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SUMMARY

This paper provides a general cost-benefit framework for evaluating the size of user prices associated with public expenditures. The optimal user charge is a weighted average of actual user prices and marginal costs. Cost recovery attempts are treated as a special case. The framework is applied to state expenditures in India for 1987-88. Whether India's "low" levels of user prices can be justified depends on what weights are used. For plausible values, reflecting distributional concerns and the shadow price of public income, the services are on the whole underpriced.

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COST-BENEFIT ANALYSIS, USER PRICES AND STATE EXPENDITURES IN INDIA

Cost-benefit analysis has traditionally been constructed on the assumption that user prices are fixed. The price was usually fixed close to zero for social expenditures concerning health and education. With the recognition that not all government expenditures were on pure public goods, and with the pressure on the availability of public funds due to the tougher economic climate in the 1980's, LDC's are now considering raising the level of user charges. When user prices can vary, cost-benefit analysis can be recast such that the criterion for approving a project is expressed in terms of the user prices. The purpose of this paper is to derive this criterion from first principles and illustrate its applicability.

The established literature on this subject has two main strands. For the first, the emphasis is on the *ex ante* decision whether a particular project is to be judged socially worthwhile. This is the cost-benefit / project appraisal field. The second strand then focuses on the issue of, given that the project now exists, what should be the price charged. This can be termed the Ramsey pricing part of the literature. In our framework, we merge these two strands. The cost-benefit decision deals with the total benefits and costs, and the pricing decision concerns effects at the margin. The key feature in our analysis will be the distinction between the social price to be attached to the incremental benefits in the cost-benefit calculation and the price that is actually charged to users. Because these two prices may be different, it is possible to formulate estimates of social prices that can be derived from actual prices, provided that the actual prices are variable.

More recently, a third "cost recovery" strand to the literature has appeared. This looks at the extent to which user prices have been employed to meet the costs of public provision of government services. From this it derives conclusions about the scope and desirability of price increases. It will be shown that cost recovery can be considered a special case of the general cost-benefit analysis via user pricing framework presented in this paper.

The derived theoretical framework will be illustrated by reference to the provision of social and economic services by the states in India 1987-88. Indian state expenditures provide a suitable area for application for two main reasons. An extensive recent analysis of cost-recovery has just been undertaken and this makes the appropriate data readily available. Also, declining and inequitable trends in user prices have been observed which can best be evaluated using the comprehensive type of appraisal technique suggested by our theoretical framework.

I. THE GENERAL FRAMEWORK.

All of the variables that will be defined below are specified in annual terms. The flow variables are assumed to be constant each year. The only stock variable is the capital cost term which is converted to an equivalent annual basis (using the social discount rate).[1] Thus the time subscript can be supressed for all variables. Define W as the (annual) welfare level that corresponds to a change in inputs and outputs that constitute a project. The scale of the project is represented by Q. The project leads to benefits B and costs K, both measured in monetary terms. The benefits go to the private sector where monetary units have a sector weighting a_B; while the costs are incurred by the public sector with a sector weighting of a_K. Assume that the group that benefits from the monetary units in the private sector is low income and the public sector units are associated with a high income group. If a_2 is the weight to the low income group and a_1 is the weight to the high income group, then the relative weight $\delta = a_2/a_1$ can be attached to the private sector benefits. Welfare can then be written as

$$W = a_B \, \delta \, B - a_K \, K \tag{1}$$

This ignores the existence of user charges. As explained in Brent (1979, 1980 and 1984), repayments R can be deducted from both the benefits and the costs to reformulate the welfare equation to be

$$W = a_B \, \delta \, (B - R) - a_K \, (K - R) \tag{2}$$

Because it is basically non-traded goods that will be considered, it is convenient to work with private sector effects as numeraire. Dividing equation (2) by $a_B\delta$ makes welfare appear as

$$W* \equiv \frac{W}{a_B \, \delta} = B - R - \omega \, (K - R) \tag{3}$$

where ω is the distributional weight θ/δ (θ is the social cost of public sector funds or a_K/a_B).

Repayments can be defined as $P.Q$, where P is the actual price charged, i.e., the user charge. Equation (3) can therefore be expressed as a function of the user price. However, recognising that all variables in this equation are functions of Q (including P in the general case where prices are not fixed) we can make our analysis in terms of Q changes, along the lines of Kirkpatrick (1979). To evaluate the project, all we need to know is whether the cost-benefit equation (3) is positive for $dW*/dQ$. But, to find the optimal user charge we need to go to the situation where no further gains can be obtained. From maximising $W*$ we then obtain

$$\frac{dW*}{dQ} = B' - R' - \omega \, (K' - R') = 0 \tag{4}$$

B is the area under the inverted social demand curve $\int P{*}dQ$, with $P*$ the social (demand) price. From this is obtained $B' = P*$ and equation (4) results in

$$P* = \omega\ K' + (1-\omega)\ R' \tag{5}$$

This states that the optimal user charge is a convex combination of marginal cost and marginal revenue. Using the well-known relation between price and marginal revenue, i.e., $R' = P(1 - 1/\eta)$ with η the price elasticity of demand, equation (5) can be restated in terms of the difference between the social and actual price

$$P* - P = \omega\ K' - P\ [\omega + \frac{1}{\eta}\ (1-\omega)] \tag{6}$$

It is important to see how our pricing rule differs from that existing in the Ramsey-pricing literature. For convenience we can define $\omega + 1/\eta\ (1-\omega) = \gamma$, which transforms equation (6) into

$$P* = \omega\ K' + P\ (1-\gamma) \tag{7}$$

The literature identifies P with $P*$, which means that their optimal price (denoted by $\tilde{P}$) is

$$\tilde{P} = \frac{\omega}{\gamma}\ K' \tag{8}$$

Note that equation (8) converts simply into the standard form of the Ramsey pricing rule[2]

$$\frac{\tilde{P} - K'}{K'} = \frac{\omega}{\gamma} - 1 \tag{9}$$

A useful way of interpreting the literature is to suggest that by identifying P with $P*$, it is being assumed that the market demand curve is the social demand curve. In this way equation (8) can be viewed as the special case of (7) when no externalities exist.

II. THE FRAMEWORK WITH COST RECOVERY.

A number of authors have recently focused their analyses on the second bracketed term in equation (2). For example, Jimenez (1987) defines the subsidy S for a project as $K - R$. Cost recovery is the aim to raise the ratio R/K equal to 1, i.e., set $S = 0$.[3] More generally we can, following Katz (1987), include also a fixed subsidy amount A and work instead with $S = (K - R) - A$ and require this to be zero. For a fixed subsidy, in either case, $S' = 0$ is imposed and thereby

$$K' = R' \tag{10}$$

The result seems to be that the project planner must try to set output, and hence prices, so as to maximise profits.[4] However, this ignores the first bracketed term in equation (2). Hence when the condition $K' = R'$ is inserted into equation (4), it leads to

$$B' = R' \tag{11}$$

Consequently, from equations (10) and (11), and because $B' = P*$, we obtain the familiar first-best efficiency condition

$$P* = K' \tag{12}$$

The conclusion then from using cost recovery objectives in the cost-benefit framework is that one can ignore the distribution weight term ω. In other words, ω is set equal to 1 in equation (4). With $B' - K' = W'$ as the marginal criterion, by integration the total criterion must be $W = B - K$.[5]

The finding that ω has no role to play is straight-forward to explain. In the cost recovery framework, the financial effect of altering Q is neutralised. There is no further transfer of funds from the private to the public sector. Income distribution will not be affected. Nor will there be any need to increase taxes or government borrowing. The issue is simply whether at the margin the social demand price is greater than the marginal cost.

It is important to understand that the cost recovery literature here assumes that there is excess demand. Under these circumstances one may increase P *and* Q and leave the subsidy unaffected. But the cost-benefit framework explains why raising P and Q is worthwhile. With excess demand, B' or $P*$ is greater than K' and expansion in output is necessary to close this gap.

A final observation seems warranted. It has been pointed out, for example by Heller and Aghlevi (1985), that cost-benefit analysis has often taken place assuming that future recurrent cost will be funded. In practice, LDC's have underfinanced these costs and so the full net benefits were not forthcoming. To avoid this happening, we can suggest that the price that is assumed to hold in the total cost-benefit criterion given by (2) could be the one that ensures $R' = K'$. In this way solving the recurrent cost problem means imposing the cost recovery assumptions in the general cost-benefit framework. Of course, it will mean sacrificing distributional objectives, as necessarily one is using the criterion given by equation (13). But, since underfinancing was taking place, any distributional objectives were not in fact being furthered to the extent specified by equations (3) and (4).

III. CBA AND STATE EXPENDITURES IN INDIA.

A comprehensive examination of user prices related to central and state government expenditures in India has recently been carried out by Mundle and Rao (1991, 1992) - hereafter M&R. The key concept in their analysis was that of a subsidy S, being the difference between the amount that was recovered R and the cost of providing the government goods and services K. The subsidy was measured in total and per capita terms. The per capita subsidy S/N is the relevant measure for our purposes. Effectively this means that the quantity unit Q is being defined by N. From this it follows that the subsidy per person is $K/N - R/N$. M&R supplied information on both these components of the subsidy per person. If we assume that the marginal and average costs coincide, then the first component K/N denotes K'.[6] R is the product of the user price P and N. Hence the second component R/N produces P.

The result is that M&R's data can be used to provide one set of estimates of the P and K' variables that appeared in the theoretical framework outlined in sections I and II. Although P and K' will be the variables used in our analysis, we will also refer to M&R's "recovery rate" R/K'. With P equal to R/N, and K' equal to K/N, the recovery rate indicates the relative size of the two variables that need to be compared in our analysis (i.e., $R/K = (R/N)/(K/N) = P/K'$).

M&R viewed the general administrative services of government as pure public goods for which user fees would not be feasible. They excluded these services (and transfer payments and tax expenditures) from their analysis. That left for study social and economic services. Since these include some cases of impure public goods, M&R's measures of subsidies constitute an upper bound. That is, they ignore externalities and assume that all of the cost could be recovered by user charges if the government chose to do so. Table 2.1 of M&R (1991) tells us that the recovery rate was 48.21% by the centre and only 16.43% by the states. With roughly equal amounts being spent by the two spheres of government on social and economic services, most of the Indian subsidies were generated at the state level (equal to 62.04% of the total subsidy in 1987-88) and it is at this state level that we will undertake our analysis.

According to table 3.9 of M&R (1992), the recovery rate for social services by the states was only 2.75%. This is so close to zero that user pricing is practically a "non-event" for these services. The main focus of our analysis will be on the provision of economic services. The average recovery rate here is 24.64% (shown in table 3.11). But, there was a great deal of variation both between the states and within the states according to the category of economic expenditure. We will exploit this variation to illustrate where, at the margin, the cost-benefit framework will have the most impact. Once the baseline estimates have been made for economic services, we will then indicate briefly some of the implications that would follow if the analysis were also applied to social services.

There are 14 main states in India. Their names are listed in all the tables that are to follow. Economic services can be split into 6 categories, viz., agriculture and allied services, irrigation, power and energy, industry and minerals, transport and communications, and other economic services. In total there are 84 state goods and services, or "projects", to be priced in our study.

Apart from M&R's data on P and K', we also need information on the weights ω and γ. Our analysis will proceed in two stages. Since no weights are required in the cost recovery framework established in section II, stage one will present the data on P and K' within the narrow efficiency framework. Basically, this will highlight the extent to which actual user prices are (not) used for the 84 projects. Stage two will then attempt to quantify what the social prices should be for these projects. As a result the amount by which the actual user prices deviate from their social counterparts can be detected.

COST RECOVERY AND USER PRICES IN INDIA.

The main issue to be resolved in the cost recovery framework (and subsequently, for the full cost benefit analysis) is how to interpret the M&R (1991, pp 7-10) measure of total costs. They define this as the sum of operating costs (what they call "revenue expenditures") and capital costs. They point out that capital expenditures that took place in 1987/88 concern the provision of services in the future and not that year. The real utilization of capital relates to the total capital stock that actually existed in that year. Hence, M&R argue, the appropriate measure of capital is the cumulative past capital expenditures associated with the current level of a service. The per unit cost that is to be attached to this capital sum (which we will call "the full interest rate" r) has three components, the interest payments, the depreciation rate, and the inflation adjustment.

The interest payment was the "imputed interest rate or the average cost of money to the government, calculated as the ratio of interest payments by central and state governments taken together to the stock of total public debt", which worked out to be 7% in 1987-88. Public debt was assumed to finance capital equipment that lasted on average 50 years. Using a straight-line depreciation method produces a depreciation cost of 2%. Because the stock of public debt related to the past, the replacement cost in today value terms needs to be raised by the inflation rate of 7.4%.[7] The total rate applied to capital expenditures was the sum of the three rates, i.e, $r = 16.4\%$.

Expressed analytically, the M&R method for measuring capital costs for 1987-88 reduces to multiplying the cumulative capital expenditures to that year, K_0, by the full interest cost involved with using the capital in that year, r, to form $r.K_0$. To help us interpret their method, we will now show how to convert stocks to flows in CBA using first principles.

The standard way of assessing the outcome of a stream of future efficiency (net) benefits $B(t)$ relative to an initial capital cost K_0 (with a shadow price

θ) is to find the net present value (NPV). Defining the NPV as the welfare from the project in period $t = 0$, and denoting this by W_0, we have

$$W_0 = \sum_{t=0}^{t=T} \frac{B_t}{(1+i)^t} - \theta.K_0 \tag{13}$$

If the net benefits are the same in each year (equal to B) and the terminal time period is long (T = 50 in the M&R studies) this can be approximated by the perpetuity version

$$W_0 = \frac{B}{i} - \theta\ .K_0 \tag{14}$$

In the Squire and van der Tak (1975) - hereafter S&T - framework, the shadow price of public funds is given by the ratio of the marginal product of public capital q divided by the social discount rate i

$$\theta = \frac{q}{i} \tag{15}$$

Substituting for θ in equation (14) produces

$$W_0 = \frac{B}{i} - \frac{q}{i}.K_0 \tag{16}$$

Define $i.W_0$ as the annual welfare equivalent to the stock of welfare W_0. This is what we have been using and called W. The NPV criterion then becomes

$$W = i.W_0 = B - q.K_0 \tag{17}$$

Focus on the capital cost term in equation (17). If the correct way of converting a capital stock to a flow of annual capital expenditures is to multiply this by q, and M&R make this adjustment by applying the rate r, then an obvious interpretation of their method is to suggest that M&R seem to be equating their r with q. In the absence of information to the contrary, we will accept this equality. With θ now equal to r/i, this implies that $r = \theta.i$. This means that they are using r as the annualised cost of capital. Consequently, what they list as capital expenditures (or $r.K_0$) is really $\theta.K$. This follows because $r.K_0 = \theta.i.K_0$ and $i.K_0 = K$.

If we are correct that M&R have measured $\theta.K$ and not just K, then this implies that their concept of a subsidy is really a shadow price measure. That is, they are using $S = \theta.K - P$, rather than $S = K - P$. On the basis of this modification, we can now apply the cost recovery framework.

For cost recovery, the social price is determined by the marginal cost, $P* = K'$. Any subsidy at all constitutes a deviation of the actual user price from its optimal level.[8] In the modified cost recovery framework, in order for there to be no subsidy, $P* = \theta.K'$.

Table 1 presents the values of P and $\theta.K'$ for the 84 projects. The information was derived from M&R's (1992) table 3.11 (bearing in mind that what they regard as K is really $\theta.K$). Their table refers to state financial figures in per capita terms, so it is already specified in the quantity units appropriate for our analysis. Row (d) in their table lists the recovery rate. One minus this rate is the per capita subsidy rate S'/K'. The reciprocal of this is K'/S'. Multiplying K'/S' by the per capita subsidy (S') given in row (b) produces the marginal cost value K'. Since $P = R'$, and $K' = R' + S'$, we can derive P by finding the difference $K' - S'$. The information for other economic services was obtained as a residual by subtracting the sum of values for the 5 other categories from the figure for total economic services. All values are measured in rupees (Rs).

Table 1 shows that even though the average recovery rate was only 24.64%, for 6 of the projects the ratio was greater than 100%, which means that user charges exceeded the costs. From the viewpoint of equation (12), which requires that social prices only equal marginal costs, the 6 projects were "overpriced". The 6 projects were in 2 categories, i.e., power and energy (in Karnataka and Kerala) and other economic services (in Andhra Pradesh, Haryana, Punjab, and Rajasthan). Of course, this means that for 78 of the projects, prices were too low by efficiency standards. The interesting question is how many of the 78 projects would still be underpriced when we apply the full social weights.

SHADOW PRICES AND USER PRICES IN INDIA.

As expressed in equation (7), the general CBA framework requires that we weight K' by ω and P by $1 - \gamma$. It is not our intention to provide "best" estimates of ω and γ. Rather we attempt to provide estimates that most people would consider as acceptable as a point of departure for the subsequent analysis. Then we provide a sensitivity analysis around the point of departure. The construction of our parameter estimates will be made explicit and the crucial assumptions identified. It should be therefore a simple matter for the reader to adapt the results in the direction of the reader's own view of what constitutes the best set of estimates.

Once we use the M&R figure for total cost, we automatically scale K' up by θ, which is our shadow price of public funds. We will now explain how we obtained values for the rest of the social weights. We begin with ω as γ depends in part on this parameter value. Since $\omega.K' = \theta.K'/\delta$, and we have derived $\theta K'$ in the cost recovery part of the analysis, all we need to explain here is the derivation of the distribution weights represented by δ.

THE DETERMINATION OF δ.

Our approach is as follows. First we provide a rationale for our estimates in terms of the standard S&T methodology. Then we take these estimates and explain why they are plausible in the context of India.

The distributional weight δ is defined as the relative weight of group 2 to group 1, i.e., a_2/a_1. In the S&T framework, the weight to any group i is the social value of a unit of consumption to the particular consumption group relative to the social value of consumption at the average level of consumption. We will use this idea, except that we will replace consumption levels with per capita income levels y. The weight for a particular income group a_i will be given by $(dW/dy_i)/(dW/d\bar{y})$. Hence, $a_2/a_1 = (dW/dy_2)/(dW/dy_1)$. Following S&T, the social value of income can be set as an isoelastic function of the groups income level such that $dW/dy_i = y_i^{-\epsilon}$, where ε is society's aversion to income inequality. This means that

$$\frac{a_2}{a_1} = (\frac{y_1}{y_2})^{\epsilon} \qquad (18)$$

The two matters to be resolved are: (a) what values to impose for the inequality aversion parameter ε, and (b) how to identify the two income groups 1 and 2.

(a) S&T recommend the value $\varepsilon = 1$ with a sensitivity analysis being used including 0 and 2 as lower and upper limits. As emphasised in Brent (1990), these values overstate the demand for inequality by policymakers in LDC's. So a value of $\varepsilon = 1/2$ was recommended, with the sensitivity range being 0 and 1. Because Squire (1989) has pointed out that most government's do not in practice explicitly use distribution weights, it seems advisable to use the more conservative range of values in this study.[9] Note that equal weights are associated with an ϵ value of zero. So the cost recovery framework, which has already been covered, implicity used $\epsilon = 0$. We therefore only need to analyse the ϵ values 0.5 and 1 in this section.

(b) It was stressed in Brent (1980) that an incidence analysis (identifying which group gets the benefits and which group incurs the costs) is a necessary ingredient in any weighting calculation. No detailed analysis of incidence among the states was developed in the M&R studies (though an attempt was made to distinguish rural/urban effects within the states). On the benefits side, we will adopt the implicit M&R assumption that incidence equals impact. That is, the benefits of a state's expenditures were retained exclusively by the state making the expenditure. a_2 will therefore relate to the particular state expenditure involved. On the cost side, we will adopt two scenarios for a_1. One will be termed *progressive* and the other will be termed *average*. In the former we will assume that the group incurring the costs is in the position of the state with the highest per capita income. In the latter scenario we assume that the group incurring the costs corresponds to a typical resident in a state at the average state income level.

The δ values corresponding to alternative values for the income inequality parameter and the two benefit incidence scenarios are shown in table 2. The state income figures come from table 3.7 of Rao and Mundle (1991). The average per capita income for all the states was Rs 2934 in 1987. This sets y_1 = Rs 2934 in the average scenario for equation (18). The state whose income was closest to this average figure was Kerala with Rs 2913 per capita. The state with the highest per capita income was Punjab. In the progressive scenario y_1 = Rs 5689.

Bihar is the poorest state (with the highest weight) and Punjab is the richest (with the lowest weight). In the average regime, with $\epsilon = 1$, the range of values for the weights is between 0.5157 and 1.5877, which is a relative factor of 3.0787. With $\epsilon = 0.5$, the range is between 0.7181 and 1.2600, and the relative factor drops to 1.7546. In the progressive regime, with $\epsilon = 1$, the range of values is between 1.0000 and 3.0785, and with $\epsilon = 0.5$, the range is between 1.0000 and 1.7546. The relative factors are the same as for the average regime. The main effect therefore of assuming a progressive rather than an average financing scenario is that the range centres around 1.9630 rather than 1.0052 when $\epsilon = 1$ (and around 1.3859 rather than 0.9630 when $\epsilon = 0.5$).

Harberger (1978), and other traditional cost-benefit analysts, are against using non-unitary weights. They consider that a formula such as equation (18) can give such large differences in weights that almost any redistributional policy would appear socially desirable. For example, someone with a quarter of the income of the average would have a weight 64 times as large as someone at the average, if ϵ were 4. But, the income distributional weights that are presented in table 2, are a lot more restrained. The fact that a rupee to a person in the poorest state only has a weight twice or three times that of the richest state should be acceptable to most cost-benefit analysts. The small range is a product of the fact that state income differences in India were not very large (as well as using an ϵ value with an upper limit of 1).

Given that the differences in the weights are not very large, even with a high level of income aversion ($\epsilon = 1$) and with the assumption of progressive financing, we shall hereafter only work with the highest values for δ (represented by $\delta = 5689/y_2$ and shown in the last column of table 2).

THE DETERMINATION OF γ.

In section II we defined the relation: $\gamma = \omega + 1/\eta\,(1-\omega)$. The two key parameters are ω and η and we will discuss them in turn.

Although we have just dealt with $\omega = \theta/\delta$, and determined δ, we have not yet established the value of θ separately, and therefore do not know what ω is on its own. This is because we used data covering jointly the product of θ and K'. We therefore need to return to the marginal product of public capital q and the social discount rate i, the two components of θ set out in equation (15). Previously we argued that M&R's work implies using the full interest rate $r = 16.4\%$ as the marginal product of public capital. What requires attention now is the social discount rate.

Our analysis has been undertaken throughout with private sector effects as numeraire. The appropriate rate of fall in the numeraire over time which defines i is therefore the consumption rate of interest (CRI). S&T determine the CRI by the formula [10]

$$i = g\,\varepsilon + \rho \tag{19}$$

where g is the growth rate in per capita income and ρ is the pure rate of time preference.

Estimates for India of the parameters in equation (19) can be found in Brent's (1992) paper on the determination of social discount rates based on alternative numeraire specifications. For the 25 year period 1965-1989, g was 1.8%. With time as the numeraire, the rate of change in life expectancies (1.13% for India) was the discount rate. But, with consumption as the numeraire, as it is in this paper, the rate of change in life expectancies can be used as an estimate of the pure time preference rate ρ. If we assume $\varepsilon = 1$, equation (19) for India would set $i = 2.93\%$.

Given the controversy in the literature over the social discount rate, it seems desirable to work with a second estimate for i. S&T (p109) recommend for ρ: "fairly low values - say, 0 to 5 percent - on the grounds that most governments recognize their obligation to future generations as well as to the present." We shall take the upper value in their low range for ρ (i.e., 5%). This fixes the alternative value for i as 6.8%.

With estimates of i equal to 2.93% and 6.8%, and with q (i.e., r) equal to 16.4%, the two estimates for θ are a high value of 5.60 and a low value of 2.41.[11] The corresponding values for ω are shown in columns 2 and 3 of table 4. This takes the delta values from the last column of table 2 and divides then into the two values for θ just derived.

The second main component of γ that we need to estimate is η, the price elasticity of demand. There are six main product groups. Information on these price elasticities is not available. We will just assume various common values for η and make estimates of γ conditional on these assumed values. The obvious values to try are those that correspond to inelastic, unit elastic, and elastic demands curves. We will therefore take values for η equal to 0.5, 1 and 2.0. Because when $\eta = 1$, $\gamma = 1$, and hence $1 - \gamma = 0$, the weight attached to P in equation (7) disappears in the unit elasticity case. We will therefore only present the estimates for γ for $\eta = 0.5$ and $\eta = 2.0$ in table 3, and leave till the final stage the unit elasticity case when we combine estimates to form the complete values for equation (7). The γ estimates in the last four columns of table 3 are constructed as follows. They take the two alternative ω values presented in the first two columns (which correspond to the two values for θ) and permute them with the two η values to provide the four estimates of γ produced by the equation $\gamma = \omega + 1/\eta\ (1 - \omega)$.

THE COMPARISON OF ACTUAL AND SOCIAL PRICES.

We are now in a position to combine the parameter values and estimate the social prices as set out in equation (7). We then can make a comparison between these and the actual prices P that are shown in table 1 (and reproduced in the tables 4-6). We start with case (i) where the elasticity of demand is assumed to be unity. This is the simplest case to cover because only marginal costs need to be weighted. When the elasticity of demand is not equal to unity, case (ii), we need to weight both the actual price and the marginal costs to obtain the social prices.

(i) As explained earlier, when $\eta = 1$, $\gamma = 1$. Hence, $1 - \gamma = 1$. Equation (7) simplifies to $P* = \omega K'$. Table 1 presented the marginal costs $\theta K'$. To obtain $\omega K'$, we need to divide these marginal cost figures by δ, as given in the last column of table 2. Thus $P* = (\theta K')/\delta$ and this is shown in table 4, along with the actual prices P. We can see that the number of cases where the actual prices are greater than the social prices is now 18. This is up by 12 from the 6 cases that existed when distribution weights were not applied to the marginal costs in table 1. Previously only power and energy, and other economic services, had cases where there was "overpricing". Now these have been expanded to include the agriculture (and allied services) and industry (and minerals) categories. While previously, 6 states had at least one case where the actual price exceeded the social price, now only two states do not have one case (Maharashtra and West Bengal). However, for 66 of the 84 projects the actual prices were still too low.

(ii) When the elasticity of demand is not unity, the full expression $P* = \omega . K' + P\ (1 - \gamma)$ must be used to calculate the social prices. The role of η can be highlighted by differentiating this social price equation to obtain

$$\frac{\partial P*}{\partial \eta} = P(1 - \omega)\eta^{-2} \qquad (20)$$

From this we get the result that variations in the size of the price elasticity may increase *or* decrease the social price depending on the value of ω. If $\omega < 1$ a higher elasticity raises the social price, while if $\omega > 1$ a higher elasticity lowers $P*$. The logic of this is straight-forward. When the price elasticity of demand is less than unity, any price increase will raise revenues. This revenue increase is important if, and only if, the government has a higher value on public income relative to distribution, i.e., ω exceeds unity. This logic must be kept in mind when interpreting the next set of results.

Table 3 produced four different sets of values for γ, corresponding to the pairing of two values for ω with two values for η. We mention here only the overall results for the four ω values, but present the full results for γ_4 in Table 5. As with the unit elasticity case, we do not use the two separate ω values in table 3 to weight the marginal cost part of equation (7). Instead we again exploit the fact that the data is in the form $\theta K'$ and that we therefore only need to divide by δ to obtain $\omega K'$.

(i) For γ_1, some states have $1-\gamma$ as positive, while others have it negative. So, for some states there is something to add to weighted marginal costs, but not for all. The end result is that 14 of the 84 projects have actual prices greater than their social prices.

(ii) On the other hand, for γ_2 (where there is a low elasticity value and a high value on ω) *all* states have $1-\gamma$ as positive and social prices must then be above weighted marginal costs. As a consequence for none of the 84 projects is there overpricing.

(iii) For γ_3, most of the states have $1-\gamma$ as negative. This lowers their social prices to below weighted marginal costs. The number of projects where the actual price is greater than the social price is thereby increased to 22.

(iv) Finally, for γ_4 (where there is a high elasticity value and a high value on ω) *all* states have $1-\gamma$ as negative. The number of projects where overpricing takes place is highest at 34. As can be seen in table 5, every one of the 6 types of project has at least one state where there is overpricing. In only two states (Tamil Nadu and West Bengal) is there no instance where the actual price matches the social price.

IV. Summary and Conclusions.

In this paper we recast the basic cost-benefit criterion, which was defined in terms of quantity changes, so that it could deal with judgments as to the adequacy, or otherwise, of user prices. The resulting criterion expressed what the user prices should be, i.e, their social values, as a weighted average of the actual price and marginal costs. The weights reflected two major social concerns that worked in opposite directions. High actual prices would adversely affect those with low incomes. But, with a high premium on public income, any increase of revenues would make available valuable resources which could be invested and help the economy to grow. Cost recovery was seen to be a special case of this general framework; one where all the weights are equal to unity. In this situation, the social pricing rule was the traditional one of requiring that prices equal marginal costs.

The framework was then applied to state expenditures on economic services in India for 1987/88. The situation to be analysed was one where user prices were such that government subsidies amounted to around 15% of India's national income. M&R argued that these subsidies could only be justified if the states in the greatest need (in terms of incomes, literacy or mortality rates) were those who received the greatest subsidy. When they found that this was not the case, they effectively concluded that India's state user charges were "too low". However, what if M&R had found that the bulk of the subsidies did go to the most needy states? How then could one make an overall assessment, when efficiency and distribution objectives go in opposite directions? The answer is conceptually clear if one uses the modern cost-benefit methodology. Weights are required that state explicitly what is the trade-off among objectives. The general shadow pricing formula constructed around these weights was therefore well suited to help decide how adequate were the user prices in India.

There were 6 main types of economic services provided by the 14 main states in India. This meant that there were 84 projects to be given social prices. M&R's data was used to provide estimates of the actual prices and marginal costs. The weights were derived using S&T's project appraisal methods. These methods resulted in distribution weights for the poorest state that were 3 times larger than for the richest state; and had the value of public funds either 2.41 times or 5.60 times as valuable as that for the private sector. Weights also varied because alternative values were tried for the price elasticity of demand for government services.

The benchmark set of results, shown in table 1, assumed the cost recovery framework. User prices were to be judged high or low relative to a project's marginal costs. Because M&R used an adjusted series to measure capital costs, and we showed that this was equivalent to applying a shadow price of capital, it was really a shadow priced measure of the subsidy that M&R were using, and a shadow priced measure of marginal costs that appeared in this table. Table 1 revealed that for 6 projects there were overpricing and for 78 projects user prices were too low. The issue was whether with non-unity weights these results would be different.

When the price elasticity of demand was equal to 1, the shadow pricing formula gave social prices as a function only of marginal costs. The weighted marginal costs given in table 1, when divided by the income distributional parameters, produced the social prices presented in table 4. This table showed that the number of projects where there was overpricing increased to 18, leaving 66 projects underpriced.

When the price elasticity deviated from unity, the weight on actual prices had to be considered in conjunction with that on marginal costs. Four different sets of weights on the actual prices were examined. They corresponded to high and low values for the price elasticity of demand, and high and very high values for public income. The results did not always raise the number of projects where overpricing took place. In fact, for one set of weights (where the value of public income was high, and the price elasticity was low) even the benchmark set of results overestimated the extent of overpricing. For not one of the 84 projects was the actual price up to the social price.

At the other extreme, one set of weights produced 34 projects that were overpriced. The assumptions underlying this set are worth highlighting. The group that was presumed to be financing the project was exclusively the highest income state (Punjab). All states had a distribution weight that was based on their state income per capita inversely proportional to Punjab's income per capita. Thus, if a state's per capita income was a third of Punjab's, their distribution weight was three times that of Punjab. The price elasticity of demand was set equal to two and public income was valued over five times as much as private income. Nonetheless, even with all these assumptions working towards lowering the value of user prices in the social pricing equation, the conclusion still was that for 50 of the projects the actual user prices were too low. The application of the cost-benefit framework to India's state user pricing experience does therefore, on the whole, support the Rao and Mundle conjecture that it is hard to justify the limited use of user pricing for government services in India.

Two other conclusions can be made from simple extensions of the main methods used in this paper. (i) The distributional weights that have been employed in our analysis were based on income. Hicks and Streeten (1979) have argued that development depends on more basic indicators than income. As explained in Brent (1990, ch.12), basic needs indicators can also be used to derive distributional weights. Using exactly the same methodology as for the rest of the analysis, but replacing state per capita income levels with first state literacy rates and then state mortality rates, we constructed tables similar to table 5. However, the number of projects where one could justify the existing low levels of user prices did not alter by much. The number of projects that had overpricing (relative to that with income distribution weights) was exactly the same with literacy distribution weights, and 6 more (i.e, 40) with mortality distribution weights. The majority of projects were still underpriced.[12]

(ii) Our analysis dealt fully only with state expenditures on economic services. If it was difficult to justify the user prices charged on these services based on cost-benefit analysis, it would be almost impossible to justify the recovery rates on social services in India (which were on average one-tenth those for economic services). For example, if we take the social service for which the recovery rate was highest from all the states (i.e., water supply, sanitation and housing for Rajasthan) and apply the set of weights that give the lowest value for the required social price, the actual price was still only three-quarters of the social price. [13]

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NOTES

1. This conversion process is made explicit below in equations (13) - (17).

2. See, for example, equation (15-10) of Atkinson and Stiglitz (1980).

3. Strictly, as pointed out by Creese (1991, p 310), cost recovery is a policy instrument and not a policy objective. So the aim to set $S = 0$ is a means to an end, and not an end in itself.

4. Creese (1991, p 311) is one who identifies cost-recovery (full-cost pricing) with profit maximisation.

5. The constant of integration should also be included.

6. For marginal and average costs to coincide one is assuming that there are constant returns to scale.

7. The reason why it is correct to measure r in money rather than in real terms is that costs and prices should be in comparable units. The user prices of services are in current terms, and capital purchases in past years need to be adjusted by the inflation rate to produce capital costs in current values.

8. This follows because if $S' > 0$, then $K' > R'$. Since $B' = P*$ and $B' = R'$ from equation (11), this means $K' > R'$ implies $K' > P*$.

9. Of course, the fact that the World Bank does not explicitly use distribution weights does not imply that weights can be ignored. They will merely be using unit weights and, as explained in Brent (1990, pp 52-54), unit weight cannot be correct if administrative costs of using the tax-transfer system exist.

10. See S&T (1975, p 69).

11. These high values for θ are not unreasonable given the fact that, (a) most LDC's have a value around 3, and (b) India does have an overall subsidy that is large relative to its national income.

12. The distribution weights using literacy levels had a range that was lower than when using income. In the progressive regime, Kerala was the least needy and had the unity weight. Rajasthan was the most needy and had a weight of 2.8852. Mortality rate weight differences were much greater. Kerala again had the unity weight, but this time Uttar Pradesh had the highest weight of 4.8889. Recall that the range for the income distribution weights was 3.0785.

13. P is 10.62 and $\theta K' = 52.04$. With $\delta = 2.5557$ and $1 - \gamma_4 = -0.5956$, $P* = 52.04/2.5557 - 0.5956(10.62) = 14.03$, and so $P/P* = 0.7569$.

TABLE 1: ACTUAL PRICES AND MARGINAL COSTS FOR ECONOMIC SERVICES (Rs).

	Agriculture & Allied		Irrigation		Power & Energy		Industry & Minerals		Transport & Comm.		Other Economic	
State	P	$\theta K'$	P	$\theta K'$	P	$\theta K'$	P	$\theta K'$	P	$\theta K'$	P	$\theta K'$
Andhra Pradesh	11.53	100.31	17.17	79.84	17.91	24.42	5.62	14.15	1.97	17.38	14.88¶	2.36
Bihar	9.59	55.57	1.64	73.03	0.05	18.91	2.62	10.83	0.29	16.78	0.90	2.54
Gujarat	12.97	107.43	47.15	156.90	0.01	25.05	4.03	20.54	0.36	15.87	6.44	8.89
Haryana	9.47	87.54	43.90	166.92	54.04	95.34	0.87	9.05	81.71	116.93	8.02¶	8.00
Karnataka	23.00	82.30	28.75	110.53	23.27¶	22.33	6.84	26.08	0.18	25.93	6.32	6.48
Kerala	18.58	57.61	3.77	53.65	8.07¶	6.43	1.32	16.13	1.46	33.60	3.99	6.01
Madhya Pradesh	63.24	81.60	3.03	86.28	12.20	31.33	0.59	10.19	1.27	34.73	1.02	2.03
Maharashtra	72.07	128.26	37.31	95.08	19.37	32.85	1.10	11.37	0.87	14.87	0.92	1.44
Orissa	23.44	66.65	2.35	93.17	6.41	9.20	1.87	16.89	0.82	27.17	1.56	2.60
Punjab	7.95	70.14	21.54	119.05	8.09	141.00	2.46	17.58	36.05	73.93	4.50¶	4.21
Rajasthan	4.20	61.06	24.08	113.86	0.19	22.62	5.97	13.01	0.16	53.91	10.52¶	6.71
Tamil Nadu	17.86	98.91	8.38	28.10	0.00	71.62	3.96	17.09	1.98	23.90	0.83	23.78
Uttar Pradesh	9.84	55.31	17.36	67.43	0.01	21.79	7.57	9.19	0.63	22.14	1.47	2.19
West Bengal	8.37	59.96	4.52	35.07	0.68	12.20	1.98	12.41	0.83	24.91	0.74	3.07

¶means actual price is greater than social price

TABLE 2: INCOME DISTRIBUTION WEIGHTS (δ).

State	Per Capita Income: y_2	Average Financing $\delta = (2934/y_2)^\epsilon$ $\epsilon = 0.5$	$\epsilon = 1$	Progressive Financing $\delta = (5689/y_2)^\epsilon$ $\epsilon = 0.5$	$\epsilon = 1$
Andhra Pradesh	2691	1.0442	1.0903	1.4540	2.1141
Bihar	1848	1.2600	1.5877	1.7546	3.0785
Gujarat	3527	0.9121	0.8319	1.2700	1.6130
Haryana	4399	0.8167	0.6670	1.1372	1.2932
Karnataka	3301	0.9428	0.8888	1.3128	1.7234
Kerala	2913	1.0036	1.0072	1.3975	1.9530
Madhya Pradesh	2398	1.1061	1.2235	1.5403	2.3724
Mahara-shtra	4479	0.8094	0.6551	1.1270	1.2701
Orissa	2199	1.1551	1.3342	1.6084	2.5871
Punjab	5689	0.7181	0.5157	1.0000	1.0000
Rajasthan	2226	1.1481	1.3181	1.5987	2.5557
Tamil Nadu	3413	0.9272	0.8597	1.2911	1.6669
Uttar Pradesh	2354	1.1164	1.2464	1.5546	2.4167
West Bengal	3095	0.9736	0.9480	1.3558	1.8381

TABLE 3: VALUES FOR ω AND γ.

State	$\omega = \theta/\delta$		$\gamma = \omega + 1/\eta\,(1-\omega)$			
	$\theta = 2.41$	$\theta = 5.60$	$\eta = 0.50$ $\theta = 2.41$ γ_1	$\eta = 0.50$ $\theta = 5.60$ γ_2	$\eta = 2.00$ $\theta = 2.41$ γ_3	$\eta = 2.00$ $\theta = 5.60$ γ_4
Andhra Pradesh	1.1400	2.6489	0.8600	-0.6489	1.0700	1.8245
Bihar	0.7829	1.8191	1.2171	0.1809	0.8914	1.4096
Gujarat	1.4941	3.4718	0.5059	-1.4718	1.2471	2.2359
Haryana	1.8635	4.3302	0.1365	-2.3302	1.4318	2.6651
Karnataka	1.3984	3.2494	0.6016	-1.2494	1.1992	2.1247
Kerala	1.2340	2.8674	0.7660	-0.8674	1.1170	1.9337
Madhya Pradesh	1.0159	2.3605	0.9841	-0.3605	1.0079	1.6802
Maharashtra	1.8974	4.4089	0:1026	-2.4089	1.4487	2.7045
Orissa	0.9316	2.1646	1.0684	-0.1646	0.9658	1.5823
Punjab	2.4100	5.6000	-0.4100	-3.6000	1.7050	3.3000
Rajasthan	0.9430	2.1912	1.0570	-0.1912	0.9715	1.5956
Tamil Nadu	1.4458	3.3596	0.5542	-1.3596	1.2229	2.1798
Uttar Pradesh	0.9972	2.3172	1.0028	-0.3172	0.9986	1.6586
West Bengal	1.3111	3.0466	0.6889	-1.0466	1.1556	2.0233

TABLE 4: ACTUAL AND SOCIAL PRICES FOR ECONOMIC SERVICES (Rs) WITH $\eta = 1$.

$$P* = \omega K' = (\theta K')/\delta$$

	Agriculture & Allied		Irrigation		Power & Energy		Industry & Minerals		Transport & Comm.		Other Economic	
State	P	P_*	P	P_*	P	P_*	P	P_*	P	P_*	P	P_*
Andhra Pradesh	11.53	47.45	17.17	37.77	17.91¶	11.55	5.62	6.69	1.97	8.22	14.88¶	1.17
Bihar	9.59	18.05	1.64	23.72	0.05	6.14	2.62	3.52	0.29	5.45	0.90¶	0.83
Gujarat	12.97	66.60	47.15	97.27	0.01	15.53	4.03	12.73	0.36	9.84	6.44¶	5.51
Haryana	9.47	67.69	43.90	129.07	54.04	73.72	0.87	7.00	81.71	90.42	8.02¶	6.19
Karnataka	23.00	47.75	28.75	64.13	23.27¶	12.96	6.84	15.13	0.18	15.05	6.32¶	3.76
Kerala	18.58	29.50	3.77	27.47	8.07¶	3.29	1.32	8.26	1.46	17.20	3.99¶	3.08
Madhya Pradesh	63.24¶	34.40	3.03	36.37	12.20	13.21	0.59	4.30	1.27	14.64	1.02¶	0.86
Maharashtra	72.07	100.98	37.31	74.86	19.37	25.86	1.10	8.95	0.87	11.71	0.92	1.13
Orissa	23.44	25.76	2.35	36.01	6.41¶	3.56	1.87	6.53	0.82	10.50	1.56¶	1.00
Punjab	7.95	70.14	21.54	119.05	8.09	141.00	2.46	17.58	36.05	73.93	4.50¶	4.21
Rajasthan	4.20	23.89	24.08	44.55	0.19	8.85	5.97¶	5.09	0.16	21.09	10.52¶	2.63
Tamil Nadu	17.86	59.34	8.38	16.86	0.00	42.97	3.96	10.25	1.98	14.34	0.83	14.26
Uttar Pradesh	9.84	22.89	17.36	27.90	0.01	9.02	7.57¶	3.80	0.63	9.16	1.47¶	0.91
West Bengal	8.37	32.62	4.52	19.08	0.68	6.64	1.98	6.75	0.83	13.55	0.74	1.67

¶ **means actual price is greater than social price**

TABLE 5: ACTUAL AND SOCIAL PRICES FOR ECONOMIC SERVICES (Rs) FOR γ_4.

$$P* = \omega K' + (1 - \gamma)P$$

	Agriculture & Allied		Irrigation		Power & Energy		Industry & Minerals		Transport & Comm.		Other Economic	
State	P	$P*$	P	$P*$	P	$P*$	P	$P*$	P	$P*$	P	$P*$
Andhra Pradesh	11.53	37.94	17.17	23.61	17.91¶	-3.21	5.62¶	2.06	1.97	6.60	14.88¶	-11.10
Bihar	9.59	14.12	1.64	23.05	0.05	6.12	2.62¶	2.45	0.29	5.33	0.90¶	0.46
Gujarat	12.97	50.57	47.15¶	39.00	0.01	15.52	4.03	7.76	0.36	9.40	6.44¶	-2.45
Haryana	9.47	51.92	43.90	55.97	54.04¶	-16.26	0.87	5.55	81.71¶	-45.64	8.02¶	-7.16
Karnataka	23.00¶	21.88	28.75	31.80	23.27¶	13.21	6.84	7.44	0.18	14.84	6.32¶	-3.35
Kerala	18.58¶	12.15	3.77	23.95	8.07¶	-4.24	1.32	7.03	1.46	15.84	3.99¶	-0.65
Madhya Pradesh	63.24¶	-8.62	3.03	34.31	12.20¶	4.91	0.59	3.90	1.27	13.78	1.02¶	0.16
Maharashtra	72.07¶	-21.86	37.31¶	11.26	19.37¶	-7.15	1.10	7.08	0.87	10.23	0.92¶	-0.43
Orissa	23.44¶	12.11	2.35	34.64	6.41¶	-0.18	1.87	5.44	0.82	10.03	1.56¶	0.10
Punjab	7.95	51.86	21.54	69.51	8.09	122.39	2.46	11.92	36.05¶	-8.98	4.50¶	-6.14
Rajasthan	4.20	21.39	24.08	30.21	0.19	8.74	5.97¶	1.53	0.16	20.99	10.52¶	-3.64
Tamil Nadu	17.86	38.27	8.38¶	6.97	0.00	42.97	3.96	5.58	1.98	12.00	0.83	13.28
Uttar Pradesh	9.84	16.41	17.36¶	16.47	0.01	9.01	7.57¶	-1.19	0.63	-8.75	1.47¶	-0.06
West Bengal	8.37	24.06	4.52	14.45	0.68	5.94	1.98	4.72	0.83	12.70	0.74	0.91

¶ means actual price is greater than social price

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