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SOME CONCEPTUAL AND EMPIRICAL ISSUES IN ESTIMATING THE DEMAND FOR WATER QUALITY

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ABSTRACT

The efficient allocation of resources to the provision of water quality requires, in part, a measurement of the benefits which result. Due to the public goods nature of water quality, benefit estimation requires the use of special techniques. One of these techniques is the probabilistic rating method described by Findlater and Sinden (1982) which can be used to derive estimates of individual willingness-to-pay for improved water quality.

Probabilistic rating has its theoretical foundation in the indifference mapping procedure outlined by Sinden (1974). Indifference mapping uses utility curves derived from a Ramsey survey technique to obtain individual demand curves for a good. This survey instrument consists of two prospects, each of which contains a two-element probability combination. Each outcome is given a probability rating of 0.5. By systematically varying the contents of the prospects until the respondent is indifferent between the two, a series of utility curves can be estimated. A transposition of the utility curves results in an individual indifference map. With the use of a budget line, a compensated demand curve for the good can be derived. The area between the demand curve and the price line is the individual's consumer surplus from consuming the good.

Sinden applied this method to the estimation of demand for a recreation site. The survey instrument was found to have two major drawbacks. Each interview took a long period of time, resulting in a loss of interest on the part of the respondent. Individuals also had difficulty determining a position of indifference when confronted with the Ramsey technique.

In response to these problems, the probabilistic rating method was developed. It also uses a Ramsey technique to elicit utility information. However, instead of altering the contents of the prospect table to achieve indifference, the two prospects are simply rated by the interviewee as presented. Findlater and Sinden used this method to derive individual demand curves for a recreation site. The prospect table for the survey is shown in Table 1. Each prospect consists of days at the subject site (A) and days at a site (B) which is a close substitute. Prospect I is assigned an arbitrary utility rating of 1 util. The subject is then asked to assign a value to prospect II relative to prospect I. This is equivalent to comparing two points on an indifference map. By altering prospect II and comparing it to prospect I a set of points on the indifference map can be evaluated. Indifference curves can then be fitted. A compensated demand curve for days at A can then be derived using budget and price information.

Table 1.

Probability	Prospect I	Prospect II
0.5	i) a days at A	iii) c days at A
0.5	ii) b days at B	iv) b days at B
	utility = 1.0	utility = t

If one assumes that weak complementarity exists between water quality and recreation, then probabilistic rating can be used as a contingent valuation technique. Suppose that opportunity A of Table 1 is defined as some water recreation site which is degraded, and B is defined as the same site but with a higher level of water quality. If the probability rating game is played successfully, the results would be an indifference map which reflects an individual's preference for the provision of water quality at the subject site. With the use of a budget line two compensated demand curves for the site can be derived from the same indifference curve; one for each level of quality. The difference in area between the two curves is a measure of willingness-to-pay for the provision of water quality. The issue is whether this method can be applied empirically.

The probabilistic rating method can be used to estimate the willingness-to-pay for water quality if there exists a population of individuals who have experienced both the polluted site and some other site characterized by a higher level of water quality. Most contingent valuation procedures have asked individuals to express their willingness-to-pay for an improvement in water quality regardless of whether they have actually experienced that quality. It cannot be expected that recreationists can assess their preferences for a good unless they have actually experienced it. Asking them to do so is source of bias (Schulze et al., 1981). The probabilistic rating game would be played only with those who have experienced the choices presented.

Three situations are seen to be possible, each dictating the way in which the alternative site B is defined. If there exists an alternative to A which is similar in all physical characteristics except quality, B can be defined as this other site. The indifference map should reflect preferences for clean water at the subject site.

If the physical characteristics of the two sites differ significantly, then B can be defined as the subject site but with the water quality experienced at the alternative site. This relies on the individual's ability to separate water quality from one location and imagine it at another. Since the respondents are familiar with both sites, this should not pose too great a

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problem.

If no local alternative to the polluted site exists, a sample of those who have experienced higher water quality elsewhere may be found. They will be asked to separate water quality from the clean site and imagine it at the subject site. This situation is the least desirable since there is no way to identify accurately the level of water quality the individual respondents select. However, it is believed this is still better than asking those who have never experienced improved water quality to assess their preferences.

Once an indifference map is estimated, a budget line is used to derive the two compensated demand curves. The recreation budget for the site can be obtained by questioning the respondent as to his or her recreation behavior. Travel cost can be used as a proxy for price.

There are several theoretical advantages to the probabilistic rating approach. It leads to a monetary measure of benefits so comparisons can be made with costs. The technique is firmly based on economic theory and the concepts of willingness-to-pay. Information bias is minimized. Individual willingness-to-pay can be estimated independently of the characteristics and behavior of other recreationists.

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