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AGRICULTURAL AND APPLIED ECONOMICS

# working paper

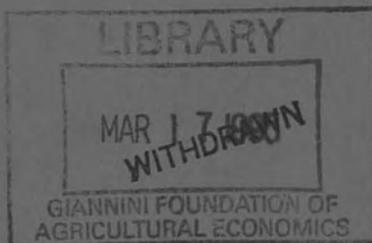
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Disparity Between Hunters' Willingness  
To Pay and Willingness to Accept  
Compensation: An Empirical Example

by

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Title: Disparity between Hunters' Willingness to Pay and  
Willingness to Accept Compensation: An Empirical Example

Abstract:

Willingness-to-pay (WTP) and willingness-to-accept (WTA) compensation models were estimated for hunters using a portion of the Clarks Hill Wildlife Management Area during 1989-1990. Hunters' WTA values ranged from 2.8 to 8 times more than WTP. Income and wealth effects as well as property rights clearly contributed to this disparity in WTP and WTA compensation for the right to hunt in the Wildlife Management Area. Responding hunters spent an average of \$750 for hunting related activities or about five percent of their disposable income.

Subject Area: Natural Resource Economics

DISPARITY BETWEEN HUNTERS' WILLINGNESS TO PAY  
AND WILLINGNESS TO ACCEPT COMPENSATION:  
AN EMPIRICAL EXAMPLE

Placing an economic value on certain natural resources has been, and continues to be, a difficult task. Questions concerning the area selected for the study, the survey methods, theoretical framework and the resulting estimated values arise. For instance, when valuing a hunter's "experience," which measure of consumers' surplus is the most appropriate, one based upon the willingness to pay (WTP) or upon the willingness to accept compensation (WTA)? What, if any, will be the variation between these two measures? Finally, what is the source of this variation?

Many experiments have shown the existence of a disparity between willingness to pay and willingness to accept compensation measures (Knetsch). In all experiments cited by Knetsch, the minimum compensation that was demanded by individuals to give up a good was larger than the maximum amount they were willing to pay in order to keep or obtain a good. However, these results have been challenged by some who infer that the difference between these measures can be eliminated by learning and experience (Coursey et al.).

The primary purpose of this paper is to demonstrate the differences that exist in the valuation of hunting by posing two questions: (1) What is the hunter willing to pay to continue their current use of the land? and (2) What compensation would the hunter require to forgo their current use of the land? In

order for this information to be used in the formulation of policy by government agencies, hunters and private forest land owners, some biases and problems that may exist are resolved or recognized.

This paper is based on a study conducted by request of the U.S. Army Corps of Engineers and South Carolina Wildlife and Marine Resources Department (SCWMRD). The primary purpose of the study was to determine area use rates by sportsmen and estimate the economic value of their activities attributable to the site.

#### Theoretical Framework

The conceptual basis for the disparity between the willingness to pay and the willingness to accept compensation measures can be attributable to the income and wealth effects. As Robin Gregory reiterated, conventional economic theory suggest that these two valuation measures will only be equivalent when significant income or wealth effects are not present.

Knetsch and Sinder (p. 516) explain these differences by describing certain actions that individuals take by saying "It appears that people are willing to spend actual or realized income or wealth less readily than opportunity income or wealth--money that they do not have but have the certain possibility of obtaining." Following from this is the idea of "loss aversion." There is substantial evidence that "the common observation that a loss has a greater subjective effect than an equivalent gain" (Kahnemand and Tversky, 1982, p. 166). In other words, it could be the case that people view money differently depending on whether they are to receive it or spend it.

Another component of the income and wealth effects is the different perception of property rights between willingness to pay and the willingness to accept compensation. For example, when a hunter responds to a willingness to accept compensation question, the right to hunt the area is assumed, whereas a hunter responding to a willingness to pay question would assume that they would have to pay in order to gain the right to hunt a particular area. These assumptions, in connection with the ones previously cited, help explain why an individual might place different values on a good or service.

A technical distinction which requires attention is the derivation of the estimated value based upon a point estimate bid. Contingent valuation literature abounds and was formulated based upon a series of iterative bids to simulate a market. In this study we implicitly recognize the possibility of an increased variance associated with the bids as a trade off to reducing the costs of the study. The hunters in the survey were asked to give a single value estimate of their hunting experience in this area. The hunting experience includes the enjoyment of the possibility of bagging a white-tailed deer or wild turkey as well as the intrinsic values of the hunt, such as the utility derived from the natural environment during the hunt.

The point estimate bid, which will be called single non-iterative bid (SNIB), is an estimate of value based totally upon a hunter's single offer; no bidding occurs. The questions in the questionnaire administered by the enumerators that ask the

hunters their willingness to pay and willingness to accept compensation were:

1. WTP: Not counting license and permit fees, how much is the hunting experience on this tract of land worth to you, i.e., if it were necessary, how much would you be willing to pay per year for the privilege to hunt here?
2. WTA: If someone would pay you to quit hunting on this tract of land for one year, how much would it take to keep you from hunting on this tract of land?

These questions correspond to the SNIB procedure in that only one bid is asked of the hunters, unlike many previous studies (Randall et al. and Brookshire et al.) which used the iterative bidding technique to create a contingent market. Again it is accepted by the authors of this paper that the SNIB technique may not be as precise as the iterative bidding format. However, the basic information that was needed to compare willingness to pay and willingness to accept compensation as well as other demographic data were collected using a one-page questionnaire. The SNIB technique seemed to provide a very efficient method in which to attain valuation measures and in some cases the increase in variance associated with the bids may be small or acceptable.

#### Potential Sources of Bias

When comparing willingness to pay and willingness to accept compensation measures certain biases may exist. For instance, the willingness to pay measure could be biased downward if the hunters feel that their responses could be transformed into higher charges for future hunting. The willingness to accept compensation measure may be biased upward if the hunters believe

there is a chance that the responses may be transformed into an actual compensation payment (Russell). This type of bias is generally referred to as gamesmanship or strategic behavior bias. Hunters believe that the responses will influence the supply of hunting, so hunters "respond in ways that are more indicative of what they would like to see done than how they would behave in an actual market (Bishop and Heberlein, p. 927)."

Whatever biases that may exist with hypothetical valuation methods are often outweighed by the usefulness of the measures. For instance, Brookshire and Coursey's study provided evidence that the willingness to pay values may be more accurate than corresponding willingness to accept compensation values. So even within these measures, some may be more accurate than others.

#### Data Collection Method

The source of data employed in this study came from a survey which used a capture-recapture technique to estimate the public use of the Clarks-Hill Wildlife Management Area (Gooding et al.) The study area consisting of 12,547 ha is located near Thurmond Lake in McCormick County, S.C. (see Figure 1). The area is known as the "mitigation land" because the SCWMMR intensively manages this U.S. Army Corps of Engineer land as partial compensation for the loss of wildlife habitat and huntable land resulting from building Lake Russell.

A questionnaire was completed during personal interviews with the people who were encountered on the study area during the survey. The survey was conducted by interviewers driving on differing predetermined routes during selected times during the

hunting seasons of late 1989 and continuing through 1990 (Gooding et al). The interview was used to determine the number of people travelling in each vehicle. Demographic information such as age, education, expenditures, miles traveled, WTP, and WTA, as well as biological information on game harvest success was also collected.

#### The Model

A model was developed to estimate WTP and WTA, and explain the difference between the two compensated measures. The regressions estimated in this study are similar to that of other studies. Gordon and Knetsch, for example, used total logarithmic functions to explain variation in responses of both willingness to pay and willingness to accept compensation. We estimated ordinary least squares, semi-log and log-log models with the log-log model giving the best results. In the model reported all variables were logged except income which was a discrete interval value. The equation estimated for willingness to pay is:

$$\text{LN(Value)} = b_0 + b_1\text{LN(Tripmile)} + b_2\text{Income} + b_3\text{LN(Expend)}.$$

The equation estimated for willingness to accept compensation is:

$$\text{LN(Comp)} = b_0 + b_1\text{LN(Tripmile)} + b_2\text{Income} + b_3\text{LN(Expend)},$$

where:

- b0 = intercept,
- Tripmile = the number of trips taken annually to the study area multiplied by the round tripmiles per trip,
- Income = a discrete variable with
  - 1 = income less than \$10,000
  - 2 = income between \$10,000 and \$19,999
  - 3 = income between \$20,000 and \$29,999
  - .
  - . etc.
  - .
  - 13=income over \$130,000,

Expend = the amount each respondent estimated that they spent on hunting each year excluding licenses and permits,  
Value = willingness to pay, and  
Comp = willingness to accept compensation.

### Empirical Results

Descriptive summary statistics for the respondents are shown in Table 1. Respondents averaged 38 years of age, 12 years of education, had an annual family income of \$28,530, traveled to the WMA an average of 13 trips, drove 80 miles one way to the area, and spent about \$750 per year on hunting excluding licenses and permits. This expenditure represented 2.65% that was spent on hunting activities of the surveyed hunters' gross income. When considering disposable income, expenditures on hunting are estimated to be about 5% of annual family income. The fact that these hunters spend about one dollar in twenty, of family disposable income to hunt, was somewhat higher than expected.

The results of this study are consistent with that of earlier studies in that willingness to pay values are smaller than those of willingness to accept compensation and the magnitude of the difference is within the range found by others (Knetch, p. 228). WTA is reported to be between two and ten times larger than WTP in other studies. The compensation value was computed after deleting 12 observations which responded with an answer of infinity, i.e., no amount of compensation would induce them to forego their right to hunt that area for one year.<sup>1</sup> One very high compensation value of \$100,000 was included because it was consistent with the individuals wealth and income.

Willingness to accept compensation was estimated to be \$1,310 at the mean compared to \$160 willingness to pay at the mean. WTA decreased to \$445 when the \$100,000 bid was excluded.

Results of the WTP and WTA equations are reported in Table 2. All variables except Tripmile in the WTP equation were significant at the five percent level. These estimates will be used with estimates of hunter use of the area (Gooding et al.) to determine sport hunters use value of the Clarks Hill Wildlife Management area in the mitigation area.

#### Summary

Hunters interviewed during 1989-1990 using the Clarks Hill WMA were found to have a significantly smaller WTP, \$160, for the right to hunt the area than the WTA compensation, \$445, to give up the right to hunt the area for one year. The difference in magnitude was a WTA compensation of about 2.8 times their WTP. These findings are consistent with a survey of other studies reported by Knetsch. These hunters reported spending about \$750 annually on hunting excluding licenses and permits, which was about five percent of disposable family income. Models of WTP and WTA were estimated using a log-log models with all variables significant except total miles driven in the WTP model. Model results will be used with the results of other ongoing studies to determine hunter values of the portions of Clarks Hill Wildlife Management Area.

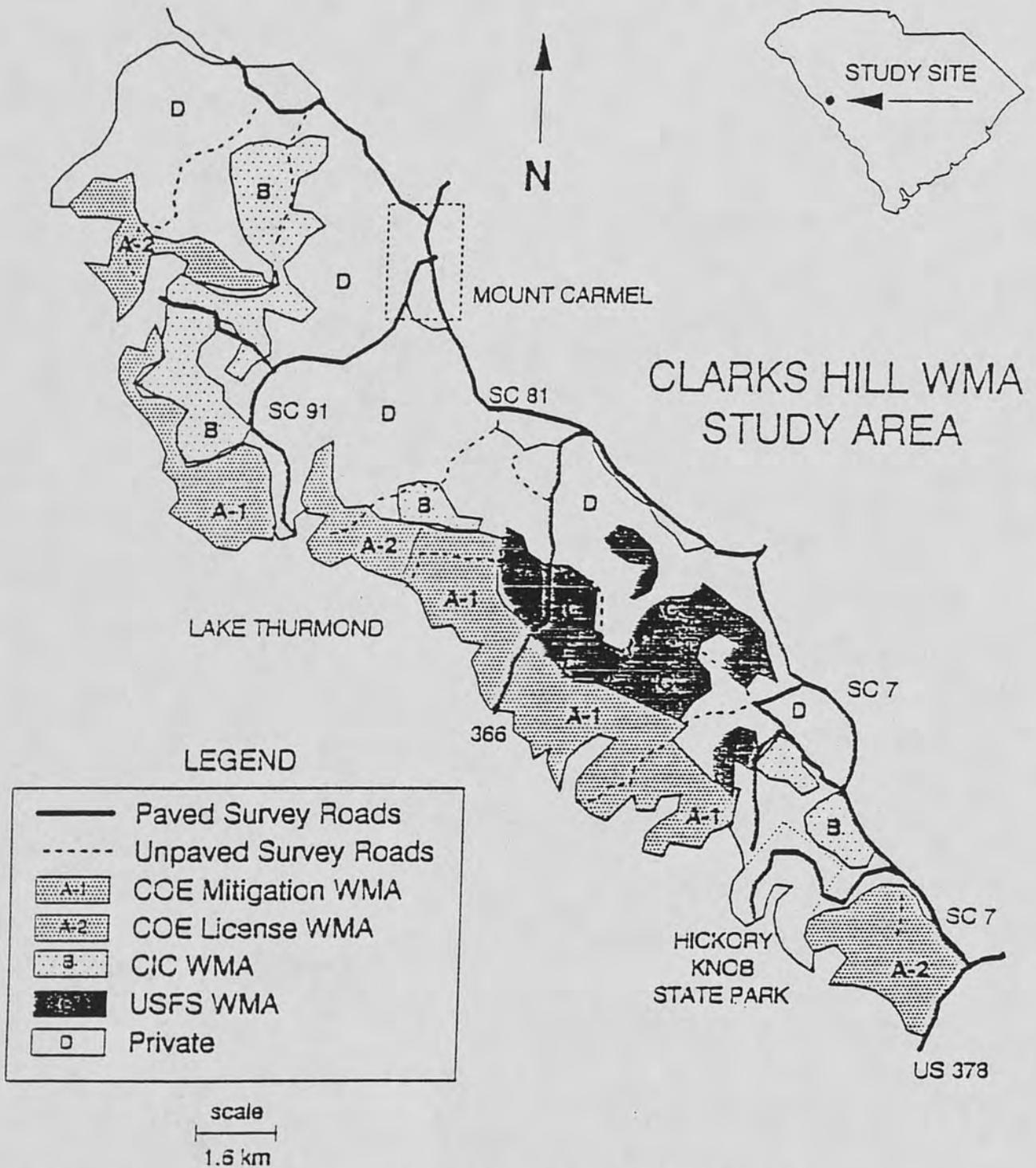


Figure 1. Clarks Hill Wildlife Management Area Study Area

Table 1. Descriptive statistics for hunters using the Clarks Hill WMA, 1990-1991.

Variable	Mean	Standard deviation	N	Minimum	Maximum
Age	38.341	13.949	126	14.00	76.00
Education	11.841	2.496	126	3.00	20.00
Income*	3.853	1.597	123	1.00	9.00
Trips	13.032	12.219	124	1.00	75.00
Miles (one way)	80.563	80.030	119	30.00	900.00
Expenditures**	754.920	754.744	125	60.00	4000.00
Value	159.992	193.402	126	.00	2000.00
Compensation	1310.783	9310.205	115	.00	100,000.00

\*Income is measured in 10,000 increments: 1 is \$10,000 or less, 2 is \$10,000 to \$19,999, etc.

\*\*Does not include licenses and permits.

Table 2. Parameter estimates for WTP and WTA for hunters using the Clarks Hill WMA, 1990-1991.

Variable	Parameter estimate	t	Prob > t
Willingness to Pay:			
Intercept	1.84590	2.95	.0040
Tripmile	.10964	1.14	.2563
Income	.11737*	2.18	.0319
Expend	.28290*	2.61	.0104
R2=.234			
Willingness to Accept Compensation:			
Intercept	.80429	1.09	.2766
Tripmile	.25344*	2.27	.0253
Income	.14807*	2.37	.0200
Expend	.42550*	3.37	.0011
R2=.347			

\*Significant at the 5 percent level.

## FOOTNOTE

1. The authors recognize that we may be deleting useful information when the infinite responses are not assigned an arbitrary high value and included in the analysis.

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