Does On-site Experience Affect Responses to Stated Preference Questions?

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Abstract: An important issue in the design of stated-preference surveys is whether the information provided to respondents within a survey instrument can result in valid value estimates. On-site experience with a resource is one way to provide respondents with first-hand information about complex ecological resources and management plans. In the research reported here we compare preference parameter estimates for on-site treatment with those for a mail survey in the context of a choice study of forest management practices. The results show that there are not sample-selection and survey-mode effects between the mail and on-site administration of the survey. Moreover, preference estimates were invariant to the information study participants acquired from a walk through the forest. This later result is similar to a finding by Tinch et al. (2010), and we have the additional insight that the results are statistically similar to those obtained from a traditional mail survey. These results suggest that study participants can answer valuation questions for complex ecological resources without acquiring direct experience with the resources, but the results need to be vetted in other resource applications before they are accepted as a stylized fact in the sated-preference literature.

Key Words: contingent valuation, mixed logit model, on-site experience, forest management

1. Introduction

A key consideration in the design of stated-preference surveys is the information provided to respondents to describe the item being valued and the increment of change, which is done in the context of the experience/knowledge respondents have with the item. In studies estimating use values respondents typically have specific, first-hand experience and the researcher focuses on describing the change in the resource that respondents may or may not have experienced. When nonuse or total values are elicited, respondents may not have specific, first-hand experience. Applications estimating nonuse or total values results in respondents who lack specific experience/knowledge to base their responses on their general knowledge/experience, which may or may not be directly relevant, and the information provided in the survey instrument. The breadth and depth of information provided in stated-preference surveys is carefully designed through one-on-one interviews, focus groups and/or field pretests (Champ, Brown and Boyle, 2003; Mitchell and Carson, 1989). A logical question that one might ask is whether the acquired information from a survey can substitute for actual experience. This may be especially relevant in applications such as valuing programs to protect ecological resources where respondents may have little or no direct experience with the resource being valued.

Researchers have shown that responses to stated-preference questions vary with respondent experience. For example, Boyle, Welsh and Bishop (1993) found that experienced white-water boaters valued scenarios of white-water trips they had not experienced the same as they valued their actual white-water experiences, but that this was not the case for less

experienced boaters. Cameron and Englin, (1997) found that value increased and variance decreased with respondent experience. The Boyle study investigated use values for Colorado River rafting where all respondents had taken at least one trip on the river, but some respondents had taken multiple trips on the Colorado River and other rivers. The Cameron study investigated what appears to be a total value for trout fishing in the Northeast U.S. where respondents may have had more or less experience fishing, but the experience need not be specific to trout or the study area. Despite these differences in study contexts, both studies indicate that the prior experience respondents bring to their participation in a stated-preference study can influence value estimates.

We can think of the information that respondents use in answering stated-preference questions as falling in two broad categories, prior knowledge and acquired knowledge. *Prior knowledge* is the knowledge that individuals possess prior to engaging in the stated-preference study. This can be specific knowledge gained from actual experience with a resource or general knowledge obtained from reading or some other indirect source of information. Survey participants can also augment prior knowledge when responding to surveys administered by mail or internet by talking to others, searching the internet, etc. before or while answering the survey questions. *Acquired knowledge* is the information that individuals obtain from participation in a stated-preference study, which is the information provided by the investigator through the survey instrument.

In the research reported here we investigate if a specific type of acquired knowledge influences responses to a stated-preference survey. A stated-preference survey, focusing on forest management, was administered by mail and on-site at a research forest. Respondents to the traditional mail administration answered stated-preference questions based on their prior

knowledge and the acquired knowledge provided in the survey instrument. Respondents who participated on-site at the research forest were asked to complete pretest and post-test administrations of the same survey instrument. After completing the pretest, respondents were taken on a guided walk through the research forest, where they received additional acquired information about natural and managed forests, and completed the post-test survey upon completion of their walks.

The research forest is unique in that half of the forest is left as a natural area with no timber harvesting and the other half is managed for high quality lumber using low-impact timber harvesting procedures (Moore and Witham, 1996). This management regime matches the policy question in the survey, which was an incentive program for owners of small forest holdings to set aside some of their forest from timber harvesting and to use low-impact logging practices on the remaining land.

In the analyses reported here we ask three questions. First, are the mail and pretest results statistically comparable? This is to investigate if those who agreed to participate on-site have the same preferences as those who agree to complete the mail survey. Second, are the pretest and post-test results statistically similar? This is the investigation of the additional acquired information where respondents experienced the forest first hand. Finally, half of the on-site participants were randomly assigned to walk through the preserved portion of the forest first and then the area with timber harvesting, and the other half of respondents walked the reverse direction. Thus, third, did the direction of the forest walk affect post-test results? Our results show that there were not sample-selection or survey-mode effects between the mail and on-site, pretest surveys. Nor were there differences between the on-site pretest and post-test administration of the survey, which is similar to previous research by Tinch et al. (2010).

2. Previous Literature

A number of researchers have investigated how varying the information and respondent experience/knowledge affects answers to stated-preference questions. Studies reveal that value estimates can be sensitive to the level of information provided when respondents have limited prior knowledge/experience (Boyle et al., 1993; Cameron and Englin, 1997; Tkac, 1998; Munro and Hanley, 2000; Hoehn and Randall, 2002). Generally, when more detailed information on resource being valued is provided responses estimated values increase (Samples et al, 1986; Bergstorm et al., 1990; Bergstrom and Dorfman, 1994; Cameron and Englin, 1997) or the variance of the value estimate is reduced (Boyle, 1989; Cameron and Englin, 1997). Providing information specific to respondents can enhance the validity of value estimates (Ajzen et al., 1996; Poe and Bishop, 1999).

When the stated-preference questions involve complex value experiments and respondents have limited prior knowledge/experience the information provided the survey administration becomes crucially important (MacMillan et al., 2006). However, respondents may find it cognitively difficult to understand written and/or verbal descriptions of complex ecological resources and may make choices based on their intuition and heuristics that may not be consistent with item and increment being valued (Urama and Hodge, 2006; Fror, 2008; Vista et al., 2009). Researchers have employed workshop approaches and group discussions, which motivate the participants to discuss with each other and consult with the facilitator to assimilate complex information (Kenyon et al., 2001; MacMillan et al., 2006). Evidences show that after deliberating and discussing the information the respondents change their preference (Spash, 2002).

However, without an actual experience with the resource, the respondents still make decision according to the prediction of their utility from what happens to the resource, not the actual utility they would get after the change (McCollum and Boyle, 2005). An ex ante evaluation can induce bias results as their preference can change after the real experience; an ex post evaluation results could be different from the ex ante results (Kahneman and Sugden, 2005; Ladenburg, 2009; Carlsson et al., 2011). Therefore, providing the respondents an experience with the resource for evaluation during the survey process has the potential to improve the accuracy and validity of the estimates.

Several studies have investigated the effect of exposure to environmental goods on stated-preference estimates of value; however the results are still not conclusive. McCollum and Boyle (2005) conduct a between subject test for two groups with or without moose hunting experience; the two samples have statistically similar value estimates when a dichotomous-choice question is posed, but not with an open-ended question. Tisdell and Wilson (2001and 2005) conducted a study that gave participants an opportunity to view sea turtles when visiting a park; the participants who saw the turtles had a higher values than those who did not observe the turtles. In another study, participants who saw mahogany gliders (an endangered possum in Australia) in the natural setting had a value that was not statistically different from their WTP before they saw them. (Tisdell and Wilson, 2008).

Kenyon and Edward-Jones (1998) showed that providing acquired information consisting of photographic, textual and ecological data resulted in respondents making the same responses as ecological experts. Boyle et al. (1995) found white-water boaters rank river flows for rafting the same as expert rafting guides. These studies suggest that the "public" can have preference over valuation scenarios that might rank alternatives the same as "experts", but this does not

answer the question of how acquired information that is specific to a resource affect value estimates.

Tinch et al. (2010) employed the workshop approach to compare respondents' preference estimates before, during and after an on-site walk through the forest. They found that preference estimates from survey administration before and after the walk were not statistically different. We employ a similar approach and ask how on-site preference estimates might differ from those estimated using a traditional mail survey approach to study implementation.

3. Study Application and Design

The valuation application is a potential program to stimulate owners of small, private forest holdings in Maine to manage their forestlands with low-impact timber harvesting and to set some of their forestlands aside from timber harvesting. At the turn of the 20th century about 30% of Maine was farmland and the remainder was forestland (Ahn et al., 2002). Today the state is nearly 90% forested.[1] Land along the coast of Maine was cleared by early settlers for farming and then abandoned due to poor soils and the movement of agriculture went to more fertile lands in the Midwest. As farmland was abandoned, it returned to the naturally occurring forestland (see Irland, 1982). These regenerated forests are maturing and are being harvested for timber for the first time in generations, and this is occurring in the areas of the highest population density in Maine (Figure 1). People who have appreciated the esthetic appeal and recreational opportunities of their neighbors' forestlands are finding that more and more of these small forest parcels are being harvested for timber. In response to the ecological and social concerns associated with the harvesting of small forest parcels, forest researchers have proposed alternative timber harvesting

[1] http://www.umaine.edu/mial/products/maine_cd.htm, accessed June 21, 2012.

practices to maximize the production of high quality timber, enhance wildlife diversity and abundance, and to maintain the forests esthetic qualities (Witham *et al*., 1999).

The application of the research reported here uses a stated-preference question to elicit public preferences for a program that would provide an incentive, through property tax rebates, to owners of forestlands who agree to use low-impact timber harvesting practices and/or set forestland aside from timber harvesting. This is a complex issue because it asks the public to weigh low-impact timber harvesting practices and the implications of setting forest land aside from timber harvesting where they may have limited prior knowledge of the implications of both actions.

3.1 Stated Preference Question

The survey was designed and implemented following guidelines proposed by Dillman (2000 and 2007). A stated-preference question was employed where respondent were asked to vote on three alternative forestry referendums and each referendum was differentiated by program attributes (Figure 3). Respondents were told what current conditions were so that they would know forestry conditions if they voted "no" for any of the referendum votes. Levels for each attribute are listed in Table 1. There are three levels for the "percent of land open for timber harvesting", 100%, 50% and 0%. The attribute of "Timber harvesting practices" is just low-impact harvesting when any of the referendums allow for timber harvesting (0% or 50%) and is not applicable for 100%. The "cost" amounts are based on a prior study of forest policy valuation in Maine (Boyle et al., 2001). .

3.2 Survey Administration

The survey was administered by mail and on-site at the experimental forest. Bringing people on-site to participate in the survey introduces a number of confounding issues for comparison results with those from the mail survey, which includes potential differences in sample frames, respondent recruitment procedures, and survey modes. Even if the sample frames and recruitment procedures are identical, people who chose to participate in the on-site survey may be different than those who participate in the mail survey. Moreover, the information conveyed in the on-site experience can have more than one type of effect. The experience visiting the forest may give respondents a better understanding of the forest ecosystems and the implications of low impact timber harvesting. However, there may also be a perverse, undesired effect; those who participate in the on-site survey may focus on the Holt Research forest specifically while those participating in the mail survey may tend to think of forest lands more generally.

These concerns are handled in several ways in the study design:

- First, we compare socioeconomic characteristics of respondents to the mail and on-site samples to see if there are any differences between those who responded.
- Second, socioeconomic characteristics were included in the statistical analyses to see if they affect the results of statistical tests.
- Third, the on-site sample subjects were asked to complete pretest and post-test surveys.

The pre/post-test design allows for the isolation of the sample frame/recruitment/mode effects and the effects of information acquired on-site by respondents. Respondents to the mail and pretest surveys answered the forest policy survey questions based on their prior knowledge. If there are no differences in socioeconomic characteristics and no differences in survey responses,

between the mail and on-site applications then this is evidence that sample frame/recruitment/mode effects do not confound the analysis of specific information respondents acquire from their walks through the experimental forest.

Answers to the posttest survey, after respondents walked through the forest are conditioned on the information they received. To help control for this effect, half of the on-site respondents walked through the area of the forest without timber harvesting first and then the harvested area. The other half walked the opposite direction following the same route through the forest. If differences are identified between the mail and post-test survey results, then this is evidence that the information acquired on-site influenced how people answered the forest policy questions and use of mail survey results should be interpreted with caution.

A key consideration in that "no difference" between the mail and post-test results suggests procedural invariance over survey modes, which is supportive of using a traditional mail survey to estimate values. Such a conclusion from our results should be interpreted with caution. Respondents may anchor their post-test responses on their pretest responses, which would falsely suggest procedural invariance. It could also be the case that the specific application may not generate an effect, but an effect could be stimulated by a different application.

3.3 Sample Selection and Survey Procedures

The study involved administering a common survey instrument to two samples of individuals. The sample (n=1,000) for the mail survey was obtained from the Maine Department of Motor Vehicles and was a random sample of adults with a driver's license or state ID card, which covers over 95 percent of the adults in the state. A total of 390 completed surveys were returned, and after excluding the undeliverable surveys the effective response rate was 48%.

The on-site sample was recruited using random digit dialing of households with phone prefixes within a 40 mile radius of the Holt Forest (Figure 2). It was not practical to recruit subjects for the on-site treatment from all over the state to participate in the survey as some people live as much as much as 4-6 hours away from the experimental forest and most people live over an hour away from the site. It took approximately 11 completed phone calls to get 1 person to participate, and 31 people were recruited to participate in the on-site survey. In addition, subjects for the on-site survey were limited to individuals age 65 or younger due to the potential rigor of the walk through the forest. Individuals in the on-site treatment were paid a $40 incentive to compensate them for their travel time to the study site. Participants in the mail survey were not limited by age and were not paid to participate in the study.

The subjects in mail sample received the survey, and were asked to complete the survey and return in an enclosed postage-paid envelope. The subjects in on-site sample were recruited to travel to the research forest and participate in the survey. These subjects completed a pretest administration of the survey when they arrived at the forest, which was the same instrument used for the mail survey. They were then taken on a walk through the forest, which took about 45 minutes and was led by a graduate student.

As noted above, the forest has two sections; one half of the forest is managed for low impact timber harvesting (harvest section) and the other half of the forest is set aside from timber harvesting (no-harvesting section). One half of the on-site sample was taken through the harvest section first and then the no-harvesting section. The other half of this sample followed the same route through the forests, but in the reverse direction.

The research forest is not a recreation area and there are no hiking trails. The walks followed the lines of transects that divided forest research plots so it was necessary to have someone lead subjects through the forest so both groups would follow the same routes.[2] Two graduate students led the groups and stopped at designated sites in the forest for participants to observe the forest conditions. The graduate students read from cards at each site where they stopped to identify the area to participants. Stops included a harvest opening in the forest and a natural clearing in the no-harvested area of the forest, a skidder path across an ephemeral stream and an ephemeral stream in the no-harvesting area, and wildlife habitat in the harvest (slash – piles of brush and limbs left from harvesting) and no-harvesting (snags – standing dead or dying trees) areas of the forest.

4. Model Specification

Respondents are assumed to have a utility function U_i that depends on x, where x is a vector of attributes associated with the forest program. V_i is the observable component of utility and ε_i is the random error (McFadden 1973; Louviere et al. 2001):

$$U_i = V_i(x) + \varepsilon_i \quad (1)$$

For a binary referendum question, where the alternatives are to have a low-impact forest program (p) or not (np), the probability that are respondent answers yes, they would vote for a program, is:

$$\Pr(\text{Yes}) = \Pr(V_p + \varepsilon_p > V_{np} + \varepsilon_{np}) = \Pr(V_p - V_{np} > \varepsilon_p - \varepsilon_{np}) = \Pr(\Delta V > \Delta\varepsilon) \quad (2)$$

Where the individual-specific subscript, i, has been suppressed for notation convenience.

[2] There were no visible signs of ongoing research that participants could observe during their walks through the forest. Transects were selected that avoided any flagging or other identification of research activities.

Assuming that the utility function is linear in coefficients, ε is iid extreme value, we get the logistic model. In this survey, each individual will answers three stated-preference questions and each individual's three choices may be correlated. We can generalize the model to allow utility parameters to vary randomly over individuals and to allow for correlated responses using a mixed or random-parameters logit model (Revelt & Train 1998; Train 1998; Train 2003). Specifically, individual i's utility associated with option alternative j is:

$$U_{ij} = \beta_i x_j + \varepsilon_{ij} \quad (3)$$

where β_i varies across individuals, x_j varies over choice alternatives, and ε_{ij} is the iid error term over individuals and choice alternatives. We assume β_i has normal density $f(\beta_i|\theta)$ with parameter vector θ that includes the mean and variance of each distributed parameter.

We estimate eight specifications of equation (3) to investigate if on-site information affects responses to the stated-preference, referendum questions. The attribute variables,x, are defined in Table 2. The omitted levels for each of the attributes are "0% of land available for harvesting", 30% "property tax rebate to landowner" and "voluntary access". We also define the binary variables to assist in detecting study-design effect. *OS* equals to 1 if the responses come from on-site (pretest, or posttest) survey and 0 if from the mail survey. $UN \rightarrow H$ equals to 1 if the respondents walk from harvest to no-harvesting areas and 0 for the opposite direction. *Asc* is an alternative specific constant that equals to 1 if the alternative represents the condition of new referendum and 0 if it represents the current condition. Socioeconomic variables are included to control for any potential differences between the mail and on-site respondents.

All equations that compare responses from the mail survey with on-site, pretest survey include a basic set of variables, referred to as Pretest Model 1 (*PreM1*). The variables are the

attributes of the forest-policy referendum (x) and the binary variable (OS) that identifies pretest responses. The second model (*PreM2*) adds interactions of OS with each of the attribute variables. Thus, *PreM1* investigates if people who participate in the on-site administration might have a fixed effect that would make them more or less likely to vote affirmatively for the referendums, and PreM2 investigates if on-site participants also had different preferences for the referendum attributes. The third and fourth equations control for potential differences in the mail and on-site, pretest responses by including socioeconomic characteristics in the equations. This is done by including the alternative specific constant (Asc) multiplied by four socioeconomic characteristics(z_i): Age, Gender, Education and Income. The third model (*PreM3*) includes the Asc interactions with the four socioeconomic characteristics and the fourth model (*PreM4*) includes just the interaction of the Asc with Age. The motivation for the fourth model is that on-site participants were restricted to individuals who were 65 years of age or younger, and this was not the case for participation in the mail sample. The empirical specifications of the utility function for these four models are:

$$PreM1 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_j} + \gamma_1 \mathrm{OS} + \varepsilon_{ij} \quad (4a)$$

$$PreM2 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_j} + \gamma_2 \mathrm{OS} * \mathrm{x_j} + \varepsilon_{ij} \quad (4b)$$

$$PreM3 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_j} + \gamma_3 \mathrm{OS} + \delta_3 \, Asc * z_i + \varepsilon_{ij} \quad (4c)$$

$$PreM4 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_j} + \gamma_4 \mathrm{OS} * \mathrm{x_{ijt}} + \delta_4 \, Asc * Age_i + \varepsilon_{ij} \quad (4d)$$

These equations are used to test the null hypothesis here is that the pretest administration does not affect estimates preference parameters (H_0: γ_k=0 v. H_a: $\gamma_k \neq 0, \forall k$).

Secondly, to compare responses between the mail and on-site, posttest surveys, we extend the basic function with the binary variable for the direction of participants walks through

the forest ($UN \rightarrow H$). Note, OS denoted the pretest data in equation (4) models and denotes the post-test data on the equation (5) models. The model (5) equations are set similar to the model (4) equations with one exception, we now consider the effects of both on-site experience and walking direction on choice preference parameter estimates. The empirical specifications of the utility functions for estimation are the followings, while β_i is assumed to be random with normal distribution.

$$PstM1 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_{ij}} + \gamma_1 \mathrm{OS} + \rho_1 OS * (UNH \rightarrow H) + \varepsilon_{ij} \quad (5a)$$

$$PstM2 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_{ij}} + \gamma_2 \mathrm{OS} * \mathrm{x_{ij}} + \rho_2 OS * (UNH \rightarrow H) * \mathrm{x_{ij}} + \varepsilon_{ij} \quad (5b)$$

$$PstM3 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_{ij}} + \gamma_3 \mathrm{OS} + \rho_3 OS * (UNH \rightarrow H) + \delta_3 \, Asc * z_I + \varepsilon_{ij} \quad (5c)$$

$$PstM4 - \ \mathrm{U_{ij}} = \beta_i \mathrm{x_{ij}} + \gamma_4 \mathrm{OS} * \mathrm{x_{ij}} + \rho_4 OS * (UNH \rightarrow H) * \mathrm{x_{ij}} + \delta_4 \, Asc * Age_I + \varepsilon_{ij} \quad (5d)$$

The *PstM* equations are used to test the null hypothesis that the post-test administration of the survey, including the direction of the walk through the forest do not affect estimates of preference parameters (H_0: γ_k=0 and ρ_k=0 v. H_a: not H_0, $\forall k$).

5. Results

Summary statistics of respondents' socioeconomic characteristics are reported in Table 3. Sample statistics reported are for respondents who answered at least one of the three stated-preference questions. For all descriptive statistics, except age, we cannot reject the null hypotheses that the mail and on-site respondent characteristics are the same. The one exception is not surprising because the on-site survey recruitment was limited to individuals age 65 or younger due to the potential rigor of the walk through the forest. These results suggest that the

individuals who chose to respond to the mail survey are statistically similar to those who chose to participate in the on-site administration of the survey.

Estimation results for the pretest models (*PreM1-PreM4*) are summarized in Table 4. Estimation results for the posttest models (*PstM1-PstM4*) are summarized in Table 5. The pattern of statistical results in terms of significance and signs are identical to the pretest results in Table 4. Bid, public access and having land available for timber harvesting are significant in all four models, and the magnitudes of rebates to landowners were not significant. Requiring public access to private land reduced the probability of an affirmative vote and having land available for timber harvesting increases the probability of an affirmative vote, and splitting the land evenly with 50% available for timber harvesting had the largest coefficient estimate. We tested whether the coefficients on H50 and H100 are the same in PreM4 and PstM4 and the null hypothesis of no difference is rejected[3]

We found that the attributes that had significant variances varied from model to model, and for parsimonious reporting of results, we report estimated models including only significant variances. Note, the variance in preferences only occurs for the amount of land available for timber harvesting.

Comparing the pretest, on-site survey results with the mail survey results indicates that the null hypothesis of no difference could only be rejected for the *PreM1* model (Table 6). However, considering all four equations indicates that there is likely no difference between the on-site, pretest results and the mail results. Model *PreM1* treats the on-site pretest as a fixed effect. When *OS* is interacted with each of the attributes (model *PreM2*), *OS*Access* is

[3] The likelihood ratio test statistics are 6.98 in PreM4 and 7.50 in PstM4, so the null hypothesis are rejected at 5% level.

significant. However, after controlling for socioeconomic characteristics in Models *PreM3* and *PreM4* there is no difference between the on-site pretest and mail results. Age has a significant negative effect on choice and controlling for this variable removes any effect of the two modes of survey implementation on estimates of preference parameters. Recall, there is a difference in average of the two groups of respondents (Table 3), which is likely due to precluding older people from participating in the on-site administration. Thus, we conclude that responses to the mail and on-site pretest results are statistically identical after controlling for age, and proceed to investigating if the information provided by the walk through the forest influenced survey responses.

While the individual coefficients on *OS* and *OS*UNH→H* are not significant in model *PstH1*, we reject the null hypothesis that the fixed effects of the walk through the forest and the direction of the walk are jointly insignificant (Table 6). When socioeconomic characteristics are added to the estimation (model *PstH3*) we cannot reject the null hypothesis that fixed effects are jointly insignificant. In model *PstH4* there is an odd result that *OS*Bid* is negative and significant, and *OS*UH→H*Bid* is positive and significant. These results suggest that people who participated in the post test have a higher marginal utility of money than those who participated in the mail survey and the walk through the no-harvesting area first lowered the marginal utility of money. Ultimately, the null hypothesis that *OS* and all interactions with this variable are zero cannot be rejected, and this result holds whether we control or do not control for *Age* in the estimation (models *PstH2* and *PstH4*).

6. Discussion

The results show that Maine residents do support a program that provides owners of forest land with incentives to use low impact timber harvesting and to set some of their land

aside from timber harvesting. Respondents preferred the intermediate level of half of an owner's forest land open for timber harvesting and half set aside to the extremes of all available for timber harvesting or none available for timber harvesting. Respondents dislike requiring participating land owners to provide public access to their land, and the magnitude of the property tax rebate did not affect preferences. These qualitative findings are not affected by survey mode or the direction people walked through the experimental forest. The estimated annual value per household for a program that would require participating landowners to use low impact timber harvesting practices and set half of their forestland aside from timber harvesting is $822 (1.643/0.002, model PreM1).

7. Conclusions

The results indicate the traditional mail survey implementation of a stated-preference study can mimic the results when study participants are provided acquired information through an on-site experience.

In conducting our study it must be recognized that there are potential selection issues between those who choose to participate in a survey at home and those who choose to participate on site. In addition, survey mode could have an effect. These confounding effects would only be deemed problematic if we observe statistically significant differences in preference parameter estimates between the mail and pretest data, but there was not a significant difference.

Demographic characteristics were similar between both groups with the exception of age where older people were not recruited to participate on-site, which indicates that there is not a selection effect that results in different people responding to the mail and on-site surveys. However, because we are conducting tests of convergent validity and the "truth" is not known

for either the sample or population, we cannot answer the question of whether there might be a sample selection effect in both survey recruitments such that subjects differ from the general population in some systematic manner.

After controlling for age, there were no differences in how respondents to the mail and pretest surveys evaluated the forest program. This suggest that the people who participated on-site were statistically similar to those who participated in the mail survey, and there are not sample selection or survey mode effects that might confound interpretation identification of information acquired on-site during the walk through the forest.

The most important finding is that the walks through the forest did not statistically affect estimates of preference parameter estimates for the forestry program, which suggests for at least the current application that specific, on-site experience was not necessary for respondents to value the policy. As with the findings above, caution in interpretation of this result. We might not observe a difference because respondents' possessed sufficient prior knowledge/experience that the knowledge acquired on-site was not necessary. This is good news as survey respondents could evaluate stated-preference questions for complex ecological information and complex forest management.

Alternatively, it could be the case that on-site respondents recalled their pretest responses and their post-test responses were anchored on their prior answers. Our research design did not test this potential effect due to budget and logistic considerations. However, our results are similar to Tinch et al. (2010) who did pretest and post-test survey in another application where participants received acquired information from a forest walk. Future research should investigate

what role anchoring may play in pretest and post-test applications to the same subjects and if our results can be replicated for other resource applications, e.g., wetland, marine protected areas, etc.

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Reference

Ahn, S., Krohn, W.B., Plantinga, A.J., Dalton, T.J., Hepinstall, J.A., 2002. Agricultural Land Changes in Maine: A Compilation and Brief Analysis of Census of Agriculture Data, 1850-1997. Maine Agricultural and Forest Experiment Station, Technical Bulletin 182.

Ajzen, I., Brown, T.C., Rosenthal, L.H., 1996. Information Bias in Contingent Valuation: Effect of Personal Relevance, Quality of Information and Motivational Orientation. Journal of Environmental Economics and Management 30 (1), 43-57.

Bergstrom, J., Dorfman J., 1994. Commodity information and willingness to pay for groundwater quality protection. Review of Agricultural Economics 16, 413-435.

Bergstrom, J., Stoll, J., Randall, A., 1990. The Impact of Information on Environmental Commodity Valuation Decisions. American Journal of Agricultural Economics 72, 614-621.

Boyle K.J., 1989. Commodity specification and the framing of contingent valuation questions. Land Economics 65, 57–63.

Boyle, K.J., Welsh, M.P., Bishop, R.C., 1993. The role of question order and respondent experience in contingent-valuation studies. Journal of Environmental Economics and Management 25, 80-99.

Boyle, K. J., Welsh M.P., Bishop, R.C., Baumgartner, R.M., 1995. Validating Contingent Valuation Estimates with Surveys of Experts. Agricultural and Resource Economics Review 24 (2), 247-254.

Cameron, T. A., Englin, J., 1997. Respondent Experience and Contingent Valuation of Environmental Goods. Journal of Environmental Economics and Management 33, 296-313.

Carlsson, F., Martinsson, P., Akay, A., 2011. The effect of power outages and cheap talk on willingness to pay to reduce outages. Energy Economics 33, 790-798.

Champ, P.A., Boyle, K.J. & Brown, T.C., 2003. Contingent valuation in practice. A primer on nonmarket valuation. Kluwer Academic Publishers, The Neatherlands.

Chanel, O., Cleary, S., Luchini, S., 2007. Individual responsiveness to information in CV surveys: commitment matters. Revue D. Economie Politique 2007(5), 761 - 779.

Dillman, D.A., 2000. Mail and Internet Surveys: The Tailored Design Method. John Wiley & Sons, Inc., New York.
Dillman, D.A., 2007. Mail and Internet Surveys: The Tailored Design Method (2nd Ed.). John Wiley & Sons, Inc., New York.

Frör, O., 2008. Bounded rationality in contingent valuation: empirical evidence using cognitive psychology, Ecological Economics 68, 570–581.

Hoehn, J.P., Randall, A., 2002. The Effect of Resource Quality Information on Resource Injury Perceptions and Contingent Values. Resource and Energy 24, 13-31.

Irland, L.C., 1982. Wildlands and woodlots; the story of New England's forest. University Press of new England, Hanover, NH.

Kahneman, D., Sugden, R., 2005. Experienced utility as a standard of policy Evaluation. Environmental and Resource Economics 32, 161-181.

Kenyon, W., Edward-Jones, G., 1998. What Level of Information Enables the Public to Act Like Experts when Evaluating Ecological Goods? Journal of Environmental Planning and Management 41(4), 463-475.

Kenyon, W., Hanley, N. Nevin, C., 2001. Citizens' juries: an aid to environmental valuation? Environment and Planning C: Government and Policy 19, 557-566.

Ladenburg, J., 2009. Visual impact assessment of offshore wind farms and prior experience. Applied Energy 86, 380-387.

Louviere, J., 2001. Choice Experiments: An Overview of Concepts and Issues, in: Bennett, J., Blamey, R. (Eds.), The Choice Modeling approach to Environment Valuation. Edward Elgar Publishing, Cheltenham, UK, pp. 13-36.

MacMillan, D., Hanley, N., Lienhoop, N., 2006. Contingent valuation: environmental polling or preference engine? Ecological Economics 60, 299-307.

McCollum, D., Boyle, K.J., 2005. The Effect of Respondent Experience/Knowledge in the Elicitation of Contingent Values: An Investigation of Convergent Validity, Procedural Invariance and Reliability. Environmental and Resource Economics 30, 23-33.

McFadden, D., 1973. Conditional logit analysis of qualitative choice behavior, in: Zarembka, P. (Eds.), Frontiers of econometrics. Academic Press, New York, pp. 105–142.

Mitchell, R.C., Carson, R.T., 1989. Using Surveys to Value Public Goods. The Contingent Valuation Method. Resources for the Future, Washington, DC.

Moore, E.H., Witham, J.W., 1996. From Forest to Farm and back Again: Land Use History as a Dimension of Ecological Research in Coastal Maine. Environmental History 1 (3), 50-69.

Munro, A., Hanley, N., 2000. Information, Uncertainty, and contingent valuation, in: Bateman, I., Willis, K. (Eds.), Valuing the Environment Preferences. Oxford University Press, Oxford, pp. 258-279.

Poe, G., Bishop, R., 1999. Valuing the Incremental Benefits of Groundwater Protection when Exposure Levels Are Know. Environmental and Resource Economics 13(3), 347-373.

Revelt, D., Train, K., 1998. Mixed Logit with Repeated Choices: Household's Choices of Appliance Efficiency Level. Review of Economics and Statistics 80, 647-657.

Samples, K.C., Dixon, J.A., Gowen, M.M., 1986. Information disclosure and endangered species valuation. Land Economics 62, 306-312.

Spash, C.L., 2002. Informing and forming preferences in environmental valuation: Coral reef biodiversity. Journal of Economic Psychology 23, 665-687.

Tinch, D., Colombo, S., Hanley, N., Unpublished results. Differences between Decision and Experienced Utility: An Investigation using the Choice Experiment method. Stirling Economics Discussion Papers, 2010-2013.

Tisdell, C., Wilson, C., Swarna Nantha, H., 2008. Contingent valuation as a dynamic process. Journal of Socio-Economics *37*(4), 1443-1458.

Tkac, J., 1998. The effects of information on willingness-to-pay values of endangered species. American Journal of Agricultural Economics 80, 1214 – 1220.

Train, K., 1998. Recreation Demand Models with Taste Variation. Land Economics 74(2), 230-239.

Train, K., 2003. Discrete Choice Methods with Simulation. Cambridge University Press, Cambridge.

Urama, K.C., Hodge, I., 2006. Participatory environmental education and willingness to pay for river basin management: empirical evidence from Nigeria. Land Economics 82 (4), 542-561.

Vista, A.B., Rosenberger, R.S., Collins, A.R., 2009. If You Provide It, Will They Read It? Response Time Effects in a Choice Experiment. Canadian Journal of Agricultural Economics 57, 365–377.

Witham, J., Hunter, M., Tedford, H., Kimball, A., White, A., Gerken, S., 1999. A long-term study of an oak-pine forest ecosystem: A brief overview of the Holt Research Forest. Maine Agricultural and Forest Experiment Station Miscellaneous Publication, Maine.

Table 1 Attributes and Levels

Attribute	Choice
Property tax rebate to landowner for participating in program.	30% 70% 100%
Percentage of land available (set aside) from timber harvesting	0% (None for timber harvesting, all set aside.) 50% 100% (All for timber harvesting, none set aside.)
Public Access to land if landowner participates in program	Voluntary Required
Cost	$1, $20, $40, $60, $80, $100, $120, $160, $180, $200, $400, $800, $1600

Table 2 Definition of Variables

Variables	Definitions
Forestry Program Attributes	
Bid	the amounts of cost to your family per year which is randomly assigned between $1 and $1600
Access	1 if public access is required and 0 otherwise
H50	1 if 50% of "land available for harvesting" and 0 otherwise
H100	1 if 100% of "land available for harvesting" and 0 otherwise
R70	1 if 70% "Property tax rebate to landowner" and 0 otherwise
R100	1 if 100% "Property tax rebate to landowner" and 0 otherwise
Binary Study-Design Variables	
Asc	1 if the alternative represents new referendum and 0 if it represents the current condition
OS	1 if the responses from on-site survey (pretest or posttest) and 0 if from the mail survey
UN → H	1 if the respondents walk from area with no timber harvesting to the harvested area in the forest and 0 for the opposite direction
Demographic Variables	
Age	age of the respondents
Gender	1 for male and 0 for female
Education	1 for college degree or higher and 0 otherwise
Income	$2500, $7500, $12500, $17500, $22500, $27500, $32500, $37500. $42500, $47500, $55000, $65000, $75000, $85000, $95000, $110000

Table 3 Socioeconomic Characteristics of Respondents

	Samples		
	Mail	On-site	Test Statistics
Gender (male=1)	53% (3)	42% (9)	z = 1.13
Average Age	48 (1)	42 (2)	t = 3.11***
Average Household Income	$46,021 (1,515)	$43,448 (4,459)	t = 0.55
Education:			
Eight years or less	2%	0%	x^2= 5.64
Some high school	5%	0%	
High school graduate or equivalent	26%	18%	
Some college, A.S degree or technical school	30%	29%	
B.A. degree or equivalent	25%	39%	
M.A. degree or equivalent	9%	7%	
Advanced degree	3%	7%	
Land Owner	18% (2)	13% (6)	z= 0.76
Members of Environmental Group	15% (2)	14% (7)	z= 0.04
Voting participation	82% (2)	81% (7)	z = 0.24
N	355	31	

Note: *** denotes significant at 1%, ** denotes significant at 5%, * denotes significant at 10%.

Table 4 Preference Estimates between Mail Survey and Pretest, On-site Survey

Variables	PreM1		PreM2		PreM3		PreM4	
	Means	Standard Errors	Means	Standard Errors	Means	Standard Errors	Means	Standard Errors
Constant	0.022		0.062		1.111***		0.830**	
	(0.178)		(0.182)		(0.406)		(0.338)	
Bid	-0.002 ***		-0.002 ***		-0.002***		-0.002***	
	(0.000)		(0.000)		(0.000)		(0.000)	
Access	-0.634 ***		-0.575 ***		-0.799***		-0.601***	
	(0.148)		(0.153)		(0.166)		(0.161)	
H50	1.643***		1.603***		1.547***	1.114**	1.538***	0.880*
	(0.233)		(0.242)		(0.215)	(0.437)	(0.262)	(0.519)
H100	1.223***	0.758***	1.292***	0.775***	1.089***		1.240***	0.631*
	(0.225)	(0.251)	(0.237)	(0.252)	(0.197)		(0.246)	(0.342)
R70	-0.041		-0.046		-0.035		-0.036	
	(0.180)		(0.189)		(0.200)		(0.195)	
R100	-0.015		-0.061		-0.048		-0.074	
	(0.176)		(0.183)		(0.194)		(0.189)	
OS	0.5967**		-0.297		0.461		-0.465	
	(0.277)		(0.820)		(0.296)		(0.829)	
*OS*Bid*			-0.000				-0.000	
			(0.001)				(0.001)	
*OS*Access*			-1.041 *				-0.969	
			(0.605)				(0.611)	
*OS*H50*			0.662				0.769	
			(0.686)				(0.725)	
*OS*H100*			-1.193		`		-1.164	
			(0.777)				(0.774)	
*OS*R70*			0.472				0.537	
			(0.736)				(0.752)	
*OS*R100*			0.780				0.752	
			(0.746)				(0.756)	
*Asc*Age*					-0.018***		-0.015***	
					(0.006)		(0.006)	
*Asc*Gender*					-0.130			
					(0.164)			
*Asc*Education*					0.106			
					(0.174)			
*Asc*Income*					-0.002			
					(0.003)			
Log Likelihood	-635.254		-630.521		-540.641		-620.587	
N	1147		1147		999		1132	

Note: standard errors in parentheses; *** denotes 1% level of significance, ** denotes 5% level of significance, * denotes 10% level of significance. The number of observations declines for PreM3 and PreM4 due to missing observations on the socioeconomic variables.

Table 5 Preference Estimates between Mail Survey and Posttest, On-site Survey

Variables	PstM1		PstM2		PstM3		PstM4	
	Means	Standard Errors	Means	Standard Errors	Means	Standard Errors	Means	Standard Errors
Constant	0.022		0.071		1.175***		0.887***	
	(0.178)		(0.184)		(0.409)		(0.344)	
Bid	-0.002 ***		-0.002 ***		-0.002***		-0.002***	
	(0.000)		(0.000)		(0.000)		(0.000)	
Access	-0.607 ***		-0.584 ***		-0.774***		-0.613***	
	(0.149)		(0.155)		(0.167)		(0.164)	
H50	1.753***		1.656***		1.622***	1.218***	1.579***	0.963*
	(0.243)		(0.251)		(0.221)	(0.441)	(0.273)	(0.521)
H100	1.343***	0.799***	1.343***	0.871***	1.173***		1.280***	0.715**
	(0.233)	(0.252)	(0.245)	(0.254)	(0.199)		(0.254)	(0.335)
R70	0.011		-0.041		0.019		-0.029	
	(0.182)		(0.191)		(0.203)		(0.198)	
R100	0.028		-0.065		0.011		-0.077	
	(0.178)		(0.185)		(0.197)		(0.192)	
OS	0.540		2.732		0.594		2.598	
	(0.390)		(1.844)		(0.426)		(1.886)	
*OS*Bid*			-0.031**				-0.031**	
			(0.014)				(0.014)	
*OS*Access*			-0.842				-0.800	
			(1.349)				(1.384)	
*OS*H50*			4.112				4.183	
			(2.569)				(2.629)	
*OS*H100*	`		1.408		`		1.306	
			(1.819)				(1.841)	
*OS*R70*			-0.179				-0.110	
			(1.478)				(1.528)	
*OS*R100*			1.874				1.679	
			(1.674)				(1.717)	
*OS*UH→H*	0.132		-1.867		-0.186		-2.148	
	(0.537)		(2.043)		(0.563)		(2.085)	
*OS*UH→H*Bid*			0.030**				0.030**	
			(0.014)				(0.014)	
*OS*UH→H*Access*			-0.904				-0.788	
			(1.692)				(1.729)	
*OS*UH→H*H50*			-1.913				-1.912	
			(2.807)				(2.871)	
*OS*UH→H*H100*			-2.064				-1.915	
			(2.174)				(2.187)	
*OS*UH→H*R70*			2.303				2.370	
			(1.922)				(1.986)	
*OS*UH→H*R100*			1.011				1.211	
			(2.115)				(2.160)	
*Asc*Age*					-0.020***		-0.016***	
					(0.006)		(0.006)	
*Asc*Gender*					-0.074			
					(0.167)			
*Ase*Education*					0.158			
					(0.175)			
*Asc*Income*					-0.003			
					(0.003)			
Loglikelihood	-630.550		-615.484		-538.117		-605.245	
N	1149		1149		1001		1134	

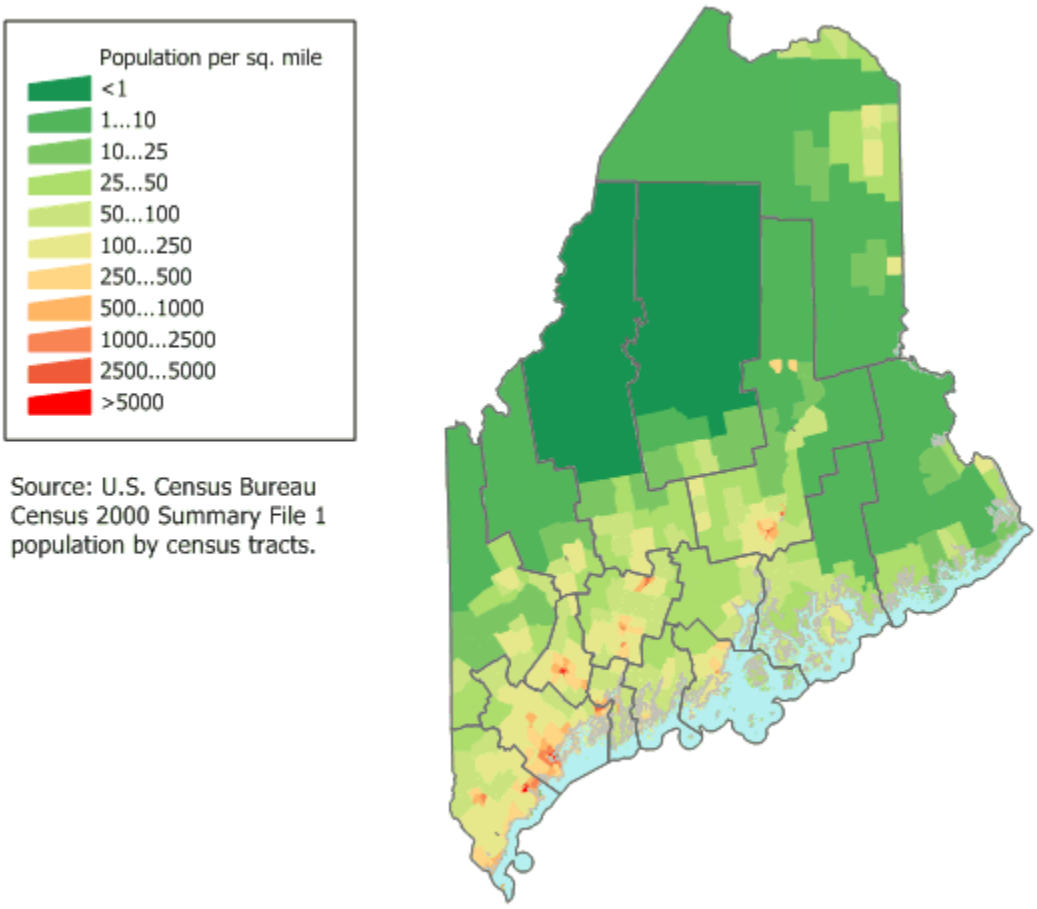
Note: standard errors in parentheses; *** denotes 1% level of significance, ** denotes 5% level of significance, * denotes 10% level of significance. The number of observations declines for PreM3 and PreM4 due to missing observations on the socioeconomic variables.

Table 6 Wald Test Results for the On-site Experience Effect

	Models			
	(1)	(2)	(3)	(4)
PreM	χ_1^2= 4.67**	χ_7^2= 11.98	χ_1^2= 2.43	χ_7^2= 10.01
PstM	χ_2^2=4.74*	χ_{14}^2= 17.94	χ_2^2=2.82	χ_{14}^2= 16.62

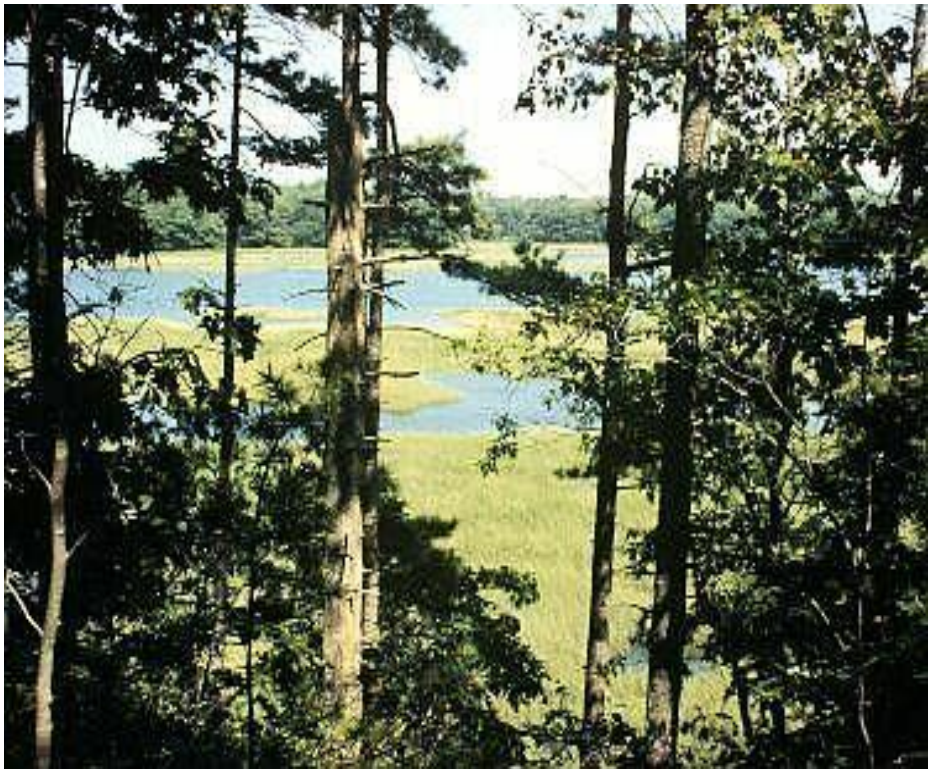
Note: ** denotes 5% level of significance, * denotes 10% level of significance.

Figure 1. Maine Population Density



Source: http://www.worldofmaps.net/en/north-america/maine-usa/map-population-density-maine.htm

Figure 2. The Holt Research Forest



Source: http://www.umaine.edu/holtforest/

Figure 3. Stated-Preference Question

Now we would like to know how you would vote on each of the referendum options if they were put on the Maine election ballot next year. Please tell us if you would vote YES to approve or NO to reject each option. You can vote YES for more than one option. (CIRCLE YES OR NO FOR EACH OPTION).

How would you vote ?

Referendum Options	Percent of land open for timber harvesting	Timber harvesting practices	Public access	Percent of property tax rebate to landowners	Cost to your family per year	(Circle YES or NO)
Current Condition in Maine	100	Forest Practices Act	Voluntary access	0	$0	
Referendum option 1						YES NO
Referendum option 2						YES NO
Referendum option 3						YES NO

Note: "percent of land available for timber harvesting" and "timber harvesting practices" are perfectly co linear. If 50% or 0%of the land is available for timber harvesting in one of the referendums, then "timber harvesting practices" would be low-impact forest practices.