Willingness to Pay for Submerged Maritime Cultural Resources*

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Abstract

Many consider salvage value and tourism expenditures as the only economic values of a historic shipwreck. This paper looks at one alternative, the non-market value generated by management of shipwrecks as submerged maritime cultural resources. We consider the question: How much are people willing to pay to maintain shipwrecks in their pristine state? The contingent valuation method was implemented during summer 2001 as part of a telephone survey to households in eastern North Carolina. We find that households are willing to pay about $35 in a one-time increase in state taxes. The double-bounded willingness to pay questions are not incentive compatible and are subject to starting point bias, despite efforts to minimize these effects. Also, the data fails to pass the scope test. We speculate that we inadvertently succumbed to the well-known "birds" problem. We find that willingness to pay is internally validated by expected relationships with prices and income.

Willingness to Pay for Submerged Cultural Resource Management:

Introduction

Submerged maritime cultural resources (i.e., historic shipwrecks) can be valuable archaeological sites with information that helps to understand past societies and the development of maritime activities throughout the world. In contrast, the market value of a historic shipwreck is the price of the artifacts salvaged from a shipwreck as determined through auction or direct sale. Contemporary salvors (i.e., treasure hunters) find profit by salvaging abandoned ships or ships in distress, a practice rooted in ancient law.

Another market value related to historic shipwrecks is the expenditures made by visitors to maritime museums, historic ship replicas, and decommissioned ships. The creation of museums and exhibits protects historic shipwrecks but they still entail the removal of the wreck and its contents from underwater. Such a venture is not economically viable for all wrecks. The cost of excavation and conservation of shipwrecks is high. Most archaeologists, historians, and even the general public would not want all shipwrecks disturbed in this manner. Ships considered tombs to those who died there, ships with historical significance, and ships too fragile to safely excavate could be maintained as underwater preserves.

In contrast to salvage value and tourism expenditures, the non-market value of shipwrecks includes the use and non-use value of the services of historic shipwrecks. Use value includes the benefits to recreational divers who enjoy historic shipwrecks as destinations. Non-use value includes the benefits to people who enjoy knowing about historic shipwrecks without on-site use. Non-users of shipwrecks might include tourists who gain knowledge by visiting coastal areas, waterfronts, maritime museums and ship memorials. The knowledge can also be obtained through reading and watching television programs.

Nevertheless, salvage is usually the only economic value typically considered when investigating the value of shipwrecks. In this context, Kaoru and Hoagland (1994) suggest that application of the contingent valuation method is the preferred methodology to obtain estimates of the value of shipwreck protection in order to balance the competing demands of shipwrecks. In one related application, Vrana (1992) estimates use value by asking respondents about willingness to pay for permits to dive in a hypothetical Great Lakes park that includes historic shipwrecks.

The purpose of this paper is to determine whether there are potentially significant non-market values for managing historic shipwrecks as submerged maritime cultural resources rather than as salvageable market commodities. We use the contingent valuation method to estimate this value. In the next section we provide a description of the survey and the responses. Next we describe the willingness to pay models. Then we present the empirical results. Finally, we offer some conclusions.

The Survey

In order to measure the non-market value of historic shipwrecks we designed contingent valuation questions as part of an omnibus survey of eastern North Carolina residents conducted during the summer of 2001. The response rate of 46% is measured as the number of completed surveys divided by the sum of completions and refusals surveys. The number of completed surveys is 913. Eight hundred eighty-four cases are useable for the analysis. This sample includes a small number of cases with household income values imputed from a regression model. The sample average household income is $37,210 (Table 1). Sixty-nine percent of the sample is white and 37% is male. Sixty-one percent of the sample is married. The average household size is 2.44. Average education is 13.39 years and the average age is almost 50 years.

Eleven questions specific to historic shipwrecks were presented to survey respondents (see Appendix). The purpose of these questions is to estimate the willingness to pay for a historic shipwreck state park with protection

from treasure hunters in North Carolina. The first two questions are about knowledge of shipwrecks and begin with some background information. Respondents are given a definition of historic shipwrecks and told that "over 5000 ships have been lost off the North Carolina coast earning the state the nickname: the graveyard of the Atlantic." We then ask respondents how much they know about historic shipwrecks. In their own opinion, 6% know a lot, 21% know some, 36% know a little, and 37% know nothing. Respondents are then told that a newly discovered wreck off the coast of North Carolina is being investigated as the possible remains of the *Queen Anne's Revenge*, the pirate Blackbeard's ship. Sixty-eight percent of the sample had heard about this ship before the survey.

Next, we ask about travel related to historic sites. Thirty-four percent, 39%, and 27% are very likely, somewhat likely, and not likely to visit local historic sites such as museums or historic parks when they go on vacation. Sixty-four percent had visited the North Carolina coast during the past 12 months. Of these, 20% visited a historic ship or shipwreck. Most of these respondents visited either the *USS North Carolina* Battleship Memorial in Wilmington, the North Carolina Maritime Museum in Beaufort, or the *Elizabeth II* replica ship in Manteo.

Attitudes about protection of historic shipwrecks are next elicited. Respondents are told that the state Historic Preservation Office monitors over 5000 shipwrecks and the state underwater archaeology unit has studied about 900 of these wrecks. Thirty-three percent, 48%, and 19% of the sample think that it is very important, somewhat important, or not very important to monitor and study historic shipwrecks. The policy problem is then described. Respondents are told that the state cannot adequately protect a shipwreck from treasure hunters. Fifty-one percent, 31%, and 18% think that it is very important, somewhat important or not very important to protect historic shipwrecks from treasure hunters.

The policy proposal is then introduced. Respondents are asked to suppose that North Carolina was considering a historic shipwreck state park that would protect the most important shipwrecks from treasure hunters. Access to the park would be monitored and controlled and information about the park would be distributed to the public. Sixty-eight percent of the sample supports the creation of a historic shipwreck state park.

Then the willingness to pay questions are presented. Respondents are told that creation of the park would require additional state money to protect the most important shipwrecks. Respondents are given "one estimate" of the cost as a one-time increase in state taxes and then asked to suppose that the creation of the park was put to a vote in the next statewide election. The willingness to pay questions are presented as a state-wide referendum (i.e., "would you vote for or against the park?").

There are eight versions of the willingness to pay questions. The first, single-bound, question has two versions for the park size (50 or 100 protected shipwrecks) and four price versions ($10, $30, $60, $90). Double-bounded questions present a follow-up. If the referendum vote is "for" on the first willingness to pay question, the next presents a variation in the proposal in which the size of the park is increased by 2.5 and the price is doubled. If the referendum vote is "against" or "don't know" on the first question the size of the park is divided by 1.25 and the price of the park is halved in the follow-up question.

For those respondents who received the 50 shipwreck park version, 67%, 51%, 34%, and 40% voted for the park at taxes of $10, $30, $60, and $90 (Table 2). The differences are statistically significant at the $p = .01$ level (χ^2=27.29[3 df]). For those respondents who received the 100 shipwreck park version, 58%, 49%, 36%, and 43% voted for the park at taxes of $10, $30, $60, and $90. The differences are statistically significant at the p =

.01 level (χ^2=12.34[3 df]). Overall, 47% and 46% voted for the 50 and 100 shipwreck parks. The differences across the size of the park are not statistically significant.

The double-bounded responses indicate that most respondents were reluctant to change their answers when the park size and tax amount changed (Table 3). Twenty-nine percent and 46% of respondents in each park size version voted for or against on each question. Less than 20% voted for on the first question and against on the second. Less than 10% voted against on the first question and for on the second.

Willingness to Pay Models

Both single-bound and double-bounded willingness to pay models are estimated. With the single-bound data the probit model is used to empirically determine the factors that affect the for and against votes in the first referendum. With the double-bounded data the random effects probit model for panel data is used (Alberini, Kanninen, and Carson, 1997; Greene, 2000). The willingness to pay models are derived from the probit coefficients using the procedures described in Cameron and James (1987). The standard errors for the coefficients and the willingness to pay estimates are constructed using the Delta Method (Cameron, 1991; Greene, 2000, p. 278). The LIMDEP econometric software is used (Greene, 1997).

Two models for the single-bound and double-bounded data are estimated. The first model includes only economic variables that might affect willingness to pay including the one-time tax amount, the size of the park (*Quantity*), on-site use prices (*Travel Cost 1* and *Travel Cost 2*), and income. The second model also includes demographic variables from Table 1.

By incorporating different sizes of the park into the experimental design we conduct a "scope" test (Whitehead, Haab, and Huang, 1998). Critics of the contingent valuation method argue that willingness to pay, and especially non-use value, is insensitive to scope. Scope insensitivity exists if willingness to pay estimates for a public good and a public good of greater quality or quantity are not significantly different. The critics argue that scope insensitivity renders the contingent valuation method invalid for policy analysis. Others argue that findings of sensitivity to scope are common. Still others argue that the scope test is not a critical test of the validity of the contingent valuation method. In fact, the only theoretical requirement is that willingness to pay should be *non-decreasing* in scope. In the current application, the expected sign of the *Quantity* variable is positive or zero.

The on-site use price variables measure the potential own-price and cross-price effects of the park as a travel destination (Whitehead, Hoban, and Clifford, 1994). The travel costs are constructed as $TC = (C \times Miles) + (\gamma \times Wage \times Miles \div MPH)$ where *C* is the cost per mile ($0.32), *Miles* is the round trip distance, γ is the opportunity cost of time (33%), *Wage* is the household wage rate (Income/2000), and *MPH* is the average miles per hour (45). The *Travel Cost 1* variable measures the travel and time costs of a trip from the population center of the respondent's county to the Outer Banks of North Carolina (i.e., "the graveyard of the Atlantic"). The town of Manteo is considered as the gateway to the Outer Banks for most visitors and is used in the distance calculation. The *Travel Cost 2* variable measures the travel and time costs of a trip to Morehead City (i.e., *Queen Anne's Revenge*). The mean travel costs to Manteo and Morehead City are $130.20 and $102.77. The expected effect of the own-price of on-site use on willingness to pay is negative. The expected effect of a cross-price on willingness to pay is positive or negative. A positive sign indicates that the sites are substitutes. A negative sign indicates that the sites are complements.

Double-bounded willingness to pay questions are prone to incentive incompatibility (Alberini, Kanninen, and

Carson, 1997) and starting point bias (Herriges and Shogren, 1996). Incentive incompatibility exists if respondents use different decision rules when answering the first and second willingness to pay questions. For example, respondents who vote for the project may perceive that government is wasting money when they are confronted with a higher tax amount. Respondents who vote against the project may perceive that the project will be of lower quality when confronted with a lower tax amount. In both cases there are incentives to vote against the project in the second question, regardless of true willingness to pay, and the second willingness to pay amount may shift downward. In response to a suggestion made by Alberini, Kanninen, and Carson (1997) we vary the quantity of the good between the first and second referendum in an attempt to minimize incentive incompatibility.

Starting point bias exists if respondents are reluctant to deviate away from their first referendum response because they perceive that the first tax amount is the true value of the project. Respondents who vote for the project perceive that the second tax amount is too high and will vote against the project. Respondents who vote against the project perceived that the second tax amount is too low and will vote for the project. In either case there is a tendency for responses to bound the starting tax amount. The model adopted by Herriges and Shogren (1996) and in this paper assumes that the final willingness to pay amount is a weighted average between the starting tax amount and true willingness to pay.

We control for both incentive compatibility and starting point bias with two additional independent variables in the double-bounded models. In the random effects probit we include a dummy variable equal to one for the second question and zero otherwise (*Shift*) and the *Shift* variable interacted with the tax amount from the first question (*Anchor*) as in Whitehead (forthcoming). When the probit results are converted to the willingness to pay model the *Shift* effect measures the difference in willingness to pay between the first and second questions. The *Anchor* effect measures the weight attached to the tax amount in the first referendum question.

Empirical Results

The results of the willingness to pay models are presented in Table 4. The vector of coefficients in each model is statistically different from zero according to the likelihood ratio test (i.e., $\chi^2 = -2[\text{Beginning LL} - \text{Ending LL}]$). In the double-bounded models the ρ parameter is the contribution of the total variance in the error term due to the error term common to the respondent (i.e., the random effects). The ρ parameter is between 0.88 and .092 which indicates that almost all of the variation is at the individual level and not random error. This result indicates that the random effects specification is appropriate.

The scale parameter, σ , is the negative inverse of the probit coefficient on the tax amount. In each model the scale parameter is positive and statistically different from zero indicating that as the tax amount increases respondents are less likely to vote for the project. Respondents are behaving rationally in the referendum. Another consistent result in each model is the lack of a scope effect. Respondents do not perceive the park with 100 shipwrecks to be more valuable than the park with 50 shipwrecks.

In each model, the coefficient on *Travel Cost 1* is negative and statistically significant. In the single-bound models the coefficient on *Travel Cost 2* is not significantly different from zero. In the double-bounded models the coefficient on *Travel Cost 2* is positive and statistically significant. These results suggest that respondents perceive that the coastal area near the Outer Banks to be the location of the proposed park and that the coastal area near Morehead City to be a substitute location for on-site activities related to the park. The absolute value of the own-price coefficient can be interpreted as the increased number of recreation trips that would be taken

with establishment of the park (Huang, Haab, and Whitehead, 1997). Across the models, the range of increased trips is .16 to .20 for each respondent. In other words, between 16% and 20% of the respondents would take one additional trip to the Outer Banks with establishment of the park.

In the models without demographic variables the coefficient on *Income* is positive and statistically significant. This result reveals that the shipwreck park is a normal good. The income elasticity of willingness to pay is 1.21 in the single-bound model and 1.10 in the double-bounded model. When demographic variables are added to the models the income coefficients are no longer significantly different from zero. This is not surprising since income is correlated with each of the demographic variables (the absolute value of the correlation coefficients range from .12 to .41).

In the single bound model willingness to pay is $26 lower for married respondents, $12 higher for each additional household member, and $12 higher for each additional year of education. In the double-bounded model, willingness to pay is $29 lower for married respondents, $14 higher for each additional household member, and $11 higher for each additional year of education. Race, gender, and age do not have statistically significant effects on willingness to pay. The vector of demographic coefficients is statistically significant according to the likelihood ratio statistic for the single-bound (χ^2=37.22[6 df]) and double-bounded models (χ^2=37.34[6 df]).

The willingness to pay estimates from the first referendum question are between $38 and $39 in the single-bound models and between $33 and $34 in the double-bounded models. The differences in the single-bound and double-bounded willingness to pay estimates are not statistically different. In the double-bounded models the shift effect is statistically significant and greater in absolute value than the willingness to pay estimates. This indicates that the incentive incompatibility is so extreme that the willingness to pay estimates implied from the second referendum are negative. The anchoring effect indicates that the willingness to pay implied from the second referendum question is a function of the starting tax amount. The weight assigned to the tax amount is between 0.52 and 0.54.

Discussion

The purpose of this paper is to provide an estimate of the willingness to pay, including non-use values, for management of submerged maritime cultural resources (i.e., shipwrecks). The empirical results indicate that respondents are willing to pay money for protection of shipwrecks from treasure hunters, preserving the public good aspects of these cultural resources. Most of the results from the willingness to pay model are sensible and conform to economic theory. This indicates that the willingness to pay estimates have some degree of validity and are useful for policy analysis.

One set of validity results concerns the effects of price and income on willingness to pay. Willingness to pay is increasing with income indicating that the shipwreck park is a normal good. The major limitation of the price results is that the location of the shipwreck park is not made explicit in the contingent valuation scenario. Therefore, we constructed prices to destinations mentioned in the scenario and define the own-price and cross-price according to what respondents perceive as revealed by the empirical results. The results suggest that if the Outer Banks is the location of the park then 16% to 20% of the respondents would take one additional trip to the Outer Banks for the purpose of consuming submerged cultural resources. This indicates that a significant portion of willingness to pay is use value.

We find that willingness to pay is insensitive to the scope of the policy. This result, by itself, does not invalidate the willingness to pay estimates since willingness to pay should be nondecreasing in scope. However, it is

troubling since an increase in willingness to pay after a doubling of the size of the park is intuitively appealing. On closer inspection of the contingent valuation scenario we may have inadvertently succumbed to the "birds" problem. Boyle et al., (1994) find that willingness to pay does not vary for a program to avoid the deaths of "much less than 1%," "less than 1%," and "about 2%" of the migratory waterfowl population in the central flyway. Hanemann (1994) has argued that it is not surprising that willingness to pay does not differ across these programs since it can be argued that respondents may not perceive any major difference in the number of birds when placed in percentage terms. In our survey, the park size varies from 50 to 100 of the 5000 shipwrecks that the state of North Carolina monitors. It should not be surprising that willingness to pay does not vary when shipwreck protection varies from 1% to 2% of the total.

Our experimental design also includes a previously untested attempt to solve the incentive incompatibility problem of double-bounded willingness to pay questions. In addition to varying the tax amount in the follow-up question, we varied the scope of the project so that respondents would be considering a different public good relative to the first referendum question. Nevertheless, we find that the follow-up responses suffer from incentive incompatibility as measured by a large shift in willingness to pay from the first to the second question. In addition, the follow-up willingness to pay responses also suffer from starting point bias. Besides some efficiency gains in individual coefficient estimates the follow-up questions do not provide substantial improvement in the willingness to pay estimates.

Our results have implications for submerged maritime cultural resource policy. An understanding of the economic value of historic shipwreck management is useful in helping to determine how many resources should be devoted toward protecting historic shipwrecks from treasure hunters and other consumptive users. Considering that there are about 650 thousand households in the sample region and using the most conservative willingness to pay estimate from Table 4 ($32.82) the aggregate willingness to pay is $21.33 million. The lower bound of the 95% confidence interval is $12.62 million and the upper bound is $30.04 million. A 30-year annuity yielding 5% would generate $1.32 million in annual revenue for managing the park. If the annual cost of managing the park is less than $1.32 million then establishment of the park represents an improvement in economic efficiency. Of course, these benefit estimates are biased downward by the extent to which residents of the rest of North Carolina value historic shipwreck protection.

Estimating economic values for submerged cultural resource management is a promising area of research. Our research is limited, however, and these limitations suggest a number of changes in the experimental design for future research. First, the contingent valuation scenario should state explicitly the location of the park in order to obtain unbiased estimates of the own-price and cross-price coefficients and potential visitation at the park. Also, inclusion of contingent behavior questions would be one way of validating these estimates (Huang, Haab, and Whitehead, 1997). Second, future research should avoid the "birds" problem. In order to obtain willingness to pay estimates that vary with the scope of the project, which allows sensitivity analysis when benefits are compared to costs, researchers should vary the size of the park by more than 1% to 2% of the potential number of shipwrecks. Finally, researchers should continue to investigate the incentive compatibility of follow-up questions in order to exploit the potential gains in efficiency without biasing willingness to pay estimates. Any variations in the wording or context of the follow-up questions that avoid misperceptions about the intentions of the questions are worth attempting. Unfortunately, no promising solutions to this problem come readily to mind.

Appendix

Q1. This section concerns the management of historic shipwrecks in North Carolina waters. Historic shipwrecks are at least fifty years old and include everything from intact ships to pieces of wood scattered along a beach or riverbank. Over 5000 ships have been lost off the North Carolina coast earning the state the nickname: the graveyard of the Atlantic. Most of these are still lying where they wrecked but some have been preserved and moved to museums.How much do you know about historic shipwrecks? Do you know … [read categories]?

a. a lot

b. some

c. a little

d. or nothing at all

e. don't know

Q2. The Queen Anne's Revenge was the name of the pirate Blackbeard's ship. A wreck off the coast of North Carolina is being investigated as the probable remains of this ship. Had you heard of this ship before this survey?

a. yes

b. no

c. maybe

d. don't know

Q3. When you go on vacation how likely are you to visit local historic sites such as museums or historic parks. Are you … [read categories]?

a. very likely

b. somewhat likely

c. or not likely at all

d. don't know

Q4. During the past twelve months, did you visit the North Carolina coast on a short-trip or a vacation?

a. yes

b. no

c. don't know

If yes, go to 5

If no or don't know, go to 6

Q5. Did you visit a historic ship or shipwreck?

a. yes

b. no

c. don't know

If yes, go to 6

If no or don't know, go to 7

Q6. What ship or shipwreck did you see? (check all that apply)

a. USS North Carolina Battleship (Wilmington)
b. North Carolina Maritime Museum (Beaufort)
c. Elizabeth II (Manteo)
d. CSS Neuse (Kinston)
e. USS Monitor exhibit, Mariner's Museum (Virginia)
f. Other _____

Q7. North Carolina monitors over 5000 shipwrecks through the state Historic Preservation Office. North Carolina's underwater archaeology unit has studied about 900 of the 5000 shipwrecks. How important do you think it is to monitor and study historic shipwrecks? Do you think it is … [read categories]?

a. very important

b. somewhat important

c. or not very important

d. don't know

Q8. Sometimes the state cannot protect a shipwreck from people who want to salvage them for their commercial value. Treasure hunters salvage as much as possible and sell the artifacts. Most artifacts leave the state and end up in private collections. How important do you think it is to protect historic shipwrecks from treasure hunters? Do you think it is … [read categories]?

a. very important

b. somewhat important

c. or not very important

d. don't know

Q9. Suppose North Carolina was considering a new historic shipwreck state park. The park would protect the

most important shipwrecks from treasure hunters and others who might damage them. Park employees would closely monitor and control people's access to the shipwrecks and distribute information about historic shipwrecks to the public. Do you support or oppose the creation of a historic shipwreck state park?

a. support

b. oppose

c. don't know

Q10. The historic shipwreck state park would require additional state money to protect the A1 most important historic shipwrecks. One estimate is that it would cost each household in North Carolina about B1 in a one-time increase in state taxes. Suppose the creation of this park was put to a vote in the next statewide election. Would you vote for or against the park?

a. for

b. against

c. don't know

If for, go to 11

If against or don't know, go to 12

Q11. Suppose the park size was expanded to include the A2 most important wrecks off the North Carolina coast. The expanded park would cost each household in North Carolina about B1 in a one-time increase in state taxes. Would you vote for or against the park?

a. for

b. against

c. don't know

Q12. Suppose the park size was reduced to include the A3 most important wrecks off the North Carolina coast. The reduced park would cost each household in North Carolina about B3 in a one-time increase in state taxes. Would you vote for or against the park?

a. for

b. against

c. don't know

Go to next section

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Table 1. Sample Demographics

	Mean	Std.Dev.	Min.	Max.
Income	37.21	20.73	5	75
White	0.69	0.46	0	1
Male	0.37	0.48	0	1
Married	0.61	0.49	0	1
Household Size	2.44	1.24	1	7
Education	13.39	2.55	0	20
Age	49.59	17.02	18	91
Cases	884			

Table 2. For/Against Responses in the Single Bound Referendum

50 Shipwrecks

Tax Amount	For	Total	%For
10	68	102	66.67
30	56	109	51.38
60	42	124	33.87
90	42	105	40.00
Total	208	440	47.27

100 Shipwrecks

Tax Amount	For	Total	%For

10	61	105	58.10
30	49	101	48.51
60	48	134	35.82
90	45	104	43.27
Total	203	444	45.72

Table 3. For/Against Responses in the Double-Bounded Referendum

50 Shipwrecks

Tax Amount	For/For	For/Against	Against/For	Against/Against
10	55	13	3	31
30	32	24	3	50
60	20	22	10	72
90	19	23	13	50
Total	126	82	29	203
Percent	28.64	18.64	6.59	46.14

100 Shipwrecks

Tax Amount	For/For	For/Against	Against/For	Against/Against
10	45	16	3	41
30	27	22	6	46
60	34	14	16	70
90	23	22	10	49
Total	129	74	35	206
Percent	29.05	16.67	7.88	46.40

Table 4. Willingness to Pay Models

	Single-Bound				Double-Bounded			
Variable	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Constant	1.85	0.07	-146.71	-2.40	-13.44	-0.70	-145.22	-2.78
Quantity	-0.12	-0.47	-0.12	-0.52	-0.01	-0.10	0.07	0.65
Travel Cost 1	-0.20	-1.81	-0.19	-1.88	-0.19	-1.95	-0.16	-1.74
Travel Cost 2	0.21	1.34	0.18	1.21	0.34	2.35	0.30	2.03
Income	1.24	2.88	0.53	1.34	1.01	3.04	0.38	1.00
White			14.05	1.05			16.21	1.25
Male			19.56	1.57			15.69	1.32
Married			-25.90	-1.74			-29.14	-2.04
Household Size			12.19	2.03			13.69	2.49
Education			12.12	3.67			11.11	3.80
Age			-0.30	-0.78			-0.62	-1.56
σ	142.40	4.82	129.51	5.20	42.00	5.41	51.06	4.56
WTP	38.20	4.30	38.99	4.78	34.15	5.21	32.82	4.80
Shift					-47.12	-4.50	-54.67	-4.26
Anchor					0.52	3.59	0.54	3.38
ρ					0.92	40.65	0.88	21.13
Beginning LL	-610.57		-610.57		-1198.52		-1198.52	
Ending LL	-587.11		-568.51		-1034.47		-1015.80	
Cases	884		884		884		884	
Responses	1		1		2		2	