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Research Note

Valuation of nature-based tourism resources using dichotomous choice contingent valuation method

Choong-Ki Lee

Department of Tourism Management, Dongguk University, 707 Sukjangdong Kyongju, Kyongbuk 780–714, Korea

The purpose of this paper is to measure the potential revenue from nature-based tourism resources in the environmentally sensitive area of Mt Minju, South Korea. A dichotomous choice contingent valuation method was employed to estimate the mean willingness-to-pay, contingent on a hypothetical market scenario. The empirical results show that the economic value of nature-based tourism resources was estimated at 5905 Won (*ca* US$ 7) per visitor. This implies that the significant economic value of natural resources will be lost from any large-scale development by degrading natural environments. In addition to the value of natural resources, nature-based tourism also provides the locally owned small tourist businesses with lower leakages than the externally owned large-scale ones. Low leakage implies that local residents gain more direct income from nature-based tourism.

Keywords: nature-based tourism, contingent valuation, dichotomous choice, willingness-to-pay, economic value, logit model, leakage

As people become more and more environmentally sensitive, nature-based tourism or ecotourism has received increased attention from tourists and recreationists. Laarman and Gregersen[1] pointed out that nature-based tourism is a small but rapidly increasing segment of the tourism market. Moore and Carter[2] predicted that nature-based tourism will be big business by the year 2000 in Australia. The idea of nature-based tourism or ecotourism is to provide some economic gains while preserving natural environments. Worker[3] pointed out that governments, local authorities and private organizations increasingly show interest in developing ecotourism in protected areas, in order to benefit communities and to help protect the ecosystem.

Valentine[4] asserted that central or local governments have difficulties in designating protected areas due to private land ownership. In the short run, the economic impact of nature-based tourism or ecotourism may not be greater than a large-scale development of tourism such as ski resorts and golf courses, in environmentally sensitive areas. However, nature-based tourism will be sustainable in the long run by providing more direct income to local residents with lower leakages than large-scale development, while securing their traditional agriculture jobs and preserving the natural environment. Unfortunately, people tend to ignore the economic value of natural resources for tourism, which can be gained by preserving natural environments in the long term. In other words, large-scale developments such as ski resort or golf courses in environmentally sensitive areas may degrade the natural environment, resulting in loss of economic benefits from natural resources for tourism.

Tourism policy-makers or planners concerned with nature-based tourism as a strategy for sustainable development may need to justify its existence on an economic basis.[5] Nature-based tourism or ecotourism is receiving growing attention from academics, but little research has been conducted to estimate the economic value of nature-based tourism in the field. In this respect, the purpose of this paper is to measure the economic value of

nature-based tourism resources using a dichotomous choice (DC) contingent valuation method (CVM).

Methodology

Study area

Mt Minju, the area of this study, is located in Chungchungbuk-do province in the southern part of the Korean peninsula. Research on the fauna shows that there exists a variety of rare species which are designated as such by the Ministry of Environment and Natural Monuments.[6] This indicates that the area has high potential for preservation. In addition, sources of clean water in the valley provide neighbouring urbanites with drinking water as well as recreation. However, a private developer who owns some territories of the area is planning to construct a ski resort, with golf courses and hotels. The local residents strongly object to this, because they desire to secure their traditionally agriculture-based jobs by preserving this area. Thus, Mt Minju has been the subject of dispute between residents and the private developer. This study was conducted through research projects funded by the Ministry of Agriculture, Forestry and Fishery, in order to investigate the economic value of nature-based tourism resources.

Contingent valuation method and dichotomous choice questionnaire

This study uses the CVM, which has been commonly employed as one of the standard approaches to measure the economic values of nonmarket goods, such as recreation resources, wildlife and environmental quality goods.[7,8] The CVM relies on the stated intentions of individuals' willingness-to-pay (WTP) for recreation resources or activities, contingent on hypothetical changes in the quantity or quality of environmental amenity.[9] In other words, the CVM basically attempts to ascertain from respondents what they would be willing to pay under certain hypothetical market scenarios.

This study also utilizes the DC questionnaire to measure individuals' WTP in the contingent valuation surveys. Respondents in the DC approach are asked only to accept or reject a suggested price under a hypothetical market situation. In other words, they need answer only a 'yes' or 'no' where each respondent is confronted with a different price. They find it easier to make their decisions in the DC question, because they are familiar with discrete choices in market transactions.[8]

Survey method and payment vehicle

The on-site survey was administered to randomly selected recreation users at the area of Mt Minju during weekends in May, 1996. The personal interview was conducted by well-trained students from the Department of Forestry of Kyungpook and Taegu Universities. Of 450 questionnaires, 48 were not usable, since several important parts associated with WTP or demographic variables were omitted. Four hundred and two questionnaires were finally collected from the CV survey, representing 89% of the total. An entrance fee was chosen in this study as a realistic and appropriate payment vehicle, since it would be a logical and realistic payment vehicle for users of recreation services.[10,11] Korean people are also familiar with paying entrance fees for activities at recreation sites.

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.[12] The CV questionnaire for interviews was carefully designed to provide respondents with adequate and accurate information to make 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 entrance fee of Mt Minju, but instead for academic research to measure the economic value of recreation 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 respondents were also informed that a ski resort with golf courses may be developed by a private developer in the area of Mt Minju. This information was provided to help respondents understand how the resort development would affect the natural environment once it was actually developed. The survey results indicate that 96% of the respondents disagree with the development of a ski resort with golf courses. Finally, the CV scenario was carefully worded for the respondents, reading: 'If it charges ___ Won (Korean currency) as an entrance fee for your recreation activities and opportunities in this area, 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 ten different offers was preselected, ranging from a minimum of 500 Won (US$ 1 = 860 Won) to a maximum of 100000 Won. These offers were chosen on the basis of previous empirical research.[13] Photographs or illustrations were not presented, since the survey was conducted on site and to the recreationists who enjoyed recreation activities in this area.

Model specification for measuring WTP

It is assumed that the individual will accept a suggested entrance fee for recreation activities to maximize his or her utility under the following condition:[14]

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

and reject it otherwise. Here, v is the indirect utility which is assumed to equal the utility u, Y is income (monthly household income), A is an offer (entrance fee), 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 ($\Delta\eta$) can be described as follows:

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

The DC 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.[15] The logit model is used in this study since it has been preferred to the probit model in many fields including recreation because of its relative simplicity to compute.[16,17] The probability (P_i) that the individual will accept an offer (A) can be expressed as the following log–logit model:[18,19]

$$P_i = F_i(\Delta V) = \frac{1}{1+e^{-\Delta V}}$$

$$= \frac{1}{1+e^{-(\alpha+\beta \ln A+\gamma \ln Y)}} \quad (3)$$

where F_{ij} is the cumulative distribution function of a standard logistic variate and socio-economic variables except income are not included in this study. β and γ are coefficients to be estimated where $\beta<0$ and $\gamma>0$ are expected.

The logit model in eqn (3) is then estimated using the maximum likelihood (ML) estimation method, which is the most common technique for estimating the logit model.[15] 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 ∞ as follows:

$$E(\text{WTP}) = \int_0^{\infty} F_{ij}(\Delta V)\, dA$$

$$= \int_0^{\infty} F_i(\alpha^*+\beta \ln A)\, dA \quad (4)$$

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

Empirical results

Probability of 'yes' answers under hypothetical market scenario

As described earlier, a hypothetical market scenario was established to measure the economic value of nature-based tourism resources at the area of Mt Minju, contingent on charging χ Won as an entrance fee for recreation activities and opportunities in this area. Ten different set of offers was preselected: 500; 1000; 2000; 3000; 5000; 10000; 20000; 30000; 50000; and 100000 Won. Each respondent received only one offer, which was randomly selected from a predetermined range of offers. Respondents were asked to accept or reject the suggested entrance fee under the hypothetical market scenario. If respondents accepted the offer, the value was recorded. *Figure 1* presents the probabilities of yes-answers for ten different sets of offers under the hypothetical market scenario. This indicates that probabilities of WTP 'yes' answers generally decrease as the proposed entrance fee increases, and *vice versa*.

Estimating logit models

In this study the logit model was estimated with linear and logarithmic functional forms. *Table 1* presents the parameter estimates of both linear and logarithmic logit models. The estimated coefficient of offer was found statistically significant at the 1% level and the sign of the coefficient was negative as expected in both linear and logarithmic functional forms. This indicates that the probability of WTP 'yes' answer decreases (increases) as the price of offer increases (decreases) under the hypothetical market scenario. The estimated coefficient of income was found statistically significant at the 5% level in both linear and logarithmic functional forms, and the sign was positive as expected. This indicates that the probability of WTP

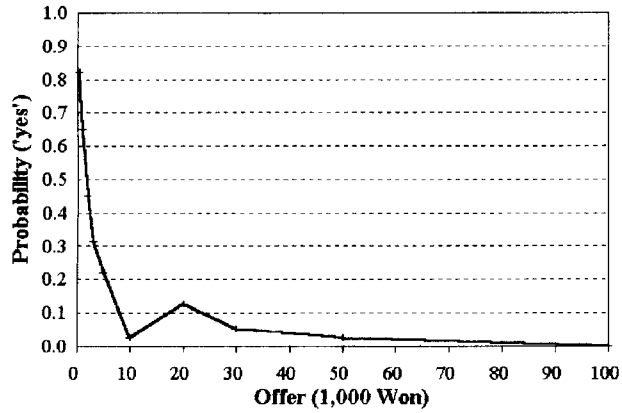

Figure 1 Probability of 'yes' answer under hypothetical scenario

Table 1 Parameter estimates of logit models

	Linear–logit model		Log–logit model	
Variable	**Coefficient**	**Elasticity**	**Coefficient**	**Elasticity**
Constant	−0.3219 (−1.2749)	−0.1751	−2.5057 (−0.6336)	−2.5057
Offer	−0.1329E−03** (−5.9006)	−0.3342	−1.1527** (−9.1740)	−1.1527
Income	0.2259E−06* (2.3673)	0.2564	−0.7649* (2.7875)	0.7649
Log-likelihood function	−170		−152	
McFadden's R^2	0.27		0.33	
Percent of right prediction	78		84	

Parentheses indicate asymptotic t-ratios
*Significant at the 5% level
**Significant at the 1% level
$N = 402$

'yes' answer increases (decreases) as the income increases (decreases).

The elasticities of offer and income appeared to be greater in the log-logit model than in the linear-logit model. McFadden's R^2 indicates that 27 and 33% of the variation in WTP were explained by the independent variables of offer and income in the linear–logit and log–logit models, respectively. Almost 78 and 84% of respondents correctly predicted WTP either 'yes' or 'no' in the linear–logit and log–logit models, respectively. Both linear–logit and log–logit models generally appeared to provide a good fit to the data, but the latter performed slightly better than the former. Thus, the log–logit model was used in this study to estimate the expected value of WTP and infer the mean WTP.

Measuring the economic value of nature-based tourism resources

Based on the estimation results shown in *Table 1*, the mean WTP was calculated using eqn (4). The utility difference (Δv) was calculated as:

$$\Delta v = -2.5057 - 1.1527 \ln(\text{offer}) + 0.7649 \ln(\text{income})$$

Mean income at its sample was calculated as 2229100 Won in order to calculate the adjusted intercept (α^*). The use of mean income is common when the mean WTP are computed:[20]

$$\Delta v = -2.5057 - 1.1527 \ln(\text{offer}) + 11.1806 = 8.6749 - 1.1527 \ln(\text{offer})$$

Then, the expected value of WTP was calculated as:

$$E(\text{WTP}) = \int_0^{100000} (1+e^{(8.6749 - 1.1527 \ln A)}) dA = 5905$$

The expected value of WTP means that the economic value of nature-based tourism resources per recreationist at Mt Minju is equivalent to 5905 Won (*ca* US$ 7) under the hypothetical market scenario. Additionally, the expected value of WTP (5929 Won) calculated by using the linear–logit model appeared to represent a similar result.

Conclusions

Nature-based tourism serves not only help to preserve natural environments, but also to provide more direct income to local residents with low leakages. Nature-based tourism resources as non-market goods have their own economic value which is frequently neglected. In other words, value will be lost from the degradation of the natural environment resulting from large-scale development such as a ski resort with golf courses and hotels in environmentally sensitive areas. In this respect, this study attempted to quantify the economic value of nature-based tourism resources in the environmentally sensitive area of Mt Minju, South Korea.

A CVM with a DC questionnaire was used to estimate the mean WTP of natural resources for tourist activities, contingent on the hypothetical market scenario. The parameter estimates of the log–logit model, using the ML estimation, indicate that the variables of offer and income were statistically significant at the 1 and 5% level, respectively. The signs of two explanatory variables indicate that in general, WTP 'yes' decreases as the price of the offer increases, while WTP 'yes' increases as household income increases. Based on the parameter estimates of the logit model, the economic value of nature-based tourism resources was estimated at 5905 Won (*ca* US$ 7). The total economic value of the natural resources for tourism, then, can be calculated by multiplying per capita economic value by the number of visitors. The findings imply that nature-based tourism in environmentally sensitive areas sustains their economic value, except for tourist expenditures, by preserving the natural environment. In other words, any large-scale development in these areas will not only degrade the natural environment, but also destroy the economic value of natural resources for tourism in the long-run.

In addition to providing the economic value of natural resources, nature-based tourism tends to generate low leakages compared to large-scale development such as a ski resort with golf courses and hotels. Nature-based tourism can provide small tourist businesses supported by local investment. These tourist businesses include bed and breakfast accommodation, restaurants, and retail shops for selling unique agricultural/forestry products grown locally. These businesses can benefit the community directly because food, beverages and labor are provided on a local basis.

By contrast, the construction of large infrastructure including modern hotels is largely financed by external capital, involving a higher proportion of imported capital input from outside the rural economy.[21] Thus, nature-based tourism is more likely to generate smaller leakages than large-scale development. Liu and Var[22] found that the smaller and locally owned accommodations generated lower leakages than large-scale and externally owned ones. They also found that the former generated more direct income to the residents than the latter. The study of Archer and Owen[23] indicates that the income multiplier of the locally owned accommodation (bed and breakfast and farmhouse) was higher than the externally owned one (caravan) due to a considerable leakage.

The magnitude of leakage also depends upon types of tourists. The wealthier the tourists targeted, the higher will be the proportion of luxury goods and services purchased outside the rural economy.[21] Tourists visiting a ski resort with golf courses and hotels may be wealthier than nature-based tourists. In other words, the former are likely to have a higher propensity for consuming luxury goods and services manufactured outside the rural economy than the latter. This implies that leakages are far greater for large-scale development than nature-based tourism. Therefore, evaluation of preservation value and leakages will help to justify the existence of nature-based tourism in environmentally sensitive areas.

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