the regional unemployment. See, Vera Lutz, *Italy, A Study in Economic Development* (London: Oxford University Press, 1962), p. 60.

[13] Sungwoo Kim, "Regional Investment Study in the Manufacturing Sector of Italy, 1951–1969," presented at the Annual Western Economic Association Meeting, June 1974. Also see, S. Kim, "Regional Determinants of Agricultural Investment: An Empirical Study of Italy," *Rivista Internazionale di Science Economiche e Commerciali,* forthcoming.

[14] For detailed discussion on the various public policies in Italy, see Posner and Woolf, *op. cit.*

Evaluation of Outdoor Recreational Resources: A Note†

OUTDOOR RECREATION has become an important element of our economy. Determination of the value of outdoor recreation to ensure more efficient allocation of resources is becoming an increasingly critical problem. Over the past several years there have been a number of approaches postulated to evaluate outdoor recreation in the absence of an efficient market. Inadequacies in these approaches should be aired. Economists must continually revise and improve existing techniques to improve the accuracy of estimates. It is in this vein that this paper is written.

One of the more prominent categories of techniques used to evaluate outdoor recreation can be labeled "travel cost approaches." This term is used to refer to those procedures utilizing travel cost as a price proxy in the estimation of demand relationships (or values) for outdoor recreation. This paper focuses attention on this category of procedures with a particularly close examination of one specific technique —that proposed by Peter Pearse.[1]

The general formulation of the travel cost approaches involves stratifying the population into categories determined by geographical distance and more recently by income and other socio-economic variables.[2] Due to categorization of recreationists, restrictive assumptions are required concerning the homogeneity of sub-populations. In addition, advocates of these procedures assume or hypothesize that a recreationist's response to an entrance fee would be identical to an increase in travel cost.

The opinion in this paper is that: (1) it is not desirable conceptually or statistically to classify observations and make use of only averages within groups, and (2) recreationists react differently to changes in onsite costs (which include cost of access) than to changes in travel costs. These two points will be discussed by relating the Pearse approach to another recent approach.[3]

In his article Peter Pearse presents and applies a framework "for analyzing the economic behavior of recreationists." Pearse points out that costs associated with "indulging in a particular recreational opportunity are in part fixed, . . . and in part variable, with respect to the number of days at the recreational site." Benefits accruing to recreationists are in terms of consumer surplus. This surplus Pearse estimates as the "sum of the maximum tolls that they [recreationists] would be prepared to pay in addition to their existing fixed costs."[4] Pearse's method of estimation involves grouping data from individual recreationists according to the visitors' income class. Visitors are ranked within each class by their fixed costs. The visitor with the largest travel cost, in each income class, is the marginal visitor realizing no consumer surplus. Since every other visitor in each class will continue purchasing recreation until his fixed costs are greater than the highest in the income class, a visitor's consumer surplus is computed as the difference between the maximum fixed cost and the actual travel cost. The sum of the consumer surpluses among visitors is an estimate of the value accruing to users of a recreational area.

In addition to the two points previously mentioned concerning all travel cost approaches, one other point unique to the Pearse technique is relevant. Is there a valid criterion to choose the appropriate income groupings? If not, it is hypothesized that the estimates of consumer surplus will vary significantly based on the number of groupings involved. The fewer the income categories the higher the estimated consumer surplus. This hypothesis will subsequently be tested.

An Empirical Consideration

Satisfaction of three objectives constitutes the remainder of this paper. These objectives are: (1) to illustrate an approach of evaluating outdoor recreation utilizing individual observations rather than aggregated data; (2) to test the hypothesis that a recreationist's reaction to increased travel cost will vary from an increase in on-site costs implying that estimates of consumer surplus will differ by the same amount as travel costs vary from on-site costs; and (3) to test the hypothesis that Pearse's consumer surplus estimates are significantly affected by the income groupings chosen.

In the approach suggested by Edwards, *et al.*, the evaluation of recreational resources is accomplished by estimating a demand function showing willingness of users to pay measurable sums for specified amounts of recreation. Total recreational usage of an area is defined as number of visits times number of days per visit. Number of days per visit is considered the quantity variable in a demand relationship and the daily on-site costs a price variable.

Recreationists incur both variable (on-site) and fixed (travel) costs. In addition, it was assumed that a daily on-site cost of sufficient magnitude exists that a recreationist will choose not to engage in the recreational experience should the cost exceed this amount. This is called the critical or maximum tolerable on-site cost. The demand relationship can be expressed as:

$$q = f(T_x, T_m, Y, n) \qquad \text{for } T_m \leq T_m^*$$

where q is the length of stay per visit per recreationist, T_x is round trip travel cost per recreationist, T_m is daily on-site costs per recreationist (including existing entrance fees), Y is annual family income, n is size of the recreation group, and T_m^* is critical on-site costs (or the highest tolerable daily on-site costs).[5]

To accomplish the previous objectives, data from recreationists using the Kissimmee River Basin in Central Florida were utilized. A statistically selected sample of lakes and streams was chosen from which recreational data were collected including total travel cost, daily on-site expenditures, days at site, and other information about individual recreationists. Every public access point on each sampled lake or river became sites for interviewing. These access points were fish camps, boat ramps, and campgrounds. A total of 316 observations were taken during the months of February to May, 1970.

The following demand relationship for an average recreationist's visit to the Kissimmee River Basin between February and May, 1970 was estimated:[6]

$$\ln q = 1.665 + \underset{(.0019)}{.0246^{**}\, T_x} - \underset{(.0193)}{.0824^{**}\, T_m} + \underset{(.000007)}{.000016^{*}\, Y} - \underset{(.335)}{.7643^{*}\, \frac{1}{n}}$$

for $T_m \leq \$7.71$

$R^2 = .395$ Degrees of freedom = 311

Maximum tolerable on-site cost ($7.71 in this case) was estimated by obtaining the minimum number of days recreationists were willing to recreate per visit, *ceteris paribus*. This corresponds to the maximum price they would be willing to pay on a demand curve. By substituting average values of all independent variables except T_m and the minimum number of days for q (4.01 in this case) into the demand relationship, the maximum value of T_m can be obtained.

The reaction of recreationists to changes in travel costs and on-site costs can be evaluated by using the coefficients of the estimated relationship.[7] From this equation one cannot expect similar reactions to changes in travel and on-site cost increases. If a toll (entrance fee) were considered an on-site cost, as it must be, then to expect responses from this toll similar to responses from travel cost increases must be erroneous.[8]

Values of recreation from this demand relationship were obtained by holding all of the independent variables except T_m at their means and integrating the demand curve from the average on-site cost ($3.25) to the maximum tolerable ($7.71). This gives an average consumer surplus of $21.62. Average travel cost was $20.16 per visitor. Mean travel cost is 6.2 times as large as the mean daily on-site cost.

The same data were used with Pearse's procedure to compare the estimated consumer surplus between the two methods. Individual observations were categorized by income classes and then ranked within each class according to travel cost. Consumer surplus for each income class was found by summing the difference between the maximum travel cost and each observed travel cost.

Using eight income groupings (similar to that done by Pearse), the estimated average consumer surplus was $143.20. This estimate is 6.6 times as large as the estimate derived by the Edwards method. Note that travel costs were 6.2 times as large as on-site costs. It seems apparent that the basic difference in the two calculations of consumer surplus stems from the fact that one is based on travel cost (the difference between observed and maximum tolerable) while the other is based on on-site costs (the difference between observed and maximum tolerable). Both procedures can be aimed at estimating values of a resource even though the Edwards, *et al.*, approach can be used to indicate marginal adjustments in quantity while Pearse's is designed only to evaluate the recreational opportunity *per se*. Comparisons of consumer surplus are appropriate.

Finally, in reference to determining income groups using Pearse's method, three alternative groupings were employed with the same data to determine the significance of choosing different income categories. The three income classes consisted of one group (Grouping I), four groups (Grouping II), and eight groups (Grouping III). It was hypothesized that Grouping III would have the lowest consumer surplus and Grouping I the highest. The results verify this: consumer surplus estimates varied from $222.08 to $195.47 to $143.20 for Groupings I, II and III respectively. The statistical difference between groupings was confirmed by a t-test to test the differences in average consumer surplus between groupings. The calculated t-statistic was 7.89 between Groupings I and II and 9.78 between Groupings II and III, both statistically significant at the one percent level. A significant difference in estimated consumer surplus indeed arises. If no valid criteria to choose the appropriate income grouping exists, the reliability of the approach is diminished.

Summary

Pearse should be applauded for some fresh ideas in evaluating outdoor recreation. However, refinements are still needed in evaluation techniques. These comments have suggested that data need not be aggregated into groups, but use of individual observations is superior. It should not be assumed that reactions of recreationists to a toll be the same as to travel cost increases. Serious policy implications are attached to this point. If travel cost were utilized rather than on-site cost to predict reactions of recreationists, estimates of value would be inflated. For example, the aggregate value in the Kissimmee River Basin during February–May, 1970 would be higher by at least $19.2 million if travel costs were employed.[9]

In addition, the Pearse procedure should be carefully considered in light of the significance of choosing income categories. It seems only fair to consider the signification of results when utilizing procedures to estimate outdoor recreation benefits. Further advancements should be realized by making comparisons and refinements as offered in this paper.

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FOOTNOTES

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1 Peter H. Pearse, "A New Approach to the Evaluation of Non-Priced Recreational Resources," *Land Economics*, February 1968, pp. 87–100.

2 Most procedures stratify the entire population from which recreationist's trip originates, while Pearse stratifies only the population of recreationists.

3 J. A. Edwards, K. C. Gibbs, L. J. Guedry and H. H. Stoevener, "The Demand for Non-Unique Outdoor Recreational Services: Methodological Issues," Oregon Agricultural Experiment Station Technical Paper No. 3317, 1972.

4 Pearse, *op. cit.*, pp. 91–92.

5 For a detailed derivation of this relationship see, Edwards, *op. cit.*

6 ** and * represent statistical significance at the one and five percent levels, respectively, with the standard errors of the coefficients in parentheses under the coefficients.

7 For an interpretation of the positive coefficient associated with the travel cost variable see, Edwards, *op. cit.*

8 An entrance fee is referred to as a "toll" by Pearse.

9 Computed by multiplying the difference in consumer surplus estimates ($143.20 — $21.62) times the estimated number of visitors.