

# VALUING TIME SAVINGS IN DEVELOPING COUNTRIES

## *A Comment*

By Anthony Barrington\*

In a recent article in this Journal, Howe [3] argues that there is little evidence to support the use of a cost-savings approach to the valuation of time savings in cost-benefit studies of transport projects in developing countries. He proposes instead the willingness-to-pay criterion, on grounds that it is amenable to measurement and "represents a clear market test of the preferences and valuations of society". He suggests that the inequities in investment patterns implied by using different values for different income groups' time savings are similar to those inherent in the cost savings approach, and that in any event the time savings values obtained from willingness-to-pay studies can be "adjusted" to reflect government policy.

Howe's strongest point is that, on the basis of evidence from developed economies, time savings benefits are frequently *presumed* to result from transport investments without adequate empirical verification, whereas the nature of transport systems in developing economies makes such presumptions questionable. However, this author believes that Howe seriously underestimates the complexities of correctly interpreting the results of willingness-to-pay studies. He also presents a confusing picture of how the potentially very significant category of commercial vehicle time savings should be measured.

As to the objectives which should underlie cost-benefit studies in developing countries and the sensitivity of transport feasibility studies to time savings benefits, there can be little disagreement with Howe. He refers to the potential for reaching distorted conclusions about desirable investment patterns, and it can be assumed that he means both between transport and non-transport projects and within the transport sector itself. This author found [5] for example, in a sensitivity analysis of eight urban fringe segments of intercity highways in Egypt, that if a value of approximately one-third of average earnings were used for all *person* time savings, rates of return were between 15 and 42 per cent higher than if person time savings were assumed to have no value.<sup>1</sup> Howe is also correct in drawing attention to the lack of useful guidelines provided by the international lending agencies.

### THE VALUE OF TIME AND ECONOMIC DISTORTIONS

Howe assumes that the problem is to obtain indigenous estimates of what different transport system users are willing to pay for time savings — which is not technically

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<sup>1</sup>This is an illustration, and should not be interpreted as an endorsement of the percentage used.

difficult—and in doing so he glosses over some very important economic facts of life.

It is widely agreed that in developing economies many of the important market prices—including wages, the cost of capital and the foreign exchange rate—are seriously distorted and therefore provide an imperfect basis for measuring social costs and benefits in investment project evaluations. In the transport sector there is also the factor of relatively high indirect taxation, much of it corrective, on vehicles and other inputs.

The elaborate, but pragmatic, “accounting price” scheme proposed by Little and Mirrlees [4] is one response to this problem. The essence of the Little-Mirrlees scheme is that border prices, as the only set of relative prices which are reasonably free of distortion, should be used directly and indirectly as a basis for a set of accounting prices for all inputs and outputs affected by an investment project. Traded and tradable goods are valued at their border prices directly. Nontraded goods are disaggregated into their constituent inputs, which in turn are valued at border prices as practicably as possible. The cost of labour is valued at its marginal product, which is ideally estimated on a sector by sector basis and divided into tradable and non-tradable components. Project benefits are expressed in terms of a common numeraire; uncommitted government income measured in foreign exchange.

It is not necessary to be fully committed to a system of accounting prices, or to agree with the Little-Mirrlees numeraire, in order to appreciate that time savings benefits estimated on the basis of willingness to pay present some peculiar problems if they are to be converted into real costs and benefits. Time values derived from willingness-to-pay studies, based as they are on individuals' perceptions of the value of time in relation to market wage rates and other prices, will frequently contain serious distortions.

Time saved in the movement of vehicles and goods presents the least difficulty. If vehicle operators and shippers indicate a willingness to pay equal to some fraction of the relevant market price, it is probably not unrealistic to apply this fraction to an accounting price computed in terms of foreign exchange or some other realistic numeraire of social cost.<sup>2</sup> As vehicles and most goods moved by the transport system are traded or tradable, estimates of accounting prices can be based directly on c.i.f. and f.o.b. prices.

Person time saved during working hours presents a greater problem because of the need, for each of the sectors in which working time is expected to be saved, (a) to determine whether the marginal product of labour is significantly different from the wage rate and (b) to convert the marginal product of labour into accounting prices which are commensurate with those for traded goods.<sup>3</sup> In practice, it may be possible to use a single factor to convert wage costs into accounting prices for a number of sectors, but the reasonableness of doing so must be verified.<sup>4</sup>

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<sup>2</sup>This presumes that vehicle operators are aware of the technical relationships involved; see below.

<sup>3</sup>Even if wage rates approximate marginal productivity, the social value of the output may have to be adjusted for distortions in the foreign exchange rate.

<sup>4</sup>Little and Mirrlees point out that the evaluator himself cannot usually estimate all accounting prices relevant to a particular project evaluation in the absence of an overall framework.

Non-working time saved is an anomaly. Only by circuitous reasoning can it be given a value in terms of a numeraire measuring real resource costs. If it can be established, for example, that there is an interdependence between time spent in commuting and workers' productivity (which there may well be), it is then possible to proceed with a series of calculations similar to those required to arrive at an estimate of the value of working time savings. Short of this, and more realistically, non-work time savings can be treated as a bonus produced by certain types of transport projects: these savings do have the advantage of being neutral with respect to private consumption, savings and other variables which the government may seek to influence by its investment policies. The virtue of willingness-to-pay estimates in relation to non-work time savings would be, as Howe suggests, to provide the government with guidance on values perceived by different income groups. However, this appears to be the one type of time savings benefit where the "preferences and valuations of society" can be used as a basis for a policy decision without a detailed technical analysis of the real resource implications. The problem presented to policy makers is whether to choose projects which produce an economically neutral consumer benefit rather than projects which may have direct or indirect impact on foreign exchange.<sup>5</sup>

Thus the weakness in Howe's argument is simply that, if time savings benefits are to be made commensurate with other types of benefits produced by transport and non-transport projects, a considerable amount of additional analysis must be undertaken.

#### VEHICLE TIME SAVINGS

Howe raises two points in relation to commercial vehicle time savings. He is sceptical of the common assumption that time savings will be translated into a reduction in the size of the commercial vehicle fleet; individual ownership of vehicles is seen to be a constraint. He also says that the literature presents a confusing picture of which items should be included in benefit estimates.

Cost-benefit studies are usually made for a time period over which considerable growth in the volume of travel can be expected to take place; the concept of a short-run reduction in the fleet size, the feasibility of which Howe questions, is not particularly relevant. Of far greater importance is the rate of growth in the vehicle stock, with and without the project being analysed, relative to the growth in the volume of travel. The issue is thus one of capital productivity over the long run.

In determining whether there is a benefit, the critical factor is simply whether the time saved is sufficient to permit the commercial vehicles whose operations are affected by the project to make an additional daily trip or trips, given both the actual running time on the additional trip(s) and the terminal time.<sup>6</sup> If the threshold of an additional trip cannot be reached, the economic value of the time savings is questionable. If trip potential is increased, it is probable that over the long run there will be an adjustment in the stock of vehicles relative to total mileage

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<sup>5</sup>The choice may be less extreme if the comparison is between a transport project which produces a non-working time savings benefit and, for example, a housing project.

<sup>6</sup>In most cases it is appropriate to assume that parameters such as the ratio of running time to daily in-service time and the amount of daily in-service time will remain constant.

produced. In the author's experience good information about commercial vehicle fleet operations can be obtained from interviews with fleet operators. Data on operating practices of owner-operators can most efficiently be obtained as part of other essential transport surveys.

The vehicle savings component of a reduction in fleet size can be measured, as Beesley and Reynolds [1] and others have suggested, by calculating the number of "vehicle equivalents" saved in each vehicle class. A practical way of doing this is to divide the replacement cost (in accounting prices) of vehicles by the lifetime number of *running* hours of vehicles (given the lifetime mileage and speed conditions which would prevail *without* the project) to compute a capital cost per hour of service.<sup>7</sup> This cost can then be multiplied by the *usable* running hour savings by the vehicle class in question to compute a benefit figure. A fleet reduction benefit will normally represent a direct saving in foreign exchange.

A reduction in fleet size also permits a reduction in the number of drivers, helpers, maintenance workers and possibly overhead staff. These reductions would normally be regarded as a benefit in a developed economy. However, there is a real question whether employment reductions constitute a "benefit" in most developing countries. Of particular importance is the fact that, as the fleet size "reduction" is likely to take the form of a slower rate of growth over time, rather than a net reduction in the short run, the employment impact may be in the form of jobs *not* created rather than actual employment losses. A policy decision appears to be the only basis on which this type of question can be resolved.

There is another potential benefit from a fleet size reduction. The "remaining" vehicles will, by definition, have to produce a higher annual mileage per vehicle. The assumption made about the relationship between annual mileage and lifetime mileage will determine whether depreciation per vehicle mile travelled will increase, decrease or remain the same.<sup>8</sup> DeWeille [2] suggests that a higher annual mileage per vehicle results in a less than proportionate increase in lifetime mileage, causing depreciation per lifetime vehicle mile travelled to decrease as vehicles are used more intensively. On this assumption, a side effect of a reduction in fleet size is to cause depreciation cost per mile travelled by the remaining fleet to decline. This is the one respect in which the rate of depreciation *per se* enters into the measurement of benefits from vehicle time savings.

DeWeille [2] has analysed the implications of alternatives to the assumption that an increase in annual mileage results in a less than proportionate increase in lifetime mileage. He finds that it is possible to use a fairly wide range of assumptions about the relationship between annual mileage and lifetime mileage without significantly affecting the rate of depreciation per mile travelled, except when operating speeds are very low. In the absence of empirical studies specifically designed to measure the factors determining vehicle depreciation in developing countries, it is necessary to take a cautious view of this source of benefit. However, the type of analysis required is quite distinct from the willingness-to-pay studies advocated by Howe.

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<sup>7</sup>In addition to the factors noted in footnote 6, an estimate of life-time running hours requires that out-of-service time, which varies with vehicle age, should also be considered.

<sup>8</sup>This discussion assumes that all depreciation is allocated to mileage.

## INTERNATIONAL LENDING AGENCIES

Howe points to the dearth of guidelines by the international lending agencies on how time savings benefits should be handled in evaluations of transport projects. This has been corrected somewhat in a recent policy paper published by the World Bank [6]. The Bank distinguishes between the time values which should be used in behavioural studies underlying the design of projects (values based on the actual income of travellers) and those which should be used ("shadow prices") in assessing the benefits of a project or in the choice between alternative new investments. The Bank, however, does not provide any guidelines on the techniques which should be used to make the necessary shadow price adjustments.

The international lending agencies could do a lot more in providing guidelines on how to make the necessary adjustments to market prices, and in promoting research in important areas such as vehicle depreciation rates under different operating conditions.

## CONCLUDING COMMENTS

In falling back on a willingness-to-pay approach Howe is unfortunately side-stepping some fundamental problems, while offering what is at first glance an appealing solution. The main problems are: (a) the real social cost of employing labour in a developing economy and thus the real social benefit of savings in working time, (b) the economic implications of investment policies which will bestow a perhaps well deserved benefit on consumers in the form of non-work travel time savings, but which may have high opportunity costs in terms of more significant consumer benefits, or in terms of export-producing/import-saving or job-creating investment projects, and (c) the technical problems of measuring the potentially very important (because of the foreign exchange implications) category of commercial vehicle time savings.

*A Rejoinder*

By J. D. G. F. Howe\*

The comments by Barrington are to be welcomed because they stimulate debate on an important subject that has hitherto received surprisingly little discussion. He raises two main objections to the arguments developed in my paper: firstly that I seriously underestimate "the complexities of correctly interpreting the results of willingness-to-pay studies"; and secondly that I present "a confusing picture of how the potentially very significant category of commercial vehicle time savings should be measured".

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It is important to make clear that the purpose of my original article was to examine "the arguments and evidence for and against the different valuations in use" and not to advocate a particular method of evaluation. (Whether I should have done so or not is another issue.) The suggestion I made that the willingness-to-pay criterion *possibly* merited more serious consideration than it has hitherto received arose from dissatisfaction with the results of the attempts to apply a cost savings approach. I would accept that I did not discuss fully the implications of applying the willingness-to-pay criterion, but I cannot agree with all the arguments advanced by Barrington in support of his objections, or with the conclusions he appears to draw from these arguments. It is important to the general debate on valuing time savings in developing countries to say why I disagree.

Barrington is, of course, quite right to point out that the money values that might be obtained from willingness-to-pay studies would need to be adjusted to reflect real social costs and benefits and, furthermore, that the commonly accepted Little and Mirlees "accounting price" scheme is elaborate. But for road users almost exactly the same adjustments would be necessary with a cost-savings as with any other form of approach. For road users, the problems of deciding realistic values for the marginal product of labour; of defining working and non-working journeys; and of dealing with the inequities associated with the "wage" distributions of different sectors of the population, remain and in fact are common to all methods of evaluation. Moreover, I do not think that adjustments for distortions in willingness-to-pay values for vehicles and goods "present the least difficulty". It will be difficult to determine experimentally, and to allocate analytically, values for time between the occupants and the vehicle, or the goods and the vehicle. In short, what is being paid for? This is not a new situation in value-of-time studies. In particular, different modes of transport usually exhibit differences other than simply the speed of the journey. This has not prevented the development of techniques to evaluate the value placed on the time element alone.<sup>7</sup>

The difficulty of interpreting willingness-to-pay measurements is acknowledged, but it is not, I submit, the real issue. This is, to paraphrase Beesley, "whether we accept evidence of what consumers do, or have done, rather than what they might do or seem to do in hypothetical conditions set up by the observer". In my view the main weakness of present methods of valuing time savings in both developing and developed countries is their very considerable reliance upon hypothetical models of consumer behaviour for which little, if any, supporting evidence can be found. The vehicle savings component of a fleet size reduction *can be* measured, and a depreciation cost reduction postulated, in the manner Barrington says. The real issue is whether, without any substantive supporting *evidence*, they *should be*. Unfortunately for every argument of the type expostulated by Barrington in support of vehicle savings, it is possible to erect an equally logical and plausible exact opposite case. In this situation it is not unfair to expect that the choice between them be based on observable facts. I contend that the failure to do this has lent a considerable positive bias to the cause of road improvements throughout the world.

As an example, there are the arguments about valuing small time savings. Conventional analysis assumes that one minute is worth *pro rata* the same as one hour. Whilst one minute saved may not have a noticeable effect on productivity, it is

usually assumed that several such savings, when aggregated, have. The problem of institutional constraints on time savings (e.g. union agreements or legal limitations on driver hours), or even on people's perception of small savings, is usually ignored. The fact that there is no convincing body of evidence either way has not prevented the pro-improvement view prevailing. Certainly no one suggests that the long-term institutional changes are doubly discounted: modern evaluation (contradictorily) assumes that they occur the moment the improvement is complete.

In the above context it is interesting to note that Barrington repudiates my concern for short-run reductions in fleet size, and contends they are not particularly relevant. He is wrong. They are relevant precisely because they are short-run, and thus in any economic evaluation relatively unaffected by the discounting of costs and benefits. Conversely, Barrington's assertion that "of far greater importance is the rate of growth in the vehicle stock, with and without the project being analysed, relative to the growth in the volume of travel" is invalid simply because it is unmeasurable. No project has ever been so large that such an effect could be isolated from other simultaneous changes in the economy.

The application of willingness-to-pay criteria is not an easy way out of present difficulties: observations and interpretations will require considerable ingenuity. However, they offer the possibility of substituting measurement for unprovable hypothesis. It is at least possible that these techniques can be used to assess not only what values consumers place on time savings, but how these values vary with conditions such as the duration of the saving. If there are definite "threshold" values of usefulness, they can only be found experimentally and not by speculation.

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