Measuring Use Value from Recreation Participation: Comment

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In a recent article in this *Journal*, Whitehead (1992) presents a method for estimating annual economic surplus for recreation trips to a natural resource site based on whether an individual participates in recreation at that site. Whitehead proposes his method as an alternative to the traditional two-stage travel cost approach. We contend that Whitehead's method contains two serious problems. The first is theoretical, and results in an overstatement of the value of recreation trips. The second is empirical, and pertains to the likely misspecification of his model in failing to incorporate what we feel is important sample information. We address these issues in order.

Whitehead defines "use value" for resource site 1 for individual *j* as "the amount of money that the recreationist would be willing to pay (WTP) to avoid [a] price increase, holding utility constant" (p.114). This definition of "use value" corresponds to a Hicksian equivalent variation measure (see for example, Mitchell and Carson, p.25; Just, Hueth and Schmitz, p.87) wherein the reference utility level is post price-change, i.e., the consumer does not have a right to the pre price-change utility level. Figure 1 illustrates the areas of several measures of economic surplus. In Figure 1 an equivalent variation measure is represented as area (p_1, p_1^*, c).

In equation 2, however, Whitehead shows use value as the difference between expenditure functions with common *prechange* utility levels and differing price vectors. This follows from equation 1, where u is specified as the reference utility level in conjunction with the initial price vector, p_i and is repeated in his indirect utility function specification $u=v(p_i,m)$). In this case, "use value" represents a Hicksian compensating variation (CV) welfare measure for a price increase, area (p_1, p_1^*, b, a) in Figure 1.

Whitehead motivates use value by discussing an individual contemplating a visit in the face of a fee increase. The visit decision is based on whether the fee increase pushes the trip price above the individual's reservation price p^*_{1j}. Whitehead asserts that if the reservation price p^*_{1j} can be estimated for each individual, then a positive difference between this price and the individual's per trip cost, p_{1j}, represents "use value per trip (UV_1/x_{1j})." He obtains annual use value by multiplying by the number of trips taken during the past year, $(p^*_{1j} - p_{1j})*x_{1j}$. This annual use value corresponds to area (p_1, p_1^*, d, a) in Figure 1. It is clear from Figure 1 that unless the individual's Hicksian demands, $h(p,u)$, are perfectly inelastic, Whitehead's calculation for annual use value will unambiguously overstate "use value" when defined as either the CV measure from equation 2 or the EV measure as verbally defined on p.114. Indeed, it will also overestimate Marshallian consumer surplus (MCS), which is illustrated in Figure 1 as area (p_1, p^*_1, a) as CV>MCS>EV for a price increase involving a normal good (Boadway and Bruce).

Second, we contend that Whitehead's modeling approach is seriously flawed. We suggest a way to improve it and simultaneously resolve part of the above theoretical problem. The logit model estimated by Whitehead is based on per trip cost

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J. Agr. and Applied Econ. 26 (1), July, 1994: 311-313
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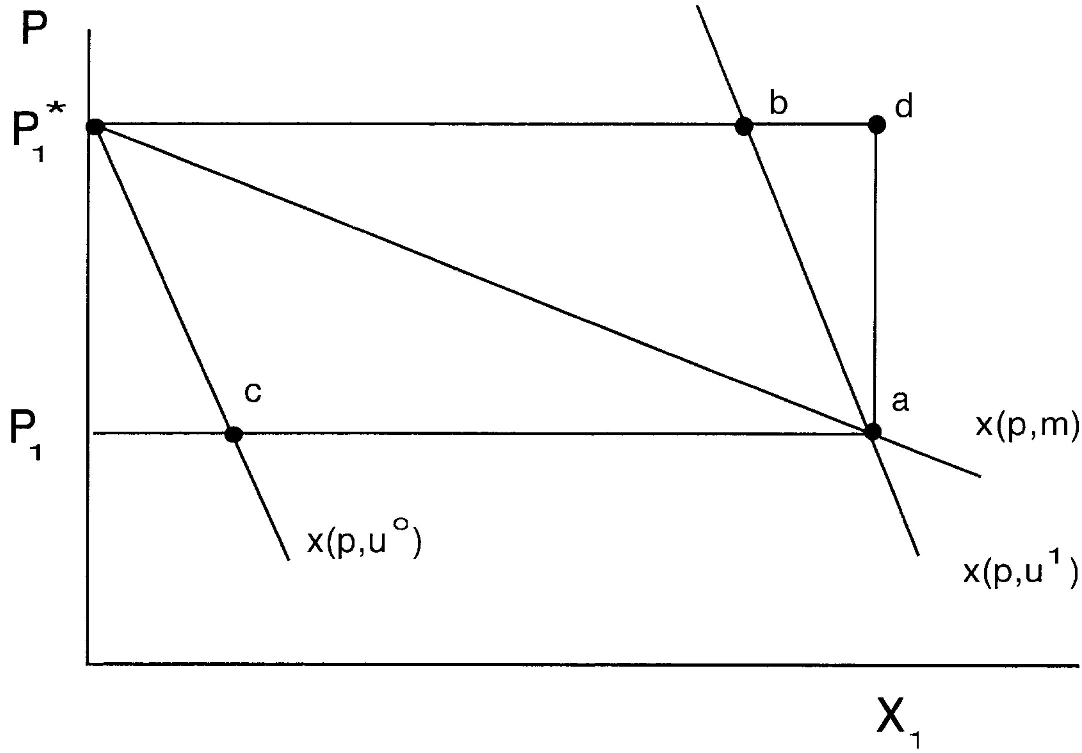
Figure 1. Example of economic surplus measures



and a vector of socioeconomic variables. Herein lies the problem. Consider two recreation participants, *A* and *B*, with identical trip costs and socioeconomic characteristics. Let *A* take one trip and *B* ten trips annually. Whitehead's specification will model these two observations identically. However, *B* is willing to pay the price per trip ten times.

We feel that the two observations contain very different information on participation intensity and underlying value, and that the model should account for these differences. Otherwise, the estimated logit function will be mislocated. In other words, we feel that the model must account for the fact that *A*'s participation yes/no decision is between taking one trip to the site or taking none, while *B*'s decision is between taking 10 trips to the site or taking none. Whitehead's approach yields an estimated median that contains a conservative bias. This bias is particularly troublesome if annual site value is desired. Interestingly, the estimation bias appears to run opposite to the inherent theoretical bias.

One improvement would be to include a trip variable in the logit model to account for differences between single and multiple trip participants. One could also estimate separate models for each trip class and aggregate results accordingly. Another approach might be to include an observation for each trip a participant takes, however this would require adjusting the estimation procedure for independence assumption violations.

We propose that participation decisions be modeled on an annual basis. Here, the probability of a yes/no response is a function of annual trip costs (p_{1j} * x_{1j}) and other socioeconomic variables. Modeling the probability of a yes/no response thus includes trip frequency information omitted by Whitehead's model, which is biased unless all participants take the same number of trips. That is, if *A* pays p_1 once and *B* pays p_1 ten times, their annual minimum values for the site are very different. This proposed approach thus captures the individual's decision to take either X_1 trips or zero trips. In addition, this approach could be modified to include certain on-site costs.

Annual individual use value (more appropriately, annual net individual use value) could then be derived following Whitehead's basic procedure with annual trip costs (AC_{1j}) replacing cost per trip in the logit model and estimating an annual expected maximum WTP based on the value which corresponds to the median value on the individual logit function estimates (AV_{1j}). Site surplus value, SSV_1, can then be estimated:

$$SSV_1 = \sum_{j=1}^{m}(AV_{1j}-AC_{1j})*I_1 \qquad (1)$$

where $I_1 = 1$ if $AV > AC$, and $I_1 = 0$ otherwise. Theoretically, this measure does not represent a Hicksian surplus but more likely approximates a Marshallian surplus which is bounded by Hicksian EV and CV measures. Sample weighting procedures used by Whitehead (p. 117) could be similarly incorporated to account for the oversampling problem.

The one-step method for estimating recreation use value for a site as proposed by Whitehead should be viewed with caution. It appears to be an innovative procedure, nonetheless it appears flawed theoretically as well as empirically. We feel that Whitehead could enrich his analysis by using more of the sample information and we have proposed a couple of avenues by which to do so.

We also feel that future studies of this type should include both travel cost and contingent valuation components. Providing a range of point estimates and associated confidence intervals from various methods could prove quite useful and come at very small additional cost. This is especially true as the work of applied economists is subjected to increasing scrutiny.

References

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