U.S. copyright law (title 17 of U.S. code) governs the reproduction and redistribution of copyrighted material.
COST-BENEFIT ANALYSIS, USER PRICES, AND STATE EXPENDITURES IN INDIA*

ROBERT J. BRENT
Department of Economics, Fordham University, Bronx, NY, USA

This paper provides a general cost-benefit framework for evaluating the size of user prices associated with public expenditures. From this perspective, a country’s fiscal deficit can be judged “too high” if its level of user fees is considered “too low”. The optimal user charge is a weighted average of actual user prices and marginal costs. The framework is applied to state expenditures in India for 1987–88. For plausible parameter values, reflecting distributional concerns and the shadow price of public income, the services are on the whole underpriced.

I. INTRODUCTION

- 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

*This paper was written while the author was a visiting fellow at the National Institute of Public Finance and Policy in New Delhi (NIPFP). I wish to thank a number of associates at NIPFP, especially K.N. Reddy and R.J. Chelliah, for providing background help and encouragement for my research and generally assisting me with my stay in India. Funds for the research were part of the Ford Foundation project on Health Care Financing in India. Versions of this paper were presented to the Public Economics Division of the World Bank and at the 1994 national ASSA meetings in Boston. Helpful comments and suggestions were received from a number of participants at these seminars. I alone am responsible for any interpretations and errors.
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.

In this paper we will recast the basic cost-benefit criterion, which was defined in terms of quantity changes, so that it can deal with judgments as to the adequacy, or otherwise, of user prices. The resulting criterion expresses what the user prices should be, i.e., their social values, as a weighted average of the actual price and marginal costs. The weights reflect two major social concerns that work in opposite directions. High actual prices adversely affect those with low incomes. But, with a high premium on public income, any increase in revenues would make available valuable resources which could be invested and help the economy to grow.

The framework will then be applied to state expenditures on economic services in India for 1987/88. The situation to be analysed is one where user prices implied government subsidies amounting to as much as 15% of India’s national income. A comprehensive examination of user prices related to central and state government expenditures in India has recently been carried out by Mundie and Rao (1991, 1992) - hereafter M&R. They 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. The application to Indian data might provide a useful example for people who wish to apply this approach elsewhere. In particular, we supply a framework that can be used to help decide when a country’s fiscal deficit can be judged “too high” (because its user prices are “too low”).

II. THE THEORETICAL FRAMEWORK

The model that is developed here extends the cost-benefit framework developed in a number of papers by the author (cited below), and pieces together elements existing in the literature, especially by Squire and van der Tak (1975) - hereafter S&T - and Kirkpatrick (1979).

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). Thus the subscript can be suppressed 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 C, both measured in monetary terms. The social value per unit of these benefits and costs define the weights. The weights depend on which sector is involved (private or public) and which income group is affected (low or high). It will be assumed that the benefits go to the private sector where monetary units have a sector weighting aB; while the costs are incurred by the public sector with a sector weighting of aC. In addition, one can (for now) view the group that benefits from the monetary units in the private sector to be low income. The costs that are incurred by the public sector units are associated with a high income group. If a2 is the weight to the low income group, and a1 is the weight to the high income group, then the relative income distributional weight \( \delta = a_2/a_1 \) can be attached to the sector benefits. Welfare can then be written as:

\[
W = a_B \delta (B - a_C C).
\]

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:

\[
W = a_B \delta (B - R) - a_C (C - R).
\]

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

\[
W^* \equiv \frac{W}{a_B \delta} = B - R - \omega (C - R)
\]

1 This conversion process is made explicit in equations (11) - (15) in the appendix.
where $\omega$ is the combined weight $\theta/\delta$ ($\theta$ is the social cost of public sector funds or $ac/ab$).

Repayments can be defined as $PQ$, where $P$ is the actual price charged, i.e., the user charge. Eq. (3) can therefore be expressed as a function of the user price. However, recognizing 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 eq. (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. The first-order condition for maximizing $W*$ is:

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

$B$ 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 eq. (4) results in:

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

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 $\eta$ the price elasticity of demand, eq. (5) can be restated in terms of the difference between the social and actual price:

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

It is important to see how our pricing rule differs from that existing in the Ramsey-pricing literature. For convenience we can define $\omega + \frac{1}{\eta} (1 - \omega) = \gamma$. $\gamma$ is the composite parameter that combines the distribution and sector weights with the price elasticity of demand. Using this definition, we can transform eq. (6) into:

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

2 There is a cost recovery literature [see for example, Thobani (1984), Jimenez (1987), and Katz (1987)] that can be interpreted to be working with a special version of eq. (4). Define a subsidy $S = K - R$. If this subsidy is fixed, this requires $S' = 0$, or $K' = R'$. This seems to imply profit maximization, as pointed out by Creese (1991, p. 311). But, this ignores the first bracketed term in eq. (2). When the condition $K' = R'$ is inserted into equation (4), it leads to $B' = R'$. The result then is the familiar first-best efficiency condition $P* = K'$ (seeing that $B' = P*$). Effectively then, the cost recovery literature is operating without the distribution weight term $\omega$ (i.e., $\omega$ is set equal to 1).

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

$$\hat{P} = \frac{\omega}{\gamma} C'. \tag{8}$$

Note that eq. (8) converts simply into the standard form of the Ramsey pricing rule:

$$\frac{\hat{P} - C'}{C'} = \frac{\omega}{\gamma} - 1. \tag{9}$$

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 eq. (8) can be viewed as the special case of (7) when no externalities exist. More generally, we would expect that $P$ would be on the market demand curve, which is different from the $P*$ that is on the social demand curve. Alternatively, one can think of a multi-governmental situation, whereby a local public agency is setting a price $P$ that is different from the central government price $P*$ that is socially optimal. One is therefore comparing two different points on the same social demand curve.

II. CBA AND STATE EXPENDITURES IN INDIA

In this section we first explain how M&R's data can be used to obtain estimates of the two key variables $P$ and $C'$ that appear in our social pricing eq. (7). Expenditure by a state on a particular category of good or service (leading to a pair of values for $P$ and $C'$) will define a "project" in our analysis. Then we identify which parts of the M&R data are most useful to illustrate the workings of the general CBA framework developed in this paper. Thereafter, we discuss how the remaining components of eq. (7) (i.e., the social weights $\omega$ and $\gamma$) can be calculated for India and present the results of comparing actual with social prices.

II. A. Making the Model Operational

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 (share of user fees in total costs) 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 at the end indicate briefly some of the implications that would follow if the analysis were also applied to social services.

The key concept in the M&R studies of user pricing in India 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 $C$. The subsidy was measured in total and per capita terms. The per capita subsidy $S/N$ (denoted by $S’$) 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 $C/N - R/N$. M&R supplied information on both these components of the subsidy per person. If we assume constant returns to scale, then the marginal and average costs coincide, and the first component $C/N$ denotes $C’$. $R$ 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 $C’$ variables that appear in the theoretical framework outlined in section I. Although $P$ and $C’$ will be the variables used in our analysis, we will also refer to M&R’s “recovery rate” $R/C$. With $P$ equal to $R/N$, and $C’$ equal to $C/N$, the recovery rate indicates the relative size of the two variables $P$ and $C’$ that need to be compared in our analysis, i.e., $R/C = (R/N)/(C/N) = P/C’$.

To conclude: what is being envisaged is a situation where the central government is providing funds for projects in states which differ in their level of social need and thus in the size of justifiable subsidies. There are 14 main states in India. Their names are listed in 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 (i.e., 6 x 14) state goods and services, or “projects”, to be priced in our study. We make the assumption that each rupee of per-capita state expenditure provides an equal unit of output of service to recipients.

The main conceptual issue to be resolved is how to interpret the M&R (1991, pp. 7-10) measure of total costs $C$. In the appendix, we present a method for converting a stock criterion into its flow equivalent. It should be noted that, Using this method

<table>
<thead>
<tr>
<th>State</th>
<th>$\delta = y_i/y_f$</th>
<th>$\omega = \theta/\delta$</th>
<th>$\gamma = \omega + 1/\eta(1 - \omega)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>2.1141</td>
<td>2.6489</td>
<td>1.8245</td>
</tr>
<tr>
<td>Bihar</td>
<td>3.0785</td>
<td>1.8191</td>
<td>1.4096</td>
</tr>
<tr>
<td>Gujarat</td>
<td>1.6130</td>
<td>3.4718</td>
<td>2.2359</td>
</tr>
<tr>
<td>Haryana</td>
<td>1.2932</td>
<td>4.3302</td>
<td>2.6651</td>
</tr>
<tr>
<td>Karnataka</td>
<td>1.7234</td>
<td>3.2494</td>
<td>2.1247</td>
</tr>
<tr>
<td>Kerala</td>
<td>1.9530</td>
<td>2.8674</td>
<td>1.9337</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>2.3724</td>
<td>2.3605</td>
<td>1.6802</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>1.2701</td>
<td>4.4089</td>
<td>2.7045</td>
</tr>
<tr>
<td>Orissa</td>
<td>2.5871</td>
<td>2.1646</td>
<td>1.5823</td>
</tr>
<tr>
<td>Punjab</td>
<td>1.0000</td>
<td>5.6000</td>
<td>3.3000</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>2.5557</td>
<td>2.1912</td>
<td>1.5956</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>1.6669</td>
<td>3.3596</td>
<td>2.1798</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>2.4167</td>
<td>2.3172</td>
<td>1.6586</td>
</tr>
<tr>
<td>West Bengal</td>
<td>1.8381</td>
<td>3.0466</td>
<td>2.0233</td>
</tr>
</tbody>
</table>

we can show that M&R have measured $\theta C$ and not just $C$. This implies that their concept of a subsidy is really a shadow price measure. That is, they are valuing capital with the shadow price of capital $\theta$. This means that M&R are using $S = \theta C - P$ rather than $S = C - P$. 

COST-BENEFIT ANALYSIS, USER PRICES, EXPENDITURES: INDIA
II. B. Estimating the Value Parameters

Apart from M&R's data on \( P \) and \( C' \), we also need information on the weights \( \omega \) and \( \gamma \). Details of the estimation are available elsewhere.\(^4\) Here we briefly indicate the methods used to provide the estimates and list the specific values obtained (summarized in Table 1). The objective is to see whether the low actual user prices could be justified by a CBA, we will choose parameter values that produce low social prices, thereby making it more likely that the actual prices would appear to be optimal if it were plausible to do so. Consequently, we will be basically working with lower bound values for \( \omega \) and \( \gamma \).

Since \( \omega C' = \theta C'/\delta \), and we recognize that M&R's cost data automatically scale \( C' \) up by \( \theta \), all we need for \( \omega \) is a value for \( \delta \). The distributional weight \( \delta \) is defined as the relative weight of group 2 to group 1, i.e., \( a_2/a_1 \). In terms of the theoretical model developed earlier, group 2 is the state providing the funds for the central government, and group 1 is now the particular state receiving the funds. As there are 14 recipient states in our application, we rewrite the relative weights as \( a_j/a_1 \) (where \( j \) runs from 1 to 14).

Based on Squire and van der Tak (1975), but using income to replace consumption as the base, a state's relative weight will be inversely proportional to its per capita income relative to the state providing the finance:

\[
\frac{a_j}{a_1} = \frac{y_1}{y_j}.
\]

(10)

Upper bound values for \( \delta \) (i.e., lower bound estimates for \( \omega \)) are obtained by assuming that the financing state 1 in this formula is specified as the richest state.

As shown in Table 1, Bihar is the poorest state with the highest weight and Punjab is the richest with the lowest weight. The range of values for \( \delta \) is between 1.0000 and 3.0785. Harberger (1978), and other traditional cost-benefit analysts, are against using non-unitary weights. They consider that a formula such as eq. (10) can give such large differences in weights that almost any redistributional policy would appear socially desirable. However, the fact that a rupee to a person in the poorer states has a weight only 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 aversion to inequality parameter with a value equal to unity, the highest value that is thought plausible).

In section I, we defined the relation: \( \gamma = \omega + 1/\eta (1 - \omega) \). The two key parameters are \( \omega \) and \( \eta \) and we will discuss them in turn. (i) Although we have just dealt with \( \omega = \theta /\delta \), and determined \( \delta \), we have not yet established the value of \( \theta \) separately, and therefore do not know what \( \omega \) is on its own. In the simplest of the S&T models, \( \theta \) is given by the ratio of the marginal product of public capital \( q \) to the social discount rate \( i \).\(^5\) This is shown as eq. (13) in the appendix. As we argue there that M&R's work implies using the full interest rate \( r \) to measure \( q \) and they estimate this to be 16.4%, this implies that 16.4% is the marginal product of public capital. The social discount rate was based on the consumption rate of interest (CRI). S&T measure the CRI by adding an estimate of the "pure rate of time preference" \( \rho \) to the per capita growth rate \( g \). For India, Brent (1993a) records that for the 25 year period 1965-1989, \( g \) was 1.80%. He uses the rate of change in life expectancies (1.1%) to estimate \( \rho \). Combining these values, we get \( i = 2.93% \). This produces \( \theta = 5.60 \).\(^6\) Dividing the \( \delta \) values in Table 2 by 5.60 leads to \( \omega \) values shown in column three of Table 2.

(ii) The second main component of \( \gamma \) that we need to estimate is \( \eta \), 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 \( \eta \) and make estimates of \( \gamma \) 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 consider values for \( \eta \) equal to 0.5, 1, and 2.0. Again choosing the estimate that produces the lowest value for \( P^* \) helps us select \( \eta = 2.0 \). We will though, for reference, also mention the \( \eta = 1 \) case.

The final column in Table 1 shows the resulting \( \gamma \) values. We can see that all of the states have \( 1 - \gamma \) as negative. This lowers their social prices to below marginal costs.

II. C. The Results: A Comparison of Actual and Social Prices

Table 2 presents the values of \( P \) and \( \theta, C' \) for the 84 projects.\(^7\) The purpose of the table is to highlight the extent to which user prices were not used to cover costs in India. It 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

---

\(^4\) See Brent (1993b) for details. Brent (1990) explains and develops the S&T methodology that underlies much of the estimation process that is being extended in this paper.


\(^6\) These high values for \( \theta \) 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.

\(^7\) The information in table 2 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 \( R/K \), which is also the per capita recovery rate \( R'/K' \). The reciprocal of this is \( K'/S' \). Multiplying \( K'/S' \) by the per capita subsidy \( S' \) gives \( R/K \) 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 the "other economic services" category 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>
<thead>
<tr>
<th>State</th>
<th>Agriculture &amp; Allied</th>
<th>Power, Energy, &amp; Minerals</th>
<th>Transport &amp; Comm.</th>
<th>Other</th>
<th>Economic</th>
<th>$P_a - \epsilon R$s</th>
<th>$P_a - \epsilon R$s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra</td>
<td>11.53</td>
<td>100.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pradesh</td>
<td>9.59</td>
<td>55.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bihar</td>
<td>9.59</td>
<td>55.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gujrat</td>
<td>12.07</td>
<td>107.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>22.04</td>
<td>128.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madhya</td>
<td>63.24</td>
<td>81.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Bengal</td>
<td>8.37</td>
<td>59.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 3**

Actual and Social Prices for Economic Services (Rs)

<table>
<thead>
<tr>
<th>State</th>
<th>Agriculture &amp; Allied</th>
<th>Power, Energy, &amp; Minerals</th>
<th>Transport &amp; Comm.</th>
<th>Other</th>
<th>Economic</th>
<th>$P_a - \epsilon R$s</th>
<th>$P_a - \epsilon R$s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra</td>
<td>11.53</td>
<td>37.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pradesh</td>
<td>9.59</td>
<td>14.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bihar</td>
<td>9.59</td>
<td>14.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gujrat</td>
<td>12.07</td>
<td>50.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>22.04</td>
<td>39.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madhya</td>
<td>63.24</td>
<td>33.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Bengal</td>
<td>8.37</td>
<td>59.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
the costs. From an efficiency point of view, 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.

Table 3 takes the actual prices \( P \) that are shown in Table 2 and compares them with the social prices as set out in eq. (7), using the weights from Table 2. The number of projects where overpricing takes place is 34 (each indicated with the \( \checkmark \) symbol). Every one of the 6 types of project has at least one state where there is overpricing. Only in West Bengal is there no instance where the actual price matches the social price. Nonetheless, the number of projects where there is underpricing is 50. Incidentally, if a value of \( \eta = 1 \) were chosen, \( \gamma = 1 \). Hence, \( 1 - \gamma = 0 \) and eq. (7) simplifies to \( P^* = \omega C'' \). In this case, the number of cases where the actual prices would be below the social prices would be 66.

Finally, given the significance of the aggregate size of the subsidies in India, it is useful to compare the overall recovery rate with shadow pricing relative to the M&R recovery rate. Recall that M&R found that the average recovery rate for economic services was 24.64% (derived from the data in Table 2). On the basis of a weighted average of the ratios of actual to social prices in Table 3, the adjusted recovery rate would have been 94.22%. Thus, when we allow for the magnitudes (and not just the number) of departures from social user pricing, we still reach the conclusion that actual user charges are too low. 8

III. SUMMARY AND CONCLUSIONS

This paper provided 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. The derived theoretical framework was 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.

In the absence of a complete CBA criterion, one could judge user prices high or low relative to a project's marginal costs. Table 2 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 the results would be different.

With distribution and sectoral weighting, we found that 34 of the 84 projects were overpriced. The underlying assumptions 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 was that for 50 of the 84 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 3. 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. 9

(ii) Our analysis dealt fully only with state expenditures on economic services. If it were 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 derived above, the actual price was still only three-quarters of the social price. 10

---

8 I thank Shantayanan Devarajan for suggesting I make this aggregate comparison.
9 The distribution weights using literacy levels had a range that was lower than when using income. 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.
10 The calculation works as follows. \( P = 10.62 \) and \( \theta = 52.04 \). With \( \delta = 2.5557 \) and \( 1 - \gamma = -0.5956 \), \( P^* = 52.04/2.5557 - 0.5956/(10.62) = 14.03 \), and so \( P/P^* = 0.7569 \).
APPENDIX

Here we explain why it is that the M&R measure of total cost C is really the shadow price expression $\theta \cdot C$. M&R define total costs as the sum of operating costs (what they call "variable 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%. 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, $C_0$, by the full interest cost involved with using the capital in that year, $r$, to form $r \cdot C_0$. 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 $C_0$ (with a shadow price $\theta$) 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:

$$W_0 = \sum_{t=0}^{T} \frac{B_t}{(1 + r)^t} - \theta \cdot C_0.$$  

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:

$$W_0 = \frac{B}{r} - \theta \cdot C_0.$$  

In the Squire and van der Tak (1975) framework, the shadow price of public capital is given by the ratio of the marginal product of public capital $q$ divided by the social discount rate $i$:

$$\theta = \frac{q}{i}.$$  

Substituting for $\theta$ in eq. (14) produces:

$$W_0 = \frac{B}{r} - \frac{q}{i} \cdot C_0.$$  

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.

COST-BENEFIT ANALYSIS, USER PRICES, EXPENDITURES: INDIA 341

Define $i \cdot W_0$ 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:

$$W = i \cdot W_0 = B - q \cdot C_0.$$  

Focus on the capital cost term $q \cdot C_0$ in eq. (17). If the correct way of converting a capital stock $C_0$ 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. Substituting $q = r$ in eq. (15), we see that $\theta$ now equals $r / i$. This implies that they are using $r$ as the annualized cost of capital. Consequently, what they list as capital expenditures (or $r \cdot C_0$) is really $\theta \cdot C_0$.

This follows because $r \cdot C_0 = \frac{r}{i} \cdot C_0$ and $i \cdot C_0 = C$.

REFERENCES


Brent, R.J. (1990), Project Appraisal for Developing Countries, New York University Press. (Also published in the UK by Harvester-Wheatsheaf Books).


Kirkpatrick, (1979), "Distributional Objectives and the Optimum Level of Road User Charges in Developing Countries: Some Results for Kenya", Manchester School of Economics and Social Studies, Vol. 47.


Squire, L. and H.G. van der Tak (1975), Economic Analysis of Projects (Baltimore: Johns Hopkins).