OPTIMAL COMMODITY TAXATION: A SURVEY OF THEORETICAL LITERATURE

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The issue of tax designing and reform of commodity taxes is a matter of considerable policy importance for a developing country like India. This paper attempts to review the theoretical literature on optimal commodity taxation on which there has been a substantial amount of research in the last quarter of the present century, specially after the path breaking works of Diamond-Mirrlees (1971).

SECTION 1: INTRODUCTION

Taxation as a means of raising revenue is of utmost importance for welfare states like India. But, leaving aside the sense of duty and patriotism on the part of taxpayers, taxes are unpalatable as they inflict burdens, both of pecuniary and non-pecuniary nature, on taxpayers. That is why it is important to ensure that the overall structure of taxation is optimal in terms of certain well defined criteria like efficiency, equity, economy, certainty, neutrality and productivity. India's tax structure, over the last four and a half decades, has come to rely more on indirect taxation. The share of direct taxes in total tax revenue had been coming down over the years from 36% to 26% between 1951 to 1991, while the share of indirect taxes had been increasing from 64% to 74%. Since 1990-91, however, in the wake of rationalisation and simplification of the tax structure recommended in the Raja Chelliah Committee Report, the proportion of direct taxes has been on the rise, whereas that of indirect taxes on the decline. The share of direct taxes in the central government tax revenue has increased to 35.9% in 1997-98 while that of indirect taxes has decreased to 63.9%.(Economic Survey, 1998-99). According to Cnossen (1977), most of the developing countries rely on indirect taxes as their main policy instruments because they lack the sophisticated administrative structure needed to rely on direct taxes. Moreover, there also exist several political constraints on direct taxes front. As is well-known, in India, huge agricultural income is yet to be brought under tax net thanks to the landlords lobby and the prevailing dominant political economy considerations.

The study of indirect taxation, therefore, occupies an important place in the formulation of economic policy in developing countries in general and India in particular.

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This makes commodity or indirect taxation one of the principal fiscal instruments in raising revenue and securing redistribution and thus commodity tax rate, a parameter of considerable policy importance.

The principal objective of this paper is to review the theoretical literature on optimal commodity taxation. The paper is planned as follows. In Section 2, we derive and describe important results and rules on optimal commodity taxation and discuss some of the important issues involved therein. Section 2.1 focusses exclusively on the efficiency aspect of the problem and Section 2.2 incorporates equity considerations as well. In Section 3 we briefly touch upon the applied works in this field in the Indian context and Section 4 lists some of the new areas the literature extends to. In the last Section, we conclude.

SECTION 2.1: THEORY: ONE CONSUMER MODEL

Analysis of the optimal commodity taxation stems from the seminal paper by Ramsey (1927). Through the works of Boiteux (1956) and Samuelson (1951) in the post second world war period; the literature in this area proliferated rapidly in the 1970s, following specially the Diamond-Mirrlees papers of 1971 which gave the theory of optimal commodity taxation its modern form and framework. Other works of importance vis-a-vis the optimal tax approach to tax designing are Boumal and Bradford (1970), Dixit (1970), Atkinson and Stiglitz (1972,1976) and Diamond (1975). One significant aspect of this theoretical development is a gradual increase in generality and a heartening march towards applying the theoretical analysis to data. Thus the optimal tax theory has moved closer to practical application and it is interesting to note that some of the earliest applications have been in the context of India. Applications to tax policy in developing countries, particularly in India, were documented in Ahmad and Stern (1987), Bagchi and Stern (1994), Ray (1986a,1986b,1988,1991,1998) and Murty and Ray (1989).

The pristine literature on commodity taxation focussed upon the following simple problem. Suppose the government wants to raise a certain amount as revenue solely by imposing taxes upon commodities. Then how these taxes be set so as to minimise the cost to society of raising the required revenue? Alternatively what is the best set of commodity tax rates to use to maximise some measure of social welfare subject to the revenue constraint ? The first solution to this problem, proposed by Pigou to Ramsey, was given by Ramsey (1927). Ramsey considered a simple efficiency problem ignoring the distributional considerations. More succinctly, the Ramsey problem can be described as follows.

Let us suppose that there are n+1 goods; $X_0, X_1, \ldots\ldots X_n$ in an economy ;

good zero is labour and the indirect taxes are imposed on the remaining n ordinarily defined goods so that tax revenue is

$$\sum_{i=1}^{n} t_i X_i$$

Where t_i is the tax on commodity i and X_i is its quantity . Let the government requires an amount R in taxes so that we must have

$$\sum_{i=1}^{n} t_i X_i = R \quad (1)$$

It is assumed that producer prices of all

goods are constant and the wage rate is fixed. The wedge between consumer prices P_i and producer prices q_i, is denoted by the tax t_i. The problem of choosing the optimal structure of commodity taxes therefore boils down to the problem of choosing the optimal structure of consumer prices, given the producer prices. Thus there are close connections between the theory of commodity taxation and that of public sector pricing.

The problem of the fiscal planner is then to maximise the utility of the consumer subject to (1), where the utility function is represented by

$$U = U(X_0, X_1, \ldots\ldots X_n)$$

This is the society's problem. The equivalent problem from the view point of the single consumer is to maximise his utility subject to the budget constraint he confronts, given by

$$\sum_{i=0}^{n} P_i X_i = 0$$

Which implies that earnings from work are exhausted on consumption of goods. It is to be noted that labour X_0 is the only factor of production and is measured negetively.

Thus we have two maximisation problems; one for the fiscal planner and another for the consumer.

For government, Max U ( )

Subject to $\sum_{i=1}^{n} t_i X_i \leq R$

The first order necessary conditions :

$$\sum_{i=1}^{n} \frac{\partial U}{\partial X_i}\frac{\partial X_i}{\partial P_j} + \mu\left(\sum_{i=1}^{n} \frac{\partial X_i}{\partial P_j} + X_j\right) = 0;\ j = 1, 2 \ldots n \quad (2)$$

Where μ is the Lagrange multiplier .

Similarly, for the consumer, Max U ( )

Subject to $\sum_{i=1}^{n} P_i X_i = 0$

The first order conditions for consumer equilibrium :

$$\frac{\partial U}{\partial X_i} - \lambda P_i = 0 \quad 1 = 1,2, \ldots\ldots, n \quad (3)$$

Combining the first order necessary conditions of both the maximisation problems and using the Slutsky equation

$$\frac{\partial X_i}{\partial P_j} = S_{ij} - X_i \frac{\partial X_i}{\partial M};\ i, j = 1,2,\ldots\ldots, n$$

Where M is total earnings of the consumer, S_{ij} is substitution term and using the symmetry of the substitution terms, ($S_{ij} = S_{ji}$)

the Ramsey rule (1927) can easily be derived; as given by the expression

$$\frac{\sum_{i=1}^{n} t_i S_{ji}}{X_i} = \theta,\ j = 1,\ldots\ldots,n \quad (4)$$

Where θ is a constant term, equal to

$$\left(\frac{\lambda - \mu}{\mu} + \sum_{i=1}^{n} t_i \frac{\partial X_i}{\partial M}\right)$$

The equation (4) is the Ramsey rule describing a system of optimal commodity taxes and an equation of this form must hold for all goods, i = 1,2,.....,n.

The left hand side of equation (4) measures the proportionate decrease in the demand for commodity j following the tax change if the consumer is compensated to stay on the same indifference curve. Note that the right side i.e. the value of θ is independent of the particular good chosen. In fact, assuming that the taxes are small,

$$\sum_{i=1}^{n} t_i S_{ji}$$

is a good approximation to the total change in compensated demand for good j due to the introduction of the tax system from an initial no tax position. Hence it follows from the Ramsey rule that taxes are optimal when the proportionate decrease in consumption of every commodity along the compensated demand curve is the same. (In general, this would imply a rate of tax that is not uniform across all goods unless certain additional restrictions are made.) This is the standard interpretation of the Ramsey rule.

What the Ramsey rule is approximately saying is that it is the distortion in terms of quantities (and not prices) that should be minimised (Myles, p. 106 ,1995) .This emphasis upon quantities suggests, defining

$$d_j = \frac{\sum_{i=1}^{n} t_i S_{ji}}{X_j}$$

where d_j is the proportional drop in demand is Mirrlees'(1976) index of discouragement. The Ramsey rule thus states that the tax system is optimal when the index of discouragement is equal for all goods.

Besides the Ramsey rule the early models in optimal tax theory have given rise to a number of interesting, intelligible and non-trivial rules/results which have become part of the conventional wisdom and have formed the basis for some policy . A few major ones follows.

The inverse elasticity rule states that proportional tax rates should be inversely related to the price elasticity of demand of the good on which they are levied. That is, higher tax rates on goods with inelastic demands, and low tax rates on goods with high elasticities . This statement can be viewed as an extreme version of the general interpretation of the Ramsey rule. In this case the inverse elasticity rule is a clearly defined result and unlike the Ramsey rule it is not necessary to be concerned with approximations.

Baumol and Bradford (1970) discusses the inverse elasticities rule in detail. The derivation of it requires further assumptions to be made on the Ramsey economy. More precisely, it makes the assumption of independent demands, implied by

$$\frac{\partial X_i}{\partial P_j} = 0 \; ; \; i \neq j$$

i.e., no cross price effects between the tax goods so that the demand for each good is dependent only upon its own price and the wage rate . This strong assumption which essentially reduces the general equilibrium model into one of partial equilibrium helps deriving a clear result. According to Atkinson and Stiglitz (1980), the inverse elasticities rule can be derived from minimising the excess burden of taxation in a partial equilibrium framework.

Another interesting result is due to Atkinson and Stiglitz (1980, p.379) which states that when the utility function is directly additive , the optimal tax rate depends inversely on

the income elasticity of demand . That is, necessities should be taxed more heavily than luxuries, the result which has important implications for the equity-efficiency controversy .

Further, the leisure - complementarity rule or Corlett - Hague (1953) rule states that when there are two commodities that are to be taxed , impose the higher tax on the commodity that is the more closely associated with the consumption of leisure time .

The rules so far show that the structure of optimal commodity tax rates should be far from uniform. However, uniform taxes are not without their supporters, see for example Hatta (1986). Deaton (1979,1981), Atkinson and Stiglitz (1976), Besley and Jewitt (1990), Sandmo (1976), and Sadka (1977), have derived conditions guaranteeing the uniformity of taxes . Sandmo (1976) and Sadka (1977), extending the model with two goods considered by Corlett and Hague (1953), to a world with many goods, have shown that if compensated cross- elasticities with leisure are equal, a uniform tax rate should be imposed on all goods, except labour. That is, if leisure is quasi- separable from all goods, which intuitively means that all goods complement leisure equally then the Ramsey rule gives uniform taxation of goods . (Deaton, 1981). Dealing with the direct and indirect tax controversy ; Atkinson and Stiglitz (1976), using the seminal work of Mirrlees (1971), showed that if the government can use a non linear income tax to redistribute income , and if the utility function is weakly separable between goods and leisure , then optimal commodity taxes should be uniform .The above results, thus, provide a case for uniform commodity taxation though under some limited circumstances. It is however to be noted that differences in preferences and non - separability of utility functions could introduce significant non-uniformity into the optimal commodity taxation structure. Similarly, the need for differentiated commodity taxation does not occur in many situations and in the literature; this uniform commodity taxation result has been confirmed and cited in many papers and textbooks: Atkinson and Stiglitz (1980, p. 437), Christiansen (1984) and Konishi (1995).

In a recent paper, of course, Naito (1999), reexamining the result of uniform commodity taxation, shows that the result of uniform commodity taxation under non-linear income taxation by Atkinson and Stiglitz (1976) no longer holds if the assumption of constant marginal cost of production is abandoned and the production side of the economy is explicitly introduced in the analysis . In particular, imposing a non-uniform commodity tax can Pareto-improve welfare, even when the government is using a Pareto-efficient non-linear income tax system under weak separability of workers' utility functions .The paper also shows that if the government uses a non-linear income tax system for income - distribution, then the introduction of distortions in the public sector can Pareto - improve welfare , which is contrary to the results in Diamond and Mirrlees (1971).

These new results have broader implications for public policy.They suggest, for example, that tariffs and source-based capital income taxes, which have been considered in the literature to be inappropriate in a small open economy, can, in fact, Pareto-improve welfare in a situation when non-linear taxes are used for income distribution . (Naito,1999)

Note that, deriving the Ramsey rule it was implicitly assumed that labour supply does not change in response to commodity taxation . But the utility function that we assumed had ordinary goods and labour as arguments . Hence the Ramsey result is, strictly speaking , valid only if the utility function is separable between all other goods and labour i.e.

$U(X_0, X_1, ..., X_n) = U_1(X_0)+U_2(X_1, ..., X_n)$

So that the maximisation of u_2 ( )

can take place independently of X_0. Alternatively, suppose that labour is completely inelastic in supply (inelastic with respect to not only the wage rate but also the prices). Hence if the government had to raise revenue the ideal thing to do would be to tax labour or given that labour can not be taxed, to tax all commodities at a uniform rate. (Sandmo, 1976).

Further , if labour can not be taxed the only reason for non-uniform commodity taxation must be in the fact that different taxed goods have different income elasticities of demand .In this connection, a very appealing and interesting result can be derived .(Jha ,1987 P.242 '). That is, we must tax those commodities that have a larger income effect (i.e., larger value of the income elasticity of demand) of tax; which like the effect of a lump sum tax is non-distortionary ; at a higher rate than those commodities for which the substitution effect (which brings distortion of taxation) is more important

It follows therefore by implication that if the utility function is not separable between labour and other goods and / or labour supply is variable then uniform taxation may not be the best thing to do. In sum, the conditions implying uniform commodity taxation are restrictive and there is no reason why they should be satisfied in practice. Therefore uniform commodity taxation is not desirable except under special circumstances.

SECTION 2.2: THEORY: MANY CONSUMERS MODEL

It is a well known fact that the solution given by Ramsey has been generalised in a number of important directions by Diamond and Mirrlees (1971), Diamond (1975), Mirrlees (1975), Lerner (1970), Dixit (1970) and Atkinson and Stiglitz (1972, 1976, 1980). Actually the Ramsey result would seem to be rather in-egalitarian in that it appears to direct commodity taxation toward necessities, which we usually consider fairly insensitive to price. This result however can be modified / extended to reflect distributional concerns.

Diamond (1975) derives a many person Ramsey rule in which the efficiency considerations described above in the context of Ramsey solution are balanced against the requirement that relatively low taxes be applied to commodities consumed disproportionately by the poor and by indivisuals with a high propensity to consume relatively heavily taxed goods and thus generate revenue for the government. Thus, if equity counts rule; often known as the Diamond-Feldstein rule that if, in addition to minimising efficiency losses, society wishes to equalise the distribution of well-being, the taxes placed on commodities in whose consumption the well-to-do specialise should be higher than the taxes levied on the commodities on which the poor concentrate their spending.

It is realised that the extension of the one person Ramsey rule to a many non-

identical person world is a relatively simple matter. Diamond and Mirrlees (1971), Diamond (1975) and Mirrlees (1975) are important works that brought this extension with a view to introduce equity considerations into the determination of the optimal commodity tax rates. To focus on the issue, let us assume that the economy consists of H households. Each household . h is described by an Indirect utility function

$$U^h = V^h (P_1, ..., P_n, M^h)$$

where P is a n1 vector of consumer prices,

M^h is income of h-th household . Social welfare is determined by a Bergson-Samuelson social welfare function which is defined on the vector of indirect utilities

$$W = W (V^1 (.), ..., V^H (.))$$

Denoting

X_i: demand for i-th commodity

X_i^h: demand of h-th individual for i-th commodity

q: nx1 vector of producer prices

t(=p-q): n x1 vector of commodity taxes

The revenue constraint is given by

$$R = \sum_{i=1}^{n} \sum_{h=1}^{H} t_i X_i^h$$

Assuming that producer prices are constant, the optimal set of commodity tax rates may be obtained by solving the maximisation problem

Max {t1., ...ta} W = W (V^1 (.), ... ,V^H (.))

subject to $\sum_{i=1}^{n} \sum_{h=1}^{H} t_i X_i^h = R$

From the Lagrangean for the maximisation, the first order conditions for the choice of the tax rate on good k, is

$$\sum_{h=1}^{H} \frac{\partial W}{\partial V^h} \frac{\partial V^h}{\partial P_k} + \mu \left[\sum_{h=1}^{H} X_k^h + \sum_{i=1}^{n} \sum_{h=1}^{H} t_i \frac{\partial X_i^h}{\partial P_k} \right] = 0 \quad (5)$$

Using Roy's identity the first term of (5) becomes

$$\sum_{h=1}^{H} \frac{\partial W}{\partial V^h} \frac{\partial V^h}{\partial P_k} = - \sum_{h=1}^{H} \frac{\partial W}{\partial V^h} \alpha^h X^h_k$$

Where we define

$$\beta^h \frac{\partial W}{\partial V^h} \alpha^h$$

Which is formed as the composition of the effect of an increase in household *h*'s utility on social welfare and the marginal utility of income for h . Hence β^h can be interpreted as the increase in social welfare resulting from a marginal increase in the income of household *h*. Diamond and Mirrlees (1971) term β^h

as the social marginal utility of income for household h.

Now, (5) becomes

$$\sum_{h=1}^{H} \beta^h X_k^h = \mu \left[\sum_{h=1}^{H} X_k^h + \sum_{i=1}^{n} \sum_{h=1}^{H} t_i \frac{\partial X_i^h}{\partial P_k} \right]$$

Substituting from the Slutsky equation into

(5) and rearranging gives the optimal tax rule

$$\frac{\sum_{i=1}^{n}\sum_{h=1}^{H} t_i S^h_{ki}}{\sum_{h=1}^{H} X^h_k} = \frac{1}{\mu}\frac{\sum_{h=1}^{H}\beta^h X^h_k}{\sum_{h=1}^{H} X^h_k} - 1 + \frac{\sum_{h=1}^{H}\left[\sum_{i=1}^{n} t_i \frac{\partial X^h_i}{\partial M^h}\right] X^h_k}{\sum_{h=1}^{H} X^h_k} \quad (6)$$

The solution to the optimal commodity taxation problem in a many person country, given by (6) follows closely that of Diamond and Mirrlees (1971)and emphasises efficiency and equity aspects. Note that the optimal commodity taxation rule (6) can be expressed in an alternative form that is closer to that of the standard Ramsey rule and is the basis for numerical applications. To do this (6) is rearranged to give

$$\sum_{i=1}^{n}\sum_{h=1}^{H} t_i S^h_{ik} = -H\bar{X}_k + \frac{1}{\mu}\sum_{h=1}^{H}\beta^h X^h_k + \sum_{i=1}^{n} t_i \left[\sum_{h=1}^{H}\frac{\partial X^h_i}{\partial M^h} X^h_k\right] \quad (7)$$

Where

$$\bar{X}_k = \frac{\sum_{h=1}^{H} X^h_k}{H}$$

is the mean level of consumption of good k across the households.

Now define

$$b^h \frac{\beta^h}{\mu} + \sum_{i=1}^{n} t_i \frac{\partial X^h_i}{\partial M^h}$$

Where, b^h is Diamond's (1975) net social marginal utility of income measured in terms of government revenue . It is net in the sense that it measures both the gain in social welfare β^h due to an increase in income to h and the increase in tax payments of β^h due to this increase in income. Thus b^h involves both equity and efficiency effects.

Employing definition of β^h, (7) can be rearranged to give

$$\frac{\sum_{i=1}^{n}\sum_{h=1}^{H} t_i S^h_{ki}}{\sum_{h=1}^{H} X^h_k} = -\left[1 - \sum_{h=1}^{H}\frac{b^h}{H}\frac{X^h_k}{\bar{X}_k}\right] \quad (8)$$

Tax rule (8) shows that the reduction in aggregate compensated demand for the k-th commodity due to the introduction of the tax system should be inversely related to the correlation between b^h and X^h_k . In other words, to the extent that the values of b^h reflect equity concerns, equity implies that goods consumed by those with high b^h's should be discouraged less or, effectively they should have lower taxes. In general, the reduction in demand is smaller:

(i) the more the good is consumed by indivisuals with a high b^h;

(ii) the more good is consumed by households with a high marginal propensity to consume taxed goods. (Myles, 1995, P.111; Atkinson and Stiglitz, 1980, P.388)

Employing the tax rule (8) we can see when the many person rule reduces actually to the standard Ramsey rule (Myles, 1995, P.112). In such circumstances the equity criteria are eliminated. This can occur in the following two examples:

(1) All households are given the same social valuation, i.e.

$$b^h = b, \text{ for all } h = 1,2,.....,H$$

(2) The tax system is unable to discriminate between households, i.e

$$\frac{X^h_k}{\overline{X}_k}$$

is the same for all k which implies that no good is consumed disproportionately by rich and poor; a situation that will arise whenever households have identical Engel curves and these are lines through the origin.

Now a note of caution is in order (Stern, 1987; Myles, 1995, P.113).The discussion of optimal commodity taxation has concentrated very heavily on the interpretation and analysis of first order conditions. The satisfaction of these conditions however does not guarantee that we have an optimum. One finds that in the literature there seems little concern for the sufficiency of first order conditions. This problem is rampant in many maximisations in Public Economics and has been explored extensively by Mirrleees (1986). Although unsatisfactory, there is typically little alternative to this. However the analysis of first order conditions does yield valuable insights. It is a matter of comfort to note that Diamond and Mirrlees (1971) in their work prove that their first order conditions do represent the solution to the optimal commodity tax problem.

SECTION 3: APPLICATIONS

In almost all fields of studies the theoretical developments as well as their empirical applications should chase one another if not go hand in hand. Because both are equally important. One is incomplete without the other. One sets the path and the other treads upon it. And the destination is same i.e., the larger benefit of society through the results derived and empirically verified and subsequent policy prescriptions emerged therefrom. This holds good for the study of optimal commodity taxation as well.

Applied works vis-a-vis optimal commodity taxation are mainly devoted to the calculation of optimal commodity tax rates. They essentially seek to solve the riddles that whether the optimal commodity taxes are uniform; whether they are sensitive to different specification of demand systems; whether they vary with changes in planner's inequality aversion parameter or concern for equity, data survey periods, data survey regions (rural or urban), estimation procedures etc. Some notable works in this regard are Ray (1986a, 1986b, 1988); Murty and Ray (1989); Ahamd and Stern (1991, 1984); Atkinson and Stiglitz (1972) and Deaton (1977). Further, a number of empirical studies (Sah, 1983; Ray,1986a; Srinivasan, 1989) are undertaken to study the redistributive impact of the existing tax system and potential gains from the optimal tax system.

Atkinson and Stiglitz (1972) computed the optimal tax rates satisfying the Ramsey rule for a single household economy and Deaton (1977), for an economy that falls somewhere between the single household and a true many household economy. Ray (1986a) is perhaps the first empirical work that computed optimal commodity taxes using the many person Ramsey rule of Diamond and Mirrlees on Indian budget data.

There are broadly two approaches usually adopted for the calculation of optimal commodity taxes;

(i) Calculation of conditional optimal taxes, and (ii) Calculation of true / actual optimal taxes. The conditional optimal taxes (with optimality defined somewhat restrictively as conditional on observed expenditure / price levels) are computed (Ray 1986a) with given data about commodity demand levels , demand derivatives and the distributional preferences of the government, with the implicit assumption that as taxes change from actual to optimum, the above informational systems remain unaffected. This is an assumption too strong to defend. In fact, this would be like defending the indefensible since a movement from actual to optimal taxes involves non marginal changes in tax rates and consumer prices. Another approach similar to that of the conditional optimum problem is the inverse optimum problem coined and adopted by Ahmad and Stern (1984). In this procedure some implicit distributional weights are looked for which will characterise the existing tax rates as optimum given the observed commodity demand levels and demand derivatives. The restriction implicit in the conditional optimal taxes problem is obviated in the computation of actual optimal taxes which recognises the implicit relationship among commodity taxes, commodity demands. demand derivatives and distributional preferences of Government (followed in Murty and Ray(1989)). Here, true optimal taxes are calculated within a framework which simultaneously calculates tax rates, prices, expenditure level and the relevant elasticities at the optimum. This iterative procedure is based on the simple rule, suggested by Ahmad and Stern (1984) that items with an above average marginal social cost of raising a unit of revenue should have their taxes lowered and vice versa.

In a subsequent paper, we will present our results whose main significance lies in the fact that it has used the AIDS i.e. An Almost Ideal Demand (Deaton and Muellbuer (1980), Agrawalla (1997)); the demand system which has never been used for the calculation of optimal commodity tax rates in the context of India and compare our results with the results of the earlier applied works on the subject under study.

SECTION 4: EXTENTIONS

The taxes that emerge from optimal tax models depend critically on the combination of three sets of assumptions: (i) the form of differences between households, (ii) the range of tax tools assumed to be available, and (iii) the structure of preferences. (Stern, 1987) The earlier simple models of optimal commodity taxation emphasise consumer welfare and government revenue, undertake a static analysis, rules out lump-sum taxes, assumes identical consumers, full forward shifting of consumer taxes, constant returns to scale and perfect competition relegating production into the background. Since the early contributions that yielded the rules and results described above in the Section 2, the optimal commodity taxation literature has been extended in a large number of ways. Researchers have relaxed assumptions, introduced additional constraints and inter-temporal considerations, and derived the implications for worlds in which some commodities are both consumed and used as inputs, or where duties on imported goods exist, or where there are pre-existing market failures that can not be undone, or where there are administrative costs associated with taxing commodities (Haveman, 1994).

The followings are some of the relatively new and interesting areas to which the

optimal taxation literature has ventured into in the last two decades : optimal tax designing

- in the presence of tax evasion, both direct and indirect (See Ray, 1998; Cremer and Gahvari, 1993 ; Virmani, 1989)
- in the presence of demographic variables (See , Ray 1988, Deaton and Stern, 1986; Ebrahimi and Heady, 1988)
- in the presence of different levels of government or tax imposing authority i.e. a federal country (See , Murty and Nayak, 1994a; Murty and Ray, 1990) and so on.

It is to be noted that, by now, a great deal of extensive reviews of optimal tax literature are available. For instances, the works of Atkinson and Stiglitz (1980), Mirrlees (1976,1986), Murty and Nayak (1994b), Newbery and Stern (1987), Sandmo (1976), Ray (1991, 1997), Slemrod (1990), Myles (1995) are a few notable ones.

SECTION 5: CONCLUSION

Looking at the available works both theoretical and applied on optimal commodity taxation it is concluded that the optimal tax rules are amenable to operationalisation, albeit in somewhat restricted settings. According to Myles (1995), the applied studies all have small commodity groupings and none truely solves the problem in its full generality since producer prices are generally taken as fixed. Besides, there is an unavoidable problem with respect to the data, its availability and quality. Yet the above works have a lot to contribute at least in terms of giving insights and a sense of direction to fiscal planners, towards tax designing and tax reforms.

REFERENCES:

Agrawalla, R K,(1997), Estimation of demographic LAIDS on Indian budget data, *Business Analyst*,18,1

Ahmad E and N Stern, (1984), The theory of tax reform and Indian indirect taxes, *Journal of Public Economics*, 25, p.259-98

———————————,(1991), *The theory and practice of tax reform in developing countries*, CUP, Cambridge

Atkinson, A B, (1977) , Optimal Taxation and direct versus indirect tax controversy, *Canadian Journal of Economics,* 10,4, p.529-49

Atkinson, A B and J.E.Stiglitz, (1972), The structure of indirect taxation and economic efficiency, *Journal of Public Economics*, 1, 1, p.97-119

———————————————————,
(1976), The design of tax structure: Direct versus indirect taxation, *Journal of Public Economics*, 6, 55-75

———————————————————,
(1980), *Lectures in Public Economics,* McGraw-Hill, New York

Bagchi, *A and N Stern, (ed.), (1994), Tax Policy and Planning in Developing Countries,* Delhi, Oxford

Baumol, W J and D F Bradford, (1970), Optimal departures from marginal cost pricing, *American Economic Review,* 60, p.265-283

Besley, T and I Jewitt, (1990), Optimal uniform taxation and the structure of consumer preferences, in G D Myles (ede.), *Measurement and Modelling in Economics,* Amsterdam:North-Holland

Boiteux, M, (1956), Sur la gestion des monpoles publics astreints a' l' equilibre budgetaire, *Econometrica*, 24,p.22-40

Christiansen, V, (1984), Which commodity taxes should supplement the income tax?, *Journal of Public Economics*, 24,p.195-220

Cnossen, s.(1977), *Excise Systems*, The John Hopkins University Press, Baltimore

Corlett, W J and D C Hague, (1953), Complementarity and excess burden of taxation, *Review of Economic Studies*, 21, p.21-30

Cremer, H and F Gahvari, (1993), Tax evasion and Optimal Commodity Taxation, *Journal of Public Economics*, 50, p.261-275

Deaton,A S, (1977), Equity, efficiency and the structure of indirect taxation, *Journal of Public Economics*, 8, 299-312

————————, (1979), Optimally uniform commodity taxes, *Economics Letters*, 2, 357-361

————————,(1981), Optimal taxes and the structure of preferences, *Econometrica*, 49.

————————, (1987), Econometric issues for tax design in developing countries, in Newbery D and N H Stern, (ed.), *Theory of Taxation in Developing Countries*, OUP.

Deaton, A.S. and J.Muellbauer (1980), An Almost Ideal Demand System, *American Economic Review*, 70

Deaton, A S, and N H Stern, (1986), Optimally uniform commodity taxes, taste differences and lump-sum grants, *Economics Letters*, 20, 263-266

Decoster, A and E Schokkaert, (1990), Tax reform results with different demand systems, *Journal of Public Economics*, 41, p.277-296

Diamond,P.A., (1975),A Many Person Ramsey Tax Rule, *Journal of Public Economics*, 4, 4, p.335-42

Diamond, P A and J.A.Mirrlees, (1971), Optimal Taxation and Public Production, Part I: Production Efficiency, and Part II: Tax Rules, *American Economic Review*, 61, 1 and 3.

Dixit, A, (1970), On the optimum structure of commodity taxes, *American Economic Review*, 60,p.295-301

Ebrahimi, A and C Heady, (1988), Tax design and household composition, *Economic Journal* (Conference Supplement), 98, p.83-96

Government of India, *Economic Survey*, 1998-99

Hatta, T, (1986), Welfare effects of changing commodity tax rates towards uniformity, *Journal of Public Economics*, 29,p. 99-112

Haveman, R H, (1994), Optimal Taxation and Public Policy, in Quigley J M and E Smolensky (eds), *Modern Public Finance*, Harvard University Press

Jha, R, (1987), *Modern theory of Public Finance*, Wiley Eastern Limited, Delhi

Konishi, H,(1995), A Pareto improving commodity tax reform under a smooth non-linear income tax, *Journal of Public Economics*, 56,p. 413-445

Lerner, A, (1970), On optimal taxes with an untaxable sector, *American Economic Review*, 60,p.284-294

Majumdar, A, (1988), A note on optimal commodity taxation in India, *Economic Letters*, 27, p.167-71

Mirrlees, J A, (1971), An exploration in the theory of Optimum income taxation, *Review of Economic Studies*, 38,

————————,(1975), Optimal Commodity Taxation in a two class economy, *Journal of Public Economics*, 4, p.27-33

————————, (1976), Optimal Tax Theory: A Synthesis, *Journal of Public Economics*, 6, p.327-358

————————,(1986), The theory of optimal taxation, in Arrow K J and M D Intrilligator (eds), *Handbook of Mathematical Economics*, Amsterdam: North-Holland

Murty, M.N. and P B Nayak, (1994a), A Normative Approach for Resource Transfers in a Federal State, in Bagchi and N Stern (eds) *Tax Policy and Planning in Developing Countries*

———— (1994b), Optimal taxation and India: A review of theory and applied work, in Bhasker Dutt (eds) *Welfare Economics*, OUP.

Murty M N and R Ray, (1989), A computational procedure for calculating optimal commodity taxes with illustrative evidence from Indian budget data, *Scandnavian Journal of Economics*, 91(4), p.665-70

————, (1990), *Optimal taxation and resource transfers in a Federal nation*, Working Paper No. 2, Centre for Development Economics, Delhi

Myles, G, (1995), *Public Economics*, CUP, Cambridge

Naito, H, (1999), Re-examination of uniform commodity taxes under a non-linear income tax system and its implication for production efficiency, *Journal of Public Economics* ,71, p.165-188

Newbery, D and N H Stern, (ed.), (1987), *Theory of Taxation in Developing Countries*, Oxford, OUP

Ramsey, F.P. (1927), A contribution to the theory of taxation, *Economic Journal*, 37.

Ray, R (1986a), On setting indirect taxes in India using the Ramsey approach: evidence from household budget data, *Journal of Quantitative Economics*, 2,2

———(1986b), Sensitivity of optimal commodity taxes to alternative demand functional forms: an econometric case study of India, *Journal of Public Economics*, 31

————,(1988), Optimal Commodity Taxes in the presence of children, The Scandinavian *Journal of Economics*, 90,p.75-92

———— (1991), Complete demand systems and recent welfare applications in India: A review, *Journal of Quantitative Economics*, 7, 1.

————, (1997), Issues in the design and reform of commodity taxes: Analytical results and empirical evidence, *Journal of Economic Surveys*, 11(4),p.353-388

————,(1998), The design of commodity taxes in the presence of tax evasion with illustrative evidence from India, *Public Finance Review*, 26(5), p.503-518

Sadka, E, (1977), A theorem on uniform taxation, *Journal of Public Economics*, 7, p.387-391

Sah, R K, (1983), How much redistribution is possible through commodity taxes? *Journal of Public Economics*, 20, p.89-101

Samuelson, P A, (1951), Theory of optimal taxation (Memorandum to the US Treasury), *Journal of Public Economics*, 30, 2, (July 1986),p.137-144

Sandmo, A, (1976), Optimal Taxation: An introduction to the literature, *Journal of Public Economics*, 6,p.37-54

Slemrod, J, (1990), Optimal taxation and optimal tax systems, *Journal of Economic Perspectives*,4, p.157-178

Srinivasan, P V,(1989), Redistributive impact of optimal commodity taxes, *Economic Letters*, 30, p.385-388

Stern, N H, (1987), *Uniformity versus Selectivity in Tax structure: Lessons from theory and policy*, DERP Discussion Paper No. 9

Virmani, A, (1989), Indirect tax evasion and production efficiency, *Journal of Public Economics*, 39, p.223-237.