Linking Recreation Demand and Willingness to Pay with the Inclusive Value:

Valuation of Saginaw Bay Coastal Marsh[1]

May 25, 2007

John C. Whitehead[2], Peter A. Groothuis[3], Rob Southwick[4]

[1] This paper was presented at the US Environmental Protection Agency Workshop, "Valuation for Environmental Policy: Ecological Benefits," Arlington, VA, April 23-24. Funding for this project was provided by the U.S. Environmental Protection Agency Great Lakes National Program Office via the National Fish and Wildlife Foundation as part of a grant to the Michigan Department of Environmental Quality, Environmental Science and Services Division, that was subsequently passed on via a Coastal Management Program grant to Ducks Unlimited. Matching funds were provided by Ducks Unlimited. The authors thank John Horowitz for comments.

[2] Contact Author: Department of Economics, Appalachian State University, Boone, North Carolina 28608; whiteheadjc@appstate.edu; fax: (828)262-6105

[3] Department of Economics, Appalachian State University, Boone, North Carolina 28608

[4] Southwick Associates, Inc., P.O. Box 6435, Fernandina Beach, FL 32035

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Abstract. In this paper we propose an alternative model for linking revealed preference and stated preference models of recreation when a single travel cost measure is difficult to obtain. We show that this model can be used to test convergent validity and offers an alternative scope test that does not rely on split-sample contingent valuation scenarios. Our results are mixed. In three of four models the inclusive value is negatively related to the willingness to donate but unrelated to the willingness to pay. This result suggests that recreation nonusers hold nonuse values while recreation users do not hold nonuse values.

Introduction

Economists have use various methods for measuring the economic value of wetlands and results have differed depending on the location and the economic methods. Woodward and Wui (2001) performed a meta-analysis of published U.S. wetlands valuation studies for a number of services including flood control, water quantity and quality, hunting, fishing, wildlife watching, amenities, etc. Only a few studies have considered Great Lakes wetlands, beginning with Jaworski and Raphael's (1978) study of the value of fish, wildlife and recreation of Michigan's coastal wetlands. Several recent studies also address the value of various Midwest wetlands. These include a travel cost analysis for three small hunting sites (van Vuuren and Roy, 1993), a study of the value for commercial fisheries (Amacher, et al, 1989) and a study of Wisconsin wetlands (Mullarkey, 1997). In addition to these, more recent studies look at Michigan residents' willingness to accept different forms of wetlands mitigation (Lupi et al, 2002 and Hoehn et al, 2003).

Whitehead et al (2006) estimate the economic values of Saginaw Bay coastal marshes with multiple methods. Using the site selection travel cost model and conservative aggregation assumptions, an increase in 1125 acres of coastal marsh is valued at about $94,000 annually. The present value is $1.83 million. Willingness to pay for coastal marsh protection is estimated using the contingent valuation method. The annual value of protection of 1125 acres of coastal marsh is $113,000. The present value is $2.2 million.

We find that each acre of coastal marsh is worth $1,627 over a recreational user's lifetime. Over and above the recreational value are the other values estimated with the contingent valuation method. These values add $1,969 per acre over a lifetime. The recreation value and the willingness to pay value may be combined because analysis of the willingness to pay values indicated that they are not associated with increases in recreation trips. They are entirely nonuse values. The total value of each acre of coastal marsh is, therefore, $3,596 over the lifetime of a resident of the sampled region. The purpose of this paper is to further explore the additivity assumption adopted in Whitehead et al. (2006) by a combination of the revealed preference and stated preference data.

The combination of revealed preference and stated preference data for environmental valuation generally improves both types of willingness to pay estimates (Whitehead et al., 2005). Stated preference data can be used to estimate behavior and values beyond the range of revealed preference data, including nonuse values. Revealed preference data can be used to ground the stated preference data in reality and mitigate hypothetical bias. Also, additional observations may improve econometric efficiency of both types of estimates. McConnell (1990) provides the theory for data combination. Cameron (1992) empirically links a revealed preference model of continuous demand and a stated preference model of willingness to pay.

Whitehead (1995a) extends the McConnell (1990) results and identifies the price of recreation trips as an exogenous predictor of willingness to pay for quality change. One implication is that in an empirical model of willingness to pay the coefficient on recreation price provides an estimate of the change in demand (e.g., recreation trips) that would result from the quality change. Whitehead (1995b) argues that this result can be used to decompose willingness to pay into use and nonuse values. Willingness to pay and trip change models can be jointly estimated to more efficiently exploit the theoretical link (Huang, Haab and Whitehead 1997). In a more ad-hoc empirical specification Whitehead (2005) includes the predicted value of the change in trips using stated preference data with a quality change as a determinant of willingness to pay. This model is most appropriately used when measurement of recreation price is problematic. In addition, this model can also be used to decompose willingness to pay into use and nonuse values.

Revealed preference research has examined the linkage between discrete choice models of recreational site selection and continuous choice models of recreational intensity with the inclusive value -- an index of the expected utility gained from recreation trips (Parsons, Jakus and Tomasi 1999). No study to date has examined the linkage between discrete choice models of recreation site selection and stated preference models of willingness to pay. In this paper we link discrete choice recreation demand, continuous choice demand and willingness to pay models with the inclusive value. We use the Saginaw Bay watershed hunting and fishing license holders subset of the data used by Whitehead et al. (2006). These data include information on the typical county of Saginaw Bay coastal marsh-based recreation, the number of annual Saginaw Bay coastal marsh-based recreation trips and willingness to pay for coastal marsh protection. In general the approach presented here has the potential to (a) test the convergent validity of revealed and stated preference data, (b) provide an indirect test for scope and (c) examine the proportion of use and nonuse values in willingness to pay. Our more limited goal is to further examine the willingness to pay decomposition for the Saginaw Bay study.

The Linked Site Selection – Willingness to Pay Model

The travel cost method (TCM) is a revealed preference approach to environmental valuation that is used to estimate the benefits of outdoor recreation activities (Parsons, 2003). A variation of the travel cost method is the site selection (i.e., random utility) model (Parsons, 2003). In the random utility model (RUM), it is assumed that individuals choose their recreation site based on differences in trip costs and site characteristics (e.g., wetland acreage) between the alternative sites. Analysis of data on recreation site choice enables estimation of the monetary benefits of any change in site characteristics.

Consider an individual who considers a set of $j = 1,..., m$ recreation sites. The individual utility from the trip is decreasing in trip cost and increasing in trip quality:

(1) $$u_{ij} = v_{ij}(y_i - c_{ij}, q_j) + \varepsilon_{ij}$$

where *u* is the individual utility function, *v* is the nonstochastic portion of the utility function, *y* is income, *c* is the trip cost, *q* is a vector of site qualities, *ε* is the error term, *i* indexes individuals, *i* = 1, …, *n* and *j* indexes recreation sites, *j* = 1, … , *s* , … *m*. The deterministic part of the utility function is linear

(2) $$v_{ij} = \alpha_c c_{ij} + \alpha_q q_j + \alpha_k^{/} z$$

where c_{ij} is the travel cost of individual *i* to site *j*, q_j is the quality of site *j* and α_k is a vector of *j* – 1 alternative specific constants interacted with income and perhaps other individual-specific variables, *z*. The random utility model assumes that the individual chooses the site that gives the highest utility:

(3) $$\pi_{ij} = \Pr(v_{ij} + \varepsilon_{ij} > v_{is} + \varepsilon_{is} \quad \forall\, s \neq j)$$

where π_{ij} is the probability that individual *i* chooses site *j*.

A site choice RUM is estimated using the multinomial logit model where the dependent variable is a choice among a set of alternatives and the independent variables are alternative specific (Haab and McConnell, 2002). For example, a recreationist choosing among a set of recreation sites might consider the travel costs to each site and the characteristics of each site. If the error terms are independent and identically distributed extreme value variates then the conditional logit site selection model results

$$(4) \qquad \pi_i = \frac{e^{v_i}}{\sum_{j=1}^{m} e^{v_s}}$$

The inclusive value is the expected maximum utility from the cost, quality characteristics of the sites and other aspects of the choice. The inclusive value, *I*, is measured as the natural log of the summation of the site choice utilities

$$(5) \qquad I(c,q,z;\alpha) = \ln\left(\sum_{j=1}^{m} e^{v_j}\right)$$

Hanemann (1999) shows that the compensating variation from a change in quality characteristics is:

$$(6) \qquad CV = \frac{I(c,q,z;\alpha) - I(c,q+\Delta q,z;\alpha)}{\alpha_c}$$

where *CV* is the compensating variation measure of welfare for each choice occasion and the marginal utility of income is α_c. Haab and McConnell (2002) show that the compensating variation for a quality change can be measured as

$$CV(\Delta q_k) = \frac{\alpha_k \Delta q_k}{\alpha_c} \tag{7}$$

where q_k is one element of the q vector. The compensating variation of site access is

$$CV(j) = \frac{-\ln(1-\pi_{ij})}{\alpha_c} \tag{8}$$

These welfare measures apply for each trip taken by the individuals in the sample. If the number of trips taken is unaffected by the changes in cost and/or quality, then the total willingness to pay is equal to the product of the per trip compensating variation and the average number of recreation trips, $\bar{x}$. If the number of trips taken is affected by the changes in quality then the appropriate measure of aggregate welfare must be adjusted by the change in trips. There are several methods of linking the trip frequency model with the site selection model (Herriges, Kling and Phaneuf, 1999; Parsons et al., 1999), we choose the original approach that includes the inclusive value parameter as a variable in the trip frequency model (Bockstael, Hanemann and Kling, 1987)[5]

$$x = x[I(c, q, z; \alpha), z] \tag{9}$$

These models are typically estimated with count (i.e, integer) data models such as the Poisson or negative binomial models (Haab and McConnell 2002). Count data makes adjustments for the fact that trips are not continuous variables but integers (e.g., 0, 1, 2, etc). Recreation demand count data tends to be clustered at zero and low integer values. The Poisson estimates the probability of trips at each integer value

[5] This is also referred to as a participation model.

(10) $$\Pr(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$$

(11) $$\ln(\lambda) = \beta_0 + \beta_1 I + \beta_2^{/} z$$

where x = 0, 1, 2, … is the number of trips, λ is the mean and variance of the trip distribution. The negative binomial model relaxes the equality restriction on the mean and variance of trips (Haab and McConnell, 2002).

Trips under various quality scenarios can be simulated by substitution of quality changes into the trip frequency model

(12) $$\hat{x}(\Delta q) = x\left[I\left(c, \Delta q, z; \alpha\right), z\right]$$

The total compensating variation of a quality change that might affect the number of trips is aggregated over the number of trips:

(13) $$CV(\Delta q_k) = \sum_{j=1}^{m}\left(\left[\hat{x}_j(\Delta q)\right]CV(\Delta q_k \mid j) + \left[\bar{x}_j - \hat{x}_j(\Delta q)\right]CV(j)\right)$$

The first component of the total value is the product of the average number of trips taken with the quality change and the value of the quality change. The second component of the willingness to pay is the product of the difference in trips and the willingness to pay for a trip to a particular site.

The contingent valuation method (CVM) can be used to estimate the willingness to pay for quality change (Mitchell and Carson, 1989; Boyle, 2003). The contingent valuation method is a stated preference approach that directly elicits willingness (and ability) to pay statements from survey respondents. Respondents are directly asked about their willingness to pay (i.e., change in compensating variation) for environmental improvement. The CVM involves the development of a hypothetical market via household surveys. In the hypothetical situation respondents are informed about the current problem and the policy designed to mitigate the problem. Other contextual details about the policy are provided such as the policy implementation rule (e.g., provision point design) and the payment vehicle (e.g., a special fund). Finally, a hypothetical question presents respondents with a choice about the improvement and increased costs versus the status quo. Statistical analysis of these data leads to the development of willingness to pay estimates.

Willingness to pay (*WTP*) for a quality change is

$$(14) \qquad v_i(c, y_i - WTP_i, q) = v_i(c, y_i, q - \Delta q)$$

where c is a vector of travel costs and Δq is the change in quality. The dual definition of willingness to pay is

$$(15) \qquad \begin{aligned} WTP_i &= e(c, q - \Delta q, v_i) - y_i \\ &= s(c, q, \Delta q, y_i) \end{aligned}$$

where $y = e(c, q, v(c, q, y))$ and $s(\cdot)$ is the variation function. Willingness to pay is decreasing in travel costs, increasing in quality and increasing in income (Whitehead, 1995a). The variation function can be specified with utility theoretic variables

$$(16) \qquad WTP_i = \gamma_0 + \gamma_1^{\prime} c + \gamma_2 q^{\prime} + \gamma_3 y + \gamma_4 z$$

where $q^{/} = q - \Delta q$. The negative of the coefficient on the travel cost variable, with an adjustment for the marginal utility of income across quality states, provides an estimate of the additional trips that would be taken with the quality change. The marginal willingness to pay for quality change can be obtained from the coefficient on the quality variable.

The proposal of this paper is that, alternatively, the inclusive value can be included as an index of travel costs, quality and income

$$(17) \qquad WTP_i = \gamma_0 + \gamma_1 I(c,q,z;\alpha) + \gamma_2 z$$

Oftentimes, alternative contingent valuation scenarios are necessary to obtain variation on quality in order to estimate its marginal value. In this case, marginal willingness to pay for changes in quality can be obtained from the coefficient on the inclusive value and simulated changes in the inclusive value

$$(18) \qquad \frac{\partial WTP_i}{\partial q} = \gamma_1 \frac{\partial I(c,q,z;\alpha)}{\partial q}$$

Alternative contingent valuation scenarios are not needed in order to obtain estimates of marginal willingness to pay for quality with the inclusive value.

Considering the revealed preference and stated preference approaches, a test of the convergent validity of the revealed preference (*CV*) and stated preference (*WTP*) methods is

$$(19) \qquad \begin{aligned} &H0: CV(\Delta q) = WTP(\Delta q) \\ &HA: CV(\Delta q) \neq WTP(\Delta q) \end{aligned}$$

Equality of value estimates would lend validity to both methods.

Survey and Data

The purpose of the "Saginaw Bay Coastal Marshes Survey" is to generate data for use in developing economic values for coastal marsh protection. The survey describes Saginaw Bay coastal marsh resource allocation issues, elicits information about coastal marsh-related recreation, inquires about attitudes regarding economic development, describes a coastal marsh protection program and elicits willingness to pay. It also obtains socio-economic information.

Names and addresses of all sportsmen living within the Saginaw Bay watershed were obtained under a special use agreement with the Michigan Department of Natural Resources (DNR). From this list, names were randomly selected. Three rounds of surveys were mailed between February and June of 2005. Ten days after each mailing, a reminder card was sent to all survey recipients. To help increase the response rate, the third round of surveys included an incentive. Survey recipients were notified that $1000 would be divided among five winners. Winners were randomly selected from the third round respondents and a check was sent to each.

For each of the 18 versions of surveys sent to sportsmen, 79 names were randomly selected from the DNR list, for a total of 1422 surveys. We obtained a response rate of 22% and, after deletion of cases with item nonresponse on important variables, we have a sample size of 251 (Table 1). The typical license holder household has 3 people with 0.82 children. The license holder sample is 79 percent male and 97 percent white. The average age is 48 years. Thirty-seven percent are members of conservation and/or environmental organizations and 8 percent owned

Saginaw Bay shoreline property. The average number of years in school is 14. Household income is $49 thousand.[6]

Respondents are asked about their Saginaw Bay coastal marsh-related recreation activities. These activities are defined as any trip where the respondent was on or near the water including the marshes where the typical plants are cattails, rushes, grasses, and shrubs. Fifty four percent of the sample had visited the Saginaw Bay or Saginaw Bay coastal marsh area for outdoor recreation or leisure. The license holders took an average of 6 coastal marsh recreation trips. Not all license holders took trips to Saginaw Bay. The recreation participants took an average of 11 trips. The primary recreation activity was fishing with 55 percent of the sample anglers. The most popular county for recreation trips was Bay County with almost 50 percent visiting there on a typical trip.

The survey elicited the willingness to pay for coastal marsh protection using the contingent valuation method. Respondents are told that 9000 of 18,000 acres of Saginaw Bay coastal marshes are currently protected and that the remaining privately owned marshes could be purchased and protected. A hypothetical "Saginaw Bay Coastal Marsh Protection Program" was introduced. Voluntary contributions would go into a "Saginaw Bay Coastal Marsh Trust Fund"

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[6] We also obtained a sample of the general population with a similar response rate and sample size but focus our analysis on the license holders sample in this paper. The results from the general population are generally consistent with those of the license holders except that the linkage between willingness to pay and the inclusive value is nonexistent.

to purchase *X* acres of coastal marsh. The acreage amount, *X*, was randomly assigned from three amounts 1125, 2500 and 4500.

Respondents are told that "Money would be refunded if the total amount is not enough to purchase and manage *X* acres. If the amount of donated money is greater than the amount required to purchase and manage *X* acres, the extra money would be used to provide public access and educational sites at Saginaw Bay coastal marshes." This is known as the provision point survey design (Poe, et al., 2002). The provision point design has been shown to minimize free riding bias in willingness to pay responses.

Then respondents are asked: "Would you be willing to make a one-time donation of money to the Saginaw Bay Coastal Marsh Trust Fund within the next 12 months?" For the license holder sample, 27 percent, 50 percent, and 23 percent would, would not, and did not know whether they would make a donation. Respondents who would be willing to make a donation are then told that "if about 1 percent (1 in 100) of all households in Michigan made a one-time donation of $*A*, the Trust Fund would have enough money to purchase and manage *X* acres of coastal marshes. Remember, if you made a one-time donation of $*A* into the Trust Fund, you would have $*A* less to spend on other things. Also remember that protected marsh would no longer be available for conversion to other uses." The dollar amount, $*A*, was randomly assigned from the following amounts: $25, $50, $75, $100, $150 and $200. The dollar amounts were chosen based on revenue streams required to purchase *X* acres of coastal marsh if 1 percent of all Michigan households made the donation.

Respondents are asked if they **"**would make a one-time donation of $*A* to the Saginaw Bay Coastal Marsh Trust Fund within the next 12 months?" Sixty-two percent, 42 percent, 36 percent, 42 percent, 26 percent, and 19 percent of the license holders were willing to pay $25, $50, $75, $100, $150 and $200.

One problem that arises with contingent valuation method surveys is hypothetical bias (Whitehead and Cherry, forthcoming). Hypothetical bias exists if respondents are more likely to say that they would pay a hypothetical sum of money than they would actually pay if placed in the real situation. Since economic values are based on actual behavior, hypothetical bias leads to upward biased estimates of economic value. One method that is used to mitigate hypothetical bias is the certainty rating (Champ and Bishop, 2001).

For those respondents who said that they were willing to pay we asked: "On a scale of 1 to 10 where 1 is "not sure at all" and 10 is "definitely sure", how sure are you that you would make the one-time donation of $*A*?" Thirty-four percent are definitely sure that they would pay and forty-percent are very sure that they would pay (i.e., their rating was 7, 8 or 9). To determine how likely respondents find the donation mechanism to work we ask "how likely do you think it is that 1 percent of all households in Michigan would make a one-time donation of $*A* to the Trust Fund within the next 12 months?" Forty-seven percent of the license holders thought that it would be somewhat likely or very likely.

Empirical Results

Revealed Preference

Recreation participants and non-participants are included in the analysis. Non-participants are those who took zero trips. The dependent variable for the site selection model is the typical county chosen for a coastal marsh-based recreation trip. We also include a nonparticipation choice for those who do not take trips. The most popular county for recreation trips is Bay County with almost 50 percent visiting there on a typical trip. Twelve percent go to Iosco and Arenac Counties, 11 percent goes to Tuscola County and 24 percent go to Huron County on a typical trip. Forty-six percent do not choose any county.

Data on wetlands acreage and other measures of site quality for each Saginaw Bay county was provided by Ducks Unlimited (Table 2). Other variables used to explain recreation site selection are the travel costs to the county site, the number of water access points in the county site and National Forest acreage. We compute distance traveled from the home zip code of the respondent to the zip code of the most commonly visited city in the county of the typical recreation trip destination using ZIPFIP software, d_{ij} (Hellerstein, 2005). Travel cost per mile is set at $0.37, time costs are valued at one-third of the wage rate, and average miles per hour is 60: $c_{ij} = 0.37 \times 2 \times d_{ij} + [(0.33 \times y_i / 2000) \times (2 \times d_{ij})] / 60$. The average travel cost is $56, the average number of wetland acres in each county is 42,000, the average number of access points is 6 and the average number of National Forest acres in each county is 10 thousand.

In Model 1, we include travel costs, wetland acres, access points and acres of National Forest land as independent variables (Table 3). As expected, the probability of site choice decreases as the travel costs to the site increases. The probability of site choice is not affected by wetland acres or acres of National Forest land. The probability of site choice increases with access points.

In Model 2, we also include alternative specific constants interacted with income. In this model, the probability of site choice decreases as the travel costs to the site increases. Surprisingly, the probability of site choice decreases with wetland acres. This is likely due to the inclusion of recreation nonparticipants in the model. In Whitehead et al. (2006), with nonparticipants excluded, the probability of site choice increases with wetland acreage. The probability of site choice increases with access points. The probability of site choice is not affected by National Forest land. The probability of site choice at each of the five counties, relative to nonparticipation, increases with income. This result indicates that coastal marsh recreation is a normal good.

We use the inclusive value computed from each of these models. We expect varying results depending on the inclusive value used and whether income is included in the linked models because the correlation coefficients between income and the inclusive values are significantly different. The correlation coefficient between the inclusive value from Model 1 and income is negative, $r = -0.33$. The correlation coefficient between the inclusive value from Model 2 and income is positive, $r = 0.52$. Nevertheless, the correlation coefficient between the inclusive values from Models 1 and 2 is positive, $r = 0.58$.

We estimate three negative binomial trip participation models. Model 1 includes the inclusive value estimated without income in the utility function (from Model 1 of Table 2) and a separate income variable. Trips increase with the inclusive value and income. The inclusive value coefficient primarily reflects the price effect. As travel costs fall (the individuals live closer to the recreation destination) the inclusive value increases.

Model 2 includes the inclusive value estimated with income in the utility function (from Model 2 of Table 2) without a separate income variable. Trips increase with the inclusive value. In this model, the inclusive value coefficient reflects the price effect and the income effect. As income increases, the individual is more likely to participate in recreation and, therefore, take more trips.

Model 3 includes the inclusive value estimated with income in the utility function (from Model 2 of Table 2) with a separate income variable. Trips increase with the inclusive value and decrease with income. Holding the effect of income on recreation participation constant, as income increases the individual takes fewer trips. From a statistical standpoint, Model 1 is preferred with a higher log-likelihood function value.

Stated Preference

The dependent variables in the willingness to pay analysis are whether the respondent is willing to pay something above zero (“donate”) and, if so (n = 129), willing to pay more than the requested donation (“give”). Following Groothuis and Whitehead (2002) the “don’t know” responses are recoded to “no” responses for a conservative estimate of willingness to pay. Since economic values are revealed by behavior, correction of hypothetical bias is necessary to develop more accurate willingness to pay estimates. We recode “give” responses where the respondent is not sure that they would be willing to pay, these respondents answered less than 7 on the follow-up certainty scale, to “no” responses. The natural log of the bid ($$A$) amount is used to improve statistical fit.

The two willingness to pay decisions (e.g., donate and give) are analyzed separately with the logit model. The probability of a “yes” response is the probability that willingness to pay, WTP, is greater than the bid amount, A (Cameron, 1988)

$$\begin{aligned} \Pr(donate) &= \Pr(WTP > 0) \\ &= \Pr\left(\frac{\lambda' z}{\kappa}\right) \end{aligned} \quad (20)$$

$$\text{(21)} \quad \begin{aligned} \Pr(give) &= \Pr(WTP > A) \\ &= \Pr\left(\frac{\theta' z - \ln A}{\kappa}\right) \end{aligned}$$

where λ and θ are vectors of coeffcients, z is a vector of independent variables and $\frac{-1}{\kappa}$ is the coefficient on the log of the bid amount. Median willingness to pay is (Haab and McConnell, 2002)

$$\text{(22)} \quad \begin{aligned} WTP &= \exp(\kappa[\theta' z]) \\ &= \exp(\gamma' z) \end{aligned}$$

The t-statistics are developed using standard errors approximated by the Delta Method (Cameron, 1991).

The willingness to pay results are presented in Table 4. In addition to the inclusive value we include the log of the bid amount and the wetland acreage in both “donate” and “give” models. Since the data was collected with a mail survey respondents could read the entire survey before answering any question. It is therefore possible that price and scope effects may be found in the donate model, although theory would not guide the inclusion of these variables. Conservation and/or environmental organization membership and income are the only socioeconomic variables included. We also include a dummy variable equal to one if the respondent thinks it is likely that enough Michigan residents would make the required donation for the program to be a success. The variable is equal to zero otherwise.

We present four models. Model 1 includes the inclusive value estimated without income in the utility function (from Model 1 of Table 2) and a separate income variable. Model 2 includes the inclusive value estimated without income in the utility function and without income as a separate variable (from Model 1 of Table 2) without a separate income variable. Model 3 includes the inclusive value estimated with income in the utility function (from Model 2 of Table 2) with a separate income variable. Model 4 includes the inclusive value estimated with income in the utility function (from Model 2 of Table 2) without a separate income variable.

We first describe some general results and then turn our attention to the inclusive value. In each model, as the bid amount increases the probability of “donate” and “give” responses decreases. The bid variable influences the decision of whether to donate any amount of money and whether to donate the bid amount. In each model respondents who are organization members are more likely to be willing to donate some positive amount of money for coastal marsh protection and more likely to give more than the bid amount.

An important test of the validity of willingness to pay responses is whether willingness to pay increases with the quantity of the good being purchased. This is known as the scope test (Whitehead, Haab, and Huang, 1998). The scope test results are mixed. In models 1 and 3, with income included as a separate variable, increases in scope makes it more likely that the respondents will donate some amount of money. However, in none of the models is marsh acreage a significant determinant of whether the respondent would give more than the bid amount. Note that failure to pass the scope test does not necessarily invalidate the willingness to pay values. Economic theory only requires that willingness to pay be non-decreasing with quantity.[7]

[7] Recent research in behavioral economics indicates that individuals do not always follow the

The provision point design is intended to provide respondents with incentives to reveal their true willingness to pay. One reason why respondents might state that they would not donate even if their willingness to pay is above the requested donation is that they believe the money would be wasted if total donations are not sufficient to fund the program. With the provision point design respondents are told that if that occurs, their money would be refunded. Survey respondents who did not believe that the donations would be sufficient were less likely to be willing to pay the bid amount. This result is further explored by Groothuis and Whitehead (2006).

Whitehead et al. (2006) adopt the theoretically preferred empirical specification by including the typical trip travel cost for users and the minimum travel cost for nonusers. The coefficient on this variable is not statistically significant which suggests that the willingness to pay estimates are nonuse values. The results with the inclusive value included in the willingness to pay model are mixed but generally support the results in Whitehead et al. (2006). In Model 1, with income excluded from the inclusive value but included separately in the model, the coefficient on the inclusive value is negative in the “donate” model and statistically insignificant in the “give” model. The same result is found in Models 2 and 3 without income in the inclusive value or as a separate variable and with income included in the inclusive value and included as a

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dictates of neoclassical consumer theory. Heberlein, et al. (2005) found that individual respondents do not pass the scope test internally for a variety of reasons. Market forces act to discipline irrational behavior for market goods. In valuation surveys this behavior is allowed to flourish. They conclude that behavior that flows from complex individual preferences and does not strictly follow neoclassical economic theory should not be considered invalid.

separate variable, respectively. The coefficient on income is positive and statistically significant in Models 1 and 3 in both willingness to pay decisions.

Models 1, 2 and 3 support an interpretation of willingness to pay as nonuse value since it does not vary in the expected direction with the inclusive. These results indicate that those with higher levels of expected maximum utility from coastal marsh recreation are less likely to be willing to donate anything for marsh protection. A naïve interpretation of this result is that it is consistent with the negative values for marsh protection found in the recreation demand model. However, the negative value result from the recreation demand model is likely due to the predominant choice of nonparticipation and the zero value of wetlands associated with that choice. Another interpretation of the willingness to pay result is that recreation nonusers hold nonuse values while recreation users do not hold nonuse values.

In contrast to Models 1-3, Model 4, with income included in the inclusive value and excluded as a separate variable, provides a different interpretation. The inclusive value is not a determinant of the decision to donate money to marsh protection but the probability of giving more than the bid amount is positively affected. This result suggests that willingness to pay is decreasing in travel cost and increasing in income and that willingness to pay contains a large component of use values. It is likely, however, that the inclusive value is picking up the income effect. It is most likely that the inclusive value is capturing ability to pay rather than the utility of recreational use of the coastal marsh.

Conclusions

We have explored the linkage between recreation demand and willingness to pay models. We have two goals. First, we further consider the decomposition of willingness to pay into use and nonuse values. If contingent valuation estimates of willingness to pay are comprised mostly of nonuse values then value estimates from revealed preference and stated preference models are additive. Second, we propose an alternative model for linking revealed preference and stated preference models of recreation when a single travel cost measure is difficult to obtain. We show that this model can be used to test convergent validity and offers an alternative scope test that does not rely on split-sample contingent valuation scenarios.

Our results with the Saginaw Bay coastal marsh data are mixed. In three of the four models estimated the inclusive value is negatively related to the willingness to donate but unrelated to the willingness to give more than the suggested bid amount. This result suggests that recreation nonusers hold nonuse values while recreation users do not hold nonuse values. As such, we believe that much of the willingness to pay estimate is comprised of nonuse values and the additivity assumption adopted by Whitehead et al. (2006) is appropriate.

The lack of an expected result may also arise from an incompatibility between the revealed preference and stated preference data. The stated preference data results from a scenario where respondents are asked to help protect an existing resource. Without this protection, the quality of future recreation resources might diminish. The revealed preference data results from existing opportunities. Future research should explore recreation demand and willingness to pay scenarios that are more tightly linked.

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Figure 1. Saginaw Bay Watershed