ELASTICITY AND BUOYANCY OF PERSONAL INCOME TAX

Ancient history of India divulges that this was a land of prosperity under the reign of great kings. Noted saints and seers hail from this soil. It has been known for its spiritual leaders, social reformers and philosophic thinkers. The country was abundantly rich with gifted resources in those days. The natural affluence of the land attracted the attention of the world rulers and that lead to competitive invasions from different directions of the globe. The history also reveals that it was during this period and after, as a result of political, social, demographic and economic exploitation, the country was deprived of her riches. After independence and planning there were signs of growth and there has been slow but steady progress in several fields. The economic scenario underwent marvelous changes during the post independence era. The country's national income grew beyond proportions.

Along with the growth of the economy and with the shifting of priorities towards an egalitarian welfare state, the need for revenue to the government also grew. In an attempt to find additional forms and modes of revenue mobilisation, the British sponsored personal income tax became handy. Though introduced to balance the deficit
resulted by the 1857 upsurge, called the first war of Indian independence, and prolonged financial crunch for the British rulers in India, personal income taxation stayed in our country as one of the major sources of direct tax revenue to the central government.

In a developing economy where the tax system has to be used as an important source of financing development, there is a need for making the various taxes income elastic. The taxes must be devised in such a manner that a large part of the increment in national income flows into the exchequer automatically. This avoids the necessity for making frequent changes in the tax rates or the tax base. There are many political and administrative difficulties in securing additional revenue by often altering the tax rates or tax base. Moreover, that will create uncertainty in the tax structure which is not conducive to economic growth (Sahota, 1961). Further, an elastic tax system is also useful for the purpose of ensuring stability of the economy. In developing countries, which are highly susceptible to inflation, an elastic tax system provides an automatic check against inflation reducing the need for discretionary measures. Thus, estimation of income elasticity of a tax helps to know the extent to which it can bring in additional revenue automatically and serve as a built-in-check against inflation (Krishna Rao, 1987).
In the above context, it may be noticed that during the period of the study 1962-1989, the Gross Domestic Product enhanced from Rs. 14,891 crores to Rs. 3,94,992 crores at current prices and it grew at constant prices with 1981-82 as the base from Rs. 67,686 crores to Rs. 2,30,989 crores, thus showing an upward movement in both. During the said period the personal income tax collections increased from Rs. 186 crores to Rs. 4,283 crores. The ratio of personal income tax to gross domestic product was 0.0125 in 1962-63 and it was 0.011 in 1988-89.

The above results of increase in personal income tax reveals that mobilisation of personal income tax revenue responded to an increase in the national income in the country and discretionary factors, though at varying degrees, over the years. In this connection, a distinction is generally made between elasticity and buoyancy of a tax or the tax system as a whole. The increase in revenue from any tax can be divided into two parts; one is the increase in revenue that automatically comes in response to increase in national income, the other being the increase in revenue due to changes in the variables, other than national income, which influence the tax revenue, the most important being the discretionary changes in the tax rates or the tax base. The responsiveness of the tax revenue to changes in national
income without any change in all the other factors which influence tax revenue is termed as "elasticity" or "built-in flexibility." The responsiveness of the tax revenue to changes in national income taking into account the change in the tax revenue due to all the factors which influence it is referred to as "buoyancy" (Sahota, 1961). Elasticity reflects the capacity of a tax to bring in additional revenue automatically as national income increases. On the other hand, buoyancy reflects the capacity of a tax to secure additional revenue through changes in all the factors influencing tax revenue including changes in the national income as well as other factors like changes in the tax rates or the tax base. Therefore, for estimating the elasticity, there is need for isolating the influence of changes in national income on tax revenue, while this is not necessary for calculating the buoyancy of a tax.

In the above context, it is worthwhile to mention some of the earlier studies which will be useful to identify the gaps and future course of the study. Studies related to personal income taxation and its elasticity and buoyancy attempted at the global level are by Slitor (1948), Mishan and Dicks Mireaux (1958), Cohen (1959), Prest (1962), Blackburn (1967) Singer (1968), Vito Tanzi (1969), David Maravetz (1971), Charles Mansfield (1972), Ronald L. Bonnet (1974), Nurun N. Choudhry (1975, 1979), Wasylenko (1975),

However, the above studies pertaining to personal income taxation in India, suffer from certain limitations. Sahota (1961) relied on 'mere' estimates of the effects of endogenous influences without realising that budget estimates of any changes in tax rates or tax coverage usually tend to be underestimated. It was also cumbersome. Gulati (1962) himself admitted that his study was not accurate. The estimates of James Cutt (1969) do not give correct picture of the income elasticity of personal income tax in India as they were based on the data for just the first year and the last year of the period for which the elasticity is calculated. The data for the intervening
years are not incorporated in the study. The estimate made by Suman (1974) was not elasticity but buoyancy of personal income taxation, since he had not adjusted the tax revenue for changes in factors other than national income which influence the tax revenue. The model of Srivastava (1975) had an artificial distinction between 'basic rate' and log-linear forms for the tax revenue functions. But generally, log-linear functions are more suitable than linear functions as the true relationship between tax revenue and national income is non-linear since the marginal tax rate increases as income increases. Krishna Rao (1987) also followed some of the methods followed by his predecessors and adopted their techniques along with the flaws. He did not effectively present the causes for the prevalence of elasticity differentials when he switched over from time series data to cross section data. The studies of Aggarwal (1989, 1991) were not exclusively dealing with elasticity and buoyancy but tilted towards the other variables in the study, namely inequality and distribution.

Further, the studies did not at all employ Divisia Index method which is superior to constant rate structure, dummy variable and proportional adjustment methods for computing elasticity and buoyancy of personal income taxation. Further, they did not consider the structural
(political) disturbances after 1975 in assessing the elasticity and buoyancy of personal income tax. Besides, these studies did not consider responsiveness of personal income taxation across different income ranges.

On the above background, the present chapter investigates the following objectives:

i) To identify the elasticity and buoyancy of personal income taxation across different income ranges during the year 1962-1989, and

ii) To examine the impact of change from political stability to political instability on elasticity and buoyancy of personal income taxation in India.

Methodology

The main methods of estimating elasticity and buoyancy of tax revenue are (i) constant rate structure method**, (ii) dummy variable method**, (iii) proportional adjustment method** and (iv) divisia index method.

Among the four methods, the Divisia Index method is the most popular one which is introduced into growth accounting procedures that link index number theory with specific functional forms. This method gained popularity for its

* See chapter I
** See Appendix 4.1
desired properties and meaningful interpretation of the results derived from it. That is, the data requirement in this method is minimal and measurement of built-in-flexibility can be derived by slightly modifying the buoyancy estimate with residual revenue growth factor similar to the total factor productivity measure of growth accounting.

Divisia Index method is analogically similar to production function. Production function shows a technological relationship between inputs and outputs of goods and services. Similarly, a tax function is defined as an institutionally determined relationship between the tax base (input) and revenue (output). Further, the function is completely determined by tax base and structure of the tax. If there are no technical changes or discretionary changes, then the given technology or discretionary changes remain unaltered. Thus, the aggregate production function or tax function remains undisturbed.

Just like technical changes influence in shifting production function, discretionary changes also induce shifting in tax function. Hence, in the event of a discretionary tax change (a technical change), change in tax yield (output) results not only from movement along the tax yield curve (production curve) caused by the growth in base
(factor inputs), but also from a shift in the curve caused by such a change. In addition, if the impact of discretionary measures can be assumed to be smooth, it is similar to the Hicks-neutral technology improvements in production. Application of analogy of discretionary tax measures on tax yield, to the effects of technical changes, requires us to construct an index of discretionary revenues over time. Such an index can be used to modify the buoyancy measure in order to derive the built-in-flexibility estimate.

To estimate the buoyancy and elasticity under Divisia Index method, the trend-in-tax ratio (tax revenue divided by gross domestic product) can be explained by writing aggregate personal income tax revenue \( T \) as a homogenous function of gross domestic product \( X \):

\[
T = AX^u
\]  \hspace{1cm} (1)

with \( X \) rising through time, the tax ratio \( T/X \) remains constant or rises through time as the value of 'u' equals or exceeds unity.

The Divisia Index of discretionary revenue growth adjusts the estimated buoyancy of personal income tax revenue in order to obtain the elasticity. The estimates of buoyancy of personal income tax are made from unadjusted
historical revenue data for the time interval \((0,n)\) by estimating the tax function. \(T = AX^u\), while the estimates of elasticity of personal income tax are obtained by adjusting the buoyancy as:

\[
\frac{\log D(n)}{\log X(n)/X(o)} = u - r
\]

Where

\[r = \text{elasticity estimate of the tax system},\]
\[u = \text{buoyancy of tax yield},\]
\[D(n) = \text{index of discretionary tax revenue growth},\]
\[X(n) = \text{gross domestic product of the current period},\]
and
\[X(o) = \text{gross domestic product of the initial period}.\]

The estimated elasticity of personal income tax revenue is expected to be smaller than its buoyancy if the overall effect of discretionary measure is to increase revenue and vice versa. Further, greater the effect of discretionary measures larger is the difference between buoyancy and elasticity.

The present study employs the above Divisia Index model to estimate elasticity and buoyancy of personal income taxation in India during the period from 1962-63 to 1988-89. The time series data collected for the purpose of analysis
of estimating elasticity and buoyancy of personal income tax in India are divided into two phases. The first phase is from 1962-63 to 1974-75 and second phase is from 1975-76 to 1988-89. This division is made to specially identify the impact of political changes and the resultant discretionary changes in the tax policies. The first phase signifies a stable political set up in the country during which the Congress party was in seat of power at the centre unchallenged, keeping the trend after independence. It was in the year 1975, a historically important internal emergency was declared by Mrs. Indira Gandhi, under the pretext of an imminent threat to the country's internal security. The excesses committed during this tough period of emergency paved the way for a non-Congress government to occupy the seat of power in Delhi in 1977. The Janatha party headed by Mr. Morarji Desai had two laurels to its credit; one being the first non-Congress government and the other marking the beginning of the short-lived governments prone to instability. Therefore, the second phase in the study marked the political non-stability period.

This division was of more use to us in the study, since it helped us to estimate elasticity and buoyancy of personal income taxation in three sets - for the whole period from 1962-1989; for the first phase from 1962-1975 and for the second phase from 1975-1989.
Similarly, the data are also grouped according to income ranges of the tax payers. The tax system of personal income tax in India itself adopted a grouping pattern according to income ranges into as many as 19 categories in 1962-63. But the number of groups was reduced to only 9 in 1988-89. Hence, the present study groups the tax payers into only four groups for simplicity, clarity and comparability over the period of 27 years of the study. The classified four groups are:

i) Those with income of Rs. 20,000 and below,
ii) Those with income from Rs. 20,000 to Rs. 50,000,
iii) Those with income from Rs. 50,000 to Rs. 1,00,000, and
(iv) those with income above Rs. 1,00,000.

Empirical Results and Discussion

Elasticity and buoyancy of personal income taxation across different income ranges during 1962-63 to 1988-89 are presented in table 4.1. The computed results reveal the following facts. The buoyancy of personal income tax revenue in India during 1962-1989 is positive but less than unity in the case of second and fourth group and also for all tax payers. But it is more than unity in respect of tax payers with income of Rs. 50,000 to Rs. 1,00,000. This
brings to light that this group responds more than proportional to the changes in the determinant variables. It is worth noting that the buoyancy of personal income tax has been negative during 1962-1989 in respect of personal income tax payable by the tax payers with income of Rs. 20,000 and below. This is simply due to discretionary changes in the exemption limit in favour of this group of the tax payers.

The estimates of elasticity during the said period for the corresponding groups of tax payers also showed mixed results. The first group responds a little while the third group responds more than proportionally with elasticities being 0.0651 and 1.0657 respectively for the said groups.

To identify and isolate the effects of the discretionary changes in the tax policies, such as exemption limits, tax rates, tax evasion, concessions and incentives given for savings and also efficiency of tax administration, the difference between the coefficients of buoyancy and elasticity was also computed. The results reveal that the discretionary changes have always had a significant impact on the tax mobilisation in India. With regard to the lowest income slab it has been negative, indicating that for this group of tax payers it is almost mandatory either to fall within the tax net or to escape from it. Their option has
no relevance in the tax policy unilaterally decided by the government. In respect of the third and fourth groups also it is negative, indicating that the discretionary changes such as, rebates and concessions had an influence on the tax liability of these groups.

The computed results of elasticity and buoyancy of personal income tax across different income ranges during the first phase of the study from 1962-63 to 1974-75 are presented in table 4.2. The buoyancy and elasticity estimates show similar trend. In the case of buoyancy, the coefficient of the first two groups are 1.1617 and 1.0049. The third and fourth groups had buoyancy coefficient of 0.7522 and 0.8737 respectively while in respect of all tax payers it was 0.9684. The elasticity coefficients were 1.3951 and 1.0061 in respect of the first and second groups, while they are less than unity in the case of third and fourth groups and with respect to all tax payers.

The differential column between buoyancy and elasticity shows that the value was negligible but negative in the case of second group and it is negative also in the case of the first group. This justifies that the benefits enjoyed by the first group over a period of 27 years is also enjoyed by the second group during 1962-1975 stability period. The benefits comprise of discretionary changes in the tax policy.
with regard to personal income taxation in India. The discretionary changes include competitive raising of the exemption limits and reduction of marginal tax rates applicable to these groups. The negativity signifies that the tax compliance and collections from these two groups are not at all given any importance by tax administrators, since their focus is on the other groups with high tax potential. Besides, the two groups with income of Rs 50,000 - Rs. 1,00,000 and Rs. 1,00,000 and above were subjected to high rates and the degree of enforcement was also severe. Therefore, the difference between the elasticity and buoyancy of these two groups is positive. Table 4.2 also indicates that the buoyancy and elasticity differential in respect of all tax payers is nearly negligible, as the first two groups and the next two group neutralise the effects of discretionary changes in the tax policies.

The second phase of the study pertains to 1975-76 to 1988-89. This period has been branded as the period of instability with regard to political set up of the country. However, the second phase of the study reveals very interesting and useful informations in relation to personal income taxation in India. When we move from the stability period to non-stability period, the results of buoyancy coefficient are greater than unity in the case of third and fourth groups, with the third group recording highest
sensitivity with 1.5389. In the case of second group and in respect of all tax payers, the buoyancy has been positive and very close to point of unity. However, in the case of first group with income of Rs. 20,000 and below it has been negative due to higher exemption limits and lower tax rates.

The elasticity of personal income tax in India during the second phase of the study during 1974-75 to 1988-89 showed very interesting results. The elasticity of personal income tax proved to be more than unity in all income ranges, except in the case of second group of tax payers with income of Rs. 20,000 to Rs.50,000. Even in this case it is somewhat close to unity. The third group with income of Rs. 50,000 to Rs. 1,00,000 had the highest sensitivity with 1.9431.

The computed results after isolating the discretionary changes in the taxation are shown in the last column of table 4.3. The difference between the buoyancy and elasticity has been very high and also negative in the case of the first group of tax payers with income of Rs. 20,000 and below. The corresponding coefficient was -2.9662. This proves beyond doubt that the discretionary changes in tax level and the tax base always have a strong negative impact on the mobilisation of personal income tax from this income group. This is due to the fact that competitive populist
policies followed by successive governments that were in power lead to raising of exemption limits by leaps and bounds and reduction of opening tax rates for the lower income slab. It was during this period the personal income tax was virtually converted from the 'mass tax' to 'class tax'. Besides, this observation can be justified by the elasticity coefficient (1.9431) in respect of the third income bracket with income of Rs. 50,000 to Rs.1,00,000. This group generally has a very good potentiality for additional taxation. Their tax compliance is always better and possibility for tax evasion is the least in this group. Because this group is mostly comprised of government employees and salaried classed in the organised sector.

The difference between the elasticity and buoyancy coefficient is negative(-0.4042) in respect of income bracket Rs. 50,000 to Rs. 1,00,000. It is due to the fact that during this period several schemes were introduced to promote savings and productive investment by the prospective tax payers of this group and most of them used the opportunity given to them and minimised their tax liability as far as possible.

A look back at the table 4.2 and 4.3, will convey group-wise information and time series discussion. The first income bracket tax payers showed a positive buoyancy
at 1.1617 in the first phase and their buoyancy coefficient became surprisingly negative during the second phase with -1.2400. However, their elasticity coefficient remained positive and greater than unity during the two phases. They enjoyed the maximum favour from the tax administrators by their discretionary policies during the two phases. The impact can be seen by the index -0.2334 and -2.9662 during the two different phases.

The second income bracket tax payers with income of Rs. 20,000 to Rs. 50,000 whose sensitivity was greater than unity both in buoyancy and elasticity during the first phase, lost their compliance during the second phase with less than unity value of elasticity and buoyancy. The tax mobilisation from this group fell sharply because of incentives and concession extended during the period.

The third income range of tax payers who responded lightly during the first phase with 0.7522 and 0.4707 buoyancy and elasticity respectively, responded more violently with the highest coefficients of buoyancy and elasticity at 1.5389 and 1.9431 respectively. As presented in the earlier paragraphs, this group of tax payers are loyal, honest and law abiding, having been belonging to the category of salaried class, who can not evade the tax liability. Though tax rebates were available to them also,
the mobilisation was remarkable from this class of taxpayers for two reasons, (i) they always have better tax compliance and (ii) there is a natural growth of this group in terms of number of taxpayers, income assessed and the tax payable.

The fourth group of taxpayers have an income of Rs. 1,00,000 and above. They include every rich person who is brought into the tax fold without exception. Though the per capita tax paid by this group of taxpayers was extremely high, in terms of buoyancy and elasticity their reaction was not uniform during the two phases. In the second phase, this group of taxpayers had a buoyancy and elasticity of 1.2810 and 1.2470. This proved that their relative share in tax revenue for every increase in national income was greater than unity during second phase of 1975-1989. But the buoyancy and elasticity became less than unity during the first phase of 1966-1975. This brings to light the fact that they were also benefitted by the reduced tax rates during the second phase and there is lesser degree of both tax avoidance and evasion in this particular group of taxpayers.

Concluding Remarks

In the literature of public finance and taxation, a distinction is generally made between elasticity and
buoyancy of a tax or the tax system as a whole. The responsiveness of the tax revenue to changes in national income automatically without any change in the other factors which influence the tax revenue is termed as 'Elasticity' or 'Built-in-flexibility' and the responsiveness of the tax revenue to changes in national income taking also into account the change in the tax revenue due to all the factors which influence it, is referred to as 'Buoyancy'.

Several attempts have been made at the global level to estimate the elasticity and buoyancy of taxes in general and personal income taxation in particular. Such studies were also made in India in respect of other taxes and also in respect to personal income taxation. Though very exhaustive and systematic, those studies suffer from certain gaps and the present study was developed taking into account those gaps and with two major objectives such as (i) to identify the elasticity and buoyancy of personal income taxation across different income ranges and (ii) to examine the impact of change from political stability to instability on elasticity and buoyancy of personal income taxation in India.

The analysis reveals that for the whole period of 27 years and for the divided two phases, the responsiveness of the tax payers and the tax yield had been significantly
different. For the whole period the first group of taxpayers behaved differently from the other groups. The buoyancy of the group has been negative and elasticity was positive. The differential between the two indicates that the discretionary measures had reasonable influence on the mobilisation of personal income tax. Conversely, all the other group had positive response during this period.

The elasticity and buoyancy estimated in respect of the first phase showed that the tax liability of the first two groups increased greater than unity. But the impact of the discretionary changes has been negative on these two groups.

However, during the second phase the results show that the sensitivity of the tax payers both in terms of buoyancy and elasticity were either greater than unity or very close to unity. It is worth while to note that during this period the exemption limit was hiked by leaps and bound and the tax rate was sliced down, and several incentives and concessions for savings and productive investment were extended. These discretionary changes resulted in the negative reaction of the lower income bracket among the tax payers. However, similar negative effect on the tax payers with income of Rs. 50,000 to Rs. 1,00,00 is really surprising. It is inferred that the lowest income group enjoyed the privilege of being dropped from the tax net or subjected to tax at the
minimal level and the other discretionary benefits enjoyed by the second group during the first phase was enjoyed by the third group and therefore the tax mobilisation from the group responded negatively due to discretionary measures during the second phase.

The results convey that the tax compliance and the yield have been better during the second phase when compared to the first phase, though the national income has been increasing consistently both at current and constant prices. This proves the fact that the discretionary changes in exemption limit, tax base, tax rates and other incentives had a strong impact both positively and negatively on tax mobilisation across different income ranges of the tax payers.

Successive Tax Reforms committees appointed from time to time in the country recommended raising of the exemption limits, to adjust with ever rising price situation and also suggested gradual reduction of tax rates. Although their recommendations were not accepted in toto, a test dose of these discretionary changes proved to be fruitful. While raising of the exemption limits, allows many erstwhile tax payers to fall out of the tax net, a reduction in the tax rate and permissible rebates came to the rescue of the middle income tax payers to slice down their tax liability.
The loss of revenue from one set of tax payers is carefully neutralised by the other groups, thereby keeping the buoyancy and elasticity always close to unity in respect of the total tax payers. The study also proved beyond doubt that the discretionary measures and tax policy changes have a sure impact on the tax mobilisation. However, the discretionary tax benefits extended to a larger number of tax payers have more political significance and therefore they have been persistently followed by successive governments as safety measures under democracy. Since the tax payer is also a voter, in any democratic country, tax policies are designed in such a way that they benefit large size of population in terms of number of tax payers, though the loss of revenue is compensated by other sources of revenue collected from less number of tax payers, who are relatively richer and less complaining and whose role in democratic process is very insignificant.
REFERENCES


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### TABLE 4.1

**ELASTICITY AND BUOYANCY OF PERSONAL INCOME TAX ACROSS DIFFERENT INCOME RANGES DURING 1962-1989**

<table>
<thead>
<tr>
<th>Income range</th>
<th>Buoyancy</th>
<th>Elasticity</th>
<th>Difference between Buoyancy and Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in rupees)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 20,000</td>
<td>-0.2054</td>
<td>0.0651</td>
<td>-0.2705</td>
</tr>
<tr>
<td>20,000 - 50,000</td>
<td>0.7901*</td>
<td>0.6409</td>
<td>0.1492</td>
</tr>
<tr>
<td>50,000 - 1,00,000</td>
<td>1.0252*</td>
<td>1.0657</td>
<td>-0.0405</td>
</tr>
<tr>
<td>1,00,000 and above</td>
<td>0.7943*</td>
<td>0.7101</td>
<td>-0.0842</td>
</tr>
<tr>
<td>All ranges</td>
<td>0.7804*</td>
<td>0.8626</td>
<td>0.0822</td>
</tr>
</tbody>
</table>

Note: * Significant at one per cent level.

### TABLE 4.2

**ELASTICITY AND BUOYANCY OF PERSONAL INCOME TAX ACROSS DIFFERENT INCOME RANGES DURING 1962-1975**

<table>
<thead>
<tr>
<th>Income range</th>
<th>Buoyancy</th>
<th>Elasticity</th>
<th>Difference between Buoyancy and Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in rupees)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 20,000</td>
<td>1.1617*</td>
<td>1.3951</td>
<td>-0.2334</td>
</tr>
<tr>
<td>20,000 - 50,000</td>
<td>1.0049*</td>
<td>1.0061</td>
<td>-0.0012</td>
</tr>
<tr>
<td>50,000 - 1,00,000</td>
<td>0.7522*</td>
<td>0.4707</td>
<td>0.2815</td>
</tr>
<tr>
<td>1,00,000 and above</td>
<td>0.8737*</td>
<td>0.7680</td>
<td>0.1057</td>
</tr>
<tr>
<td>All ranges</td>
<td>0.9684*</td>
<td>0.9835</td>
<td>-0.0151</td>
</tr>
</tbody>
</table>

Note: * Significant at one per cent level.
### TABLE 4.3

ELASTICITY AND BUOYANCY OF PERSONAL INCOME TAX ACROSS DIFFERENT INCOME RANGES DURING 1975-1989

<table>
<thead>
<tr>
<th>Income range</th>
<th>Buoyancy</th>
<th>Elasticity</th>
<th>Difference between Buoyancy and Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 20,000</td>
<td>-1.2400*</td>
<td>1.7262</td>
<td>-2.9662</td>
</tr>
<tr>
<td>20,000 - 50,000</td>
<td>0.0349*</td>
<td>0.7507</td>
<td>0.0842</td>
</tr>
<tr>
<td>50,000 - 1,00,000</td>
<td>1.5389*</td>
<td>1.9431</td>
<td>-0.4042</td>
</tr>
<tr>
<td>1,00,000 and above</td>
<td>1.2810*</td>
<td>1.2470</td>
<td>0.0340</td>
</tr>
<tr>
<td>All ranges</td>
<td>0.9966*</td>
<td>1.0926</td>
<td>-0.0960</td>
</tr>
</tbody>
</table>

Note: * Significant at one per cent level.
APPENDIX 4.1

Constant Rate Structure Method

The constant rate structure method applies the base year rate structure to the tax base in the following years. The resulting series are employed to measure 'T', computing built-in-flexibility of the tax. However, the prohibitively heavy demands on data requirements severely restrict its applicability, because detailed data on tax rates and bases are generally not available.

Dummy Variable Method

The second method by singer (1968), does not involve any direct adjustment of gross tax revenues. However, it requires the introduction of dummy dichotomous variables into regression equations at the rate of one for the intercept and one for slope in each year of discretionary rate changes. With such dummy variables, the required equation to be estimated is presented below:

\[
\log T = a + b \log Y + \sum_{i=1}^{n} C_i D + \sum_{i=1}^{n} d_i D \log Y
\]

Where,

\( T \) = Tax revenue,

\( Y \) = Income, and

\( D_i \) = '1' in the year of discretionary change and 'zero' otherwise.
It is obvious that the number of parameters to be estimated proliferates into twice as many as there are discretionary changes. This results in a heavy loss of statistical degrees of freedom and a consequent loss of confidence in the reliability of the parameter estimates, especially in small samples. In the end, it turns out that this method also is statistically quite expensive under normal circumstances.

**Proportional Adjustment Method**

The objective of the third method, popularly known as the Prest (1962) - Mansfield (1972) method, is to accommodate both tax rate and base changes into the adjustment process. According to this method, a base year is chosen to represent the constant structures and the historical tax revenue series of the later years are proportionally adjusted for the additional revenues arising from discretionary tax changes in those years.

The Prest-Mansfield method of proportional adjustment attempts to 'clean' the historical series of a tax by subtracting from each year's gross tax revenue, an estimated yield due to discretionary changes. The computations involve the following procedures: Let \( A_i \) be the budget estimate of additional yield from discretionary rate and/or base revisions, \( T_i \) the historical revenue series of the tax
and \( P_i \) the adjusted tax revenue in the \( i \)th year. For the sake of analysis, let 'i' be the year in which discretionary changes were introduced first. The Prest-Mansfield method retains the structure of \( i \)th year and the effects of discretionary measures introduced since the \( i \)th year and the years following it as shown below:

\[
P = \frac{T - A}{T_i}
\]

\[
P = \frac{T - A}{T_{i+1}}
\]

\[
P = \frac{T - A}{T_{i+n}}
\]

It tries to proportionally adjust the historical revenues to compute the conceptually 'clean' series that correspond to the constant structure of the tax. This method also, obviously depends crucially on both the availability and reliability of data for its gainful applicability.