenue in Maharashtra in Section 2. As regards the total State tax revenue, only Karnataka has a noticeably higher buoyancy coefficient than Maharashtra; and as regards the elasticity of total State tax revenue, Maharashtra tops the list along with Andhra Pradesh.

ii) The buoyancy and elasticity of the total State tax revenue in Maharashtra are found to be fairly close to the corresponding buoyancy and elasticity of the sales tax revenue. To a large extent, this near-equality could be attributed to the fairly high proportion of the sales tax revenue in the total State tax revenue of Maharashtra.

iii) Coming to the income responsiveness of the individual tax revenues, we find that the buoyancy and

elasticity of the sales tax revenues in Maharashtra make a reasonably good comparison with those of the other States. Much the same is applicable to the income responsiveness of revenue from the various components of the sales tax. This observation is also true of revenues from the entertainment tax and the passenger and goods tax.

iv) The State excise duty, the second most important source of tax revenue in the Indian States, shows an appreciably higher buoyancy and elasticity in Maharashtra than in almost all other States considered. Only Tamil Nadu has a marginally higher buoyancy coefficient of State excise revenue than Maharashtra.

v) The taxes which show distinctly lower income responsiveness in Maharashtra are stamps and registration fees, the motor vehicles tax and the electricity duty. Both in terms of buoyancy and elasticity, these taxes make a poor comparison with their counterparts in the other States. The elasticities of revenue from all these three taxes in Maharashtra are below unity indicating a very low automatic income responsiveness.

vi) Land revenue, which shows negative income responsiveness in many of the States considered, has a positive and significant income responsiveness in Maharashtra. Although land revenue constitutes a very small proportion of the total State tax revenue in Maharashtra, this is quite an interesting result.

A Note on the Sources, Quality and Necessary
Adjustments of the Data

The data used in the present analysis relate to
three items: the State domestic product (for the States
considered), actual revenue (for individual taxes, for each
State considered), and estimated change in revenue due to
discretionary measures adopted (for individual taxes for
each State considered). The first two did not pose any problems,
since they were easily available from different sources. The
SDP figures are taken from various issues of Indian Economic
Statistics (Public Finance), Ministry of Finance, Government
of India. The tax revenue (actuals) data are from various
State Budgets.

The third, however, posed certain problems, which
are important because the elasticity values estimated depend
to a considerable extent on the estimated additional revenue
due to discretionary measures. There are three possible
sources from which data on this item can be obtained - the
Planning Commission, the Finance Commission Cell in the
Ministry of Finance, and the Reserve Bank of India Bulletin.
A fourth, of course, is the State Governments themselves,
which could not be resorted to due to the insufficient
time at our disposal.

Among the other three, RBI Bulletin reproduces the
estimates given in the State budgets. These are comparatively
inferior due to two reasons:(i) these estimates do not take
into account post-Budget measures except in very few

cases, and (ii) these are prepared within a very short period. Data on the same items submitted by the State governments to the Finance Commissions and the Planning Commission are better on both counts.

However, we were unable to obtain these data for the whole reference period and for all the States considered from the Finance Commission Cell or from the Planning Commission. Of necessity, we had to use the data reported in RBI Bulletins.

Even in the case of RBI Bulletins, the necessary details were not available in some cases. We tried to fill these gaps with the information from the Report on Currency and Finance (Annual), as far as possible. Despite our best efforts, some gaps remained, because of which we had to shorten our reference period for some States and had to drop Tamil Nadu altogether from the list of States for which elasticities of taxes were calculated.

In a few cases, the data on discretionary measures were obviously unreliable, because the estimated increase in revenue in a year due to discretionary measures were greater than the actual revenue in that year. In such cases, we ignored the estimates, but noted the fact that discretionary measures were adopted. This led us to a slightly different method of estimating elasticities in those cases. This is discussed a little later.

The last point to be mentioned here is about the
adjustments that were required while calculating elasticity.
The proportional adjustment method adopted by us requires
the adjustment of the actual tax revenue figures for the
cumulative effect of the discretionary measures adopted.
For these adjustments, the relevant data are those on the
discretionary measures undertaken during each year. However,
in some cases the reported data on such measures were not
for the whole year but a part of the year, because those
measures were effective in the first year of operation for
that part only. The hypothetical (constant rate and base)
revenue figures for such years were calculated as net of
the amount actually reported, but for adjusting the revenue
of subsequent years using the proportional adjustment method,
the revenue effects of those discretionary measures for the
whole year were used. This was done so that the hypothe-
tical revenue figures for those particular years were not
underestimated, while avoiding at the same time overesti-
mation of the hypothetical revenue figures for the
subsequent years.

Estimation Method

The usual method of estimating buoyancy as well as elasticity is that of ordinary least squares (OLS) regressions using the logarithmic values of the variables, as discussed in Section 3. The coefficient of SDP then yields the buoyancy (or elasticity, as the case may be) estimates straightaway.

However, OLS estimation is correct only when certain assumptions about the variables concerned as well as the disturbance (or error) term are fulfilled. In regressions involving time-series data, one of these assumptions may not hold true, viz., that of no autocorrelation.

To test the validity of this particular assumption, the Durbin-Watson statistic was calculated in all cases. Wherever autocorrelation was present, corrective steps were taken.

There are various methods suggested to correct for autocorrelation, of which we chose the two-step procedure. For details of the method reference may be made to Kmenta (1971, pp. 287-289). Without going into details, the method can be outlined very briefly here.

Assuming the first order autoregressive scheme,

$$u_t = \rho u_{t-1} + \epsilon_t$$

where $-1 < \rho < 1$, ϵt satisfies the OLS assumption and u_t stands for the disturbance term in the true equation. ρ can be calculated from the OLS residuals as

$$\hat{\rho} = \frac{\sum e_t \, e_{t-1}}{\sum e^2_{t-1}} \, , \text{ where } e_t \text{ refers to OLS residuals.}$$

Using this estimated value, all the variables are transformed as

$$Y'_t = Y_t - \hat{\rho} Y_{t-1}$$

where Y_t stands for the variables used and Y'_t stands for the transformed ones. The transformed values of the variables are then used for reestimating the equation using OLS method. The coefficient of the transformed SDP variable, in our case, will give a more consistent estimate of buoyancy or elasticity.

Besides correcting for autocorrelation, we deviated from the usual loglinear estimation in a few other cases. These were those for which the data reported for additional revenue due to discretionary measures were obviously unreliable, as discussed earlier. In such cases, since the quantitative aspects of the discretionary measure was doubtful but the qualitative aspect was not, we used the dummy variable method instead of the proportional adjustment method for estimating elasticity.[1]

_____

1/ The dummy variable method is discussed briefly in Section 4.

Estimates of Elasticity Using the Data Supplied by the Government of Maharashtra

As was explained in the text and Annexure A.I.1, the income elasticities of State taxes were estimated through the proportional adjustment method by using the data on the revenue effects of discretionary tax measures published in the RBI Bulletins. Alternatively, the Finance Department, Government of Maharashtra, supplied to us a set of data on what they called the normal growth of tax revenues, (i.e., the growth of tax revenue that would have occurred had there been no discretionary tax measures) for the major taxes in Maharashtra for the period from 1961-62 to 1979-80. Using these normal tax revenue series we estimated an alternative set of income elasticities of State taxes in Maharashtra. These estimates are presented in Table A.I.3.1 along with the estimates of income elasticities reported in the text.

The elasticity of State tax revenue (excluding the Central sales tax) estimated by using the normal tax revenue series supplied by the Maharashtra Government works out to be slightly lower than our estimate. However, this is not true of the elasticities of all individual taxes. In the case of general sales tax, motor spirit tax, motor vehicles tax, electricity duty, entertainment tax and stamps and registration fees the elasticities computed by using the Maharashtra Government data are lower than our estimates whereas in the case of State excise duty, passenger and goods tax, purchase tax and land revenue they are higher than our estimates.

TABLE A.I.3.1

Elasticity of State Taxes in Maharashtra Using the
Data Supplied by the Maharashtra Government
(1961-62 to 1979-80)

Tax	Our estimates (1961-62 to 1978-79)	Using Maharashtra government data (1961-62 to 1979-80)
1. State revenue[a]	1.1905	1.0146
2. General sales tax	1.3192	1.1678
3. Central sales tax	NC	1.0920
4. Motor spirit tax	1. 589	0.9320
5. State excise duty	1.8326	1.9549
6. Electricity duty	0.8565	0.7136
7. Motor vehicles tax	0.8447	0.8063
8. Entertainment tax	1.3207	1.0675
9. Stamps and registration fees	0.6901	0.5754
10. Passenger and goods tax	1.1393	1.1915
11. Land revenue	0.4579	0.6000
12. Purchase tax	0.9653	1.2883

Note: a Excludes Central Sales Tax.

The differences in the two sets of elasticities could be due to (i) the differences in the data used on the revenue effects of discretionary tax measures and (ii) the differences in the method of adjusting the actual tax revenue series for the discretionary tax measures. It is difficult to comment on the relative superiority of the data on the revenue effects of discretionary tax measures supplied by the Maharashtra Government vis-a-vis the data published in the RBI Bulletins. In terms of the cleaning of the tax revenue series for discretionary tax measures, the method used by the Maharashtra Government is not based on any generally accepted methods in the literature. In that respect, the proportional adjustment method that we have used for adjusting the tax revenue series is certainly better founded than the one used by Maharashtra Government. Moreover, even if it is shown that the data used by the Maharashtra Government are better than the ones used by us, it is difficult to get similar data for the other States that are included in the present study. Consequently, one of the objectives of the present study, namely, comparison of the buoyancy and elasticity of taxes in Maharashtra with those of the other States would be defeated.

ANNEXURE A. II

REGRESSION RESULTS RELATING TJ BUOYANCY ESTIMATES

TABLE A.II.1

Andhra Pradesh
(1961-62 to 1978-79)

	Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. Statistics
1.	Total state tax revenue	-2.69232 (-5.4614) ***	1.2971 (10.7654) ***	0.8778	115.894	1.737
2.	Sales tax (total)	-3.50163 (-8.2244) ***	1.5315 (12.5139) ***	0.9068	156.597	1.597
3.	General sales[2] tax	-3.1422 (-6.9407) ***	1.4313 (10.7914) ***	0.8783	116.455	1.605
4.	Central sales tax	-0.158121 (-16.8875) ***	2.2090 (18.4594) ***	0.9523	340.749	1.477
5.	State excise duty	-3.91832 (-6.5191) ***	1.5993 (9.1255) ***	0.8372	83.274	1.403
6.	Electricity duty	-0.129149 (-7.3176) ***	2.0044 (6.1955) ***	0.7003	38.385	2.157
7.	Motor vehicles[3] tax	-7.5926 (15.4982) ***	1.3041 (20.8284) ***	0.9622	433.823	1.402
8.	Entertainment tax	-0.124420 (-22.2049) ***	1.7909 (25.0083) ***	0.9735	625.413	1.553
9.	Stamps and registration Fees	-6.27188 (-10.3225) ***	1.0934 (14.0802) ***	0.9207	198.256	1.615
10.	Land revenue	-1.14690 (-0.7848) ***	0.5297 (2.8358) ***	0.2929	8.042	2.052

1/ In what follows, ***, ** and * indicate that the relevant statistic is significant at the one, five and ten per cent levels, respectively.

2/ Includes sales tax on motor spirit.

3/ Includes passenger and goods tax.

TABLE A.II.2

Gujarat
(1961-62 to 1977-78)

	Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1.	Total state tax revenue	-5.73067 (-14.4598)***	1.3680 (25.9983)***	0.9768	675.913	2.785
2.	Sales tax (total)	-0.11964 (-29.9906)***	1.5643 (45.6654)***	0.9929	2085.326	2.733
3.	General sales tax	-0.116663 (31.2705)***	1.4884 (17.0190)***	0.9933	2210.785	2.755
4.	Central sales tax	-0.116663 (-15.2605)***	1.8852 (18.2867)***	0.9542	334.405	1.659
5.	Motor spirit tax	-0.107800 (-18.0953)***	1.5908 (20.1120)***	0.9619	404.491	2.656
6.	State excise duty	-3.38905 (-5.6103)***	1.0049 (5.5791)***	0.6676	31.126	1.539
7.	Electricity duty	-8.25023 (-15.4884)***	1.3321 (18.8360)***	0.9567	354.795	1.753
8.	Motor vehicles tax	-4.86203 (-10.9195)***	0.8931 (15.1081)***	0.9342	228.255	1.805
9.	Entertainment tax	-0.103459 (-19.1659)**	1.5470 (21.5854)***	0.9667	465.932	2.611
10.	Stamps and registration fees	-6.20760 (-15.7704)***	1.0646 (20.3702)***	0.9628	414.946	2.356
11.	Passenger and goods tax (1963-64 to 1977-78)	-9.46816 (-15.4626)***	1.5202 (18.9494)***	0.9624	359.081	2.592
12.	Land revenue	0.44 (0.7305)	0.2073 (2.6115)***	0.2667	6.820	2.064

TABLE A.II.3

Karnataka
(1961-62 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue	-5.55617 (-14.6180) ***	1.4779 (24.8487) ***	0.9732	617.456	1.165
2. Sales tax (total)	-8.95363 (-20.7913) ***	1.6876 (29.5517) ***	0.9809	873.306	1.323
3. General sales[1]/tax	-8.3124 (-20.1472) ***	1.5818 (28.9106) ***	0.9800	835.824	1.252
4. Central sales tax	-0.159264 (-18.8071) ***	2.3455 (20.8865) ***	0.9624	436.247	1.434
5. State excise duty	-5.41685 (-6.5263) ***	2.0393 (0.0901) ***	0.8011	65.449	1.474
6. Electricity duty	-6.99374 (-6.6933) ***	1.0956 (7.9067) ***	0.7835	62.517	1.587
7. Motor vehicles tax	-1.16888 (-6.7195) ***	0.8714 (2.8007) ***	0.2996	7.844	1.329
8. Entertainment tax	-3.52600 (-6.7523) ***	1.7570 (7.7785) ***	0.7881	60.505	1.657
9. Stamps and registration fees	-5.90090 (-13.5116) ***	1.0346 (17.8638) ***	0.9493	319.116	2.251
10. Passenger and goods tax	-9.13048 (-7.7420) ***	1.3434 (8.6126) ***	0.8693	74.177	1.260
11. Land revenue	1.746294 (2.2215) **	-0.0017 (-0.0162)	-0.0625	0.000	1.754

1/ Inclludes sales tax on motor spirit.

TABLE A.II.4

Kerala

(1961-62 to 1977-78)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue	-1.18974 (-4.0509)***	1.1981 (8.5521)***	0.8279	73.138	1.258
2. Sales tax (total)	-3.34206 (-10.1243)***	1.3611 (16.4876)***	0.9475	271.846	1.539
3. General sales tax[1]/	-3.4760 (-10.5833)	1.3734 (16.8534)***	0.9497	284.037	1.543
4. Central sales tax	-8.05068 (-15.6577)***	1.3217 (17.9903)***	0.9528	323.651 ***	1.138
5. State excise duty	-1.5385 (-2.9689)***	1.4092 (4.1115)***	0.5146	16.9048	1.044
6. Electricity duty	-16.2056 (-4.7654)***	2.3139 (4.7616)***	0.5753	22.676	2.762
7. Motor vehicles tax	-1.4203 (-2.2167)**	0.8617 (3.3333)***	0.4027	11.1112	1.043
8. Entertainment tax	-3.0031 (-1.5024)*	0.7484 (1.2762)	0.0402	1.6287	1.486
9. Stamps and registration fees	-2.49011 (-11.7114)***	1.0389 (16.2892)***	0.9463	265.340	1.236
10. Passenger and goods tax	-1.08965 (-0.3132)	0.1572 (0.3209)	-0.0685	0.103	1.156
11. Land revenue	-3.04935 (-3.1088)***	0.5383 (3.8408)***	0.4622	14.752	1.601

1/ Includes sales tax on motor spirit.

TABLE A.II.5

Madhya Pradesh
(1961-62 to 1978-79)

	Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1.	Total state tax revenue	-5.60805 (-12.0190)***	1.3276 (21.6929)***	0.9651	470.581	1.351
2.	Sales tax (total)	-8.47913 (-14.0357)***	1.5946 (20.1251)***	0.9596	405.018	1.371
3.	General sales tax 1/	-8.4878 (-14.2247)***	1.5596 (19.9283)***	0.9589	397.139	1.396
4.	Central sales tax	-5.8957 (9.5316)***	1.5147 (12.0678)***	0.9004	145.6312	2.007
5.	State excise duty	-6.50835 (17.720)***	1.2178 (25.2910)***	0.9741	639.637	1.546
6.	Electricity duty	-9.40378 (20.2573)***	1.3915 (22.8553)***	0.9684	522.365	1.978
7.	Motor vehicles tax	-3.9129 (-5.0805)***	1.0257 (6.3697)***	0.7121	40.5726***	1.374
8.	Entertainment tax	-9.55123 (-18.3082)***	1.3901 (20.3161)***	0.9603	412.744	1.872
9.	Stamps and registration fees	-7.34676 (-18.6273)***	1.1938 (23.0777)***	0.9690	532.58	1.858
10.	Passenger and goods tax	-5.8903 (-6.8913)***	1.4968 (8.3311)***	0.8104	69.4076	1.514
11.	Land revenue	-2.03655 (-1.9680)**	0.5689 (4.1914)***	0.4936	17.568	0.676

1/ Includes sales tax on motor spirit.

TABLE A.II.6

Maharashtra
(1961-62 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue	0.0034 (29.91)***	1.3443 (58.98)***	0.9951	3748.03	1.494
2. Sales tax (total)	-6.9235 (-27.08)***	1.4331 (46.62)***	0.9922	2173.27	1.240
3. General sales tax	-6.96717 (-31.72)***	1.3903 (52.64)***	0.9939	2771.37	1.611
4. Central sales tax	-4.4747 (-11.60)***	1.4832 (16.5882)***	0.9449	275.1681	2.170
5. Motor spirit tax	-4.8324 (-21.1105)***	1.1588 (28.2493)***	0.9803	789.0214	1.287
6. State excise duty	-15.4086 (-32.633)***	2.110 (37.18)***	0.9878	1382.44	1.827
7. Electricity duty	-2.9791 (-7.4982)***	1.0095 (11.4629)***	0.8907	131.3992	2.430
8. Motor vehicles tax	-2.6432 (-11.2739)***	0.9129 (17.4349)***	0.9498	303.9763	1.807
9. Entertainment tax	-9.2447 (-27.28)***	1.4153 (34.73)***	0.9861	1205.90	1.502
10. Stamps and registration fees	-2.1780 (-5.8165)***	0.7987 (9.8597)***	0.8574	97.2136	1.118
11. Passenger and goods tax	-2.8849 (-6.7866)***	1.2069 (9.3636)***	0.8442	87.6768	2.392
12. Purchase tax	-11.1832 (18.75)***	1.5346 (15.79)***	0.9394	241.19	2.183
13. Land revenue	0.0416 (5.72)***	0.6662 (9.97)***	0.8527	99.43	1.723

TABLE A. II. 7

Tamil Nadu
(1961-62 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D. W. statistics
1. Total state tax revenue	-5.60126 (-18.0337)***	1.3714 (34.3399)***	0.9858	1179.229	1.443
2. Sales tax (total)	-8.63971 (-25.3041)***	1.6784 (38.2321)***	0.9885	1461.690	1.459
3. General sales tax	-8.78873 (-24.9143)***	1.6596 (36.5892)***	0.9875	1338.769	1.513
4. Central sales tax	-11.8078 (-8.3807)***	1.8429 (10.1725)***	0.8577	103.480	2.378
5. Motor spirit tax	-10.4619 (-22.2366)***	1.6103 (26.6191)***	0.9765	708.576	1.704
6. State excise duty	-4.2343 (-1.3482)*	2.3948 (1.4513)*	0.0647	2.1063	1.367
7. Electricity duty	2.1231 (0.6866)	-0.2439 (-0.3844)	-0.0563	0.1478	2.026
8. Motor vehicles tax1/	-6.5109 (-9.8566)***	1.2384 (14.5812)***	0.9256	212.611	1.974
9. Entertainment tax	-4.7708 (-13.4760)***	1.3540 (17.3120)***	0.9492	299.7065	1.690
10. Stamps and registration fees	-1.2077 (-3.1219)***	0.6597 (7.3286)***	0.7671	53.7081	1.605
11. Land revenue	4.616808 (2.4859)***	-0.3557 (-1.4897)*	0.0669	2.219	2.586

1/ Includes passenger and goods tax.

TABLE A.II.8

Uttar Pradesh
(1963-64 to 1978-79)

	Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1.	Total state tax revenue	-3.0538 (-4.9092) ***	1.3166 (9.2743) ***	0.8414	86.0134 ***	1.800
2.	Sales tax (total)	-10.1688 (-14.6121) ***	1.7158 (20.7162) ***	0.9618	429.160	1.176
3.	General sales tax	-11.4276 (-16.9240) ***	1.8267 (22.7300) ***	0.9681	516.554	1.340
4.	Central sales tax	-14.9913 (-16.0570) ***	1.9720 (17.7471) ***	0.9486	314.951	1.386
5.	Motor spirit tax	-12.4636 (-20.3287) ***	1.6853 (23.0951) ***	0.9691	533.429	1.769
6.	State excise duty	-7.48577 (-14.8901) ***	1.2744 (21.2988) ***	0.9638	453.637	1.789
7.	Electricity duty	-13.2907 (-7.2896) ***	1.6723 (7.7066) ***	0.7745	59.392	1.748
8.	Motor vehicles tax	3.1838 (5.5674) ***	1.1735 (7.2016) ***	0.7607	51.8629 ***	1.645
9.	Entertainment tax	-12.1485 (-21.3692) ***	1.6762 (24.7736) ***	0.9730	613.730	1.730
10.	Stamps and registration fees	-5.1336 (-7.4535) ***	1.5065 (9.6224) ***	0.8513	92.5905	1.919
11.	Passenger and goods tax	-14.9671 (-11.2726) ***	2.0197 (12.8518) ***	0.9112	165.168	1.380
12.	Land revenue	14.46689 (2.9972) ***	0.0021 (2.4008) **	0.22	5.764	1.480

TABLE A.II.9

West Bengal

(1961-62 to 1976-77)

	Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1.	Total state tax revenue	-4.51789 (-14.6494)***	1.1732 (30.7308)***	0.9823	944.381	1.264
2.	Sales tax (total)	-6.93507 (-21.2371)***	1.3887 (34.3541)***	0.9858	1180.206	1.564
3.	General sales tax	-8.32169 (18.0228)***	1.4951 (26.1578)***	0.9757	684.231	1.548
4.	Central sales tax	-4.0722 (-7.0568)***	1.1556 (10.7921)***	0.8783	116.4693	2.082
5.	Motor spirit tax	-7.80342 (-18.6396)***	1.2053 (23.2574)***	0.9695	540.906	2.231
6.	State excise duty	-4.59680 (-15.4057)***	0.9142 (24.8950***	0.9733	619.762	1.399
7.	Electricity duty	-3.99777 (-9.9509)***	0.7654 (15.3908)***	0.9328	236.876	2.031
8.	Motor vehicles tax	-2.5746 (-5.6118)***	0.7997 (8.2219)***	0.8063	67.6005	
9.	Entertainment tax	-3.9003 (-7.2845)***	1.4397 (8.7755)***	0.8261	77.0088	1.730
10.	Stamps and registration fees	-1.8415 (-5.2274)***	0.8794 (8.1229)***	0.8024	65.9816	1.696
11.	Passenger and goods tax	-4.6437 (-4.1935)***	2.1148 (4.8046)***	0.5799	23.0841	1.118
12.	Land revenue	-0.034025 (-0.0284)	0.2370 (1.5992)*	0.0839	2.557	0.715

ANNEXURE A.III

REGRESSION RESULTS RELATING TO ELASTICITY ESTIMATES

TABLE A.III.1

Andhra Pradesh
(1951-62 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue[a]	-1.9767 (-4.0165)***	1.2204 (7.9909)***	0.7971	63.8539	1.939
2. General sales tax[b]	-3.3907 (-7.2052)***	1.4552 (11.0206)***	0.8827	121.4543	1.689
3. Motor vehicles tax[1/]	-2.6192 (-7.1720)***	0.8790 (10.8224)***	0.8789	117.1246	1.742
4. Entertainment tax	-6.4561 (-11.2463)***	1.6769 (12.7236)***	0.9095	161.8902	1.944
5. Stamps and registration fees	-5.0725 (-7.3573)***	0.9297 (10.5486)***	0.8664	111.2722	1.315
6. Land revenue	-1.0702 (-0.7298)	0.5149 (2.7472)***	0.2781	7.5474	2.033

Note : 1/ Includes passenger and goods tax.

a and b. See below Table A.III.8.

TABLE A.III.2

Gujarat
(1961-62 to 1978-79)

	Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1.	Total state tax revenue[a]	-4.6487 (-14.0496)***	1.1836 (26.9421)	0.9784	725.8782	2.802
2.	General sales tax[b]	-10.4549 (-29.1823)***	1.3853 (45.1405)***	0.9927	2037.6628	2.661
3.	General sales tax (excluding motor spirit tax)	-6.7216	1.3721 (26.7593)***	0.9781	716.0619	3.076
4.	Motor spirit tax	-8.6454	1.2712 (16.2409)***	0.9426	263.7692	1.514
5.	Electricity duty	-7.4684 (-21.3855)***	1.1333 (25.5212)***	0.9760	651.3317	2.354
6.	Motor vehicles tax	-4.0528 (-8.5476)***	0.7691 (12.2169)***	0.9026	149.2523	1.493
7.	Entertainment tax	-9.1701 (-18.6156)***	1.3683 (20.9209)***	0.9647	437.6826	2.589
8.	Stamps and registration fees	-6.1514 (-15.7663)***	1.0510 (20.2891)***	0.9625	411.6488	2.337
9.	Land revenue	0.7405 (1.2995)	0.1417 (1.8723)**	0.1354	3.5055	2.534

a and b : See below Table A.III.8.

TABLE A.III.3

Karnataka

(1963-64 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue[a]	-4.2930 (-1.6115)*	1.663 (3.3462)***	0.4047	11.1973	2.210
2. General sales tax[b]	-6.2076 (-13.8920)***	1.2787 (21.8711)***	0.9695	478.3467	1.320
3. State excise duty	-4.5788 (-4.1135)***	1.8264 (5.3100)***	0.6602	28.1964	1.259
4. Electricity duty	-4.4087 (-3.9864)***	0.7195 (4.9724)***	0.6126	24.7245	2.311
5. Motor vehicles tax	-3.2884 (-4.3821)***	1.1317 (6.0481)***	0.7176	36.5800	1.316
6. Entertainment tax	-12.1453 (-23.3652)***	1.7715 (26.0467)***	0.9783	678.4307	1.308
7. Stamps and registration fees	-4.6628 (-8.7246)***	0.8651 (12.3708)***	0.9102	153.0366	2.531
8. Land revenue	3.5511 (3.6997)***	-0.2565 (-1.9866)***	0.1642	3.9466	1.762

a and b : See below Table A.III.8.

TABLE A.III.4

Kerala

(1961-62 to 1977-78)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue[a]	-1.0710 (-3.6595) ***	0.9911 (8.4430) ***	0.8241	71.2836	1.662
2. General sales tax[b]	-5.4114 (-20.1613) ***	1.2454 (32.4712) ***	0.9850	1054.3819	1.363
3. State excise duty	-1.7359 (-3.5150) ***	1.3436 (4.8689) ***	0.6022	23.7056	1.098
4. Electricity duty	-16.0049 (-4.2150) ***	2.2673 (3.7646) ***	0.5456	10.6067	2.763
5. Motor vehicles tax	-1.1953 (-2.1513) **	0.7477 (3.4138) ***	0.4153	11.6543	1.007
6. Entertainment tax[D]	-6.2176 (-3.5960) ***	0.5519 (2.0125) **	0.6391	15.1651	1.131
7. Stamps and registration fees	-2.3732 (-8.1443) ***	0.9644 (11.0213) ***	0.8893	121.4696	1.540
8. Land revenue	1.1102 (1.0072)	-0.1096 (-0.6959)	-0.0333	0.4843	1.314

Note : D- The regression has been estimated by using a dummy variable.

$D_1 = 1$ for 1963-64 onwards and zero for other years.

a and b: See below Table A.III.8.

TABLE A.III.5

Madhya Pradesh
(1961-62 to 1978-79)

Item	Constant	Coefficient of SDP	R^2	F-value	D.W. statistics
1. Total state tax revenue[a]	-0.6802 (-1.6372)*	0.7436 (5.1385)***	0.6136	26.4040	1.619
2. General sales tax[b]	-6.6984 (-12.6064)	1.2615 (18.1015)***	0.9505	327.6597	1.341
3. State excise duty	-6.0918 (17.6219)***	1.1491 (25.3439)***	0.9742	642.3136	1.644
4. Electricity duty	-1.5489 (-2.1811)**	0.7134 (2.4701)**	0.2418	6.1013	1.554
5. Motor vehicles tax	-0.4710 (-1.3023)	0.5506 (2.0731)**	0.1709	4.2978	1.121
6. Entertainment tax	-8.0538 (-16.7406)***	1.1600 (18.3841)***	0.9520	337.9739	1.808
7. Stamps and registration fees	-4.3823 (-11.6475)***	-0.7473 (15.1431)***	0.9307	229.3133***	1.213
8. Land revenue	8.2566	-0.9002	0.7336	47.8935***	1.586

a and b : See below Table A.III.8.

TABLE A.III.6

Maharashtra
(1961-62 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue[a]	-4.6807 (-28.3731)***	1.1905 (60.0133)***	0.9953	3601.5931	1.770
2. General sales tax[b]	-6.3424 (-31.3017)***	1.3192 (54.1478)***	0.9942	2931.982	1.645
3. General sales tax (excluding motor spirit tax)	-6.4180	1.3118 (50.6189)***	0.9934	2562.2728	1.579
4. Motor spirit tax	-7.5515	1.1589 (40.5317)***	0.9903	1642.8169	0.771
5. State excise duty	-7.7702 (-9.2634)***	1.8326 (10.8824)***	0.8801	118.4261	1.692
6. Electricity duty	-2.0323 (-4.3764)***	0.8565 (7.1226)***	0.7566	50.7309	2.277
7. Motor vehicles tax	-4.5387 (-24.6916)***	0.8447 (38.2182)	0.9885	1460.6345	1.635
8. Entertainment tax	-8.6692 (-29.3775)***	1.3207 (37.2204)***	0.9879	1385.355	1.855
9. Stamps and registration fees	-1.4262 (-3.6767)***	0.6901 (6.9253)***	0.7459	47.9598	1.050
10. Land revenue	-1.5748 (-2.1708)**	0.4579 (5.2496)***	0.6097	27.5586	1.637

a and b: See below Table A.III.8.

TABLE A.III.7

Uttar Pradesh
(1963-64 to 1978-79)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue[a]	-4.6011 (-7.6870) ***	1.1392 (16.1746) ***	0.9456	261.6178	1.792
2. General sales tax[b]	-10.2845 (-13.9145) ***	1.7145 (19.7137) ***	0.9627	388.6304	1.818
3. General sales tax (excluding Motor spirit tax	-11.1899	1.7923 (19.6211) ***	0.9624	384.9381	1.770
4. Motor spirit tax	-13.0091	1.7481 (19.5656) ***	0.9622	382.8111	2.039
5. State excise duty	-3.3906 (-3.7115) ***	0.7692 (7.1564) ***	0.7700	51.2140	1.387
6. Electricity duty	-11.8616 (-5.8539) ***	1.4755 (6.1887) ***	0.7132	38.3006	2.344
7. Motor vehicles tax	-5.6966 (-7.4478) ***	1.3506 (9.2769) ***	0.8587	86.0601	1.597
8. Entertainment tax	-10.8438 (-15.3955) ***	1.5124 (18.2489) ***	0.9568	333.0225	1.809
9. Stamps and registration fees	-9.4651 (-11.7048) ***	1.4420 (15.1551) ***	0.9384	229.6764	1.283
10. Land revenue	22.0301 (3.7513) ***	-5.3552 (-3.7073) ***	0.4765	13.7440	1.597

a and b : See below Table A.III.8.

TABLE A.III.8

West Bengal
(1961-62 to 1976-77)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. Total state tax revenue a	-2.2672 (-8.2005)***	0.8440 (24.3722)**	0.9753	594.0054	1.948
2. General sales tax b	-6.5614 (-19.8002)***	1.2871 (31.0071)***	0.9846	961.4428	2.037
3. General sales tax (excluding motor spirit tax)	-6.7137	1.2696 (19.2530)***	0.9610	370.6782	1.808
4. Motor spirit tax	-7.7225	1.2221 (18.7597)***	0.9590	351.9276	1.331
5. State excise duty	0.3729 (0.9817)	0.1762 (1.0579)	0.0084	1.1192	2.225
6. Electricity duty	-2.4416 (-4.8681)***	0.5441 (8.6611)***	0.8315	75.0147	2.067
7. Motor vehicles tax	-2.6200 (-12.2966)***	0.4938 (18.5014)***	0.9579	342.3009	1.362
8. Entertainment tax	-6.8939 (-17.1063)***	1.0488 (20.7752)***	0.9663	431.6085	1.422
9. Stamps and registration fees	-1.4377 (-3.2405)***	0.4272 (7.6871)***	0.7948	59.0915	1.392
10. Land revenue D	2.2882 (0.6591)	-0.0535 (-0.1133)	-0.0279	0.8982	1.428

Note : D: The regression has been estimated by using three dummy variables;
D_1 = 1 for 1964-65 onwards and zero for other years;
D_2 = 1 for 1972-73 onwards and zero for other years; and
D_3 = 1 for 1976-77 and zero for other years.

a: Excludes Central Sales Tax.

b: Includes sales tax on motor spirit.

TABLE A.III.9

Regression Results Relating to Elasticity of State
Taxes in Maharashtra Using the Data Supplied by
the Maharashtra Government
(1961-62 to 1979-80)

Item	Constant	Coefficient of SDP	$\bar{R}^2$	F-value	D.W. statistics
1. State revenue	-3.398	1.022 (64.166) ***	0.996	4117.272	1.502
2. State revenue[a]	-3.433	1.015 (44.575) ***	0.996	4169.995	1.486
3. Sales tax (total)	-4.803	1.132 (52.669) ***	0.994	2774.039	1.500
4. General sales tax[b]	-5.371	1.168 (45.853) ***	0.992	2102.479	1.719
5. Central sales tax	-6.379	1.092 (37.383) ***	0.987	1397.462	0.928
6. Motor spirit tax	-5.935	0.932 (30.620) ***	0.982	937.588	0.651
7. State excise duty	-14.777	1.955 (28.008) ***	0.977	784.455	1.306
8. Electricity duty	-3.848	0.714 (22.590) ***	0.966	510.324	1.613
9. Motor vehicles tax	-4.240	0.806 (37.302) ***	0.987	1391.475	1.267
10. Entertainment tax	-6.805	1.067 (35.162) ***	0.986	1236.396	1.838
11. Stamps and registration fees	-2.393	0.575 (12.871) ***	0.901	165.655	1.023
12. Passenger and goods tax	-8.375	1.191 (17.929) ***	0.947	321.452	1.412
13. Land revenue	-2.658	0.600 (9.672) ***	0.837	93.547	1.789
14. Purchase tax	-9.782	1.288 (3.328) ***	0.359	11.073	1.037

Note: a. Excludes Central Sales Tax.

   b. Excludes Motor Spirit Tax.

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