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Estimating the Use and Preservation Values of Jirisan National Park Using a Dichotomous Contingent Valuation

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Abstract : This research was conducted to estimate the use and preservation values of Jirisan national park, using a dichotomous choice contingent valuation. Jirisan national park was estimated to have the use value of 6,377 won per visitor. In terms of preservation value was estimated 13,030 won per housed per year. The results of this research show that Jirisan national park generated considerable use and preservation values, exceeding far greater than current admission fees. The findings also indicate that the estimated economic value provides enough justification for the national park service to increase admission fees in order to maintain the quality of the natural environment. This result may contribute to guidance on the pricing policy of national park managers and practitioners, although public policy may be made in the political arena.

Key words **:** *national park, contingent valuation, use value, preservation value*

Introduction

With the current growing concern with environmental conservation and sensitivity, attention to nature-based tourism is also increasing world-wide. National parks have long been recognized as popular nature-based tourist sites for Koreans. In 2004, approximately 26 million people were reported to have visited the national parks in South Korea (Korea National Park Service, 2005). Koreans like to hike with their families or friends and use the national parks for socializing, improving health, and escaping from their routine lives. Jirisan national park was designated as the first park in 1967, and now there are currently 20 national parks in the country. Jirisan national park is the largest one of Korea's mountain national parks. The picturesque mountain, home to a rich variety of species of animals and plants, forms the extreme southern end of the Great Paekdu mountain range, which splits the southern Korean Peninsula into east and west. This makes it the perfect starting point for backpackers travelling across the Paekdu range. The park is considered harmonious because it straddles the border of three provinces and five cities. In 2004, approximately 3 million people visited the Jirisan national park (www.knps.or.kr).

The purpose of this research is to estimate the use and preservation (or non-use) values of natural and cultural resources in Jirisan national park, using a dichotomous choice contingent valuation. Use value is related to benefits received from actual recreational use, while preservation value is related to benefits form non-use satisfactions, such as existence, option, and bequest values. Nature-based tourism resources such as national parks, are receiving growing attention from academics (Moore & Carter, 1993; Laarman & Gregersen, 1996), but little research has been conducted to estimate the economic value of nature-based tourism in the field (Lee and Han, 2002). The results of this research may help park managers and practitioners to establish practical park management policy, such as admission fee structures.

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Methodology

1. Contingent valuation method (CVM) and dichotomous choice (DC) questionnaire

The CVM is designed to ascertain from respondents what they would be willing to pay for recreation resources or activities contingent on hypothetical changes in the quantity or quality of the environmental amenity (Walsh, 1986). The method has two underlying advantages (Sorg, Loomis, Donnelly, Peterson, & Nelson, 1985; Sorg & Nelson, 1987). First, it is able to assess an individual's WTP for hypothetical changes in the quality of recreational activities, beyond present conditions. Second, while the travel cost model is used only to valuate trips

with a primary purpose or primary destination, the CVM is able to valuate trips with multiple purposes or destinations. Third, the CVM is the only technique that allows non-use benefits of environment amenity to be elicited from both users and non-users (Carson & Mitchell, 1993).

The dichotomous choice (DC) contingent valuation method, first introduced by Bishop and Heberlein (1979), has been widely used to elicit WTP for recreation, option, existence, and bequest values (Hanemann, Loomis, & Kanninen, 1991; Hanemann, 1994). In the DC approach, respondents are asked only to accept or reject a suggested price under a hypothetical market situation. That is, they need answer only a "yes" or "no" when presented with a randomly selected monetary price. This methodology facilitates respondents' decision-making because they are familiar with discrete choices in market transactions (Hanemann, 1994). The DC format is generally considered to be the superior elicitation method (Lockwood & Tracy, 1995).

However, a limitation of CVMs generally is that they rely on individuals' stated willingness to pay under given hypothetical market scenarios (Lee & Han, 2002). Since a hypothetical setting of the DC contingent valuation method tends to result in overestimating WTP, this study employs a specially- designed field experimental survey in a real condition, using the DC contingent valuation method with a real setting in order to increase the accuracy of the WTP estimate by reducing hypothetical bias.

2. Type of value to be estimated

A review of environment economics literature suggests that resources be distinguished as having use and preservation values (Walsh, Loomis, & Gillman, 1984): use value is related to consumer surplus benefit from actual recreational use, while preservation value is related to benefits from non-use satisfactions. Preservation value include option, existence and bequest value (Greenley, Walsh, & Young, 1981): option value is defined as WTP for retaining the recreation opportunity for possible future use; existence value as WTP for knowledge that natural resources are preserved; and bequest value as WTP for the satisfaction derived from endowing future generations with natural resources. This research attempts to assess preservation value as a whole as well as examining use value.

3. Survey method

Deriving an accurate value is highly dependent upon a survey method. The direct face-to-face interview is the most commonly used approach at recreation sites (Forster, 1989). The on-site survey was conducted in Jirisan national park during the peak period of summer vacation in 2005. The direct face-to-face interview was administered by well-trained students, who randomly selected visitors who came down after experiencing or enjoying natural and/or cultural resources, and who agreed to participate in the survey. In case of many family members, one person was chosen for the survey. However, a self-administered questionnaire was given to those who preferred to complete the questionnaire by themselves.

The questionnaire included two major parts that of questions on measurement of recreation use and preservation values and questions on demographic characteristics.

A total of 372 usable questionnaires were finally collected from the CV survey.

4. Payment vehicle

It is important for researchers to choose a realistic payment vehicle in the CV survey, which is related to how WTP offer would be paid by the respondents. The payment vehicle may include an admission fee, sales tax, license fees, or a special fund; admission fees would be a logical choice and a realistic payment vehicle for users at recreation sites (Forster, 1989; Randall, Ives, and Eastman, 1974).

An admission fee was chosen for measurement of use value in this research as a realistic and appropriate payment vehicle since Korean people are familiar with paying admission fees for activities at recreation sites. Also, a special tax levied by government, such as an education tax, was selected for measurement of preservation value.

5. Hypothetical market scenario

Contingent markets should be established in the absence of market prices for nonmarket goods, such as natural resources, in order to provide a reasonable basis for estimating their values (Sellar, Chavas, and Stoll, 1986). The CV questionnaire for interviews was carefully designed to provide respondents with adequate and accurate information, making them fully aware of the hypothetical market situation. The respondents were informed that data on their responses would not be used for specific pricing policies for the admission fee of the national park, but instead for academic research to measure the economic value of recreation and/or cultural resources. This information from the CV questionnaire was intended not only to help them reveal their true values as accurately as possible, but also to reduce the rate of rejection from the respondents.

The two CV scenarios were carefully worded for the respondents. The first CV question pertaining to use value reads: "If Jirisan national park provides you with opportunities for appreciating natural and/or cultural resources, hiking, and resting, and it charges x_1 won (Korean currency) as an admission fee per person, would you be

willing to pay for it?" The second CV question pertaining to preservation value reads: "If it charges x_2 won per household per year as a tax for preservation of Jirisan national park, would you be willing to pay for it?" In the blank, each respondent received only one offer, which was randomly selected from a predetermined range of offers. If the respondents answered "yes," then the values were recorded. A set of nine different offers were selected on the basis of pretest where maximum WTP (MWTP) for entrance fee was asked to visitors to the national park, using open-ended questionnaire. The results show that WTP ranged from 0 to 50,000 won with mode and median values of 5,000 won, respectively. In this study, offers were determined from 2,000 won to 50,000 won (MWTP); thus, a set of seven different offers included 2,000, 5,000, 10,000, 15,000, 20,000, 30,000 and 50,000 won.

6. Model specification for measuring WTP

It is assumed that the individual will accept a suggested admission fee for recreation activities (or a suggested tax for preservation), to maximize his or her utility under the following condition (Hanemann, 1984):

$$v(1,Y-A,s)+\varepsilon_1 \geq v(0,Y;s)+\varepsilon_0 \quad (1)$$

and reject it otherwise. Here, v is the indirect utility which is assumed to equal the utility u, Y is income, A is an offer (admission fee or tax), s is other socio-economic characteristics affecting individual preference, and ε_0 and ε_1 are the identically, independently distributed random variables with zero means.

The utility difference (Δv) can be described as follows:

$$\Delta v=v(1,Y-A,s)-v(0,Y;s)+(\varepsilon_1-\varepsilon_0) \quad (2)$$

The dichotomous choice format of CVM has a binary choice dependent variable which requires a qualitative choice model. The probit and logit models are commonly used qualitative choice methods (Capps and Cramer, 1985). The logit model is used in this research since it has been preferred to the probit model in many fields including recreation because of its relative simplicity to compute (Bishop and Heberlein, 1979; Seller, Stoll, and Chavas, 1985). The probability (P_1) that the individual will accept an offer (A) can be expressed as the following logit model (Hanemann, 1989):

$$P_1=F_\eta(\Delta v)=\frac{1}{1+\exp(-\Delta v)} \quad (3)$$

where $F_\eta(\cdot)$ is the cumulative distribution function of a standard logistic variate and some of socio-economic variables are included in this research. There are three method that compute the value of WTP: the first method, called mean WTP is to calculate the expected value of WTP by numerical integration, ranging from 0 to ∞; the second method, called overall mean WTP is to calculate the expected value of WTP by numerical integration, ranging from $-\infty$ to $+\infty$; and the third method, called truncated mean WTP, is to calculate the expected value of WTP by numerical integration, ranging from 0 to maximum bid. The last method is preferable because it satisfies consistency with theoretical constraints, statistical efficiency, and ability to be aggregated (Duffield and Patterson, 1991). Thus, the truncated mean WTP is used in this research.

The logit model in equation (3) is then estimated using the Maximum Likelihood (ML) estimation method, the most common technique for estimating the logit model (Capps and Cramer, 1985). Once the parameters have been estimated using the ML method, then the expected value of WTP can be calculated by numerical integration, ranging from 0 to maximum bis (A) as follows:

$$E(WTP)=\int_0^A F_\eta(\Delta v)dA=\int_0^A (\alpha^*+\beta A)dA \quad (4)$$

where E(WTP) is the expected value of WTP, and α^* is the adjusted intercept which was added by the socioeconomic term to the original intercept term of α. The area under the curve in equation (4) can be also used to make inferences of truncated mean of WTP.

Empirical Results

Logit models may be estimated with either linear or logarithmic functional forms in measuring both use and preservation values. However, the linear-logit models were employed in this study because linear functional form was better in terms of goodness of fit measures (i.e, percent of right prediction and model chi-squire statistics) and is much easier to compute mean WTP. This research included several variables: bid, income, gender, age, and travel time, respectively. Although their estimated coefficients showed the expected signs, variables with statistical insignificance were excluded in the following logit models, which were found to be the best models.

1. Estimating logit model for Jirisan national park

Table 1 presents the parameter estimates of the linear-logit models of measuring use values for Jirisan national park. Three variables of offer (Bid), income and age were included in the logit model of measuring use value. The estimated coefficient of offer which is the most important explanatory variable of probability of WTP, was found statistically significant at the 1.0 percent level with the expected negative sign. This indicates that the probability of WTP 'yes' decreases (increases) as the price of

Table 1. Results of logit model for use value.

Variables	Coefficient	Standard Error	t-value
Constant	-3.734	.711	27.545
Bid	-.991	.169	34.348
Income	.399	.098	16.614
Age	.049	.012	15.801
-2 log likelihood		295.4	
Cox & Snell R^2		.208	
Nagelkerkel R^2		.324	
Percentage of right Predictions		83.3	

※Description of variables
Bid : unit 10 thousand won
Income (monthly income of the household): unit 10 thousand won
<100=1, <200=2, <300=3, <400=4, <500=5, ≤500=6
Age: year

Table 2. Results of logit model for preservation value.

Variables	Coefficient	Standard Error	t-value
Constant	-.291	.178	2.683
Bid	-.321	.089	13.710
-2 log likelihood		439.5	
Cox & Snell R^2		.041	
Nagelkerkel R^2		.058	
Percentage of right Predictions		69.9	

offer increases (decreases) under the hypothetical market scenario. The estimated coefficients of income and age were found statistically significant at the 1.0 percent level, the sign of were positive as expected. The results reveal that almost 83 percent of respondents were correctly allocated to predicted WTP either 'yes' or 'no' in the model, indicating a relatively good-fit to the data (see also Cox & Snell R^2 and Nagelkerke R^2).

The variable of offer was only significant in the model of measuring preservation value. The estimated coefficients of offer was found statistically significant at the 1.0 percent level, with the expected negative sign. 70 percent of respondents were correctly allocated to predicted WTP, either 'yes,' or 'no,' in the model.

2. Measuring use and preservation value

Equations 5 and 6 show the expected value of truncated mean WTP, which represents use and preservation value of Jirisan national park. It was calculated by numerical integration, ranging from 0 to maximum bid after parameters from logit models were estimated using the ML method. The socioeconomic term was estimated and added to an adjusted intercept together with the original intercept term of α.

$$\int_0^5 \frac{1}{1+\exp[-(-.113-.991\cdot A)]}dA \quad (5)$$

$$\int_0^5 \frac{1}{1+\exp[-(-.291-.321\cdot A)]}dA \quad (6)$$

Jirisan national park was estimated to have the use value of 6,377 won. The results imply that use value seems to be affected by location for users as well as beauty and/or cultural resources. In terms of preservation value was estimated 13,030 won per housed per year.

Conclusion

This research was conducted to estimate the use and preservation values of natural and/or cultural resources in Jirisan national park, using a dichotomous choice contingent valuation method. The results of this research show that natural and/or cultural resources of the Jirisan national park generated considerable use and preservation values, exceeding far greater than current admission fees of 3,200 to 3,800 won per visitor (including cultural assets entrance fee).

The findings indicate that the estimated economic value provides enough justification for the National Park Service to increase admission fees in order to maintain the quality of the natural environment, and thereby avoid the degradation of natural resources, should the government reduce or withdraw budgeting support. The findings also indicate that natural and/or cultural resources of Jirisan national park provide considerable use and preservation values for citizens. Thus, the Korean government should continue to finance park management in order to maintain citizens' welfare. This result may contribute to guidance on the pricing policy of national park managers and practitioners, although public policy may be made in the political arena.

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