TAXATION AND HOUSEHOLD SAVINGS IN INDIA : AN EMPIRICAL STUDY

1. Introduction

The objective of the present study is an empirical analysis of the effect of taxation on household savings in the Indian economy. In other words, it attempts to answer the question as to what extent taxation affects household savings in the Indian economy. The broad forms of taxation, the effects of which are considered in the present study are (i) income taxation and (ii) commodity taxation, with special emphasis on the former. In the public finance literature (See, for example, Atkinson and Stiglitz (1980), Musgrave (1959) and Shoup (1969)) income taxes are supposed to affect household savings by affecting (i) work effort, (ii) household disposable income and (iii) the rate of interest. The present study does not analyse the first of these effects. Its main focus is on the latter two effects of income taxation.

Empirically, the effect of income taxation on household savings through its effect on household disposable income and the rate of interest can be analysed with the help of a household consumption or savings function. Accordingly, in Section 2 we specify a household consumption function for India and in Section 3 we present the empirical results of estimating it. In the specification and estimation of the consumption function for India, we focus on the following aspects of the problem:

(i) the role of permanent income vis-a-vis absolute income in the consumption function;

(ii) the differences in the marginal propensity to consume between the agricultural and the non-agricultural sectors; and

(iii) the role of interest rate in household consumption.

Each one of these issues is important in analysing the effect of taxation on household savings. Consider the first issue. It is extremely important in analysing the dynamic implications of income tax changes for the consumption-saving decisions of the households. The speed with which changes in income tax affect savings would depend upon whether the households base their consumption-saving decisions on their permanent income or absolute income. More specifically, under the absolute income hypothesis, income taxes affect household savings instantaneously whereas under the permanent income hypothesis they do so with a distributed lag. The issue as to whether there exists a significant difference in the marginal propensity to consume between the agricultural and the non-agricultural sectors an issue investigated by some earlier work in the area too (see Krishnamurthy and Saibaba (1981)) - gains importance in evaluating the effect on savings of any tax-transfer policy which alters the income terms of trade between the two sectors. Similarly, the role of interest rate in the consumption/savings function is of extreme importance in assessing the intemporal substitution effect of a change in the income tax rate on household savings. It is also important for the controversy on the relative superiority of an expenditure tax vis-a-vis the income tax. (See Chelliah (1980), King (1980) and Meade (1978)). It gains added significance because of the almost total absence of any quantitative evidence on the interest elasticity of household consumption/savings in the Indian context.

The effect of commodity taxation on household savings is not discussed much in the public finance literature except that of an overall consumption tax. However, a fairly obvious effect of commodity taxation on household savings that can be easily discerned is a negative income effect: Given the money incomes of the households, an increase in the rate of tax on a commodity raises the price of that com odity which, in turn, reduces real income, real consumption and real savings of the households. The magnitude of such income effects of commodity taxes would differ from one commodity to another depending upon the weight of the commodity in the consumption basket of the households; these weights may, however, depend on the relative commodity prices. Only in the polar case where all commodities have equal weights in the household consumption basket would this income effect be the same for all commodities. In Section 4 we briefly examine this income effect of commodity taxes.

Using the empirical evidences of Sections 3 and 4, in Section 5 we evalute the impact and the long run effects of some selected hypothetical tax changes on household savings. In Section 6 we present the summary and conclusions. The sources and the problems of data used in the study are discussed in Section 3.1 and Annexure B.

2. Specification of The Model

Generally, the household savings or the consumption function is derived from an intertemporal decision-making model of the representative economic unit (say, a representative household). Typically, in such models the economic unit is assumed to be maximising an intertemporal (or multi-period) utility function subject to the budget constraint that the economic unit's lifetime consumption should be equal to its lifetime income, the latter adjusted for inheritances and bequests (See Friedman (1957) and Modigliani (1949)). After suitable aggregation over the economic units, such a maximisation excercise yields the following aggregate household consumption function: 1/

(2.1) $$C_t = a_o + a_1 X_t^*$$

1/ Following Friedman (1957) some assume proportionality between consumption and permanent income and constrain a_o to be zero. However, in Friedman's framework there is nothing that suggests that a_o should be zero *a priori*. Essentially, Friedman took the proportionality hypothesis as an empirical approximation. On this point see Mayer (1972), p.35.

where

C_t denotes the real consumption of the household sector,

X_t^* denotes the permanent real disposable income of the household sector and subscript t denotes time. This convention holds for the rest of the paper.

Given equation (2.1), the household sector's real savings in period t, S_t can be derived as:

$$(2.2) \quad S_t = (X_t - C_t)$$

$$(2.3) \quad X_t = Q_t(1 - A_t)$$

where

Q_t denotes the real income of the household sector,

A_t denotes the average income tax rate on the household sector, and hence

X_t denotes the real disposable income of the household sector.

A common assumption made in deriving equation (2.1) from the intertemporal decision-making model of the households is that the real post-tax rate of interest remains constant over time. One way of introducing a variable interest rate is to modify equation (2.1) to: 2/

2/ Instead of introducing the rate of interest linearly as we have done here, some introduce it non-linearly. For example, Carlino (1982) and Springer (1975) make the proportionality parameter a_1 a function of the interest rate. However, in our empirical estimation of the consumption function the linear specification always yielded much better statistical results.

$$(2.4) \quad C_t = a_o + a_1 X_t^* + b\, r_t$$

$$(2.5a) \quad r_t = R_t - \pi_t^e$$

and

$$(2.5b) \quad R_t = i_t (1 - M_t)$$

where

- i_t denotes the nominal before tax rate of interest,
  M_t denotes the marginal tax rate on interest income,
  π_t^e denotes the expected rate of inflation, and hence R_t and r_t denote the nominal and real post-tax rates of interest, respectively.

It is generally postulated that b is negative on the assumption that as the real post-tax interest rate rises, economic units substitute future consumption for present consumption. However, if the economy is characterised by the predominance of 'fixed target savers' (i.e., economic units which aim at a fixed amount of life time real savings) the sign b could be positive (See Musgrave (1959)). Note, however, that a postively signed b would imply, contrary to the widely held view, that the household savings rate can be raised by increasing the tax rate on interest income.

For empirical work, the consumption function of equation (2.4) raises two sets of problems:

(i) the proper concept of C_t and
(ii) the proper measure of X_t and π_t^e

As regards the concept of C_t, Darby (1974) has shown that an equation such as (2.4) is a proper specification of the consumption function only if C_t is measured in terms of 'service flows' of goods and services. However, if C_t refers to 'consumer expenditures on goods and services', as is generally the case with National Accounts estimates of it, besides the permanent income, X_t^* one should include the transitory component of income, $(X_t - X_t^*)$ as well in the consumption function:[3/]

$$(2.6) \quad CE_t = a_0 + a_1 X_t^* + a_2 (X_t - X_t^*) + br_t$$

where

CE_t denotes the consumer expenditure of the households sector as distinct from C_t which is a measure of household consumption in terms of the service flow of goods.

Since our study uses the estimate of private final consumption expenditure as given in the National Accounts (which is closer to CE_t than to C_t), the consumption functions that we have estimated are in the form of equation (2.6). An alternative, but one which would involve enormous computational exercise and data problems, could have been to derive an estimate of household consumption corresponding to the analytical concept of 'service flow' of goods and use this measure of consumption to estimate equation (2.4). We have not attempted this in the present study.[4/]

The second set of problems - the one relating to the proper measures of X_t^* and π_t^e - arises because both these variables are not observable; hence for empirical work they need to be approximated in some fashion. Following Darby (1972), permanent income, X_t^* can be specified in terms of the adaptive expectations framework as:

3/ Note that this reformulation of the permanent income theory requires that a_1 and a_2 should be positive but that a_1 is greater than a_2.

4/ For a discussion of the relative usefulness of the two concepts of consumption for consumption function studies refer to Mayer (1972), pp.12-16.

(2.7) $X^*_t = \lambda X_t + (1-\lambda)\ (1+g_1)\ X^*_{t-1}$; $0<\lambda\leq 1$

where

g_1 can be estimated from the regression:

(2.8) $\text{Log}\ X_t = g_o + g_1\ t + u_t$

where

t denotes time and u_t the error term of the regression.

To estimate the coefficient of adjustment, λ we use the familiar grid search procedure which boils down to estimating various series of X^*_t based on alternative values of λ and substituting these values of X^*_t in equation (2.6) and choosing that value of λ which gives the minimum residual sum of squares for the consumption function.5/ The base year value of X^*_t for estimating the series of X^*_t is given by the exponential of g_o.

The expected inflation rate Π^e_t is estimated using the following adaptive expectations model:

(2.9) $\Pi^e_t = \quad _{t-1} + (1-\beta)\dot{\Pi}^e_{t-1}$ $\quad 0<\beta\leq 1$

The procedure used to estimate β is the same as the one used to estimate λ.

An important point that needs careful consideration in estimating the household consumption function is the widely

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5/ Analternative could have been to estimate the consumption function (2.6) after applying the familiar Koyck transformation to equations (2.6) and (2.7). It can, however, be checked from these equations that such a Koyck-transformed consumption function needs to be estimated through non-linear methods such as non-linear least squares, since it would imply coefficient restrictions. Since the package for such estimation methods was not at our disposal we have not followed this alternative method of estimating the consumption function in the present study.

held view that in India the marginal propensity to consume (m.p.c) may differ significantly between the agricultural and the non-agricultural sectors (See, for example, Raj (1962)). More recently, Krishnamurthy and Saibaba (1981) and Lahiri et al (1983) have shown that this sectoral m.p.c. (or equivalently, m.p.s.) differential is substantial. For example, Krishnamurthy and Saibaba found that m.p.s. of the non-agricultural sector is appreciably higher than that of the agricultural sector, the difference between the two being around 0.4[6/]. From the point of view of the effect of taxation on household savings, sectoral m.p.s. differential of such magnitude implies that a given lump-sum income tax on non-agricultural incomes would reduce the aggregate household savings much more than that on agricultural incomes. Similarly, any other tax-transfer policy which affects the income terms of trade between the two sectors will affect the aggregate household savings appreciably. To take account of such m.p.c. differential between the agricultural and the non-agricultural sectors, we modify equation (2.6) as:

$$(2.10) \quad CE_t = d_o + d_1 XA_t^* + d_2 (XA_t - XA_t^*) + d_3 XNA_t^* + d_4 (XNA_t - XNA_t^*) + br_t$$

where

XA_t and XNA_t denote the real disposable incomes of agricultural and the non-agricultural sectors respectively and asterisks on XA and XNA denote that

6/ Earlier, working with a slightly different sectoral classificatory scheme, Gupta (1970) and Roychoudhury (1968) in their time series study of household saving function found that the m.p.s. of the urban households is substantially higher than that of the rural ones. For example, Roychoudhury found that the m.p.s. of the urban households is around 0.53 whereas that of the rural households is only around 0.015.

they are the permamanent values. The sectoral permanent incomes, XA_t^* and XNA_t^* can be estimated using equations similar to (2.7) and (2.8).

3. Empirical Results

Before we present the results of estimating the household consumption function, it may be useful to briefly discuss the sources of data and the construction of the variables that are used for the estimation.

3.1 Data

The Central Statistical Organisation (C.S.O.) in its 'National Accounts Statistics' (N.A.S.) publishes a series on 'private final consumption expenditure in the domestic market' at constant (1970-71) prices, which is available from 1950-51 onwards. It covers expenditure on current account of resident and non-resident households and non-profit making bodies serving households; it relates to outlays on new durable as well as non-durable goods (except land) and on services reduced by net sales (sales less purchases) of second-hand goods, scraps and wastes. (See, C.S.O. (1980)). It is this series that we have used as household consumption expenditure, CE.

The N.A.S. also give data on personal disposable income at factor cost at current prices from 1960-61 onwards. For the '50s we got a comparable series directly from C.S.O. We added 'indirect taxes less subsidies', given in the N.A.S. to this series to derive personal disposable income at market prices. This series was deflated by the implicit price deflator for private consumption expenditure to derive personal disposable income at constant (1970-71) prices. It is this series that we have used as X_t.

To compute the implicit price deflator for private consumption expenditure, data on private consumption expenditure at current prices were not available for the '50s. Consequently, we had to derive it from the data on macro-aggregates given in the N.A.S. by subtracting government final consumption expenditure, gross domestic capital formation and net exports (i.e., exports minus imports) of goods and services from the gross domestic product at market prices.

The break-up of personal disposable income into agricultural and non-agricultural is not given in the N.A.S. To derive this sectoral break-up, we first computed personal disposable income of the agricultural sector at factor cost by deducting land revenue and agricultural income tax from income (net) originating from agriculture at factor cost at current prices. The latter series is not available in the N.A.S. for the '50s but is published in C.S.O.'s 'Estimates of National Income' (E.N.I.). These data, however, are not comparable to the revised national income data published in the N.A.S.. Hence, we computed the ratio of income (at factor cost and at current prices) orginating from agriculture to net domestic product at factor cost from the E.N.I. and applied this ratio to the revised N.A.S. data on net domestic product to derive income originating from agriculture at factor cost for the '50s. We then apportioned indirect taxes less subsidies between agricultural and non-agricultural sectors on the basis of the sectoral income shares[7/] (i.e., the share of each sector's income in the net domestic product at factor cost). Once the disposable income of the agricultural sector at market prices was derived, disposable income of the non-agricultural sector was derived residually. We then deflated the sectoral disposable incomes at market prices by the implicit price deflator for private consumption expenditure to derive XA and XNA.

As regards the rate of interest, i, we chose two rates: (i) the weighted rate of interest on time deposits with commercial banks and (ii) the rate of return on capital employed in the corporate sector (medium and large public limited companies). In a sense, the former represents the yield on financial assets and the latter on physical or real assets. We selected the rate of return on capital rather than the usual measure of the yield rate on corporate shares (published in Reserve Bank of India Bulletins) as the rate of return on savings in physical

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7/ Allocation of indirect taxes according to sectoral incomes shares may not be entirely satisfactory since the consumption basket of the two sectors may be different and hence their indirect tax liabilities as a proportion of income may differ. To account for this difference, however, one needs to have information on the commoditywise indirect tax and subsidy rates and the consumption basket of the two sectors. The former is extremely difficult to obtain and hence the assumption that indirect taxes less subsidies are proportional to sectoral incomes is almost unavoidable in empirical work.

assets on the rationale that the former not only proxies the rate of return on corporate shares better (since it includes capital gains) but also may serve as a good indicator of the rate of return on investment in the non-corporate private sector. The latter argument is especially relevant in the Indian context since in the Indian National Accounts the unincorporated business firms (and hence their incomes and savings) are included in the household sector.

The weighted rate of interest on time deposits is computed as a ratio of interest payments on time deposits by commercial banks to the average stock of time deposits with them. Data on both interest payments and time deposits are taken from the 'Statistical Tables Relating to Banks in India' published by the Reserve Bank of India (R.B.I.). The rate of return on capital in the corporate sector is computed as a ratio of gross profits (profits before tax plus interest payments) to capital employed (net fixed assets plus net current assets) for the medium and large public limited companies. These data are taken from the 'Financial Statistics of Joint Stock Companies' published by the R.B.I.

The marginal tax rate, M_t is computed from the data on income-bracket-wise assessed income and tax demand relating to 'individuals' (A.I.I.T.), published by the Directorate of Inspection (Research, Statistics and Public Relations). More specifically, it is constructed as a weighted average of the income-bracket-wise marginal tax rates, the weights being the proportion of income assessed in each income bracket to the total income assessed of 'individuals'. Since the data given in the A.I.I.T.S. relate to assessment years and the fiscal years lag the assessment years by one period, we lagged the weighted marginal tax rate by one period in computing the post-tax nominal rate of interest.

For computing the expected inflation rate we have used the percentage change in the wholesale price index of all commodities from 1926 onwards. The reason for going as far back as 1926 was to select the 'initial' value for the computation of the expected inflation rate from as distant a period from the first year (1950-51) of the sample period of the present study as possible, so that the resulting series on the expected inflation rate becomes quite insensitive to the 'initial' value chosen. The initial value of the expected inflation rate chosen for the present study is the average inflation rate during the three years from 1927-28 to 1929-30; it worked out to be - 2.29.

Given the real disposable income-aggregate as well as its sectoral break-up, to compute the corresponding permanent incomes we need the initial values ($e^{g}o$) and the trend rates of growth (g_1). The values used in the present study are as follows:

Initial values	(i)	Aggregate disposable income :	15543
in Rs. crores	(ii)	Agricultural disposable income :	8027
($e^{g}o$)	(iii)	Non-agricultural disposable income	7599

Trend Rates of growth (g_1)	(i)	Aggregate disposable income:	0.03870
	(ii)	Agricultural disposable income:	0.03268
	(iii)	Non-agricultural disposable income:	0.04346

3.2 Estimates

We estimated the consumption function both in its aggregative version (equation (2.6))and in its sectoral version (equation (2.10)) for alternative values of λ and β for the period 1950-51 to 1978-79. The method of estimation used is ordinary least squares. At the very outset, two points are worth mentioning about these estimated equations: (i) In general, the expected inflation rate (computed for values of β ranging from 0.1 to 1 with an interval of 0.1), both when it was introduced through the interest rate and independent of it, turned out to be unimportant as an argument in the consumption fuction; (ii) The coefficient of the weighted time deposit rate turned out to be statistically insignificant when introduced along with the rate of return on capital in the corporate sector as well as without it and both with and without adjustments for marginal tax rate and expected inflation rate. Consequently, we dropped both these variables from the consumption function and estimated it with the post-tax nominal rate of return on capital in the corporate sector as the interest rate variable.

However, from these results it is difficult to infer much about the importance of inflation expectations for household consumption-saving decisions since what is rejected is a 'joint hypothesis' of adaptive inflation expectationsand the sensitivity of household consumption to the real rate of interest. It is quite possible that the insignificance of the expected inflation rate in the consumption function may be entirely due to the particular expectation formation hypothesis that we have postulated. In other words, inflation expectations may still be relevant for the consumption-saving decisions of the households but not the hypothesis of adaptive expectation formation. Hence, the role of inflation expectations still remains an unsettled issue; it may be worthwhile in future research in this area to experiment with inflation expectation hypothesis other than adaptive expectations.

The aggregative version of the consumption function when estimated for alternative values λ ranging between 0.1 and 1 with an interval of 0.1 yielded results which generally support the permanent income theory rather than the absolute income theory (See Table A.1 of Annexure A). In particular, the λ value which minimised the residual sum of squares turned out to be 0.1. The preferred equation is as follows:8/

$$(3.1) \quad CE_t = 4484.5 + \underset{(22.87)}{0.7264}\, X^*_t + \underset{(3.37)}{0.3581}\, (X_t - X^*_t) - \underset{(1.00)}{78.99}\, R_t$$

$\bar{R}^2 = 0.993$; D.W. = 1.09; SEE = 580.93 $\qquad \lambda = 0.1.$

Two aspects of equation (3.1) deserve special mention:

8/ In what follows, the figures below the coefficients of the variables represent their respective t-values, D.W. and SEE stand for Durbin Watson Statistic and the Standard Error of Estimate respectively. Note also that R_t denotes the post-tax rate of return on capital in the corporate sector, i.e., the rate of return on capital net of the weighted marginal income tax rate.

(i) It supports the permanent income theory in general and the Darby reformulation of it in particular. The coefficients of both permanent and transitory incomes are statistically significant; yet the coefficient of permanent income is more than twice that of transitory income. The small coefficient of transitory income coupled with a fairly low value of λ implies that the effect of taxation on savings (through the disposable income channel) is not instantaneous but distributed over a number of years.

(ii) The coefficient of the post-tax rate of interest bears negative sign but is not statistically significant, indicating that the intertemporal substitution effect on savings of a tax on interest income is not significantly different from zero.

An important limitation of equation (3.1) is the low value of the Durbin-Watson statistic indicating positive autocorrelation of the residuals. In an attempt to see whether the allowance for the marginal propensity to consume to differ between the agricultural and the non-agricultural sectors reduces the problem of autocorrelation, we estimated the sectoral version of the consumption function for alternative values of λ ranging from 0.1 to 0.9 with an interval of 0.1 between successive λ values. The standard errors of estimate of these regressions are given in Table A.2 of Annexure A. The equation that minimised the residual sum of squares has λ values of 0.9 for agricultural income and 0.1 for non-agricultural income:

$$(3.2) \quad CE_t = 4248.81 + \underset{(6.01)}{0.8957\, XA_t^*} - \underset{(0.59)}{0.6414(XA_t - XA_t^*)} + \underset{(5.91)}{0.6625\, XNA_t^*} + \underset{(3.50)}{0.3787(XNA_t - XNA_t^*)} - \underset{(2.43)}{152.66\, R_t}$$

$\bar{R}^2 = 0.998$; D.W. = 1.66; SEE = 428.89

$\lambda = 0.9$ for XA_t^* and 0.1 for XNA_t^*

The significant improvement in the Durbin-Watson statistic from equation (3.1) to (3.2) indicates that the sectoral version of the consumption furnction is better than the aggregative version. Furthermore, equation (3.2) suggests that:

(i) the permanent income theory is more applicable to the non-agricultural sector than to the agricultural sector.

(ii) the marginal propensity to consume between the agricultural and the non-agricultural sectors differs in the short run as well as in the long run; however, this difference is much less in the long run than in the short run.

(iii) the post-tax nominal rate of interest has a significant negative effect on consumption indicating that a reduction in the tax on interest income would lead to an increase in real household savings. The interest elasticity of household savings computed at sample means of the variables works out to be 0.88.

Since the coefficient of transitory income of the agricultural sector has an insignificant coefficient in equation (3.2) we re-estimated it by dropping this variable. The result is:

$$(3.3) \qquad CE_t = 4283.94 + \underset{(7.38)}{0.8401}\, XA_t^* + \underset{(7.57)}{0.6990}\, XNA_t^*$$

$$+ \underset{(3.65)}{0.3509}(XNA_t - XNA_t^*) - \underset{(2.40)}{140.94}\, R_t$$

$$\bar{R}^2 = 0.996;\ D.W. = 1.68;\ SEE = 423.01$$

$$\lambda = 0.9 \text{ for } XA_t^* \text{ and } 0.1 \text{ for } XNA_t^*.$$

Except for minor differences, the basic message of equation (3.3) is the same as that of equation (3.2): the sharp contrast in the λ values between the agricultural and the non-agricultural sectors. Note that the value of λ for the non-agricultural sector is 0.1 whereas for the agricultural sector it is as high as 0.9. At such high values of λ for the agricultural sector there is very little difference between permanent income and absolute income; consequently, without much loss of generality one can substitute absolute income for permanent income for the agricultural sector. Accordingly, we estimated a version of the consumption function with absolute income for the agricultural sector and permanent income for the non-agricultural sector. These equations are presented in Table A.3 of Annexure A. Once again, a λ value of 0.1 for the non-agricultural sector minimised the residual sum of squares. The relevant equation is:

$$(3.4) \qquad CE_t = 4348.62 + \underset{(7.08)}{0.7597\ XA_t} + \underset{(8.44)}{0.7526\ XNA_t^*}$$

$$+ \underset{(3.25)}{0.3093}\ (XNA_t - XNA_t^*) - \underset{(2.10)}{125.87\ R_t}$$

$$\bar{R}^2 = 0.996;\ D.W. = 1.71;\ SEE = 434.84$$

$$\lambda = 0.1 \text{ for } XNA_t^*$$

An important feature of equation (3.4) is the equivalance of the long run marginal propensity to consume (hence the long run marginal propensity to save too) between the agricultural and the non-agricultural sectors — note that the coefficients of XA_t and XNA_t^* are very close to each other. This is in sharp contrast to the results obtained by Krishnamurthy and Saibaba (1981) and Lahiri et al (1983) who reported substantial propensity differentials between the sectors both in the short run and the long run.

An inevitable conclusion that follows from the above results is that whereas the non-agricultural households seem to base their consuption-saving decisions on their permanent income, the agricultural households seem to base it largely on their absolute income. The greater relevance of the permanent income theory to the non-agricultural sector can probably be explained in terms of the better capital market in the non-agricultural sector than in the agricultural sector. A better capital market allows economic agents to finance present consumption out of past as well as expected future incomes, which is what the basic message of the permanent income theory is. In a sense, therefore, the behaviour of the non-agricultural households of the Indian economy in respect of consumption-saving decisions may perhaps be quite similar to that of the households in the developed economies. What is more important in this context is that our estimate of λ for the non-agricultural sector at 0.1 is very close to the ones obtained for the United States by Darby (1974) and Seater (1982).

To have a firmer estimate of λ for the non-agricultural sector, we conducted a finer grid search for λ values between 0.01 and 0.3 with an interval 0.01 between successive values of λ. Once again, we found that a λ value of 0.1 minimised the residual sum of squares although λ values of 0.08, 0.09 and 0.11 also gave near-identical residual sum of squares. We also conducted F-tests on these regressions to determine the upper limit of λ. The test showed that the value can be anywhere up to 0.24 and 0.3 at the 10 per cent and 5 per cent levels of significance, respectively. We report a few of these regressions below:

(3.5)
$$CE_t = 4224.51 \quad \underset{(XNA_0)}{0.7939}\ XA_t + \underset{(8.44)}{0.7298}\ XNA^*_t + \underset{(2.70)}{0.2929}\ (XNA_t - XNA^*_t) - \underset{(2.05)}{125.03}\ R_t$$

$\bar{R}^2 = 0.996$; D.W. = 1.73; SEE = 441.57

$\lambda = 0.15$ for XNA^*_t.

(3.6)
$$CE_t = 4122.05 + \underset{(8.64)}{0.8354}\ XA_t + \underset{(8.41)}{0.6956}\ XNA^*_t + \underset{(2.38)}{0.2935}\ (XNA_t - XNA^*_t) - \underset{(1.94)}{121.46}\ R_t$$

$\bar{R}^2 = 0.996$; D.W. = 1.73; SEE = 452.39

$\lambda = 0.2$ for XNA^*_t.

(3.7) $$CE_t = 4061.30 + \underset{(9.31)}{0.8661}\ XA_t + \underset{(8.41)}{0.6679}\ XNA_t^*$$

$$+ \underset{(2.23)}{0.3028}\ (XNA_t - XNA_t^*) - \underset{(1.85)}{117.71}\ R_t$$

$\bar{R}^2 = 0.995$; D.W. $= 1.73$; SEE 461.01

$\lambda = 0.24$ for XNA_t^*.

In general, these equations convey the same message as equations (3.2) through (3.4). Thus, in a nutshell, the empirical estimate of the consumption function suggest that: (i) the permanent income theory is more relevant for the non-agricultural sector than for the agricultural sector; (ii) there are substantial differences in the marginal propensity to consume between the agricultural and the non-agricultural sectors in the short run but this difference is much less in the long run; and (iii) the post-tax nominal interest rate has a significant negative effect on household consumption. Estimates of the consumption function for the more recent sub-period 1960-61 to 1978-79 did not give different results than these; in particular, except for minor differences, the coefficient estimates of the consumption function for the sub-period were very close to the ones for the full period.

4. Commodity Taxes and Household Savings

How do changes in commodity taxes affect household savings in terms of the consumption function of the previous sections? The basic channel through which commodity taxes affect household consumption or savings is through their effect on market prices of the commodities. More specifically, given the producer prices of the commodities, an increase in the commodity taxes (say, an increase in the excise tax rate) leads to an increase in the market prices of the commodities, the extent of the price rise being dependent on the degree of tax shifting. Assuming full shifting of the commodity taxes, we can write:

$$(4.1) \qquad P_i^m = P_i^d (1 + E_i)$$

where

P_i^m and P_i^d denote the market price and producer price of the i^{th} commodity respectively. E_i denotes the ad valorem commodity tax rate on the i^{th} commodity.

The general price level relevant for consumption-saving decisions of the households is a weighted average of such individual commodity prices, the weights being the proportions of each commodity in aggregate consumption. In the context of the present study, this general price level is represented by the implicit price deflator for private final consumption expenditure -- the price deflator that we have used to convert nominal incomes into real incomes. In a two commodity case (say, the two commodities being food and non-food), we can write:

$$(4.2) \qquad P = W_f \cdot P_f^m + W_{nf} \cdot P_{nf}^m$$

with $\qquad W_f + W_{nf} = 1$

where

P denotes the general price level, say, the implicit price deflator for private consumption.

P_f and P_{nf} denote the price of food and non-food, respectively with the superscript 'm' standing for market prices.

W_f and W_{nf} denote the weight of food and non-food respectively in the household consumption basket.

Consider an increase in the market price of food by one unit consequent on an imposition of excise tax on it. Combining equations (4.1) and (4.2) we can discern two distinct effects of this tax measure:

(i) an increase in the general price level, P and

(ii) an increase in the relative price of food to that of non-food, (P^m_f / P^m_{nf})

The former reduces the real income of the households and hence has a negative income effect on both real consumption and real savings of the households, the relative reduction in consumption and savings, of course, depending upon the marginal propensity to consume. It is easy to check that this effect on savings is equal to the product of two partial derivatives: the partial derivative of savings with respect to the general price level and of the general price level with respect to the price of food.

The effect of a change in the relative price between commodities (in the present context between food and non-food prices) on consumption-saving decisions of the households is not clear *a priori*. In the literature, such relative price changes are supposed to induce only substitution between commodities (i.e., a lower consumption of food accompanied by a higher consumption of non-food) and not between aggregate consumption and savings. This is also the maintained hypothesis of almost all empirical estimates of the household consumption or the savings function; note that, in general, empirical estimates of these functions do not include relative prices between commodities as arguments.9/

However, to the extent that such relative price changes lead to substitution among commodities, it may lead to variations in the weights of each commodity in the household consumption basket and hence in the general price level initiating an income effect on real consumption and savings. Such income effects of relative price changes would depend upon the response of the relative demand for commodities to relative prices. An indepth study of such income effects of commodity taxation on consumption and savings would require estimates of these responses for various commodities or commodity-groups which make up the consumption basket of the households at a fairly disaggregated level. One way of tackling the issue then is

9/ An exception to this being Darby (1975) who in his consumer expenditure function included the relative price of durables to non-durables as an argument. He, however, found the coefficient of this relative price to be statistically insignificant. In this context, it may be mentioned that we also included two relative commodity prices — one the relative price of durables to non-durables and the other the relative price of food to non-food-in various versions of our consumption function. The coefficient of both the relative prices turned out to be statistically insignificant.

to estimate a complete linear or extended linear expenditure system of household consumption. (See, Lluch *et al* (1977)). This, however, is largely outside the scope of the present study. Hence, what we have attempted here is much more rudimentary — to estimate the response of the relative demand for commodities to relative prices at a highly aggregative level. For this, we divided the aggregate consumption CE_t into food and non-food and estimated simple relative demand functions of the following type.10/

(4.3) $W_f = k_0 + k_1 (P^m_f / P^m_{nf})$ $k_1 < 0$

which, by the adding up condition that

$W_f + W_{nf} = 1$, implies:

(4.4) $W_{nf} = (1 - k_0) - k_1 (P^m_f / P^m_{nf})$.

Equations (4.3) and (4.4) are very rudimentary; they are certainly not full-fledged specifications of the relative commodity demand functions. However, for the limited purpose of getting some broad estimates of the effect of the relative price on the general price level, they may serve reasonably well. Equation (4.3)

10/ We further divided food expenditures into: cereals and other food and non-food expenditure into: clothing and others. We then estimated relative demand functions such as equations (4.3) and (4.4) for these four categories of expenditures but the coefficients of the relative prices turned out to be statistically insignificant. Hence, the results of this disaggregated exercise are not presented here.

when estimated [11] for the period 1950-51 to 1979-80 gave the following result.[12]

$$W_f = 0.78939 - 0.16907 \; (P^m_f \, / \, P^m_{nf})$$
$$(6.45)$$

$$\bar{R}^2 = 0.583; \; D.W. = 0.598; \; RHO = 0.646.$$

The coefficient of the relative price of food is negative and significant suggesting that an increase in the relative price of food results in a reduction in the relative demand for food. However, the Durbin-Watson statistic shows significant autocorrelation of the residuals. Therefore, we estimated the above regression by using the two-stage correction procedure for autocorrelation (See, Kmenta (1971) pp. 287-8). This gave the following estimates of k_o and k_1:

$$k_o = 0.71318 \text{ and } k_1 = - 0.09227.$$

Substituting (4.3) and (4.4) in (4.2) and partially differentiating P with respect to P^m_f and P^m_{nf} we have:

$$(4.5) \quad (\partial P / \partial P^m_f) = (k_o - k_1) + 2k_1 \, (P^m_f \, / \, P^m_{nf})$$

11/ In the estimated equations, the implicit price deflator of private expenditure on food and on non-food represent the price of food and the price of non-food, respectively. For details regarding the computation of these price deflators refer to Annexure B.

12/ The counterpart of this equation for W_{nf} is:

$$W_{nf} = 0.21151 + 0.16907 \; (P^m_f \, / \, P^m_{nf})$$
$$(6.45)$$

$$\bar{R}^2 = 0.583; \; D.W. = 0.598; \; RHO = 0.646.$$

$$(4.6) \qquad (\partial P/\partial P^m_{nf}) = (1-k_0) - k_1 \, (P^{m^2}_f / P^{m^2}_{nf})$$

Substituting the estimated values of k_0 and k_1 and the sample means of (P^m_f/P^m_{nf}) and $(P^{m^2}_f/P^{m^2}_{nf})$ in (4.5) and (4.6) we have:[13/]

$$(\partial P / \partial P^m_f) = 0.6408 \text{ and } (\partial P/\partial P^m_{nf}) = 0.2116.$$

Using these values of the partial derivatives along with the estimates of the consumption function of Section 3, we can compute the broad magnitudes of the effect of select commodity prices on aggregate household savings. This is done in the next Section.

5. Impact and Longrun Effects of Taxation on Savings.

With the help of the empirical results of sections 3 and 4, we can attempt to answer the question that we raised in Section 1, namely, to what extent taxation affects household savings in India. Accordingly, we now examine the effects on household savings of a few hypothetical tax-transfer policies. The specific policy effects

13/ The elasticities of P with respect to P^m_f and P^m_{nf} at the sample means of the variables worked out to be 0.6251 and 0.2218 respectively indicating that the percentage increase in the general price level for a given percentage increase in food prices is almost three times that of a given percentage increase in the price of non-food articles.

that we consider here are the effects on household savings of:

(i) a rupee reduction in the income tax on (a) agricultural incomes and (b) non-agricultural incomes,

(ii) transfer of a rupee from the agricultural to the non-agricultural sector,

(iii) a per cent reduction in the marginal income tax rate and

(iv) a per cent increase in the prices of select commodity-groups that make up the consumption basket of the household sector.

The numerical magnitudes of these effects can be computed by combining the estimated consumption function(s) of Section 3 and the relative commodity demand functions of Section 4 with the definitional relation (2.2) and partially differentiating household savings, S_t with respect to the relevant variable. However, the numerical magnitudes of these effects so computed would generally overestimate the true effect on household savings (as defined in the National Accounts) marginally since private final consumption expenditure and net household savings as given in the National Accounts do not add upto personal disposable income. On an average, during the sample period of the present study, the former as a ratio of the latter has varid mildly around 0.90 to 0.95. This discrepancy may perhaps be due to the differences in the method of estimation and the source-material used by the C.S.O. for compiling the different macro-aggregates. It may also be due to the fact that the measure of consumption used here is that of consumption expenditure 'within the domestic market' whereas a more relevant measure (for National Accounts) could be the parallel 'national' concept.14/ Due to this discrepancy, the definitional relation of equation (2.2) does not strictly hold good in practice. However, in computing the tax policy effects on household savings, we have proceeded as if that the definition of equation (2.2) strictly holds good.

With the above caveat in mind, consider the case of a rupee reduction of tax on agricultural incomes. In terms of equations (3.3) through (3.7), such a tax measure results in an increase in household savings, the magnitude of the increase ranging from Rs. 0.16 to Rs. 0.24. There seems to be very little lag in the effect of such a tax measure on household savings. In that sense, the adjustment of household savings to variations in the tax on agricultural incomes can be termed 'instantaneous'. This is in sharp contrast to the case of a rupee reduction of tax on non-agricultural incomes, the dynamic effects of which are presented in Table 1.

Note that the impact effect of a reduction of income tax on the non-agricultural sector is to raise household savings by around 0.60 rupees whereas the long run effect is of much smaller order of magnitude ranging from 0.25 to 0.33 rupees. What is more important, the

14/ For details regarding these concepts refer to C.S.O. (1980).

effect is spread over a large number of years suggesting that unlike in the case of a tax reduction on agricultural incomes, a tax reduction on non-agricultural incomes has a long distributed lag effect on household savings. This seems to be a fresh piece of empirical evidence on the time-path of the effect of tax reductions on household savings in India.

TABLE 1

The Dynamic Effect on Household Savings (in Rs.) of a Rupee (Once-and-for all) Reduction of Tax on Non-Agricultural Incomes

Time period (Years)	Alternative Consumption Functions				
	Equation (3.3)	Equation (3.4)	Equation (3.5)	Equation (3.6)	Equation (3.7)
1	0.6143	0.6464	0.6501	0.6261	0.6096
2	0.5816	0.6048	0.5906	0.5590	0.5401
3	0.5509	0.5657	0.5359	0.5030	0.4850
4	0.5221	0.5290	0.4911	0.4562	0.4413
5	0.4950	0.4945	0.4496	0.4171	0.4066
6	0.4696	0.4621	0.4128	0.3845	0.3791
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
Long Run Effect	0.3010	0.2474	0.2702	0.3044	0.3321

Though the time-path of the effect on household savings of a tax reduction on non-agricultural sector differs substantially from that of corresponding tax reduction on the agricultural sector, the difference in the ultimate effects of the two tax measures is much smaller. This can be checked from Table 2 which presents the dynamic effects on household savings of transfer of a rupee from the agricultural to the non-agricultural sector. Note that in terms of equation (3.4) and (3.5), though such a transfer policy has a significant positive impact effect on household savings, it has almost no long run effect on it implying that household savings rate cannot be stepped up 'permanently' by such a transfer policy. The same applies to any tax-transfer policy aimed at altering the income terms of trade between the agricultural and the non-agricultural sectors. Equations (3.3), (3.6) and (3.7), however, show some sizeable long-run effect of such a transfer policy on household savings. Equation (3.7) implies the maximum long-run effect of around Rs.0.20. However, note that even this is half the magnitude of the effect (of such transfer policies) indicated by the Krishnamurthy-Saibaba (1981) study.

Table 3 presents the familar substitution effect on household savings of taxing interest income. Note that for every one per cent reduction in the marginal tax rate on interest income, household savings increase in the range of 0.21 to 0.25 per cent. Put differently, on an average, to bring about around Rs 50 crore increase in household savings, the marginal tax rate needs to be reduced by around 10 per cent. A 10 per cent reduction in the latter does not seem to call for a drastic policy change since during the period of the present study (a period in which no drastic tax changes were implemented),

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18th November, 1977.

WHOMSOEVER IT MAY CONCERN

I have great pleasure in certifying that Mrs.Sujata Datta, M.A., is personally known to me for the last one year. She worked as Senior Research Fellow in a research project which I have been conducting with financial assistance from the Indian Council of Social Science Research, New Delhi. During the brief period of about 8 months (17th January to 22nd August, 1977) that she worked with me, I found her to be an extremely conscientious assistant, hard working as well as dependable in all respects both academic and otherwise. She developed an insight into cost functions which were formulated by her for analysis with regard to the operation of electric supply undertakings in India. I am glad to say that the statistical regressions which she helped in formulating have been appreciated by all who are knowledgeble in the field. I have no hesitation in saying that she has in her potentialities of a first rate econometrician.

I wish her a very successful career.

TABLE 2

The Dynamic Effect on Household Savings (in Rs) of Transfer of a Rupee (Once-and-for all) from the Agricultural to the Non-agricultural Sector

Time Period (Years)	Alternative Consumption Functions				
	Equation (3.3)	Equation (3.4)	Equation (3.5)	Equation (3.6)	Equation (3.7)
1	0.3704	0.4061	0.4440	0.4615	0.4757
2	0.4158	0.3645	0.3845	0.3944	0.4062
3	0.3932	0.3254	0.3318	0.3384	0.3511
4	0.3652	0.2887	0.2850	0.2916	0.3074
5	0.3382	0.2542	0.2435	0.2525	0.2727
6	0.3128	0.2218	0.2067	0.2199	0.2452
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
Long-Run Effect	0.1411	0.0071	0.0641	0.1398	0.1982

the marginal tax rate has, in fact, varied by around 10 per cent in three years and by around 20 per cent in another two years, the average variation for the entire period being of the order of 5 per cent per year. Considered against this backdrop, the magnitude of the substitution effect of taxing interest income on household savings appears to be quite substantial. Once again, this is a fresh piece of empirical evidence since in the Indian context hardly any study has investigated the interest elasticity of household savings.

TABLE 3

The Effect of One Per cent Reduction in the Marginal Tax Rate (On Interest Income) On Household Savings[1/]

Alternative consumption functions	Percentage increase in household savings per one per cent reduction in the marginal income tax rate
Equation (3.3)	0.2464
Equation (3.4)	0.2201
Equation (3.5)	0.2186
Equation (3.6)	0.2124
Equation (3.7)	0.2058

1/ These figures are computed at sample means of the variables.

Table 4 presents the elasticity of household savings with respect to some select commodity prices computed at sample means of the variables. In general, household savings is more elastic with respect to food prices than to non-food prices - a highly plausible result in a low income country like India where expenditure on food constitutes the major share of the household budget. Note that the short run elasticity of household savings with respect to the price of cereals is very close to minus unity indicating short run inverse proportionality between household real savings and cereals prices. The long run elasticity is, however, much lower at around - 0.6; hence, in the long run a given percentage increase in cereal prices would lead to a less than proportional cut in household saving.

TABLE 4

Elasticity of Household Savings with Respect to Commodity Prices

Alternative Consumption Functions	Elasticity With Respect to															
	Food Group								Non - Food Group							
	Cereals and Cereal Substitutes		Milk and Milk Products		Edible oils		Sugar		Clothing		Fuel and Power		Tobacco		Alcoholic Beverages	
	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run
Equation (3.3)	1.1693	0.6233	0.3357	0.1790	0.1896	0.1011	0.2179	0.1162	0.1627	0.0867	0.1083	0.0577	0.0772	0.0412	0.0412	0.0220
Equation (3.4)	1.2100	0.6480	0.3474	0.1860	0.2030	0.1087	0.2255	0.1209	0.1684	0.0902	0.1121	0.0600	0.0799	0.0428	0.0427	0.0229
Equation (3.5)	1.1607	0.6375	0.3332	0.1830	0.1948	0.1070	0.2163	0.1188	0.1615	0.0889	0.1075	0.0590	0.0767	0.0421	0.0409	0.0225
Equation (3.6)	1.0871	0.6339	0.3121	0.1820	0.1824	0.1064	0.2026	0.1182	0.1513	0.0882	0.1007	0.0587	0.0718	0.0419	0.0383	0.0224
Equation (3.7)	1.0256	0.6357	0.2944	0.1822	0.1721	0.1065	0.1911	0.1183	0.1427	0.0883	0.0950	0.0588	0.0677	0.0419	0.0362	0.0224

Note: For typographical convenience, the negative signs of these elasticities are neglected here.

Next to cereals, the price of milk and milk products appear to have the largest effect on household savings followed by the prices of edible oils and sugar. Among the non-food group, the most important commodity-groups are clothing and fuel and power, the longrun elasticity of household savings with respect to the prices of these two being around -0.09 and -0.06 respectively.

The basic message of Table 4 is that from the point of view of fostering household savings, taxation of food in general and that of cereals in particular is much more harmful than taxation of tobacco or alcoholic beverages and for that matter even clothing or fuel and power. To take a less extreme example, note that the elasticity of savings with respect to the prices of milk and milk products is approximately twice that with respect to the price of clothing, thrice that with respec to the price of fuel and power and four and nine times that with respect to the prices of tobacco and alcoholic beverages respectively. Hence, a 10 per cent increase in the price of milk and milk products would reduce household real savings by the same amount as would a 20 per cent increase in the price of clothing, a 30 per cent increase in the price of fuel and power, 40 and 90 per cent increases in the price of tobacco and alcoholic beverages respectively. Thus, in general, these results provide an additional argument for lower taxation of food items, besides the usual equity argument.

6. Summary and Conclusions

The present study attempted an empirical analysis of the effect of taxation in general and that of income taxation in particular on household savings in India. It considered two specific effects of income taxation - one which runs through the household disposable income and the other which runs through the net rate of return on household savings. Since the consumption function (or alternatively, the savings function) is the basic analytical tool that is generally used to analyse these effects, it specified and estimated a household consumption function for India for the period 1950-51 through 1978-79. Besides the effects of income taxation, it also considered the 'income effects' of commodity taxation, albeit at a highly aggregative and somewhat rudimentary level. To summarise the major conclusions that follow from the present study:

(i) The empirical evidence on the household consumption function shows that income taxation has significant effects on household savings through both the disposable income channel and the interest rate channel. More specifically, a reduction in the income tax rate induces a higher savings by shifting the household budget constraint as well as by changing its slope in favour of savings.

(ii) There has been a long-held belief in India that the Keynesian absolute income theory is better applicable than the permanent income hypothesis to the consumption-saving decisions of the Indian households.

By implication, it meant that the effect of taxation on savings through the disposable income channel is 'instantaneous'. Empirical evidence to such a belief was provided by Gupta (1970) and Laumas and Laumas (1976). The results of the present study indicate that while such a view may be a reasonably good approximation to the agricultural sector, it does not hold good for the non-agricultural sector. We find that whereas for the agricultural sector the absolute income theory is better applicable, for the non-agricultural sector the permanent income hypothesis is far more applicable than the absolute income theory. This implies that the time-path of the effect of a rupee reduction of income tax on household savings depends upon whether the tax reduction benefits the agricultural sector or the non-agricultural sector. If the tax reduction benefits the agricultural sector, its effect on household savings is fairly instantaneous; however, if it benefits the non-agricultural sector, the effect is spread over a large number of years, the longrun effect being much lower than the short-run effect.

(iii) Another commonly held view in India regarding the consumption-saving decisions of the households is that the marginal propensity to consume (or save) differs significantly between the agricultural and the non-agricultural sectors. (See Chakravarty (1974) and Raj (1962)). Empirical evidence to such a view was found by Krishnamurthy and Saibaba (1981). They found that the m.p.s. of the non-agricultural sector is much higher than that of the agricultural sector, the difference between the two being around 0.4. Sectoral m.p.s. differentials of such magnitude imply that a significant increase in the household savings rate can be achieved by a tax-transfer policy which alters the income terms of trade in favour of the non-agricultural sector. The present study provides only partial support to such a view - partial because it finds that whereas the shortrun marginal propensity to save of the non-agricultural sector is much higher than that of the agricultural sector, the longrun m.p.s. of the former is only marginally greater than that of the latter. In fact, in certain cases it finds that the long run m.p.s. of the two sectors are almost the same, thereby implying that tax-transfer policies which aim at altering the income terms of trade in favour of the non-agricultural sector cannot 'permanently' raise the household savings rate.

(iv) The significant positive interest elasticity of savings that we have found in the present study suggests that a reduction in the tax on interest income can lead to substantial increase in the household savings. It also suggests that the substitution of income tax by an expenditure tax may lead to a higher household savings rate. This is of some interest in the Indian context since the income tax in India is slowly tending towards an expenditure tax in that it exempts certain forms of savings and that such exemptions have grown substantially over time.15/

15/ If a measure of the net effect of these various exemptions on the marginal tax rate on interest income were available, it would have been interesting to estimate the effect of these exemption clauses on household savings. Unfortunately, however, it is extremely difficult to get such a measure, given the complexity of these exemption clauses.

(v) Our examination of the income effects of commodity taxation on household savings, albeit highly aggregative and rudimentary in nature suggests that, from the point of view of fostering household savings, taxation of food is much more harmful than the taxation of non-food items such as clothing, power and fuel, tobacco or alcoholic beverages. In terms of magnitudes, a 10 per cent increase in the price of milk and milk products would reduce household savings by the same amount as would a 20 per cent increase in the price of clothing, a 30 per cent increase in the price of fuel and power, 40 and 90 per cent increase in the prices of tobacco and alcoholic beverages respectively. However, these estimates of the effects of commodity taxes are derived from a highly aggregative relative commodity demand functions. As we have already mentioned, an indepth study of the income effects of commodity taxation on household savings would require estimation of the price responses of the relative commodity demand at a highly disaggregative framework. In future research in the area, it may be worth attempting such an exercise.

TABLE A.1

Annexure-A

Estimates of The Consumption Function : Aggregative Version (Dependent Variable : CE_t)

λ Values	constant	Independent variables			$\bar{R}^2$	DW	SEE
		X_t^*	$(X_t - X_t^*)$	R_t			
0.1	4484.5231	0.7264 (22.8684)	0.3581 (3.3719)	-78.9957 (-0.9989)	0.9925	1.0920	580.9323
0.2	4530.6213	0.7251 (21.9658)	0.3427 (2.7851)	-80.6241 (-0.9807)	0.9921	1.0342	598.0028
0.3	4573.7560	0.7223 (21.0667)	0.3290 (2.2600)	-78.9657 (-0.9232)	0.9916	0.9719	616.2201
0.4	4606.4700	0.7188 (20.3461)	0.3102 (1.7679)	-75.0799 (-0.8493)	0.9912	0.9230	631.7640
0.5	4626.1762	0.7148 (19.7979)	0.2823 (1.3012)	-69.3002 (-0.7640)	0.9908	0.8849	644.6356
0.6	4634.2029	0.7104 (19.3933)	0.2408 (0.8654)	-61.9936 (-0.6704)	0.9905	0.8530	655.3730
0.7	4633.1757	0.7059 (19.1079)	0.1735 (0.4588)	-53.8143 (-0.5741)	0.9902	0.8252	664.2331
0.8	4625.9257	0.7016 (18.9195)	0.0397 (0.0694)	-45.4993 (-0.4810)	0.9900	0.8010	671.3193
0.9	4614.8722	0.6977 (18.8073)	-0.3675 (-0.3210)	-37.6062 (-0.3955)	0.9899	0.7807	676.7737

TABLE A.2

Annexure-A

Standard Error of Estimate of Regressions With Alternative Values of λ For Agricultural and Non-Agricultural Incomes

Agricultural income (λ Values) \ Non-agricultural income (λ Values)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.1	442.9	457.7	466.4	469.6	470.0	469.1	467.3	464.9	461.8
0.2	443.8	456.9	466.7	471.3	472.9	472.7	471.5	469.5	466.7
0.3	444.4	454.7	463.9	468.8	470.7	470.9	470.0	468.2	465.7
0.4	443.6	452.0	460.7	465.5	467.5	467.9	467.2	465.6	463.2
0.5	442.1	448.8	456.9	461.6	463.7	464.1	463.5	462.0	459.7
0.6	439.6	444.9	452.5	457.0	459.0	459.5	458.9	457.5	455.3
0.7	436.3	440.5	447.7	452.1	454.[illegible]	454.5	453.8	452.4	450.3
0.8	432.5	436.2	443.1	447.4	449.2	449.6	448.9	447.4	445.3
0.9	428.9	432.4	439.4	443.6	445.4	445.6	444.8	443.2	441.1

TABLE [illegible]

Estimates of The Consumption Function With P[illegible]
And Absolute Income For Agriculture [illegible]

λ Values	Constant	Independent variables XNA^{*}_{t}	$(XNA_t - XNA^{*}_{t})$	XA_t
0.1	4348.6187	0.7526 (8.4436)	0.3093 (3.2469)	0.7597 (7.0836)
0.2	4122.0542	0.6356 (8.4047)	0.2935 (2.3794)	0.8354 (8.6411)
0.3	3997.9714	0.6318 (8.5150)	0.3256 (2.1081)	0.9036 (10.2153)
0.4	3936.2996	0.5894 (8.8594)	0.3756 (1.9947)	0.9460 (11.4354)
0.5	3900.6235	0.5608 (9.3193)	0.4363 (1.8920)	0.9717 (12.3473)
0.6	3876.8485	0.5430 (9.8192)	0.5142 (1.7657)	0.9880 (13.0465)
0.7	3860.0050	0.5313 (10.3204)	0.6294 (1.6113)	0.9986 (13.6030)
0.8	3848.2042	0.5235 (10.8038)	0.8417 (1.4307)	1.0055 (14.0634)
0.9	3840.5658	0.5185 (11.2623)	1.4450 (1.2248)	1.0100 (14.4571)

Annexure-A

ermanent Income For Non-Agriculture
(Dependent Variable ; CE_t)

R_t	$\bar{R}^2$	DW	SEE
-125.8676 (-2.0966)	0.9958	1.7081	434.8419
-121.4616 (-1.9416)	0.9955	1.7281	452.3902
-111.9085 (-1.7208)	0.9951	1.7309	471.8118
-103.7142 (-1.5629)	0.9948	1.7409	483.4752
-97.7391 (-1.4615)	0.9947	1.7510	489.2566
-93.6290 (-1.3977)	0.9947	1.7616	491.2655
-90.7368 (-1.3590)	0.9947	1.7710	490.7969
-88.7602 (-1.3376)	0.9947	1.7796	483.6529
-37.4404 (-1.3283)	0.9948	1.7880	485.4157

Annexure B

Computation of Commodity-Wise Implicit Price Deflators for Private Consumption for the '50s

For the period 1960-61 to 1979-80, the commodity-wise implicit price deflators for private final consumption was obtained by dividing current price consumption by the corresponding constant price consumption - both given in the N.A.S. However, for the '50s we had to estimate them since commodity-wise private final consumption expenditures at current prices are not available in the N.A.S. for this period. The procedure that we followed in estimating them is as follows.

For the period 1960-61 to 1979-80, we regressed the commodity-wise implicit price deflators on either the corresponding wholesale price indices or the relevant sectoral N.D.P. deflators (wherever the relevant wholesale price index was not available) and used the parameters of these regressions to compute the commodity-wise implicit price deflators for the '50s. More specifically, for the period 1960-61 to 1979-80, we ran regressions of the type:

$$IPDC_j = m_o + m_1 \, WPI_j$$

where

$IPDC_j$ denotes the implicit price deflator of private consumption for the jth commodity or commodity-group,

WPI_j denotes the wholesale price index or the N.D.P. deflator of the jth commodity/ sector.

m_0 and m_1 are constants.

Using the estimated values of m_0, m_1 and the relevant WPI_js we estimated the $IPDC_j$s for the '50s. The data on wholesale price index numbers were taken from (i) Chandok, H.L., (1978) Wholesale Price Statistics: India 1947-1978, Volume I, Economic and Scientific Research Foundation, Delhi and (ii) Government of India, Revised Index Numbers of Wholesale Prices in India (various issues). Table B.1 gives the details regarding the WPI_js used in the relevant regression and the estimates of m_0 and m_1. Parametres with asterisks are OLS estimates whereas the ones without asterisks are estimated by using the two-stage correction procedure for autocorrelation (See Kmenta (1971) p.287-8). Note also that the WPI_js are with the base 1970-71 = 100 and the $IPDC_j$s are with the base 1970-71 = 1.

Annexure B

TABLE B.1

Commodity-Wise Estimates of m_o and m_1 (Sample Period 1960-61 to 1979-80)

Dependent Variable ($IPDC_j$)	Independent Variable (WPI_j)	m_o	m_1
IPDC of Cereals and Cereal Substitutes	WPI of Foodgrains	0.10911*	0.00888*
IPDC of Milk and Milk Products	WPI of Milk and Milk Products	0.00599	0.01052
IPDC of Edible Oils	WPI of Edible Oils	-0.0009	0.01077
IPDC of Meat, Egg and Fish	WPI of Meat, Egg and Fish	-0.02045	0.00980
IPDC of Sugar	WPI of Sugar	-0.05491	0.01015
IPDC of Salt	WPI of Salt	0.00506*	0.00996*
IPDC of Non-Alcoholic Beverages	Weighted WPI of Tea and Coffee	-0.66156	0.01229
IDPC of Other Items Excluding Non-Alcoholic Beverages	Weighted WPI of Other Miscellaneous Products (Excluding Salt) and Bakery Products	0.16469*	0.00933*
IDPC of Pan, Alcoholic Beverages and other Intoxicants	WPI of 'Wine' Industries	0.00143	0.01020
IPDC of Tobacco	WPI of Tobacco	0.12265*	0.00871*
IPDC of Clothing	Weighted WPI of Cotton Textiles (Excluding Yarn), Woolen Textiles, Silk, Art Silk and Synthetic Fibres	-0.15697	0.01167
IPDC of Footwear	WPI of Footwear	0.33113	0.00845
IPDC of Fuel and Power	WPI of Fuel, Power and Light	0.4415	0.00613
IPDC of Personal Transport Equipment	WPI of Transport Equipment	-0.20895	0.01219
IPDC of Furniture, Furnishings, Household Equipment, etc.	Weighted WPI of Radio Receivers, Televisions, Wood and Wood Products, Refrigerators, Air Conditioners, Steel Furniture and Utensils	-0.31181	0.01339
IPDC of Residual Consumption	Weighted NDP deflator of commerce Transport and Communication and other services	0.19117	0.00863

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