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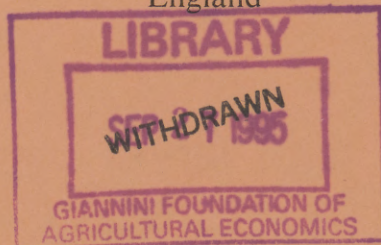
WARWICK

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TAX REFORM : INCOME DISTRIBUTION,
GOVERNMENT REVENUE AND PLANNING*

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Discussion Paper 26

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- * This is a slightly revised version of the V.K. Ramaswami Memorial Lecture given on March 25th 1983 at the Delhi School of Economics. I am grateful for the comments of Amaresh Bagchi, Kaushik Basu and Sudhir Mulji. Some parts of this lecture are based on work with Ehtisham Ahmad in connection with our programme at the Development Economics Research Centre at the University of Warwick, on taxation in developing countries.

§1. Introduction

Many of the issues and questions which concerned V.K. Ramaswami and to which he and his collaborators contributed so much have been central to research in the 1970s. I shall be discussing in particular that part of the research with which I am most familiar, the research in public economics. This, broadly speaking deals with the question of how policies, in particular taxes and subsidies, should be set in imperfect economies. By this we mean economies where markets, the behaviour or interaction of agents and the tax tools which are available do not accord with the assumptions of standard competitive microeconomics. The purpose of this lecture is to present some of the results that have emerged, or re-emerged, in public economics in the 1970s and to show how they may be applied to provide insights into policy discussion of important practical problems.

Unfortunately I never met V.K. Ramaswami. I was a graduate student in the late 1960s and thus come from a different generation. However, his concern with using simple models to try to understand real practical problems is itself an outstanding demonstration to subsequent generations of how economic theory can and should be put to use.

We shall begin in the first part of this lecture by presenting some of the central results which have been the subject of the theory of public economics in the last 10 or 15 years. I shall concentrate on those concerned with the optimum taxation of commodities partly because this is the area in which the theory is best developed and partly because commodity taxation is the prime source of tax revenue in India. In the second part of the lecture we shall see how some of the theory can be helpful in the discussion of real policy issues. We shall show how it can be used to demonstrate that

many arguments concerning taxation which are advanced as obvious are simply confused or wrong. Secondly, I shall argue that we need to distinguish carefully between arguments for particular taxes and rates which are based on theory and those which are based on administrative considerations. This does not, of course, mean that one should ignore either theory or administration, and they should be closely linked. For example, theory can both point to, and show the consequences of, different administrative arrangements. And administrative difficulties can point to costs and constraints which should be embodied in the theory. In the third part of the lecture we shall discuss some recent extensions of the theory to problems of reform rather than optimality. By reform we mean a movement from a particular starting point or state of affairs as opposed to the analysis of optimality which is concerned to find the best policy irrespective of a starting point. I shall argue that problems of reform are in many ways analytically more tractable, less demanding of data and of greater practical importance. The argument will be illustrated using examples of recent work on the Indian economy by Ahmad and myself. In the final part we shall indicate areas where further research is necessary in the light of the previous discussion of optimality, reform and its application. It is a research programme with a mixture of theory and empirical work which I hope is in the tradition of V.K Ramaswami.

§2. Recent Research in Public Economics ^{1/}

Before choosing amongst government tax or subsidy policies one should describe what the consequences of the different policies under consideration will be. This in itself forms an important part of modern public economics.

^{1/}. Some of the presentation of standard theory in this section is taken from my chapter entitled "Taxation for Efficiency" in Microeconomic Efficiency and Macroeconomic Performance, edited by David Shepherd, Aubrey Silberston and Jeremy Turk, and published by Philip Allan in 1983.

Thus we may ask about the consequences of income or wealth taxation for risk-taking, or ask how different forms of company taxation will affect investment, and the distribution of profits. This can be considered the positive side (concerned with the prediction of consequences) as opposed to the normative which uses value judgements and addresses directly the choice amongst policies. It is clear that if the calculation of the consequences of policies themselves is difficult then choosing the optimum amongst all policies runs the risk of being intractable. For one is then searching over a set of options each of which presents analytical difficulties. Thus the normative part of public economics has, in the main, been concerned with rather simpler models than those used for the analysis of positive questions only.

Before describing some normative results I should draw attention to a third main area of recent research in public economics which is of considerable importance but which I shall not discuss in detail here. This concerns the econometric estimation of the positive models used in public economics. It involves the empirical analysis of how people will react to different tax, pricing or rationing schemes. And this has led to a closer integration between the theory and estimation of consumer choice and the behaviour of firms on the one hand, and the theory of public economics on the other. After estimation one can try to use the estimated demand and utility functions to analyse the welfare effects of possible changes in policy. There have been a number of recent examples of this vertical integration of the analysis of data, economic theory, econometric skills and policy discussion which provide good examples of what economics can do. I will not go into detail here but refer to, for example, the Journal of Public Economics (which recently completed its first decade), where much of the research I am discussing has been published.

Let us now turn to the theory of optimum commodity taxation. It is well known that under a number of assumptions, including the absence of both externalities, and increasing returns to scale, a first-best optimum can be achieved using a competitive price mechanism. Government revenue is raised and income is redistributed by using lump-sum taxes, i.e., taxes whose level cannot be affected by the behaviour of agents. By first-best here we mean the optimum with respect to some social welfare function where the only constraints concern productive feasibility, i.e. technology and resources. The theory of optimum commodity taxation, and many other parts of public economics, may be seen as part of the theory of the second-best in that lump-sum taxes, or at least those which might interest us, are assumed not to be possible. And we shall note in passing that the theory shows, in my judgement, that the rather nihilistic view of the economics of the second best is fundamentally misconceived. It has been argued that, outside first-best models, welfare economics can say nothing. The work of V.K. Ramaswami itself shows that, in this context, welfare economics has a great deal to contribute.

The examination of optimum taxation where lump-sum taxes are impossible has been concentrated on commodity taxation and income taxation. Analysis of the former problem goes back to Ramsey (1927), and important papers by Boiteux (1956) and Samuelson (1951) were written shortly after the second world war, but the subject expanded rapidly in the 1970s following the papers by Diamond and Mirrlees of 1971. The subject of optimum taxation was created by Mirrlees in his famous paper in The Review of Economic Studies, 1971.

The Ramsey problem is to raise a given revenue from a consumer through the taxation of the commodities he consumes in such a way as to minimise the loss in utility that arises from taxation. Ramsey considered the case

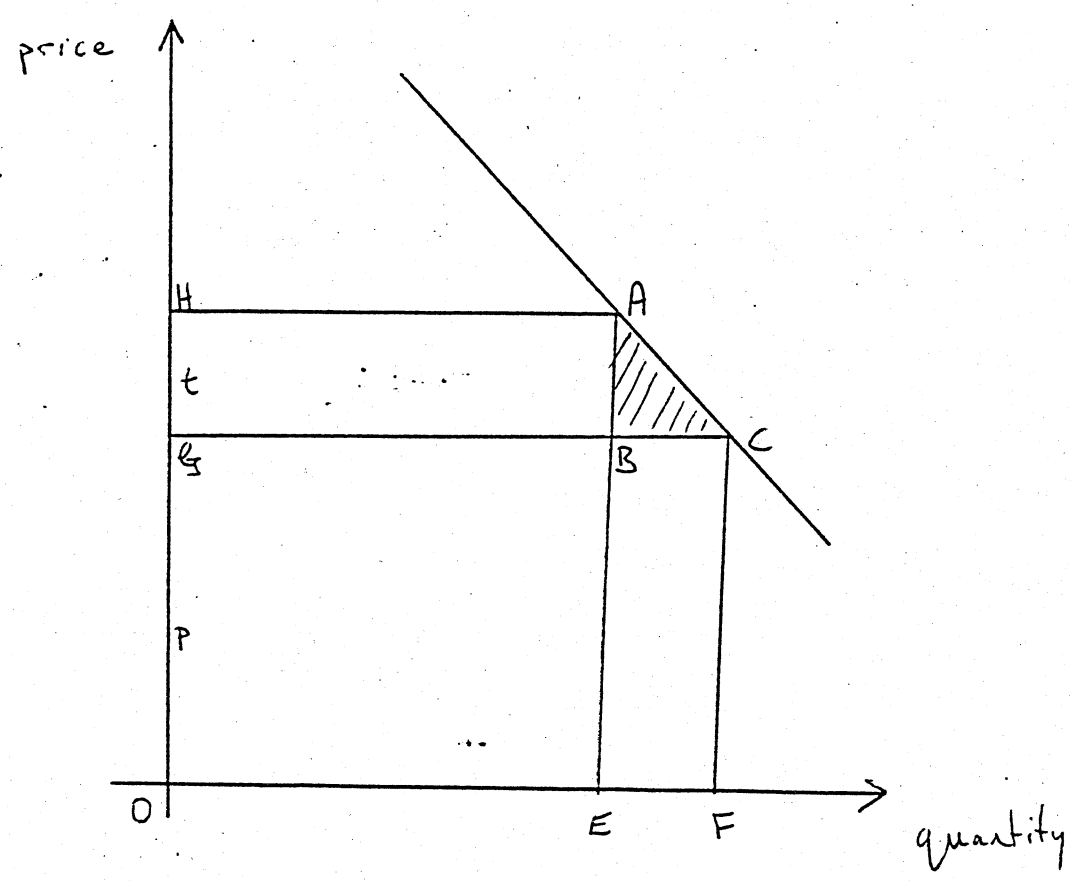
of one consumer (or equivalently identical consumers who are treated identically) so we have a simple efficiency problem in that distributional considerations are ignored (a point to which we shall return).

It will be useful for the interpretation of the results from the Ramsey problem, and for further reference below, to have in front of us a brief description of the partial equilibrium approach to the question. These two pieces of analysis will be used to demonstrate the methods and develop some intuition which we shall use in later arguments. They are, however, obviously very simple and unsatisfactory in a number of ways.

The partial equilibrium assumption here is that the demand for a good or commodity does not depend on the price of other goods, so that we can draw the familiar demand curve DD (see the Figure). We assume producer prices p are fixed so that the effect of a tax vector t is to increase prices q faced by consumers from p to $p + t$. The so-called 'deadweight loss' from the taxation of the i^{th} good is measured by the shaded triangle ABC in the Figure. The motivation for this definition of deadweight loss is as follows. The state of affairs associated with a given tax and thus consumer price and demand is evaluated by the sum of benefits to consumers (measured by consumer surplus), to the government (measured by tax revenue) and to producers (measured by profits). Note that the sum is unweighted so that one rupee to each group is regarded as equally valuable.

Profits here are taken as zero (producer prices are fixed so competition would drive profits to zero) and therefore we consider only consumer surplus plus government revenue. In the absence of

Figure



taxation, government revenue is zero and consumer surplus is the area below the demand curve and above the line GC. With taxation, government revenue is given by the rectangle ABGH and consumer surplus is the area below the demand curve and above AH. Thus the net loss, or deadweight loss, is the triangle ABC.

One then examines the minimization of the sum across goods of triangles ABC (i.e. total deadweight loss), subject to the constraint that the sum across goods of the rectangles ABGH (i.e. total tax revenue) is not less than a given figure. It is straightforward to show that this leads to the result that the tax as a proportion of the consumer price of each good should be inversely related to the elasticity of demand. Formally $t_i/q_i = \mu/\epsilon_i$ where μ is constant across goods and q_i , t_i , and ϵ_i are respectively consumer price, tax and price elasticity of demand for the i^{th} good.

There have been a number of calculations of such triangles in the empirical literature following the work of Harberger (1954) who applied this approach to deadweight losses from monopoly (the distance of price above marginal cost playing an analogous role to the tax). The more modern approach is to use explicit utility functions and 'equivalent variation', thus avoiding the unattractive assumption that the demand for a good does not depend on the prices of other goods (see e.g. Rosen, 1978).

We now give a brief mathematical formulation of the central result in optimum commodity taxation, the so-called Ramsey rule. This dispenses with the partial equilibrium assumption concerning

demands and works directly with utility functions. It will be of considerable help in our discussion of practical arguments and in our examination of reform. To keep things simple, we retain the assumption that producer prices are fixed so that an increase in taxes implies an equal increase in consumer prices (we also ignore for the moment one or two other theoretical considerations). We consider just one consumer whose individual demands $X(q)$ are a function of consumer prices only: we assume his lump-sum income is fixed. The maximum utility an individual can achieve when facing prices q is written $V(q)$: this is the indirect utility function. The problem then becomes to choose t , or equivalently q , to maximise $V(q)$ (and thus minimise utility loss) subject to the constraint that the tax revenue $\sum_k t_k X_k$ meets the requirement R . The suffix on a vector denotes the particular component: thus t_k is the tax on the k^{th} good.

Formally then we have the problem

...
 Maximise by choice of q $V(q)$

$$\text{subject to } R(t) = \sum_k t_k X_k \geq \bar{R} \quad (1)$$

Taking a Lagrange multiplier for the constraint λ the first order

$$\text{conditions for maximisation are } \frac{\partial V}{\partial t_i} + \lambda \frac{\partial R}{\partial t_i} = 0 \quad (2)$$

Remembering that producer prices are fixed so that differentiation with respect to t_i and q_i are equivalent, we have

$$\frac{\partial V}{\partial q_i} + \lambda \left(X_i + \sum_k t_k \frac{\partial X_k}{\partial q_i} \right) = 0 \quad (3)$$

Using $\frac{\partial V}{\partial q_i} = -\alpha X_i$ where α is the marginal utility of income and

the standard decomposition of $\frac{\partial X_k}{\partial q_i}$ into an income effect and a

substitution effect we have the Ramsey-rule.

$$\frac{\sum_k t_k s_{ik}}{X_i} = -\theta \quad (4)$$

where s_{ik} is the utility - compensated change in demand for the i^{th} good when the k^{th} price changes, and where θ is a positive number independent of i .

An intuitive interpretation of (4) is as follows. We can think of $\sum_k t_k s_{ik}$ as the (compensated) change in demand for the i^{th} good as the result of the imposition of the vector of small taxes t_k . The typical term in the sum is $t_k \left. \frac{\partial X_i}{\partial t_k} \right|_{\text{constant utility}}$ which is the change in the compensated demand for good i as a result of the increase in consumer price t_k if t_k is small. Summing across k gives the change arising from the vector of taxes. Strictly, of course, the size of the taxes t_k is determined within the problem and we are not really justified in assuming the t_k are small. With this qualification, however, the Ramsey rule is that the proportional reduction in compensated demand as a result of the

imposition of the set of taxes should be the same for all goods.

This result is an important one and provides the main insight into tax rules which arise from the theory of optimum commodity taxation. It should be emphasised that it is proportional quantity changes that are equal in this rule. Thus, crudely speaking, those quantities which are relatively insensitive to price will be taxed relatively more. It will be important in our argument which follows that this is in general very different from the proposition that taxation should be uniform i.e. that all proportional price changes should be equal.

The result provides a generalisation of the rule that taxes should be inversely related to elasticities of demand which is familiar from the less rigorous and partial equilibrium treatment which we have just seen. Note, however, that one needs considerable care with substitutes and complements, a question which is suppressed by the partial equilibrium approach. This would be important when we consider the application of the model to public sector pricing (see below). The pricing of household gas and electricity supplies, for example, would have to take note of the close substitution possibilities between them. Where, of course, they were perfect substitutes the above approach would imply identical prices. The Ramsey rule provides an example of the general principle that efficient taxation is directed towards those goods which cannot be varied by consumers.

We should note here that there is a sense in which the one-consumer economy is an awkward theoretical vehicle for the development

of the argument. The reason is that lump-sum taxation (which we know in general is first-best) becomes simply a poll-tax, which it might be argued would be feasible. Alternatively where there are fixed lump-sum incomes this may be achieved equivalently through proportional taxation of all goods (including factor supplies). Some technical issues arise here and we deal with some of them briefly in the appendix. The real case of interest is, of course, the many-consumer economy and here the poll-tax is in general not by itself the best way to raise revenue and indirect taxation will be required. Our discussion of the Ramsey-rule should therefore be seen as a development of the intuition for application in the more general case.

The Ramsey result would seem to be rather inegalitarian in that it appears to direct commodity taxation towards "necessities" which we usually think of as being fairly insensitive to price. But the formulation in terms of one consumer has explicitly ignored distributional questions. The result can, however, be generalised to many consumers in a fairly straightforward way. We simply replace $V(q)$ in (1) by the social welfare function $W(u^1, u^2, \dots, u^H)$ where u^h is the utility function of the h^{th} individual which we consider again as a function of consumer prices q . The function $X(q)$ becomes $\sum_h x^h(q)$ where $x^h(q)$ is the demand function for individual h . The rule then is no longer that the proportional reduction in compensated demand should be the same for all goods or commodities but the modified rule shows how it should vary across goods. The proportional reduction in quantity for a good should now be higher where the share of the rich in its total consumption is higher. Strictly I am using "the rich" here for those whose social

marginal valuation of income is low. This distributive argument is to be set against the efficiency argument which we have just seen which apparently points to the taxation of necessities.

In addition to the question of optimum tax rules there is an interesting and important set of questions concerning productive efficiency and optimum commodity taxation. Diamond and Mirrlees (1971) raised the question of the circumstances under which it is desirable for the public sector to be efficient. Formally, we ask whether the solution to the tax problem implies corresponding demand vectors, and thus production in the public and private sectors which are either, in the former case, on the public production possibility frontier or, taking public and private sectors together, whether aggregate production should be on the frontier of possibilities for the economy taken as a whole. The issue itself emphasises that problems of public finance cannot be divorced from problems of public production.

Further, the answer to the questions will have substantial consequences for public sector planning. If it is desirable for the public sector to be efficient then all public sector enterprises should use the same shadow prices in planning public sector investments using social cost-benefit analysis. Where public enterprises have objectives expressed in market prices, then sales from one public firm to other firms should be at the same price: for example, identical coal to power stations and to steel works should be priced identically. Public sector enterprises usually form, of course, only a part of the system of production and one would be interested in the efficiency of the whole system taken together. Thus, the concept of aggregate production

efficiency is introduced and defined as follows: a plan is efficient if taking all firms together, public and private, it is impossible to have more of one good without having less of another. Aggregate efficiency implies public sector efficiency. If aggregate efficiency is a feature of the optimum, then public sector shadow prices should equal market prices.

Broadly speaking we can summarise the answers to these questions on productive efficiency as follows. Public sector efficiency is desirable in a very general class of cases, i.e. in general it would not be sensible for the government to so organise its production that the resources it uses could produce strictly more of some good without producing less of another. However, aggregate production efficiency would not in general be a feature of the optimum. Thus we may wish to use taxation on commodities in such a way as to increase or decrease the profits of certain enterprises depending on our view of the distribution of income resulting from profits. For example, one might want to subsidise inputs, or remit taxes on outputs, for firms that are considered particularly worthy - an example might be subsidised inputs where one was trying to reward cooperative enterprises.

The theory presented so far explains, I hope, the sub-title of the lecture: income distribution, government revenue and planning. We are dealing with problems of raising government revenue and are trying to do this in a way which does least damage to the welfare of the individuals in the population where we take particular account of the distribution of welfare. At the same time we have seen that the public finance problem is intimately related to the choice of public sector outputs i.e. to physical planning.

§3. Application to Policy Discussion

The theory we have just seen constitutes only one example, albeit an important one, from the modern theory of public economics. It can be used, however, to show that a number of common arguments and assertions about policy are simply confused or wrong.

We begin with the problem of choosing public sector prices. This is a problem to which the Ramsey rule has an immediate application. For if we think of the producer prices p as (constant) marginal costs, the problem (1) is simply to maximise utility or minimise welfare loss subject to a revenue constraint on the public sector. It was indeed precisely this practical problem which generated the work by Boiteux (1956). After the second world war there was considerable discussion concerning the French nationalised industries such as the railways (SNCF) and electricity (EDF) over the appropriate modification of the marginal cost pricing rule for public enterprises, a rule familiar since the work of Dupuit (1844), to cover the case of a budget constraint on the enterprise. The controversy was between those who argued that the price should be set by "what the market will bear" and those who thought that efficiency required all prices to be increased in proportion to marginal cost. Boiteux showed, following a line of argument similar to Ramsey, that the former position was preferable and the latter simply wrong (see Drèze, 1964).

Secondly, it is remarkable how often one finds, and at high level, the argument that efficiency considerations point in the direction of the same proportional tax for each good (e.g. a uniform VAT). For example, on the introduction of VAT the British government

claimed "a more broadly-based structure ..., by discriminating less between different types of goods and services, would reduce the distortion of consumer choice ... Selective taxation gives rise to distortion of trade and of personal consumption patterns, and can lead to the inefficient allocation of resources" (HMSO, 1971, p.3). To repeat, that argument is, in general, mistaken in logic and the demonstration of the error is a good example of how simple theory can contribute to a practical discussion of efficient taxation and pricing.

A third application concerns the taxation of income and savings and particularly the arguments one often hears concerning an expenditure tax. An expenditure tax it is often claimed has the virtue of taxing consumption now and consumption in the future at the same rate. There is no extra taxation of consumption in the future via so-called double taxation of savings. Thus it is sometimes suggested that there is no distortion in the allocation of consumption between now and the future. But again we see that the simple argument is wrong. If we interpret the different goods in the Ramsey problem as consumption in different periods we have a very simple savings model. The Ramsey result shows that even in this case the argument that taxation of goods should be uniform is not sustainable. Thus the simple theory of public economics does not point to an expenditure tax.

The above examples show that those who advocate uniformity of taxation of various kinds cannot in general find their support in economic theory although it is remarkable how often they believe they can. The arguments for uniformity are usually administrative and it is important that they are seen as such. I do not mean by this that administrative considerations are unimportant but that they should be carefully distinguished from the

theoretical arguments. It would, of course, be more satisfying in some respects to include the administrative costs and difficulties explicitly in our economic modelling but that has proved an intractable problem and little progress has been made.

The administrative arguments in favour of uniformity concern problems in classifying goods. Shops and firms which sell different products will have to distinguish carefully between them in adding the appropriate tax. And possibilities for evasion are introduced since in the records goods at a high rate may be presented as being something different. A common example in the U.K. concerns VAT on house-repairs, which it is at the standard rate of 15%, whereas VAT on new construction is zero. Thus many repairs are passed off as new construction. The arguments for the expenditure tax, in for example the lifetime version proposed by Kay and King (1980) for the UK also concern administrative simplicity at least relative to the system that exists. It essentially avoids certain problems associated with distinguishing for tax purposes between income and capital (one simply adds income to asset reduction to find expenditure which then forms the basis of taxation. Thus tax incentives for converting income into capital, or vice versa do not arise. And one could do away with elaborate schemes to encourage saving. I doubt, however, whether the argument concerning the relative administrative simplicity of the expenditure tax would apply to India.

But at the same time it is important not to exaggerate administrative problems. India does operate a highly differentiated tax system (although as we shall see later it is not as differentiated as it might seem). Similarly it is often argued in discussions of VAT that the system of rebating tax on inputs involves administrative costs and problems which are too great. Yet, for example, a number of states operate such a system of rebates on certain goods - for example some aspects of rice processing and

iron-related industries in Karnataka. I cannot comment, however, on how well these systems function.

The administrative problems concerned with rebating taxes on inputs which arise with VAT are avoided if one merely taxes final goods, for example, as in the UK purchase tax which preceded the VAT. Under this scheme most firms would not be concerned with the indirect tax authorities at all. The administrative difficulty arises in identifying the final sale and this may be particularly severe where the final sales outlets are small and very numerous. Whilst the VAT brings very many firms into the administrative net it does avoid the difficulty of identifying the final point of consumption (final agents define themselves in that they do not and cannot reclaim the VAT on their purchases).

A final example where a little theory can go a long way in identifying confusion in policy discussion concerns the appropriate balance between direct and indirect taxation - Let me illustrate from two recent policy debates, one in the UK and one in India. At the time of his first budget in 1979 the new Conservative chancellor, Sir Geoffrey Howe,, indicated that the switch from direct to indirect taxation that he was introducing was motivated by the desire to increase incentives. But it is immediately clear from the simplest consideration of the individual budget constraint that raising spending power through lowering of direct taxes and increasing prices in the same proportion (which I take it is what a simple switch means) will in the absence of money illusion have no effect on factor supplies or commodity demands. And appeals to intertemporal considerations will not work either if people believe the changes are permanent. The argument, which was apparently presented as simple and obvious, must be more complicated or wrong.

In India there was considerable discussion at the time of the IMF loan of how extra resources should be raised and indirect taxation was denounced by some as regressive in that indirect taxes fall on both rich and poor. But where consumption patterns vary substantially across income groups, as in India, one can achieve quite a lot of progression by taxing commodities consumed by the higher income group at higher rates. Of course we know from the work of V.K. Ramaswami and others that one would wish to go to the "heart of the matter" and deal with income distribution considerations through the taxation of resources at the disposal of households. But the appropriate set of lump-sum transfers is not possible. And we also know from the theory of optimum income taxation and its relation with commodity taxation that the circumstances under which one would want to rely on income taxation only are very restrictive (similar arguments would apply to wealth taxation). Thus in theory a considerable redistributive role can be allotted to indirect taxation (see technical appendix for further discussion).

Note that in this case the theoretical and administrative arguments seem to point the same way since it appears rather easier in India to collect indirect than direct taxes.

§4. Tax Reform

Up to this point we have been discussing at a rather general level. We turn now to the direct application of some of the modern theory of public economics in terms of specific empirical problems and calculations. Here I should like to indicate some of the issues that have concerned my colleague at Warwick, Ehtisham Ahmad, and myself in our work on tax reform in India (see e.g. Ahmad and Stern 1983). We have concentrated much of the time

on local reform (i.e. small movements from the status quo) for a number of reasons. First there are costs of large changes in the system which do not apply to local movements and thus the starting point is important. Secondly the informational requirements and assumptions required for local changes are much weaker than for large moves or full optimisation. For in the latter cases one needs to know or assume how individual agents will behave in circumstances which may be a considerable distance from where we are now. Thirdly there is the simple practical consideration of being taken seriously. In my experience if you speak of optimality you run the risk of being taken as a peculiar, ivory-tower academic, whereas if you speak of reform you have some chance of being seen as a serious, solid, practical chap.

The work of Ahmad and myself will be presented in Delhi next September and is currently far from complete but I should like to describe very briefly some of the approaches, results and problems.

The analysis should be considered that of the medium term in the sense that we do not examine short-term demand management problems concerning unemployment, inflation and so on, and it is not long-term in that there is no explicit treatment of growth. Up to the present our work has fallen into two parts. The first has been the calculation of the tax component in the price of a final goods taking into account the taxes that fall on inputs, inputs into inputs and so on. We call this the effective tax. This calculation involves a simple input-output model of the economy and we have been working with data from the sixth plan documents. These data have been used together with actual tax collections allocated to different commodities to calculate effective

taxes. We have treated subsidies as simply negative taxes.

We can then compare these effective taxes with nominal taxes i.e. those which are calculated simply by allocating the actual collections to commodities. Our results are still preliminary but the comparisons between nominal and effective rates already yield some interesting conclusions, examples of which follow. First effective taxes are much more evenly spread across commodities than nominal taxes. This means that progressivity using nominal rates overstates the progressivity of the indirect tax system. Secondly certain goods, for example khadi, bear an effective tax even though they are nominally subsidised. This suggests that some of the effects of indirect taxation may be unintended by the authorities. Thirdly, many intermediate and capital goods are subject to high tax rates which may conflict with productive efficiency and a desire to encourage investment. Fourthly the method allows us to calculate the extent to which exports are taxed via their inputs and thus allows quantitative examination of the levels of export subsidies which are consistent with rebating taxes on inputs. It should again be noted that this type of subsidy was an issue which concerned V K Ramaswami. Fifthly the main source of taxation of inputs, because of its quantitative importance and the commodities with which it is concerned is the union excise. It should be emphasised that these results are preliminary and that much work remains to be done but I suspect that they will survive the further analysis.

The second part of our work which follows from the analysis of effective rates is the examinations of directions for reform. Thus we look for changes in indirect taxes which keep revenue constant and which

through their effects on the living standards of different household groups raise social welfare. The evaluation of changes in social welfare depends on the distributional values of the decision-maker and we can investigate different possible sets of value judgements. The sensitivity of possible reforms to those value judgements involves some detail but let me briefly describe the method.

We ask for each good how much the tax would have to be increased to raise one extra rupee of revenue where we take account of possible demand changes and taxation of other goods. We can then calculate for good i the welfare loss to each household from a price increase of this magnitude. For small changes this is given in money terms by the price increase times the quantity consumed by the household of the i^{th} good. Aggregating across consumers using given welfare weights we find the loss in social welfare, which we call λ_i , from raising one more rupee from taxing the i^{th} good. From what I have said this is $\frac{\partial V}{\partial t_i} / \frac{\partial R}{\partial t_i}$. Clearly if λ_i exceeds λ_j then we raise welfare at constant revenue by switching on the margin from i to j . Note that in the Ramsey-optimum all the λ_i are equal.

Applying this method to all India data for 1979-80 we find for example that if one is not concerned about income distribution then a decrease in subsidy, or an increase in tax, on cereals would be indicated in that the λ_i for cereals is in this case ranked low in the list. However with a fairly moderate aversion to inequality the result would be reversed in that λ_i for cereals would have a much higher rate. Thus distributional judgements do matter in indirect tax policy. Again our specific calculations are not yet complete but the

example given is likely to survive.

The example I have given is of the balance of indirect taxation across goods. The same kind of technique can be applied to the balance between different kinds of taxes. We compare the welfare cost from raising the marginal rupee from each tax under consideration. It could also be extended to the level of government revenue itself.

Finally we have looked at non-marginal changes such as a movement to uniform taxation i.e. taxing all goods in the same proportion. Using simple notions of equivalent variation we can ask what happens to the levels of real income of different groups. Given that the Indian effective tax system does have some progressivity (albeit less than would be apparent from nominal taxes) such a reform would benefit the better-off groups and hit the poor. The same is true, although to a lesser extent, if one looks at modifications which exempt certain categories.

One should be careful however, to distinguish uniform taxation and a VAT. The defining feature of a VAT is that taxes are rebated on inputs. It need not be uniform although it is often assumed to be so. The advantages of rebating taxes on inputs concern production efficiency. If intermediate goods are taxed then producers are facing different relative prices for the transformation of one good into another and inefficiency can arise. The calculations of such efficiency losses lies outside the scope of the simple fixed-coefficients input-output model and is something for further research. The considerations of income distribution and government revenue examined

today should really be set against those from the production side.

§5. Conclusions and Further Research

Let us conclude by taking stock and indicating some areas of further research. I hope I have shown how the modern theory of public economics can both help clarify policy discussion and be applied fairly directly in a quantitative way. We saw, for example, how the simple Ramsey argument and its extensions can show that economic theory does not provide a general presumption in favour of uniform indirect taxes. We argued further that arguments for uniformity are largely administrative and should be carefully distinguished from those arising from economic theory.

We saw too how one could apply modern theories in a specific quantitative way to the analysis of the effect of reforms in India on government revenue and the distribution of welfare. An important part of that, and of interest in its own right, was the calculation of the effect of taxes on price where much of the taxation falls on intermediate goods.

But much remains to be done both in the theory and in empirical work and the most important weakness of our discussion today would appear to be the treatment of the production side.

It is remarkable that much of the theoretical and applied discussion of indirect taxes and tariffs in developed countries is concerned with government revenue and income distribution. Producer prices are commonly assumed to be fixed. On the other hand analysis of

taxes and tariffs in poorer countries has concentrated very much on the production side and comparisons are often made between market prices and other sets of prices e.g. shadow prices of various kinds. Where world prices are the alternative set one example is the study of effective protection. The study at constant producer prices, and this includes much of my discussion today, ignores important production effects. On the other hand simple effective protection studies do not trace the consequences of taxes and tariffs for the structure of production and for factor incomes. Thus they do not tell us how household incomes and welfare are affected by tax policies. There is therefore major theoretical and empirical work before us.

We want to build simple models which integrate the analysis of the production side on the one hand and, on the other, the consequences for households and government revenue which lie at the heart of the theory of public economics we have been discussing. And we must do this in a way which allows quantitative and plausible empirical application. This is urgently required for the rational analysis of tax policy and I believe that if V.K.Ramaswami were still with us he would be a major force behind such work.

Technical Appendix

We should note here that there is a sense in which the one-consumer economy is an awkward theoretical vehicle for the development of our argument. We know in general form the basic theorems of welfare economics that the optimum taxes in a many consumer economy, if they are feasible, are lump-sum taxes and transfers. The problem with these taxes is that they are not usually feasible since the assembly of information for their calculation and collection would mean they are no longer lump-sum. In the one consumer (or identical consumer) case, however, all that is needed is a poll-tax or transfer. Equivalently where lump-sum income is fixed in the one-consumer economy one can have equi-proportional taxes on all goods (including factor supplies - see below). For example a 10% tax on all goods would be equivalent to a poll-tax of 10% of the lump-sum income. Formally in equation (4) this can be seen by noting that $\sum_k q_k s_{ik} = 0$. (since compensated demands are homogeneous degree zero) so that (4) is satisfied by proportional taxes with $\theta = 0$.

In the one-consumer economy, however, equi-proportional taxation would not be optimal if there is a constraint on indirect taxes. For example it may not be possible to tax certain goods. In these circumstances (4) applies for those goods which can be taxed and the solution with equi-proportional taxes on all goods would not be available. Neither would proportional taxes on all goods be feasible where there are no lump-sum incomes (for then such a system would raise no revenue). And in the many-consumer economy the system of "equivalent" lump-sum taxes

associated with uniform taxation may be very unattractive and far from optimum for distributional reasons.

In the above discussion goods may be either bought or sold by consumers. Sales would be treated as negative purchases. One sometimes finds it convenient to treat the sale of labour differently from other goods and thus identify it separately (as l , say) in the utility function and the budget constraint. Thus the individual problem becomes

$$\text{Maximise } u(x, l) \quad (\text{A.1})$$

$$x, l$$

$$\text{subject to } q x - w l = M$$

This is merely a notational change and does not change the Ramsey-rule if we merely consider $(-l)$ as a good like any other. But it becomes more than notational if we insist either that labour cannot be taxed or we allow special forms of taxation of labour. The special forms are usually associated with discussions of income taxation and its relation to indirect taxation.

If labour is untaxed then we have to consider, in the analysis of the Ramsey-rule, issues of complementarity and substitutability of the taxed consumer goods with labour or leisure. A notable early example was the work of Corlett and Hague, (1953), although it should be noted that labour is singled out only through the assumption that it is the sole untaxed good (if some other good were the only untaxed good

then it would simply replace labour or leisure in the analysis and interpretation). One can then discuss special circumstances (involving e.g. homotheticity of preferences) under which uniform or equi-proportional commodity taxes are optimum (see Atkinson and Stiglitz, 1980, Chapter 12).

Where labour can be taxed in special ways one may discuss the appropriate combination of income and commodity taxes. It is usual to assume for such analyses that the only difference between individuals arises in their earning power, i.e. their wage. Thus utility functions are the same for everyone. In these circumstances one can show, for example, that if non-linear income taxation is possible and labour is separable from other goods in the utility function then the optimum involves equi-proportional commodity taxes (which could in general be replaced by zero taxes and an appropriate adjustment to the income tax). Similarly if we further assume a linear expenditure system we can get the same result where only linear income taxes (i.e. a poll-tax and proportional marginal taxation) are available. For further discussion see Atkinson and Stiglitz (1980, Chapter 4). But the assumptions required for these theorems are clearly very restrictive and one must conclude that non-uniform commodity taxes will in general be desirable at the optimum. Nevertheless the results draw attention to the close relation between assumptions concerning functional form for utility and demand functions and the resulting form of optimum taxation.

In general then optimum indirect taxes will not be uniform and will be determined in part by the many-person version of the Ramsey-rule (4). It is for this reason that it is important to gain insight into the consequences of this rule.

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