On-site Experience Effect on the Preferences of Interest Groups for Forest Management

Xiaoshu Li [Virginia Tech]
Agricultural and Applied Economics 410A
Bishop-Favrao Hall
Blacksburg, VA 24061
E-Mail: xiaoshu@vt.edu

Kevin J. Boyle [Virginia Tech]
Program in Real Estate 430A
Bishop-Favrao Hall (0715)
Blacksburg, VA 24061
E-Mail: kjboyle@vt.edu

Thomas P. Holmes [USDA Forest Service]
Forestry Sciences Lab
Southern Research Station
Research Triangle Park, NC 27709
E-Mail: tholmes@fs.fed.us

Genevieve Pullis LaRouche [U.S. Fish and Wildlife Service]
Chesapeake Bay Field Office
Fairfax Drive, Room 4020
Arlington, VA 22203
E-Mail: LaRouche@fws.gov

Abstract: Forest owners and environmental activists are two groups who actively influence the design of forest management policies. These interest groups have more knowledge and experience with the forest. However, these interest groups may not represent the preferences of the general public for forest management. In the research here we conduct a stated-preference survey to investigate if the preferences for forest management policies differ between two forest interest groups and the general public. And we provide an on-site treatment during the survey to check how the information about forest ecosystem got from an on-site experience would affect their preferences. The results show that the preferences are significantly different between each group in both the pretest survey and post-test survey. All their preferences have not significantly changed after the forest walk.

Key Words: stated preferences; on-site experience; forest management; interest groups

2.1 Introduction

There is a growing concern about the health of forest ecosystem, and the demand for forest management to promote forest health is increasing. Forest professionals propose alternative harvesting practices which are designed to simultaneously provide consistent timber production and protect the forest ecosystem. According to alternative harvesting practices, the landowners are required to harvest timber from their forests at regular intervals and set part of their land away from harvesting each time. These alternative harvesting practices could maximize the production of high quality timber, enhance wildlife diversity and abundance, and maintain the forests aesthetic qualities (Witham et al. 1993). Legislation and referendum could be imposed to regulate timber harvesting and incentive forest owners to undertake these alternative harvesting practices.

An understanding of the public attitudes and value toward forest management legislations would be helpful in the design and administration process. Forest owners and environmental activists are two interest groups that will be affected by the forest management decisions, they often actively participate and influence the design of forest management policies. The attitudes and perceptions of these stakeholders should also be jointly considered in the forest use strategies. However, as interest groups have diverse opinions on forest values, their preferences may not represent the preferences of the general public. They can have shared and also conflicting attitudes with the general public toward forest management policies.

The preferences of interest groups for forest management policies have been investigated for a long time (Bliss et al. 1994; Rantala and Primmer 2003; Watson and McFarlane 2004; Kant and

Lee 2004). Researches have shown differences in preferences between interest groups (Kumar and Kant 2007; Berninger et al. 2009; Berninger et al. 2010). Foresters have a stronger preference for the economic use of the forest than Aboriginal groups, Environmental Non-government Organizations, and Ministry of Natural Resources (Kumar and Kant 2007), and they consider the current forest policies and stakeholders' power status more acceptable than the other citizens (Valkeapaa and Karppinen, 2013). The specialist forest users like cyclists, horse riders are more bio-oriented and exhibit higher values for improvements of recreation facilities in forests than the general users (Christie et al. 2007).

There are also studies which show the common attitudes among stakeholders. The attitudes of the general public are not significantly different from the non-industry private forestland owners for timber harvesting (Bliss 1994; Bliss 1997; Schaaf et al. 2006). In another study, campers and the public were found to share common bio-centric attitudes toward forest values (Watson and McFarlane 2004). And the values of open access right and forest ownership are broadly shared among stakeholders (Rantala and Primmer 2003).

This diversity of attitudes toward forest management policies are influenced by a lot of social and culture factors. Age, gender, education, income, religon and ethnicity are all factors which may affect environmental preference (Tarrant et al. 2003; Schaaf et al. 2006; Kumar and Kant 2007). In addition, the preferences among different interest groups can also change across time and region with different forest use conditions and history (Torgler and Garcia-Valinas 2007; Berninger et al. 2009; Berninger et al. 2010).

Knowledge and Experience with forest management has been shown to be important to obtain accurate valuation of environmental resources (Boyle et al. 1993; Cameron and Englin

1997; Hoehna and Randall 2002). For forest practices, research has shown that increased knowledge can raises public's acceptability of clear cutting (Bliss et al. 1997). Broussard et al. (2001) provided a series of educational experiences to American urban youth, and found that the participants changed their attitudes with timber harvesting and agreed that it could be beneficial. However, in another study McFarlane and Boxall (2003) used the number of correct responses to forest-related facts as an index for knowledge, and found that it is not correlated with campers' and hunters' attitudes about forest management.

There has been no research that investigated whether the difference of knowledge level affects attitude diversity among interest groups. Woodlot owners and environmental activists are more familiar with the functioning of forest ecosystems. The owners of forestlands have substantial experience with timber harvesting and are familiar with the effect of alternative forest management practices. On the other hand, environmental activists are more aware of the environmental consequences of timber harvesting, and the benefits from appropriate forest management. The public can also obtain their knowledge of forest ecosystem from social media and recreation activities. The differences in their knowledge level may influence their standpoints toward forest management policies.

In this study, we compare the preferences of different groups of individuals in a choice study of forest management practices. We randomly recruited study participants from three groups of individuals, an organization of small woodlot owners, an environmental group actively attempting to influence forest management policy and the general public. We provide an on-site treatment during the survey which ensures that all the groups share the same information about forest ecosystem and forest management for evaluation. Study participants were recruited to the research forest where half of the land is managed using low-impact timber harvesting procedures

and the other half of the land is left as a natural area. Subjects completed a stated-preference survey on forest management practices when they arrived at the site (pretest), were led on walks through both sections of the forest, and then were re-administered the survey (post-test).

By providing an actual experience with the forest, the study intends to: (1) compare the perceptions of different groups for forest management policies, and (2) investigate whether the onsite experience affects the preferences among different individuals for forest management practices. The results show that there exists preference heterogeneity among interest groups and these differences still exists after the on-site experience. The on-site experience has not significantly changed the preferences towards forest management for each group. So the knowledge with forest management has little effect on the preference diversity among interest groups.

2.2 Survey Design

The on-site survey took place at Holt Research Forest, which is managed by the University of Maine. 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-harvest section). The trees in Holt Research Forest had arrived at maturity for timber harvesting, and the low impact harvest had been conducted for five years. Therefore, the visit to this forest could provide suitable information to the on-site participants of the effects on ecosystems from low impact timber harvesting.

2.2.1 Sample Recruitment

The recruitment of the on-site sample was conducted through phone calls. The sample of the small landowner group was drawn from the members of Small Woodlot Owners of Maine

(SWOM) or from the landowners who had their land registered in the Maine's Tree Growth program. All of them needed to own more than 10 acres of land. The environment activists sample was drawn from the members of Maine Audubon's activist (MAA) who did not belong to the small landowner group. The general public sample was collected from Maine citizens via random digit dialing, and they did not belong to the two groups above.

The sample of small land owners and the general public were identified from the communities within one hour drive distance from the Holt Research Forest, and the environment activists lived in the town within one hour and half drive distance, since there were fewer samples available. 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 were paid a $40 incentive to compensate them for their travel time to the study site.

A total of 100 people participated in the study; 35 were owners of small forest holdings and members of SWOM, 34 were members of the Maine Audubon, and 31 were from the general public. The on-site sample was limited due to available budget, but mostly due to the logistics of on-site administration and the desire of the forest researchers that our experiment has minimal impact on the forest and on-going research.

2.2.2 Survey Administration

The subjects in the on-site sample were recruited to travel to the research forest and participate in the survey. All three groups responded to the same survey instrument, but the survey was administered to each group on a different day over three weekends. These on-site subjects completed a pretest administration of the survey when they arrived at the forest. They were then led by two graduate students to walk through the forest which took about 45 minutes.

After the walk, all the participants got together, and answered the post-test surveys which were identical to the pretest surveys.

The walks followed transect lines that divided the forest into research plots and it was necessary to have someone lead subjects through the forest so both groups would follow the same routes and not walk across research plots.[1] Two graduate students led the groups and stopped at designated sites in the forest for participants to observe the forest conditions. There are also cards to read which described the characteristics of the forest, so the participants could gain knowledge about different characteristics of the forest and the effect of harvesting. Stops included a harvest opening in the harvest section and a natural clearing in the no-harvest area of the forest, a skidder path across an ephemeral stream in the harvest section and an uninterrupted ephemeral stream in the no-harvest section, and wildlife habitat in the harvest section (slash – piles of brush and limbs left from harvesting) and no-harvest section (snags – standing dead or dying trees) of the forest.

2.2.3 Stated-preference Survey

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 1). Respondents were informed about current conditions so that they would know what continuing forest management conditions would be if they voted "no". The 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

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[1] 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.

low-impact harvesting when any of the referendums allow timber harvesting (100% or 50%).

The "cost" amounts are based on a prior stated-preference study of forest policy in Maine (Boyle et al. 2001). A random design was used to assign the attribute levels to each choice situation, and there were at least one different attributes between each of the three alternative choice situations.

2.3 Model Specifications

2.3.1 Random Utility Model

Respondents are assumed to have a utility function U_i such that V_i is the observable component of utility and ε_i is the random error (McFadden 1973; Louviere et al. 2001):

$$U_i = V_i(x) + \varepsilon_i \tag{1}$$

where x is a vector of attributes from the forest management program. Assuming that the utility function is linear in parameters and ε has iid extreme value distribution, we obtain the conditional logit model.

$$\Delta U_i = \beta \Delta x_i + \Delta \varepsilon_i \tag{2}$$

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 employed the conditional logit model to estimate the preferences for all three interests groups seperately in the pretest survey and the post-test survey.

2.3.2 Hypothesis Test

To investigate if pretest and post-test respondents have different preferences for the referendum attributes we test the null hypothesis that their parameter estimates are statistically

indistinguishable from each other.

$$H_0: \beta_{\text{before}} = \beta_{after} \text{ vs. } H_a: \text{not } H_0 \tag{H1}$$

Unlike linear regression parameters, in the estimation of logistic models ε_i is standardized to have a variance of 1, so estimated parameter estimates $(\hat{\rho})$ are confounded with the variance $(\rho = \mu\beta)$, where μ is the scale parameter, $\mu = 1/\sigma$ and σ is the standard error. Thus, the true preference parameter vector is β, but we observe $\hat{\rho}$.

We apply the method described by Swait and Louviere (1993) to calculate the relative scale parameter and test whether the scale parameter and preferences are the same between pretest and post-test surveys. First, we calculate the likelihood ratio test statistics $\lambda_1 = -2[L_\mu - (L_{before} + L_{after})]$ to check whether the preferences for all the attributes are equal. L_μ is the log likelihood value from the pooled sample after adjusting for the relative differences in scale parameters. L_{before} is the log likelihood value for the estimation with the pretest data and L_{after} is the log likelihood value from the post-test data.

If we cannot reject the null hypothesis, we test the hypothesis that the scale parameters are equivalent:

$$H_0: \mu_{before} = \mu_{after} \text{ vs. } H_a: \text{not } H_0. \tag{H2}$$

These hypothesis tests are conducted using the likelihood ratio test statistics, $\lambda_2 = -2(L_p - L_\mu)$. L_p is the log likelihood value from the pooled sample regression with the scale parameter restricted to be equal. Both test statistics λ_1 and λ_2 are asymptotically chi-squared distributions with k degrees of freedom, the number of restrictions imposed by the test.

We follow the above steps to test the preference differences between pretest survey and post-test survey separately for all three interest groups. We also follow the same procedure to test the preference differences of interest groups between each other in the pretest survey or the post-test survey.

2.4 Results

Summary statistics of respondents' socioeconomic characteristics are reported in Table 3. We use t test, z test and chi-square test to identify whether these groups of respondents have the same social economics characteristics. The environment activists and the public have the same proportion of gender and mean of age, while the woodlot owners have more males and are much older. The woodlot owners and the environment activists have higher household income and education levels than the general public. Moreover, woodlot owners and environmental activists are more actively involved in forest management than the general public. These differences of socioeconomic characteristics may also affect the perception and attitudes toward forest management.

2.4.1 Estimation Results for interest groups

Estimation results of the conditional logit models for every interest group are summarized in Table 4. The preferences of woodlot owners are significantly influenced by the choice attributes of public access and 100% of land available for timber harvesting in both the pretest and posttest. Requiring public access to private land reduces the probability of an affirmative vote and 100% of land available for timber harvesting increases the probability of an affirmative vote. For environmental activists and the general public, the cost to households (*Bid*) has a significantly negative effect on their choice decisions. Splitting the land evenly with 50%

available for timber harvesting and 50% set aside from timber harvesting increases the probability of an affirmative vote. For the general public, requiring public access to private land also has a significant negative effect on their choice decision.

2.4.2 Tests of Preference Parameter Equivalency

The results for the comparison of preference parameters between groups and surveys are shown in Table 5. For all interest groups, we cannot reject the null hypothesis that the preference parameters and the scale parameters are the same between pretest and post-test survey.

The Comparisons among interest groups in the pretest survey shows that there exist preference differences between each pair of interest groups. The null hypothesis that the preferences of woodlot owners and environmental activists (general public) are the same is rejected at 1% level. The null hypothesis that the preferences of environmental activists and general public are the same is rejected at 10% level. The preference difference between environmental activists and the general public is relatively smaller than the difference between woodlot owners and the general public. We cannot test the null hypothesis of no difference in the scale parameters between the interest groups as we reject the null hypothesis of no difference in preference parameter estimates in the first step.

2.5 Conclusion

The results indicate that stated preferences for forest attributes do not vary between the pretest and post-test of surveys for all three interest groups. However, preference differences exist among the three interest groups both in the pretest and post-test survey. This suggests that the preference of interest groups (woodlot owners and environmental activists) do not represent the preference of the general public for proposed forestry programs. Furthermore, this preference

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heterogeneity does not just come from a lack of knowledge or experience with forest management. These results indicate that the lobbying on forest policy by SWOM and Maine Audubon, which satisfies the preferences of their respective members, may not be representative of the preferences of the general public. Thus, policy makers must seek information on the preferences of the public when making forest policy and not assume that the input of interest groups is sufficient to design policies that maximize public benefits.

The sample sizes are small due to the logistics of administering the study on-site at the experimental forest. Future research should include larger on-site samples as budgets and study site conditions permit. Then the sample would make a better representation of the preferences for forest attributes and provide more reliable hypothesis testing. We should offer more attribute levels of choices in the stated-preference questions which would be helpful to identify the preferences for any individual.

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Table 1.   Attributes and Levels

Attributes	Levels
Property tax rebate to participating landowners	30%
	70%
	100%
Percentage of land available (set aside) for timber harvesting	0% (All set aside)
	50%
	100% (None set aside)
Public Access to land of participating landowners	Voluntary
	Required
Cost per household	$1, $20, $40, $60, $80, $100, $120, $160, $180, $200, $400, $800, $1600

Table 2. Definitions of Variables

Variables	Definitions
Bid	Negative value of cost per household
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
Asc	1 if the alternative represents referendum conditions and 0 if current condition

Table 3. Socioeconomic Characteristics of Respondents

	Woodlot Owner	Environmental Activist	General Public	Test Statistics
Gender	79%	34%	42%	W&E: z=3.62***[a]
(male=1)	(7)	(8)	(9)	W&G: z=3.02***
				E&G: z=0.62
Average Age	50	44	42	W&E: t=2.72***
	(2)	(2)	(2)	W&G: t=3.49***
				E&G: t=0.86
Average Household Income	64833	58485	43448	W&E: t=0.93
	(5060)	(4542)	(4459)	W&G: t=3.17***
				E&G: t=2.36**
Education				
High school graduate or equivalent	0%	0%	18%	W&E: x^2=2.37
Some college, A.S degree or technical school	21%	9%	29%	W&G: x^2=11.63**
B.A. degree or equivalent	33%	30%	39%	E&G: x^2=18.26***
M.A degree or equivalent	33%	45%	7%	
Advanced degree	12%	15%	7%	
Voting Participation	94%	97%	81%	W&E: z=0.56
	(4)	(3)	(7)	W&G: z=1.61
				E&G: z=2.05**
Observations	35	34	31	

[a] *** denotes 1% level of significance, ** denotes 5% level of significance, * denotes 10% level of significance.

Table 4. Preference Parameter Estimates for Interest Groups

	Woodlot Owner	Environmental Activist	General Public
Pretest Survey			
Asc	0.260	0.815	-0.320
	(0.721)	(0.569)	(0.761)
Bid	-0.0003	-0.0009*	-0.0016**
	(0.0006)	(0.0005)	(0.0007)
Access	-1.647***	-0.530	-1.533***
	(0.529)	(0.462)	(0.543)
H50	0.549	2.348***	1.976***
	(0.89)	(0.643)	(0.600)
H100	1.501**	0.633	-0.069
	(0.644)	(0.531)	(0.707)
R70	1.692***	-0.0394	0.498
	(0.652)	(0.594)	(0.652)
R100	0.506	-0.534	0.645
	(0.636)	(0.575)	(0.663)
Log-likelihood	-50.889	-58.396	-46.253
N	102	102	91
Post-test Survey			
Asc	0.223	0.525	-0.248
	(0.912)	(0.581)	(0.820)
Bid	-0.0007	-0.0020***	-0.00290**
	(-0.0008)	(0.0007)	(0.0013)
Access	-1.801***	-0.113	-1.106*
	(0.674)	(0.475)	(0.574)
H50	1.183	2.290***	2.862***
	(0.821)	(0.707)	(0.687)
H100	2.707***	-0.054	1.124
	(0.871)	(0.536)	(0.723)
R70	1.309	-0.435	0.962
	(0.825)	(0.608)	(0.727)
R100	1.046	-0.247	1.373*
	(0.815)	(0.594)	(0.751)
Log-likelihood	-36.388	-55.378	-40.609
N	93	102	93

Table 5.   Hypothesis Test Results for Comparison between Groups and Surveys

	$X^2(\beta)$	$X^2(\mu)$
Comparison between pretest and post-test surveys		
Woodlot Owner	0.867	0.154
Environmental Activist	0.808	0.598
General Public	0.908	0.347
Comparison between groups for pretest survey		
Woodlot Owner & Environmental Activist	0.002	
Woodlot Owner & General Public	0.008	
Environmental Activist & General Public	0.098	
Comparison between groups for post-test survey		
Woodlot Owner & Environmental Activist	0.000	
Woodlot Owner & General Public	0.001	
Environmental Activist & General Public	0.077	

Figure 1. 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 100% of the land is available for timber harvesting in one of the referendums, then "timber harvesting practices" would be low-impact forest practices.