INDIRECT TAXES IN INDIA
AN INCIDENCE ANALYSIS

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TABLE OF CONTENTS

prices. They also did not take care of the Proforma Credit Scheme (PCS) which was operating at the time of their study although they were aware of it.

Under PCS input duty credit is available to manufacturers against the excise and countervailing (henceforth called C.V.) duties paid on excisable raw materials and components used in the manufacture of excisable finished or semi finished goods. This scheme applies only when both the inputs and the final product fall under the same tariff heading of the Central Excise Tariff. If there are some excisable inputs which do not fall under the same tariff heading then no duty credit is available for those inputs. C.V. duties are levied (over and above customs duties) on imports at the same rates as excise duties on like products produced domestically. These duties change simultaneously with the excise duties and are imposed on the assumption that they are just sufficient to effect the cost disadvantage of domestic products.

With the introduction of MODVAT in early 1986 the PCS has been extended to all excisable commodities with the exception of a few with "special problems" viz, petroleum, tobacco and textile products. The scheme of MODVAT allows manufacturers to obtain complete reimbursement of excise duty and C.V. duty paid not only on all excisable components and raw materials used in the manufacture of excisable final products but also on the essential parts of the marketed product, e.g. paints, packaging materials etc. However, as in PCS, the excise duty on the final product is then increased by exactly the same amount as the subsidy provided on inputs. This scheme, while keeping the government revenue unchanged, affects the final consumer price if a profit mark up is applied to the input costs. It can be easily understood by means of a simple example.

An Example of Consumer Price Change with MODVAT

	Calculation of Consumer Price	Before MODVAT (Rs.)	After MODVAT (Rs.)
1.	Cost of inputs	10,000	10,000
2.	- Input duty credit	-	- 500
3.	Net Cost	10,000	9,500
4.	+ Profit (= 10% of net cost)	+ 1,000	+ 950
5.	Total assessable value	11,000	10,450
6.	+ Duty on output	+ 1,650	+ 2,150 (= 1,650+500)
	(duty as % of total assessable value)	(15%)	(20.6%)
	Final consumer Price	12,650	12,600

Note from this example that while a duty rebate of Rs.500/- is given, excise tax is increased from 15% to 20.6% in order to keep the government revenue neutral. Note also that if all the inputs are covered under MODVAT, the new nominal rate of excise duty (20.6%) is also the effective rate due to the set-off of duties paid on inputs. Since the final consumer price is affected, this may have serious implications for incidence or tax burdens on various consumer classes. However, there will be no direct change in consumer price in the absence of profit margins. It can be checked that in this case the consumer price is Rs.11,500/- (=10,000 + 1,500 or 9,500 + 1,500 + 500) both before and after the introduction of MODVAT.

In this paper we take care of all the aforesaid problems by allowing for positive mark up rates as also the scheme of MODVAT by studying the data for 1984-85. In the next section we present our model to derive the effective rates of taxes from nominal rates with the help of input - output coefficients. We then present the calculated effective rates for union excise and import duties for 1984-85 and compare them with those obtained in the absence of MODVAT. It turns out from this comparison that the tax reform undertaken by the government is indeed able to reduce the effective rates in all sectors, the most notable being electricity for which the effective excise duty comes down from a level of 12.75% to 11.71% and pesticides for which the reduction is from 16.52% to 15.45%.

In section 3, we give a description of the methodology for the calculation of the traditional concept of tax burden. We find, as expected, that with the introduction of MODVAT there is a reduction in the tax burdens due to both excise and import duties for each of the expenditure classes in both rural and urban areas. The excise tax burdens are perfectly progressive, being higher for urban than for rural areas. This is supported well by the evidence in Chelliah-Lal (1981) and to a lesser extent by Ahmad-Stern (1983) and Murty (1987) (which covers commodity taxes in general). However, unlike the earlier studies, we find that the burdens from import duties are more or less stable across expenditure classes at least in the rural areas.

Section 4 explains the theory for obtaining the effects of changes in tax rates. We present and discuss the effects on market prices and public revenue due to tax changes in various groups of commodities in both pre-and post-reform regimes when wages are indexed to prices and when they are not. We assume here that there is a 100% shifting of indirect taxes to consumer prices.

The incidence analysis or the study of gains/losses in consumer utility levels in terms of change in utility as a proportion of mean expenditure is explained in section 5. Using the results from the previous section we, therefore, calculate the effects on various consumer classes when taxes of one or more commodity groups are increased.

2. THE MODEL

2.1. PRICE EQUATIONS

For purposes of comparison we shall use notations as close to those of Ahmad and Stern (1983) (henceforth called AS) as possible. (′) superscript denotes the transpose of the relevant vector or matrix.

Let L be the number of all commodities indexed by the set I_L. If M and N are the numbers of commodities respectively covered and not covered by MODVAT then their index sets are denoted by I_M and I_N with $I_L = I_M \cup I_N = \{1,\ldots,L\}$. Henceforth, we shall call the former MODVAT commodities and the latter non-MODVAT commodities.

t^d, t^m and τ^m respectively denote the specific excise, customs and countervailing (C.V.) duty rates in the absence of MODVAT.

$\hat{t}^d$ is the specific rate of excise duty after introduction of MODVAT.

A^d and A^m are respectively the domestic and imported input use coefficients matrices of size L x L.

y is the vector of gross value added and it is decomposed as $y = W + \Pi$.

W is a vector of personal incomes. It includes wages, distributed profits, interest etc.

Π constitutes the non-personal or profit income. It consists of corporate and government incomes such as retained profits which may be used for investment purposes, tax on profits, depreciation etc. For our purposes we shall call Π the profit income. It is obtained by applying a fixed mark up to prime costs, namely, the material costs and W.

π is the vector of fixed profit margins as applied to the prime costs. It includes tax on profits, depreciation and obsolescence, other overheads etc.

For any matrix $B = ((b_{ij}))$ the following variations are defined

$$\bar{B} = ((\bar{b}_{ij})) \text{ with } \bar{b}_{ij} = b_{ij} \text{ if } i,j \in I_M \\ = \emptyset \text{ otherwise}$$

$$\tilde{B} = ((\tilde{b}_{ij})) \text{ with } \tilde{b}_{ij} = (1 + \pi_j)\, b_{ij}$$

$$\tilde{\bar{B}} = ((\tilde{\bar{b}}_{ij})) \text{ with } \tilde{\bar{b}}_{ij} = (1 + \pi_j)\, \bar{b}_{ij}.$$

Similarly for any vector Z, $\tilde{Z}$ is defined as

$$\tilde{Z} = (\tilde{Z}_j) \text{ with } \tilde{Z}_j = (1 + \pi_j)\, Z_j.$$

$$q^d' = (q^m'\tilde{A}^m + \tilde{W}' - \tau^m'\tilde{\bar{A}}^m)\ (I-\tilde{A}^d)^{-1} + \hat{t}^d'(I-\tilde{\bar{A}}^d)(I-\tilde{A}^d)^{-1} \quad (2.7)$$

Effective excise duty rate is then defined as

$$\hat{t}^{de}' = \hat{t}^d'(I-\tilde{\bar{A}}^d)(I-\tilde{A}^d)^{-1} \quad (2.8)$$

Effective import duty rate is defined as

$$\hat{t}^{me}' = [(t^m' + \tau^m')\tilde{A}^m - \tau^m'\tilde{\bar{A}}^m](I-\tilde{A}^d)^{-1} \quad (2.9)$$

where $(t^m + \tau^m)$ is the import tax component in q^m.

Considering a number of special cases, let us now see how the definitions (2.7), (2.8) and (2.9) simplify.

Special Cases:

Case (a) When profit rates are zero, we have

$$\tilde{A}^d = A^d, \quad \tilde{A}^m = A^m, \quad \tilde{W} = W$$
$$\tilde{\bar{A}}^d = \bar{A}^d, \quad \tilde{\bar{A}}^m = \bar{A}^m$$

Definitions (2.7), (2.8) and (2.9) become

$$q^d' = (q^m'A^m + W' - \tau^m'\bar{A}^m)(I-A^d)^{-1} + \hat{t}^d'(I-A^d)(I-A^d)^{-1}$$

or,

$$q^d' = (q^m'A^m + W')(I-A^d)^{-1} + t^d'(I-A^d)^{-1} \quad (2.7.a)$$

$$\hat{t}^{de}' = \hat{t}^d'(I-\bar{A}^d)(I-A^d)^{-1}$$
$$= (t^d' + \tau^m'\bar{A}^m)(I-A^d)^{-1} \quad (2.8.a)$$

and $$\hat{t}^{me}' = [(t^m' + \tau^m')A^m - \tau^m'\bar{A}^m]\ (I-A^d)^{-1} \quad (2.9.a)$$

Comparing (2.8.a) and (2.9.a) it is clear that there is a redistribution of tax burden amounting to $\tau^m'\bar{A}^m(I-A^d)^{-1}$ from the consumers of imported inputs to consumers of domestically produced outputs. However, under the assumption of full forward shifting of taxes, both these tax burdens would be passed on to the consumers of final products.

Case (b) When all goods are covered under MODVAT, we get

$$\bar{A}^d = A^d \qquad \bar{A}^m = A^m$$

This case is exactly the same as that of AS. Note also that (2.7.a) and (2.7.d) are identical. That is, as we have also seen earlier in the example, in the absence of any positive profits the consumer price is same under MODVAT as without it. This is to be expected because of revenue neutrality condition. However, with the removal of MODVAT, the redistribution of tax burden which was taking place between (2.8.a) and (2.9.a) is no more present.

For each unit of output produced, if we add together the effective rates of excise and import duties, the resulting sum will give us the taxes actually passed on to the consumers taking into account their direct consumptions of all domestically produced goods and 'indirect consumptions' of all imported and domestically produced goods. This sum, under MODVAT, can be obtained by adding equations (2.8) and (2.9).

$$\hat{t}^{de\prime} + \hat{t}^{me\prime} = [(t^{d\prime}+\tau^{m\prime}\bar{A}^{m})(I-\bar{A}^{d})^{-1}(I-\tilde{\bar{A}}^{d}) + (t^{m\prime}+\tau^{m\prime})\tilde{A}^{m} - \tau^{m\prime}\tilde{\bar{A}}^{m}]\ (I-\tilde{A}^{d})^{-1} \qquad (2.10)$$

Similarly, in the absence of MODVAT, equations (2.8.c) and (2.9.c) give us

$$t^{de\prime} + t^{me\prime} = [t^{d\prime}+(t^{m\prime}+\tau^{m\prime})\tilde{A}^{m}](I-\tilde{A}^{d})^{-1} \qquad (2.11)$$

The difference between (2.10) and (2.11), therefore, provides us an estimate of the increase/decrease in taxes effectively paid by the consumers and hence the change in burdens carried by them* with the induction of MODVAT. It can be easily checked that

$$(\hat{t}^{de\prime}+\hat{t}^{me\prime})-(t^{de\prime}+t^{me\prime}) = -(\hat{t}^{d\prime}\bar{A}^{d}+\tau^{m\prime}\bar{A}^{m})\ \mathrm{diag}\ \pi^{**}(I-\tilde{A}^{d})^{-1} < \emptyset \qquad (2.12)$$

It is very clear from equation (2.12) that the tax reform in the form of MODVAT is certainly beneficial for the consumers since it is able to reduce the burdens borne by them in the form of central excise and import duties. But since the reform is revenue neutral a question that immediately arises is : who bears the burden of the tax difference as shown by (2.12)? This question can be answered as follows:

With the introduction of MODVAT, the net cost to a typical producer of a MODVAT commodity is reduced by the amount of the input duty credit. This means, when a fixed mark up is applied to

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* See section 3 for the actual burdens carried.

** This matrix is defined as

$$\mathrm{diag}\pi = \begin{bmatrix} \pi_1 & \emptyset & \cdots & \cdots & \emptyset \\ \emptyset & \pi_2 & \ddots & \cdots & \emptyset \\ \vdots & \emptyset & \pi_3 & \cdots & \emptyset \\ \vdots & \vdots & \ddots & \cdots & \vdots \\ \emptyset & \cdots & \cdots & \cdots & \pi_L \end{bmatrix}$$

this reduced cost, total profits of the producer go down* in general, implying thereby that the final tax burden is borne not only by the consumers but also by the producers. This happens despite the fact that there is a 100% shifting of excise duty on the output of each producer to the consumers. Note from the right hand side of equation (2.12) that the producers' burden with MODVAT is exactly the input subsidy inflated by the profit margin taking into account all direct and indirect requirements of inputs produced domestically. In practice, however, if the current price formation rule is not followed and profits are calculated before subtracting the subsidies from variable costs then the profits are likely to be higher whereas the consumers may have to bear the total brunt of taxes as in the pre-MODVAT regime.

Another way of understanding the foregoing argument is as follows:

In the case of MODVAT the tax revenue from production received by the government can be expressed either as

$$\hat{t}^{d\prime} X^d + (t^{m\prime} + \tau^{m\prime})\tilde{A}^m X^d - \hat{t}^{d\prime}\bar{A}^d X^d - \tau^{m\prime}\bar{A}^m X^d$$

or as

$$(\hat{t}^{de\prime} + \hat{t}^{me\prime})F + (\hat{t}^{d\prime}\bar{A}^d + \tau^{m\prime}\bar{A}^m)\ \text{diag}\ \pi(I-\tilde{A}^d)^{-1}F \qquad \text{(i)}$$

$$= (t^{de\prime} + t^{me\prime})F \qquad \text{(ii)}$$

The first term in expression (i) denotes the 'net' amount of tax paid by the consumers while the second term denotes the amount of subsidy received by the consumers from the producers (which comes in the form of reduced consumer prices). The 'gross' tax paid by the consumers which is the sum of the two terms in (i) can be seen to be the same as the tax paid by the consumers before the introduction of MODVAT (see expression (ii)).

In the absence of MODVAT, the revenues generated from excise (R^d) and from import duties (R^m) are given by

$$\begin{aligned} R^d &= t^{d\prime} X^d \\ R_x{}^m &= (t^{m\prime}+\tau^{m\prime})A^m X^d \\ R_c{}^m &= (t^{m\prime}+\tau^{m\prime})(X^m - A^m X^d) \\ R^m &= R_x{}^m + R_c{}^m \\ &= (t^{m\prime}+\tau^{m\prime})X^m \end{aligned}$$

where $R_x{}^m$ and $R_c{}^m$ are net collections of import duty from use of imported goods in production and in final consumption respectively. $A^m X^d$ is the demand for imported inputs so that $X^m - A^m X^d$ is the demand for private consumption. X^d and X^m represent the gross output and imports respectively. Total revenue from these two sources is then $R = R^d + R^m = (t^{m\prime}+\tau^{m\prime})X^m + t^{d\prime}X^d$. Once MODVAT is introduced, the revenue collections net of excise and import duty credits are

$$R^d = \hat{t}^{d\prime} X^d - \hat{t}^{d\prime}\bar{A}^d X^d = \hat{t}^{d\prime}(I-\bar{A}^d)X^d$$

$$= (t^{d\prime}+\tau^{m\prime}\bar{A}^m)X^d \quad \text{using equation (2.5)}$$

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* See Table 4.1 for the computed profits.

the equivalence between s and t^d and not between τ^m and t^d. The rates t^m and τ^m are obtained by dividing their respective duty collection with the corresponding import flow. The details about the calculation of production, imports and tax collection are given in appendix A.1.

The Input-Output Coefficient Matrices

Using the TN coefficients for 1984-85, the commodity X commodity coefficient matrix for total (domestic and import) flows at factor cost is obtained as

$$A = BD$$

where B is the commodity x industry input use coefficients matrix and D gives the make matrix coefficients of dimension industry x commodity. In these calculations the quantity units are chosen such that all the producer prices are normalized to Re.1 per unit. The import coefficient matrix A^m is derived in a similar fashion as

$$A^m = C^m D$$

The elements of the matrix C^m are obtained from the commodity X industry imported input use coefficients matrix B^m at c.i.f. prices, i.e., inclusive of taxes as

$$c_{ij}^m = b_{ij}^m/(1+t_i^m+\tau_i^m)$$

C^m is a commodity x industry matrix after tax.

The matrix of domestic flows of dimension commodity X commodity is then obtained as

$$A^d = A - A^m$$

The Gross Value Added

The vector y of gross value added per rupee of output is taken from TN.

The gross value added in each sector j is broken into personal and non-personal (profit) incomes. In order to get this break up for 1984-85, we use that obtained for 1979-80 by Dreze (1983) for a 26-sector classification of the economy. We denote the profit and gross value added per rupee of output for each of these 26 sectors by θ_j° and y_j° respectively. This gives us the ratio $a_j^\circ = \theta_j^\circ/y_j^\circ$. We then link each of our 50 sectors with the corresponding sector in Dreze's list and apply the corresponding a_j° to obtain $\theta_j = a_j^\circ y_j$ and $W_j = y_j - \theta_j$. The link between his and TN's classifications is given in appendix A.2. Appendix A.3 carries the break up of gross value added per rupee of output between personal and profit incomes as obtained for 1984-85.

Administered Price Sectors: Among the core sectors the nominal rate is highest for "cement"(34), being 52.2% and 57.96% in the pre- and post-MODVAT scenarios. The corresponding effective rates are 62.37% and 62.17% implying a difference of 10.17% and 4.21% respectively. Note here the "closing" gap between the two rates with the introduction of the tax reform. The most interesting among these sectors is fertilizers (30) for which a negligible level of "desired" rate at the nominal level has translated to an "actual" rate of about 18% (in both regimes). This is almost double the rate of 8.9% obtained in AS since a major input "petroleum products" (28) has had an increase of about .. in prices between 1979-80 (the year for AS analysis) and 1984-85 (see, e.g., Jha and Mundle (1987)). This trend may have very serious future implications for the fertilizer industry since its manufacturers are not permitted to obtain the reimbursement of excise and C.V. duties paid on petroleum inputs; the latter having been left out of the new scheme. However,if this industry is supplied these inputs at subsidized rates on a priority basis then this problem may not occur. The difference between nominal and effective rates range from about 4% to 15% for other core sectors, namely, "coal and lignite" (11), "crude petroleum and natural gas" (12), "iron and steel" (36), "non-ferrous metals" (37), "rail transport services" (45) and "electricity" (47).

Agricultural Sectors: With the advent of MODVAT the negligible nominal rates in these sectors are modified to a maximum nominal rate of 3.6% for "tea and coffee" (6) and a minimum of 0.7% for "pulses" (4). On the other hand, the effective rates have reduced by less than 0.3% in all agricultural sectors. The difference between effective and nominal rates under MODVAT is maximum at 3.2% for "animal husbandry" (8) followed by 2.3% for "wheat" (2) and 1.7% for "paddy" (1) and "other cereals" (3). The difference for other sectors is very marginal.

Basic and Intermediate Goods: These goods include those with the highest rates of duty, namely, "synthetic fibres and resin" (32) with MODVAT and no-MODVAT nominal rates of 103% and 88.5% respectively, followed by "cement" (34) with rates of 58% and 52.2%. The corresponding effective rates are higher by 3.5% and 20.8% for sector 32 and by 4.21% and 10.17% for sector 34. The differences (20.8% and 10.17%) between the two rates in a situation of no-MODVAT are much higher for both (32) and (34) as compared to the differences of 7% and 6% respectively for 1979-80 (AS). One reason for this is the general increase in various tax rates. However, a more important reason seems to be the assumption of a positive mark-up applied to the prime costs in our model.

Among the other intermediate goods sectors the difference between MODVAT rates of effective and nominal excises hovers around 2% for "coal and lignite" (11) "other metallic minerals" (14) "coal tar products" (29), "other non-metallic mineral products" (35), "iron and steel" (36), "non-ferrous metal" (37) and "non-metallic and minor minerals" (15). This difference is slightly higher for the rest of the intermediate goods being 4% for "other chemicals" (33) and 3% for "iron ore" (13).

Engineering Industries: All these industries show a doubling or more than doubling of the nominal excise rates as between no-MODVAT and MODVAT. Since the new nominal rates are very close to the effective rates this gives a much clearer picture of the actual tax rates faced by the consumers. The difference between these two rates under the new scheme varies marginally from 1% to less than 2% for all engineering industries, viz., "non-electrical machinery" (38), "electrical machinery" (39), "rail equipments" (40), "motor vehicles" (41), "other transport equipments" (42), "communication and electronic equipment" (43) and "other manufacturing" (44). Within this group "motor vehicles" (41) have the highest effective excise duty rate of 34.9%. This rate varies from 21% to 28% for all other sectors in this group.

Other Consumption Goods: In this group "rubber products" (26) have the highest nominal rates of 37.3% without MODVAT and 56.7% with MODVAT. The corresponding effective rates are 60.26% and 59.36% implying differences of 32.96% and 2.66% between the desired and actual rates in the pre- and post-reform regimes. The highest difference between effective and nominal rates is 4.3% for "plastics" (27) followed by differences varying from 1% to 2.8% for "sugar" (16), "khandsari and boora" (17), "wood based industries" (23), "paper and paper based industries"(24) and "leather and leather products" (25). Among the food items covered here, sugar has the highest effective rate of 23.37%. However, this is dominated by the non-MODVAT sector "other food and beverage industries" (18) with a rate of 34.47%. But the numbers for this industry should be used with caution since more than 20% of its output is accounted for by tobacco products and the duty on cigarettes alone is about 400-450% of the value of clearances. The duty on this sector does not include the excise on liquor since that is covered by state excises.

Services: Among the various services, "other services" (50) have the highest "effective rate" of 15.52% and 15.64% respectively in the MODVAT and no-MODVAT scenarios. Although most of the services were not taxed in the previous regime, after the tax reform it becomes imperative to tax them, thus bringing out the implicit taxes carried by these sectors. The difference between the effective and nominal rates in the post reform period is 2.52% for "rail transport services" (45), 5.93% for "other transport services" (46), 4.58% for "electricity" (47), 1.3% for "construction" (48), 0.6% for "communication" (49) and 0.9% for

"other services" (50). These numbers are higher for sectors 46 and 47 since thenon-MODVAT sector 28 "petroleum products" forms a major input and attracts a duty at the rate of 21.8%.

Import Duties:

A comparison of nominal excise and customs duties from Table 2.1 shows the extent to which the domestic producers are hedged against foreign competition. The table also gives an idea of the tax burdens borne by consumers (see section 3 for a detailed analysis) from final consumption of imported goods. Some of the sectors have low import duties such as "leather and leather products" (25) with a duty rate of 4.8% and "petroleum products" (28) with a rate of 2.4%. Note that the domestic production of the latter leads to an effective excise duty of as high as 30.48%. The effective rates of import duty as calculated from the formula given in equation (2.9) are presented in Table 2.2. The i-th element of the vector of effective import duty rates gives the amount of duty collected from the use of imported inputs in the production of the (corresponding) i-th good. It is not, however, comparable to the nominal rate of import duty paid for i-th imported good. On the other hand, a comparison of the effective rates of excise and import duties gives us the distribution of government revenue arising from the two duties from each of the domestic production sectors.

The highest import duties paid on inputs per unit output are by the sector "rail equipments" (40) with the effective import tax being 3.79% and 4.18% respectively under MODVAT and no-MODVAT. The duties paid by agricultural sectors are negligible. The effective excises are substantially higher than import duties for all sectors. This implies, as may be expected, that a major portion of government revenue from production sectors originates from excise taxes. This is especially pronounced in the case of "synthetic fibres and resins" (32) with effective rates of 102.5% and 1.37% for excise and customs respectively.

We will not discuss these duties any further. Although the effective import duties may be of interest in studying, e.g., foreign trade policies, in this paper, we are concerned mainly with the calculation of consumer tax burdens due to these duties.

3. DISTRIBUTIONAL INCIDENCE: THE TAX BURDENS

Tax burden borne by a household group is defined as the ratio of the taxes paid on its 'direct and indirect consumption' of all goods and its mean expenditure. For instance, the tax burden from excise duties on the hth group is

$$b^{dh} = \frac{\hat{t}^{de} \, x^{dh}}{\bar{x}^{h}} \qquad (3.1)$$

where $\hat{t}^{de}$ is the vector of effective excise taxes, x^{dh} the vector of consumption from domestic production and $\bar{x}^{h}$ the mean total expenditure of the group. In order to calculate the tax burden from import duties we should, unlike the earlier studies, consider the burden arising out of not only effective import duties on consumption from domestic production but also nominal duties on imported final consumption. That is,

$$b^{mh} = \left[\hat{t}^{me} \, x^{dh} + (t^{m\prime} + \tau^{m\prime}) \, x^{mh} \right] / \bar{x}^{h} \qquad (3.2)$$

where $\hat{t}^{me}$ is the vector of effective import duties as applicable to domestically produced consumption x^{dh}. And x^{mh} is the final consumption from imports.

Excise duties are said to be progressive if $b^{d1} < b^{d2} < \ldots < b^{dH}$ for $\bar{x}^{1} < \bar{x}^{2} < \ldots < \bar{x}^{H}$. Similar definition holds for import duties.

In their study for 1973-74, Chelliah and Lall (1981) found the taxes to be progressive on the whole. Also taxes such as central excise, import duty, sales taxes and other taxes were found to be progressive when taken separately. AS in their study for 1979-80 also found taxes to be more or less progressive in general with a few exceptions. They covered subsidies also. However, since we are concerned with excise and import duties we report their results only for these two duties. These are presented in Tables 3.1 and 3.2.

The effective tax burdens for 1984-85 in the absence and presence of MODVAT are presented in Tables 3.3 (a) and 3.3 (b) respectively. These numbers have increased significantly as compared to both 1973-74 and 1979-80. This increase may be attributed to at least two reasons. One is the general increase in almost all nominal taxes even before the introduction of MODVAT. The other reason is that we have allowed for positive mark-ups on all variable costs which reflects itself in the calculation of effective taxes and hence in the tax burdens.

Table 3.3(a) Tax Burdens for 1984-85 : Before MODVAT

Annual percapita exp. (Rupees)	Rural Areas			Urban Areas		
	Population proportion	Central Excise Duty	Import Duty	Population proportion	Central Excise Duty	Import Duty
Ø- 389	.ØØØ7	.1Ø38	.Ø164	.ØØØ2	.125Ø	.Ø172
389- 518	.Ø215	.1Ø29	.Ø151	.ØØØ5	.1244	.Ø174
518- 648	.Ø457	.1Ø81	.Ø152	.Ø131	.1245	.Ø184
648- 777	.Ø72Ø	.1133	.Ø154	.Ø28Ø	.1294	.Ø176
777- 9Ø7	.Ø88Ø	.1189	.Ø157	.Ø451	.1355	.Ø181
9Ø7-11Ø1	.1456	.1256	.Ø162	.Ø9Ø4	.14Ø7	.Ø186
11Ø1-1296	.1383	.1323	.Ø165	.1Ø32	.1474	.Ø19Ø
1296-1619	.1799	.1416	.Ø171	.17Ø8	.1558	.Ø199
1619-1943	.1Ø92	.1513	.Ø176	.1381	.1616	.Ø2Ø2
1943-2591	.1Ø66	.1512	.Ø164	.1714	.1695	.Ø2Ø7
2591-3239	.Ø422	.1683	.Ø18Ø	.Ø896	.1763	.Ø21Ø
3239-3887	.Ø189	.1753	.Ø18Ø	.Ø519	.1812	.Ø213
>3887	.Ø254	.1836	.Ø178	.Ø92Ø	.1888	.Ø223

Table 3.3(b) Tax Burdens for 1984-85 : After MODVAT

Annual percapita exp. (Rupees)	Rural Areas			Urban Areas		
	Population proportion	Central Excise Duty	Import Duty	Population proportion	Central Excise Duty	Import Duty
Ø- 389	.ØØØ7	.1Ø28	.Ø162	.ØØØ2	.1240	.Ø169
389- 518	.Ø215	.1Ø2Ø	.Ø149	.ØØØ5	.1234	.Ø171
518- 648	.Ø457	.1Ø72	.Ø15Ø	.Ø131	.1236	.Ø181
648- 777	.Ø72Ø	.1123	.Ø151	.Ø28Ø	.1284	.Ø174
777- 9Ø7	.Ø88Ø	.1179	.Ø155	.Ø451	.1345	.Ø179
9Ø7-11Ø1	.1456	.1247	.Ø16Ø	.Ø9Ø4	.1397	.Ø183
11Ø1-1296	.1383	.1313	.Ø162	.1Ø32	.1463	.Ø188
1296-1619	.1799	.14Ø6	.Ø168	.17Ø8	.1548	.Ø196
1619-1943	.1Ø92	.15Ø2	.Ø173	.1381	.16Ø5	.Ø199
1943-2591	.1Ø66	.15Ø1	.Ø161	.1714	.1683	.Ø2Ø4
2591-3239	.Ø422	.1671	.Ø176	.Ø896	.175Ø	.Ø2Ø6
3239-3887	.Ø189	.174Ø	.Ø176	.Ø519	.18ØØ	.Ø2Ø9
>3887	.Ø254	.182Ø	.Ø173	.Ø92Ø	.1873	.Ø219

industries" (18), "cotton textiles" (19) and "petroleum products" (28) (and as we have seen these are the major constituents of tax component in consumer expenditure) have been exempted from SED the effective taxes for these items are bound to increase due to the rise in tax rates on other items as a result of SED. This is to be expected since the latter enter as inputs in the production of the former. The fact that the overall burdens increase can be seen *from* the following. According to Government of India (1988 b) SED alone would amount to a revenue of Rs.650 crores whereas all other commodity tax reductions/ subsidies would provide a relief of only Rs.510 crores. In this paper, we will not delve more into the effects of recent changes in taxes.

Table 3.4 Overall Tax Burdens as percentage of total consumer expenditure

Year		Central Excise Duty	Import Duty
Chelliah/Lall (1973-74)		5.34	1.43
Stern/Ahmad (1979-80)		5.44	0.99
1984-85	Before MODVAT	15.67	1.86
	After MODVAT	15.55	1.83

The fact that the previous studies highly underestimated the burdens from various taxes (by ignoring the profit margins applied by the producers) is well borne out by Table 3.4. However, as compared to the non-MODVAT regime, the union excise and import tax burdens have reduced marginally by 0.17% and 0.03% with the introduction of MODVAT. We must also note that these results may still present an underestimate of the actual picture due to the weaknesses in the NSS consumer expenditure data. For instance, the NSS covers only the private households and excludes the houseless population including the population in, e.g., prisons, orphanages and hospitals. Also, it does not fully capture the consumption of several commodities such as tobacco and intoxicants (due to underreporting) and fruits, beverages and consumer durables (due to non-cooperation from the more affluent households who are the major consumers of these items). For more details on these problems see Joshi, et.al. (1987), Mukherjee (1986) and Vaidyanathan (1986).

4. SIMULATION EXERCISES

4.1. EFFECTS OF CHANGES IN TAX RATES

In order to calculate the effects of changes in the tax rates let us rewrite equation (2.6)

$$q^{d\prime} = q^{d\prime}\tilde{A}^{d} + q^{m\prime}\tilde{A}^{m} + \hat{t}^{d\prime}(I-\tilde{\bar{A}}^{d}) - \tau^{m\prime}\tilde{\bar{A}}^{m} + \tilde{W}'$$

When input use coefficients are fixed then, for small changes, totally differentiating this equation yields

$$dq^{d\prime} = dq^{d\prime}\tilde{A}^{d} + dq^{m\prime}\tilde{A}^{m} + d\hat{t}^{d\prime}(I-\tilde{\bar{A}}^{d}) - d\tau^{m\prime}\tilde{\bar{A}}^{m} + d\tilde{W}' \qquad (4.1)$$

where

$$d\hat{t}^{d\prime} = (dt^{d\prime} + d\tau^{m\prime}\bar{A}^{m})(I-\bar{A}^{d})^{-1} \qquad (4.2)$$

and

$$dq^{m\prime} = dt^{m\prime} + d\tau^{m\prime} \qquad (4.3)$$

As far as W_j is concerned we assume that the only component in it which changes directly with prices is the wage component. That is, the wages are indexed with respect to the general level of prices P,

$$w_j = \delta_j + \pi_j P \,, \quad j \in I_L \qquad (4.4)$$

where

$$P = \Sigma_i \beta_i q_i^d \qquad (4.5)$$

is a weighted average of domestic consumer prices. If l_j is the labour coefficient in sector j, we may write

$$dW_j = l_j\, dw_j$$

or, $dW_j = l_j \pi_j dP$ (using equation (4.4))

or, $dW_j = l_j \pi_j \Sigma_i \beta_i dq_i^d$ (using equation (4.5))

or, $d\tilde{W}_j = (1 + \pi_j)\, l_j \pi_j\, \Sigma_i \beta_i dq_i^d$

$$= \tilde{l}_j \pi_j \Sigma_i \beta_i dq_i^d$$

In matrix notations,

$$d\tilde{W}' = dq^{d\prime}\beta(\tilde{l}^{n})' \qquad (4.6)$$

Substituting in equation (4.1), we get

$$dq^{d\prime} = dq^{d\prime}\tilde{A}^{d} + dq^{m\prime}\tilde{A}^{m} + d\hat{t}^{i\prime}(I-\tilde{\bar{A}}^{d}) - d\tau^{m\prime}\tilde{\bar{A}}^{m} + dq^{d\prime}\beta(\tilde{l}^{n})'$$

of changes in taxes for both MODVAT and non-MODVAT regimes through various simulation exercises.

4.2. DATA FOR THE SIMULATIONS

The Labour Coefficients and the Weighting Diagram for WPI

The labour coefficients (l_j) and the weighting diagram (β_i) for the general price level, which is here taken to be the wholesale price index, are taken from Jha and Mundle (1987).

The Relation between the Wage Rates and the General Level of Prices

In order to estimate a relation between the nominal wage rates and the wholesale price index as given by equation (4.4) we partition the economy into agriculture and non-agriculture. We further assume that the estimates obtained for these two broad sectors apply to their respective sub-sectors. Taking the wage indices as calculated in Jha and Mundle (1987) we get the following regression equations.

Agricultural Sector:

$$w = \underset{(-1.025)}{-6.355} + \underset{(29.020)}{0.974}*WPI \qquad (1960\text{-}61 \text{ to } 1985\text{-}86)$$

$\bar{R}^2$ = 0.97, Degrees of Freedom = 24

Non-agricultural Sector:

$$w = \underset{(-2.262)}{-9.777} + \underset{(32.806)}{1.073}*WPI \qquad (1960 \text{ to } 1980)$$

$\bar{R}^2$ = 0.98, Degrees of Freedom = 19

Note : Figures in parentheses indicate t-values.
* denotes significance at 0.1% level of significance.

Given these two equations, we apply a wage indexation coefficient $\eta_j = 0.974$ for all the agricultural sectors $j = 1,\ldots,10$. For the non-agricultural sectors $j=11,\ldots,50$ we use $\eta_j = 1.073$.

The Simulations

We run the model to obtain the effects of a 10% increase in one or more taxes simultaneously. For administrative reasons it is preferable to calculate the effects of changes in nominal taxes and not in effective taxes. Furthermore, since the tax rates under MODVAT are directly linked to those in the absence of MODVAT, for purposes of comparison of the two schemes we compute the effects of changes in tax rates prevalent in the latter scheme. That is, we introduce changes in the non-MODVAT nominal rates t^d, t^m and τ^m which affect the MODVAT nominal rates $\hat{t}^d$ and hence the effective tax rates $\hat{t}^{de}$ and $\hat{t}^{me}$. These,

in turn, will have further repercussions in the form of changes in, interalia, prices, revenue, welfare and the tax burdens borne by various consumer classes. For each simulation we change either the excise duty t^d or the customs duty t^m for the corresponding combination of sectors. We also assume $dt^m = dt^d(1+t^m)$, i.e., the change in C.V. duty rate is equal to that in excise duty for given t^m.

The various combinations of sectors for simulations are the following:

I. A 10% increase in excise duty in *

Non-MODVAT sectors

(1) Crude Petroleum and Natural Gas (12)
(2) Other Food and Beverage Industries (18)
(3) (a) Cotton Textiles (19)
    (b) Art Silk and Synthetic Fibre Textiles (20)
    (c) Woollen Textiles (21)
    (d) Other Textiles (22)
(4) Petroleum Products (28)

Administered Price Sectors

(5) (a) Coal and Lignite (11)
    (b) Crude Petroleum and Natural Gas (12)
    (c) Petroleum Products (28)
    (d) Cement (34)
    (e) Iron and Steel (36)
    (f) Non-Ferrous Metals (37)
    (g) Electricity (47)

Agricultural Sectors

(6) (a) Tea and Coffee (06)
    (b) Other Crops (07)

Basic and Intermediate goods

(7) (a) Coal and Lignite (11)
    (b) Iron Ore (13)
    (c) Non-Metallic Minor Minerals (15)
    (d) Synthetic Fibres & Resin (32)
    (e) Other Chemicals (33)
    (f) Cement (34)
    (g) Other Non-Metallic Mineral Products (35)
    (h) Iron and Steel (36)
    (i) Non-Ferrous Metals (37)

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* Figures in parentheses indicate the serial number of the sector in TN classification.

Engineering Industries

(8) (a) Non-Electrical Machinery (38)
(b) Electrical Machinery (39)
(c) Rail Equipments (40)
(d) Motor Vehicles (41)
(e) Other Transport Equipments (42)
(f) Communication and Electronic Equipments (43)
(g) Other Manufacturing (44)

Other Consumption goods

(9) (a) Sugar (16)
(b) Wood Based Industries (23)
(c) Paper and Paper Based Industries (24)
(d) Leather and Leather Products (25)
(e) Rubber Products (26)

Services

(10) (a) Electricity (46)
(b) Other Services (50)

II. A 10% increase in customs duty in

Agricultural Sectors

(11) (a) Other Crops (07)
(b) Animal Husbandry (08)
(c) Forestry and Logging (09)

Fertilizers

(12) Fertilizers (30)

Non-Electrical Machinery

(13) Non-Electrical Machinery (38)

Administered Price Sectors

(14) (a) Coal and Lignite (11)
(b) Crude Petroleum and Natural Gas (12)
(c) Petroleum Products (23)
(d) Fertilizers (30)
(e) Cement (34)
(f) Iron and Steel (36)
(g) Non-Ferrous Metals (37)

where the domestic market price vector q^d is obtained after taking into account the direct and indirect effects of costs and prices (see equations (2.7) and (2.7.c)).

Since, in general, net costs go down (see the example in section 1) due to input subsidy as a first round impact of introduction of MODVAT, total profits per unit of output also decrease (when the same profit rate is applied to variable costs). The reduction is highest for "other metallic minerals" (14) from about 18 paise to about 10 paise for every unit produced. The sector earning the highest per unit profit is "crude petroleum and natural gas" (12) with a figure of 26 paisa per unit followed by "forestry and logging" (9) with a profit of 19 paisa per unit produced. In both these sectors, value added is about 90% of the value of output. However, there are two exceptions where average profit after MODVAT is higher than that before MODVAT. First is sector 28 ("petroleum products") which is not covered under MODVAT and hence attracts no duty rebate. Also, about 88% of its input cost consists of sector 12 ("crude petroleum and natural gas") which is also left out of MODVAT and has a negligible input cost compared to its output. The second sector for which average profit increases with the introduction of MODVAT is "other transport services" (46). For this sector again sector 28 constitutes about 70% of the input costs.

For both pre- and post-MODVAT regimes, Table 4.2 presents the results of 19 simulations in the form of 10% increase in various combinations of either excise or customs duties. These results consist of changes in government revenue from the same vectors of outputs and imports (see equation (4.11)) and also changes in wholesale price index in two cases when wages are indexed to prices and when they are not.

Notice the tremendous difference in price changes between the two cases of wage indexation and no wage indexation. For instance, a comparison of either columns (3) and (5) (after MODVAT) or (4) and (6) (before MODVAT) for the first row shows that a 10% increase in all excise duties leads to a change in WPI in the presence of wage indexation which is almost 3 times that in the absence of it. In other words, the change of 2.64% in WPI in column (3) is only about 34% of the change of 7.7% in column (5). The numbers in these columns are also comparable to the "partial and total response elasticities" obtained in Jha and Mundle (1987). For example, an increase of 10% in excise duty on "crude petroleum and natural gas" (12) leads to an increase of 0.28% in WPI (see column 3, simulation 1). The increase of 10% in excise duty on crude oil and gas would amount to an absolute increase of 0.03 in its effective tax which is 0.30. Since the change in price is equal to the change in effective taxes, this would mean the price of oil goes up by 0.03. Since the nominal rate of excise duty on this sector is 0.277, the consumer price before tax changes would be approximately by 1.277. Hence a 10%

Table 4.2: Changes in Prices and Revenue due to a 10% increase in various combinations of Taxes

10% Change in		Sectors Covered	Change in Wholesale Price Index (percent)				Change in Govt. Revenue (Rs.Crore
			Without Wage Indexation		With Wage Indexation		Both before and after
			After MODVAT	Before MODVAT	After MODVAT	Before MODVAT	MODVAT
(1)		(2)	(3)	(4)	(5)	(6)	(7)
Central Excise Duty		All Sectors	2.64	2.78	7.70	8.12	1377.90
		Non MODVAT Sectors					
	1.	12	0.28	0.44	0.81	1.28	179.51
	2.	18	0.45	0.45	1.30	1.31	158.09
	3.	19-22	0.20	0.20	0.58	0.58	68.42
	4.	28	0.29	0.30	0.85	0.87	201.60
		Administered Price Sectors					
	5.	11.12.28.30. 34.36.37.45.47	0.87	1.02	2.53	2.99	539.74
		Agricultural Price Sectors					
	6.	6.7	0.01	0.01	0.04	0.04	1.13
		Basic & Intermediate Goods					
	7.	11,13,15, 32-37	0.63	0.62	1.84	1.81	413.50
		Engineering Industries					
	8.	38-44	0.23	0.22	0.67	0.65	213.34
		Other Consumption Goods					
	9.	16, 23-27	0.24	0.23	0.70	0.68	120.42
		Services					
	10.	47,50	0.31	0.30	0.91	0.87	14.62
Customs Duty		Agricultural Sectors					
	11.	7-9	0.00	0.00	0.01	0.01	9.00
		Fertilizers					
	12.	30	0.00	0.00	0.00	0.00	0.11
		Non Electrical Machinery					
	13.	38	0.00	0.00	0.01	0.01	14.83
		Adminsitered Price Sectors					
	14.	11.12.28.30. 34.36.37	0.07	0.07	0.21	0.21	102.70
		Non MODVAT Sectors					
	15.	12	0.02	0.02	0.05	0.05	10.98
	16.	18	0.00	0.00	0.00	0.00	23.68
	17.	19-22	0.00	0.00	0.01	0.01	6.92
	18.	28	0.00	0.00	0.00	0.00	4.75

change in excise duty on oil and gas would translate itself into a change of 2.35% (= Ø.Ø3/1.277 x 1ØØ) in its price. That is, our initial result of an increase of Ø.28% in WPI is due to an increase of 2.35% in the petroleum price. If this price were, instead, raised by 1%, the change in WPI would have been Ø.119% (=Ø.28/2.35) which is approximately equal to the partial response elasticity of WPI with respect to 'crude oil and gas' (in the absence of wage indexation) as given in Table 2 of Jha and Mundle (1987).

Panda and Sarkar (1987), using a 1Ø sector CGE model, find that a rise of 1Ø% in petroleum prices would lead to an increase of Ø.55% in GDP deflator assuming that wages are indexed to consumer price index (CPI). This increase is almost the same as the increase of Ø.545% (=1.28/2.35; see column (6) of Table 4.2 and the previous paragraph for explanations) which would come about as a result of a 1Ø% increase in petroleum price in our model when wages are indexed and there is no-MODVAT.

Since government revenues (see column (7) of Table 4.2) are calculated for given levels of outputs and imports, they do not change with wage indexation. Since introduction of MODVAT is revenue neutral, the revenue does not change even between MODVAT and no-MODVAT situations. From Table 4.2 it can be observed that a 1Ø% hike in excise duties on all administered price sectors would generate the maximum revenue of about Rs.54Ø crores among all simulations considered. However, this would also lead to a price rise of 2.53% under MODVAT. This means, if the revenue were to be raised to the tune of Rs.1ØØ crores the taxes on administered price sectors would have to be increased by 1.85% each (1Ø/54Ø x 1ØØ) instead of 1Ø% each. This would mean that WPI would increase by Ø.45% (= 2.53/1Ø x 1.85).

5. THE INCIDENCE ANALYSIS OF TAX CHANGES

5.1. METHODOLOGY

Given a change in some taxes, the consumer prices and incomes (wages) will change in the way presented in equations (4.8) and (4.6) respectively. If x^{dh} and x^{mh} are the consumption vectors for household h from domestic production and imports respectively, and the utility function is $u^h(x^{dh}+x^{mh})$ then the indirect utility function is given by $v^h(q^d, q^m, I^h)$ where I^h is the income of h-th household from all sources assuming fixed factor supplies. For small changes, the change in consumer welfare is then given by

$$dv^h = \sum_j \left[\frac{\partial v^h}{\partial q_j^d} dq_j^d + \frac{\partial v^h}{\partial q_j^m} dq_j^m \right] + \frac{\partial v^h}{\partial I^h} dI^h \qquad (5.1)$$

where
$$\frac{\partial v^h}{\partial I^h} = \mu^h \qquad (5.2)$$
is the marginal utility of money.

From Roy's identity we have

$$\frac{\partial v^h}{\partial q_j^d} = -\mu^h x_j^{dh} \qquad (5.3)$$

and

$$\frac{\partial v^h}{\partial q_j^m} = -\mu^h x_j^{mh} \qquad (5.4)$$

Equation (5.1) can now be written as

$$dv^h = \mu^h \left[dI^h - \sum_j (x_j^{dh} dq_j^d + x_j^{mh} dq_j^m) \right] \qquad (5.5)$$

Equation (5.5) gives us the price and income effects of a change in taxes on consumer welfare. Note that if all taxes are changed in the same proportion, the effective taxes also change in the same proportion and we can obtain the change in utilities of different income groups. However, this does not apply in the case of our simulation exercises where we change only some of the taxes (see section 4). Here, a change in nominal tax vector is first converted to a (possibly different) change in the effective tax vector which is then used in calculating the change in consumer welfare.

The monetary value of utility gain is $dI^h - \sum_j (x_j^{dh} dq_j^d + x_j^{mh} dq_j^m)$. This, divided by income, I^h, will give us the monetary gain as percentage of income to household h

$$db^h = \frac{dI^h - \sum_j (x_j^{dh} dq_j^d + x_j^{mh} dq_j^m)}{I^h} \qquad (5.6)$$

In order to make use of the data, equation (5.5) can be reformulated as

$$dv^h = \mu^h \left[dI^h - \sum_j \left[q_j^d x_j^{dh} \frac{dq_j^d}{q_j^d} + q_j^m x_j^{mh} \frac{dq_j^m}{q_j^m} \right] \right]$$

or
$$dv^h = \mu^h \left[dI^h - \sum_j \left[q_j^d x_j^{dh} \dot{q}_j^d + q_j^m x_j^{mh} . \dot{q}_j^m \right] \right] \qquad (5.7)$$

where $q_j^d x_j^{dh}$ and $q_j^m x_j^{mh}$ are respectively the consumption expenditures on domestically produced and imported good j by household h.

5.2. DISTRIBUTION OF CONSUMPTION EXPENDITURES

For consumption expenditure we make use of the National Sample Survey (NSS) data for the 38th round for 1983-84 published in Government of India (1986 c). This gives the `value of consumption (in Rs.) of (19) broad groups of items per person for a period of 30 days by monthly per capita expenditure classes' for both urban and rural areas with 13 expenditure classes each. We update this data according to the average annual rates of growth of consumptions of various commodity groups at the aggregate level between 1977-78 (NSS, 32nd round; see Government of India (1986 b)) and 1983-84. We then convert it into value of consumption (in Rs.) of (the same 19) broad groups of items per person for a period of one year by annual per capita expenditure classes'. This gives us two matrices of dimension 19 x 13, one each for rural and urban areas.

However, there is a large degree of overlapping between the NSS and the Planning Commission Classifications (see Government of India (1986 a)) of sectors. For instance, the groups `edible oils', `meat fish and eggs' and `milk and milk products' of NSS are all clubbed together into the group `other food and beverage industries' of TN. On the other hand, an item like `fuel and light' of NSS corresponds to at least two groups, `coal' and `electricity'of TN. Whereas, an item like `misc.goods and services' in NSS clubs together a variety of services including `gas' which may go into the oil sector of TN, `transport' which goes into `railways' and `other transport' of TN and so on. Since we are also trying to use the effects of tax changes in various commodities on the price levels, it may be worthwhile to break up the non-MODVAT sectors such as `textiles' or `clothing' into subsectors in order to have a better picture of the underlying complications. To take care of these and similar other problems,

nominal taxes t^d and t^m of the corresponding sectors. In the simulations 1 to 10 we introduce a change only in nominal excise duties. For the next 8 simulations we allow only customs duties to change for the sectors considered. In simulation 0 we raise all excise duties by 100% and calculate the effects on consumer welfare.

Table 5.0 Simulation 0: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered: All

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility(in Rs.)as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.1190	-.1409	-.1202	-.1422
389- 518	-.1169	-.1405	-.1180	-.1418
518- 648	-.1222	-.1417	-.1233	-.1429
648- 777	-.1274	-.1458	-.1287	-.1470
777- 907	-.1334	-.1524	-.1346	-.1536
907-1101	-.1407	-.1580	-.1418	-.1593
1101-1296	-.1475	-.1651	-.1488	-.1664
1296-1619	-.1574	-.1744	-.1587	-.1757
1619-1943	-.1675	-.1804	-.1689	-.1818
1943-2591	-.1662	-.1887	-.1676	-.1902
2591-3239	-.1847	-.1956	-.1863	-.1973
3239-3887	-.1916	-.2009	-.1933	-.2025
>3887	-.1993	-.2092	-.2014	-.2111

CHANGES IN EXCISE DUTIES

On the whole, excise duties seem to be progressive as seen from Table 5.0. In other words, when all excise taxes are increased by 100% the loss in utility (in rupees) as a proportion of expenditure increases directly with total expenditure. In the no-MODVAT situation these losses range from 12 to 20% for rural areas and 14 to 21% for urban areas. With the introduction of MODVAT these losses go down for all classes as expected.

It is interesting to note from Tables 5.1 to 5.5 that a 100% hike in excise duty either in individual non-MODVAT sectors or in all administered price sectors or in all agricultural sectors leads to losses in consumer welfare which are significant in both pre- and post-MODVAT regimes.

On the other hand Tables 5.7 to 5.10 show that increasing the excise taxes by 100% on 'basic and intermediate goods' or 'engineering industries' or 'other consumption goods' or 'services' leads to losses in consumer utilities which are lower in both the regimes.

Among simulations 1-10, simulation 5 (see Table 5.5), where the excise duty on all administered price sectors is increased by 100%, seems to have the worst implications in the sense that it not only leads to the largest increases in consumer burdens it is also regressive. This could be mainly due to larger shares of expenditure on "petroleum products" (28) (see also Table 5.4) and "electricity" (47) for the poor classes as compared to the rich classes both in rural as well as in urban areas. The poorest rural class spends about 5.76% of its expenditure on petroleum products and 3.04% on electricity as against the expenditures of 1.6% and 0.83% respectively by the richest class. In the urban areas the percentages of expenditure, by the lowest and uppermost income classes respectively are 4.83 and 1.91 on petroleum products and 2.2 and 0.99 on electricity.

Table 5.1 Simulation 1: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered : No. 12

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.0177	-.0156	-.0290	-.0256
389- 518	-.0161	-.0156	-.0263	-.0254
518- 648	-.0153	-.0157	-.0250	-.0257
648- 777	-.0147	-.0146	-.0239	-.0239
777- 907	-.0142	-.0141	-.0231	-.0231
907-1101	-.0137	-.0137	-.0223	-.0223
1101-1296	-.0130	-.0132	-.0213	-.0215
1296-1619	-.0125	-.0127	-.0204	-.0207
1619-1943	-.0119	-.0122	-.0194	-.0199
1943-2591	-.0113	-.0116	-.0185	-.0190
2591-3239	-.0106	-.0110	-.0172	-.0179
3239-3887	-.0101	-.0104	-.0164	-.0169
>3887	-.0092	-.0094	-.0150	-.0154

Table 5.2 Simulation 2: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered : No. 18

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.0458	-.0562	-.0458	-.0562
389- 518	-.0456	-.0597	-.0456	-.0597
518- 648	-.0496	-.0673	-.0496	-.0673
648- 777	-.0529	-.0649	-.0530	-.0649
777- 907	-.0572	-.0696	-.0572	-.0696
907-1101	-.0619	-.0737	-.0619	-.0737
1101-1296	-.0661	-.0778	-.0661	-.0778
1296-1619	-.0706	-.0833	-.0706	-.0833
1619-1943	-.0743	-.0855	-.0744	-.0856
1943-2591	-.0644	-.0873	-.0644	-.0874
2591-3239	-.0767	-.0879	-.0767	-.0879
3239-3887	-.0758	-.0884	-.0759	-.0885
>3887	-.0684	-.0808	-.0684	-.0809

Table 5.3 Simulation 3: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered : Nos. 19,20,21,22

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.0019	-.0007	-.0020	-.0008
389- 518	-.0019	-.0012	-.0020	-.0013
518- 648	-.0023	-.0017	-.0024	-.0018
648- 777	-.0030	-.0015	-.0032	-.0017
777- 907	-.0037	-.0021	-.0038	-.0023
907-1101	-.0046	-.0027	-.0047	-.0029
1101-1296	-.0058	-.0035	-.0060	-.0037
1296-1619	-.0076	-.0043	-.0077	-.0045
1619-1943	-.0100	-.0054	-.0102	-.0056
1943-2591	-.0136	-.0077	-.0137	-.0079
2591-3239	-.0163	-.0100	-.0171	-.0102
3239-3887	-.0210	-.0114	-.0212	-.0116
>3887	-.0220	-.0165	-.0222	-.0167

Doubling of excise duty on basic and intermediate goods (see Table 5.7) has lower losses in welfare for all classes. These losses also increase with the level of expenditure, implying thereby a progressivity.

Table 5.2 presents the results where a doubling of nominal excise duty on 'other food and beverage industries' (18) leads to the second largest (after administered price sectors) additions to consumer burdens. These additions are as high as 5.6% for the urban poor and 8.1% for the urban rich. For the rural classes the burdens go up by 4.58% for the poor and 6.84% for the rich.

The least influential of all the cases are simulations 3,6,8 and 9 (Tables 5.3, 5.6, 5.8 and 5.9) corresponding to clothing, agricultural goods, engineering industries and other consumer goods respectively.

Table 5.6 Simulation 6: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered : Nos. 6,7

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.0004	-.0004	-.0004	-.0004
389- 518	-.0004	-.0005	-.0004	-.0005
518- 648	-.0004	-.0005	-.0004	-.0005
648- 777	-.0004	-.0005	-.0004	-.0005
777- 907	-.0004	-.0005	-.0004	-.0005
907-1101	-.0005	-.0005	-.0005	-.0005
1101-1296	-.0005	-.0006	-.0005	-.0006
1296-1619	-.0005	-.0006	-.0005	-.0006
1619-1943	-.0005	-.0006	-.0005	-.0006
1943-2591	-.0005	-.0006	-.0005	-.0006
2591-3239	-.0005	-.0006	-.0005	-.0006
3239-3887	-.0005	-.0006	-.0005	-.0006
>3887	-.0005	-.0006	-.0005	-.0006

Table 5.9 Simulation 9: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered : Nos. 16,23 - 26

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.0041	-.0063	-.0042	-.0064
389- 518	-.0054	-.0090	-.0055	-.0092
518- 648	-.0063	-.0079	-.0064	-.0081
648- 777	-.0070	-.0086	-.0071	-.0087
777- 907	-.0074	-.0086	-.0076	-.0087
907-1101	-.0080	-.0089	-.0082	-.0091
1101-1296	-.0087	-.0093	-.0088	-.0095
1296-1619	-.0096	-.0099	-.0098	-.0100
1619-1943	-.0106	-.0100	-.0108	-.0102
1943-2591	-.0120	-.0103	-.0123	-.0105
2591-3239	-.0121	-.0107	-.0124	-.0109
3239-3887	-.0130	-.0108	-.0133	-.0111
>3887	-.0166	-.0120	-.0170	-.0123

Table 5.10 Simulation 10: An increase of 100% in Excise Duty when wages are not indexed.

Sectors covered : Nos. 47,50

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Expenditure			
	MODVAT		No-MODVAT	
	Rural	Urban	Rural	Urban
0- 389	-.0184	-.0317	-.0188	-.0322
389- 518	-.0190	-.0240	-.0194	-.0245
518- 648	-.0200	-.0182	-.0204	-.0186
648- 777	-.0211	-.0257	-.0215	-.0262
777- 907	-.0220	-.0271	-.0225	-.0276
907-1101	-.0232	-.0279	-.0236	-.0284
1101-1296	-.0244	-.0297	-.0249	-.0302
1296-1619	-.0265	-.0316	-.0269	-.0321
1619-1943	-.0288	-.0338	-.0293	-.0343
1943-2591	-.0316	-.0367	-.0322	-.0372
2591-3239	-.0332	-.0386	-.0338	-.0393
3239-3887	-.0345	-.0422	-.0351	-.0427
>3887	-.0378	-.0461	-.0383	-.0466

Table 5.13

Simulation 13: An increase of 100% in Customs Duty when wages are not indexed.
Sectors covered : No. 38

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Exp. No-MODVAT/MODVAT	
	Rural	Urban
0- 389	-.00010	-.00009
389- 518	-.00010	-.00010
518- 648	-.00010	-.00010
648- 777	-.00010	-.00009
777- 907	-.00010	-.00009
907-1101	-.00010	-.00009
1101-1296	-.00010	-.00009
1296-1619	-.00010	-.00009
1619-1943	-.00009	-.00009
1943-2591	-.00009	-.00009
2591-3239	-.00009	-.00009
3239-3887	-.00009	-.00009
>3887	-.00010	-.00009

Table 5.14

Simulation 14: An increase of 100% in Customs Duty when wages are not indexed.
Sectors covered : Nos. 11,12,28,30, 34,36,37

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Exp. No-MODVAT/MODVAT	
	Rural	Urban
0- 389	-.00299	-.00269
389- 518	-.00269	-.00271
518- 648	-.00258	-.00270
648- 777	-.00250	-.00257
777- 907	-.00245	-.00251
907-1101	-.00240	-.00246
1101-1296	-.00233	-.00241
1296-1619	-.00231	-.00239
1619-1943	-.00230	-.00235
1943-2591	-.00235	-.00234
2591-3239	-.00233	-.00231
3239-3887	-.00239	-.00230
>3887	-.00305	-.00254

Table 5.15

Simulation 15: An increase of 100% in Customs Duty when wages are not indexed.
Sectors covered : No. 12

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Exp. No-MODVAT/MODVAT	
	Rural	Urban
0- 389	-.00130	-.00115
389- 518	-.00117	-.00114
518- 648	-.00111	-.00115
648- 777	-.00107	-.00107
777- 907	-.00103	-.00103
907-1101	-.00099	-.00100
1101-1296	-.00095	-.00096
1296-1619	-.00091	-.00093
1619-1943	-.00086	-.00089
1943-2591	-.00082	-.00085
2591-3239	-.00078	-.00080
3239-3887	-.00073	-.00075
>3887	-.00068	-.00068

Table 5.16

Simulation 16: An increase of 100% in Customs Duty when wages are not indexed.
Sectors covered : No. 18

Annual Expenditure Class (1984-85) (In Rs.)	Gain in Utility (in Rs.) as a proportion of Exp. No-MODVAT/MODVAT	
	Rural	Urban
0- 389	-.00545	-.00688
389- 518	-.00540	-.00715
518- 648	-.00589	-.00808
648- 777	-.00630	-.00777
777- 907	-.00682	-.00835
907-1101	-.00739	-.00885
1101-1296	-.00791	-.00935
1296-1619	-.00846	-.01002
1619-1943	-.00892	-.01030
1943-2591	-.00770	-.01052
2591-3239	-.00921	-.01058
3239-3887	-.00910	-.01065
>3887	-.00819	-.00871

We also observe that a hike of 10% in all excise duties increases the tax burdens by as much as 1.2 to 1.4% of expenditure for poor classes to 2 to 2.1% for rich classes. Among all the scenarios considered, a 10% increase in excise duty of all administered price sectors seems to have the worst implications in the sense that it not only leads to the largest increases in consumer burdens it is also regressive. Hence, although it generates a revenue of about Rs.540 crores.such a reform should be attempted with due caution. These results are particularly important when considered in the light of the pre-budget price hikes of petrol and steel.

APPENDIX A. 1

Calculation of Production, Imports and Tax Collections

Production

The data on the value of production is based on the value of clearances given in the Statistical Year Book brought out by the Directorate of Statistics and Intelligence (DSI), Central Excise and Customs. This is done because of absence of data on value of production for 1984-85. The value of clearance for each sector is multiplied by the ratio between the quantity produced and that cleared on payment of duty to arrive at the value of production. The data regarding value covers only duty paying goods for which returns are submitted to the excise department. Thus, value of exempted goods and most of the goods produced without the aid of power is left out. This is particularly so in the case of textile and food items.

Excise Tax Collections

To obtain total duty collection, the excise classification is suitably matched with the TN classification with the help of Planning Commission classification of the economy into 115 sectors for 1973-74 (see Input-Output Transactions 1973/74, Central Statistical Organisation, Sept., 1981). In cases where a particular excise item was covered by two or more items of TN classification, the detailed data available in the Statistical Year Book was used to allocate the revenue from the excise commodity to various heads in the TN table.

Imports

The data regarding value of imports is taken from the Monthly Statistics of Foreign Trade in India, March 1985, brought out by the Directorate General of Commercial Intelligence and Statistics, Calcutta. The customs classification is then matched with the TN classification to get the value of imports for our 50 sectors.

Import Tax Collections

The data for this item is taken from the tariff-headwise revenue figures available with the DSI, Central Excise and Customs. Total revenue from baggage items excluding those under customs tariff no.100-02(1) and 100-03(1) amounting to Rs.313.933 crores (import duty) and Rs.2.901 crores (additional duty) is individually allocated to different items as under:

(i) 50% to TN sector 42 (Communication and Electronic Equipment)

(ii) The remaining 50% is allocated to TN's items 13 to 27.39 and 44 in proportion to respective revenue collections as follows:

APPENDIX A.4

Break-up of the 19 broad groups of items in NSS into the 50 groups of TN

TN Sector (1)	NSS Sector (2)	Fraction of NSS going to TN (3)
1. Paddy	Total Cereals (1) Cereal Substitutes (3)	Ø.5Ø Ø.5Ø
2. Wheat	Total Cereals (1) Cereal Substitutes (3)	Ø.3Ø Ø.3Ø
3. Other Cereals	Total Cereals (1) Cereal Substitutes (3)	Ø.2Ø Ø.2Ø
4. Pulses	Gram (2) Pulses (4)	1.ØØ 1.ØØ
5. Fibre Crops	--	-
6. Tea and Coffee	--	-
7. Other Crops	Vegetables (8) Fruits and nuts (9)	1.ØØ 1.ØØ
8. Animal Husbandry	--	-
9. Forestry/Logging	--	-
1Ø. Fishing	--	-
11. Coal and Lignite	--	-
12. Crude Petrol/Natural Gas	--	-
13. Iron Ore	--	-
14. Other Metal Min.	--	-
15. Non Metal + Minor Min.	--	-
16. Sugar	Sugar (1Ø)	1.ØØ
17. Khandsari + boora	--	-
18. Other Food and Beverage Industries	Milk and milk products (5) Edible Oils (6) Meat, eggs and fish (7) Salt (11) Spices (12) Beverages and refreshments (13) Pan, tobacco and intoxicants (14)	1.ØØ 1.ØØ 1.ØØ 1.ØØ 1.ØØ 1.ØØ 1.ØØ
19. Cotton Textiles	Clothing (16)	Ø.64 (rural) Ø.3Ø (urban)
2Ø. Art Silk/Synth. Fil. Tex	Clothing (16)	Ø.Ø8 (rural) Ø.17 (urban)
21. Woollen Textiles	Clothing (16)	Ø.Ø2 (rural) Ø.Ø5 (urban)

TN Sector (1)	NSS Sector (2)	Fraction of NSS going to TN (3)
22. Other Textiles	Clothing (16) Durable goods (19)	Ø.26 (rural) Ø.4Ø (urban) Ø.18
23. Wood Based Inds.	Durable goods (19)	Ø.18
24. Paper/Paper Products	--	-
25. Leather/Leather Products	Footwear (17)	Ø.9Ø
26. Rubber Products	Footwear (17)	Ø.1Ø
27. Plastics	--	-
28. Petroleum Products	Fuel & light (15)	Ø.7Ø
29. Coal Tar Products	--	-
3Ø. Fertilizers	--	-
31. Pesticides	--	-
32. Synth.Fibres + Resin	--	-
33. Other Chemicals	--	-
34. Cement	--	-
35. Other Non-Met.Prod.	--	-
36. Iron and Steel	--	-
37. Non-Ferrous Metals	--	-
38. Non-Elect. Machinery	--	-
39. Electrical Machinery	Durable goods (19)	Ø.18
4Ø. Rail Equipments	--	-
41. Motor Vehicles	Misc.goods and services (18) Durable goods (19)	Ø.Ø1 Ø.1Ø
42. Other Transport Equip.	--	-
43. Commun./Elect.Equip.	--	-
44. Other Manufacturing	Misc.goods and services (18) Durable goods (19)	Ø.Ø2 Ø.36
45. Rail Transport Services	Misc.goods and services (18)	Ø.Ø2
46. Other Transport Services	Misc.goods and services (18)	Ø.Ø9
47. Electricity	Fuel and Light (15)	Ø.2Ø
48. Construction	--	-
49. Communication	Misc.goods and services (18)	Ø.Ø1
5Ø. Other Services	Fuel and light (15) Misc. goods and services (18)	Ø.1Ø Ø.85

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