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METHODS

Comparative analysis of non-market valuation techniques for the Eduardo Avaroa Reserve, Bolivia

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ARTICLE INFO

Article history:
Received 22 July 2005
Received in revised form 11 July 2006
Accepted 25 July 2006
Available online 18 September 2006

Keywords:
Contingent valuation
Contingent behavior
Bolivia

ABSTRACT

Ecological tourism has held up as a potentially important development alternative in relatively undeveloped regions and countries. However, tourism is a highly vulnerable activity where tourists display voluntary and discretionary behavior. While tourism can serve as an income-generating activity for the region, uncontrolled tourism that is developed without consideration of the environmental impact can adversely affect the natural areas. Determining what to charge tourists to view a natural area is difficult since demand elasticities are not readily available from observable transactions. In order to better gauge the value tourists place on the reserve and their sensitivity to changes in the costs of visiting Eduardo Avaroa, non-market valuation provides several valuable tools. Here, we test the convergent validity between two popular non-market valuation alternatives: the contingent valuation method and the contingent behavior method. Tourists to the Eduardo Avaroa Reserve in Bolivia were asked their willingness to pay (in visitor-days or in dollars) due to an improvement in tourism services at the reserve. Our models show that the traditionally important variables predict willingness to pay for improved services for the contingent behavior, contingent valuation and the pooled model. However, we find statistically and empirically meaningful distinctions in the estimates derived from the two methods. Comparisons of the implications of adopting the entrance fee recommendations from the two non-market valuation techniques are made based on the revenues predicted to accrue to Eduardo Avaroa Reserve if park management techniques were improved. This research highlights the challenges in using non-market valuation techniques for policy formation, particularly in a developing country setting.

1. Introduction

Tourism is among the world's largest and fastest growing industries. Ecological tourism has been held up as a potentially important development alternative in relatively undeveloped regions and countries (Wall, 1997). In the case of developing countries, a rapidly growing tourism industry has proved to be an increasingly important source of foreign exchange inflows (Wunder, 2000). In fact, the demand for ecotourism flows mainly from the developed countries to the developing countries, as the willingness to pay for non-consumptive use and nonuse values of natural resources among residents of developing countries is often relatively lower than in developed nations, even after controlling for income differences (Herath, 2002).

However, tourism is a highly vulnerable activity where tourists display voluntary and discretionary behavior. Although

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doi:10.1016/j.ecolecon.2006.07.014

entry fees are among the few policy tools available to capture directly tourism expenditures at the reserve gate, determining what to charge tourists to experience a natural area is challenging since there are no readily available market signals (Pigram and Wahab, 1997). Nonetheless, Schultz et al. (1998) find that the use of differential entrance fees for national parks and protected areas are useful to generate revenues to recover costs, to ensure quality goods and services, to reduce congestion in overcrowded parks, and promoting visitation to less crowded parks.

In order to better gauge the value tourists place on the reserve and their sensitivity to changes in the costs of visiting Eduardo Avaroa, non-market valuation provides several valuable tools. Here, we explore the policy implications of two popular non-market valuation alternatives; the contingent valuation method and the contingent behavior method. We compare the implications of adopting the entrance fee recommendations of these techniques on the revenues predicted to accrue to Eduardo Avaroa Reserve. The objective is to test whether there is a statistical difference, or even noticeable distinction in park entrance fee policy recommendations, between the two non-market valuation elicitation methods to facilitate the use of tourism as an engine of economic development. Our research highlights the challenges in using non-market valuation techniques for policy formation, particularly in a developing country setting.

2. Study site: Eduardo Avaroa Reserve, Bolivia

Nestled in the southwest corner of Bolivia, the Eduardo Avaroa Reserve or Reserva Eduardo Avaroa (REA) is a Priority I ecoregion due to its unique ecological and archeological features. The reserve has an arid landscape, which consists of volcanoes, geysers, salt marshes and mountain lakes. Eduardo Avaroa Reserve spans an area of 1.8 million acres and has more than 50 archeological sites making it rich in cultural and archeological heritage. REA houses at least 190 species of plants and trees and 80 different species of birds including three of the world's six flamingo species. It is one of the most visited reserves in Bolivia and also one of the most economically depressed regions in the country with threats to the region consisting of mining, poor farming practices and unregulated tourism. While tourism can serve as an income-generating activity for the region, uncontrolled tourism that is developed without consideration of the environmental and cultural impacts can adversely affect the natural areas. In order to avoid the potential negative impacts, a proposed fee increase is examined so to improve the park's reserve management (The Nature Conservancy).

3. Estimating the demand for ecotourism services

This study employs two methods to estimate the willingness to pay (WTP) for entrance to the Eduardo Avaroa Reserve and compares results from the contingent valuation method (CVM) and the contingent behavior (CB) estimates of willingness to pay. The convergent validity between the two valuation methods is examined. Convergent validity investigates consistency of contingent valuation estimates with estimates provided by another non-market valuation method, in this case contingent behavior (Champ et al., 2003). One issue that arises with convergent validity is strategic bias. Strategic bias exists when the respondent has the incentive to misrepresent their true preferences in order to achieve a more desired outcome. However, Boardman et al. (2005) state that when potential users are asked to choose between an existing and an alternative private good, the respondents have no incentive to misstate their true preferences over their choices. Since entrance into Eduardo Avaroa Reserve is rival and excludable it can be viewed as a private good. Further, the survey respondents were asked if they would visit the park again if it included additional services (i.e. visitor's center and improved park facilities) only available to those who paid the increased fee level. Therefore, strategic bias is not an issue in valuing the willingness to pay for entrance to Eduardo Avaroa Reserve.

3.1. *Contingent valuation method*

The contingent valuation method is facilitated by positing behavioral changes due to different fee levels contingent on the provision of a new visitor center, improved park services and facilities and local naturalist tour guides. It is a direct interview (i.e. survey) approach that can be used to provide acceptable measures of the economic value of recreation opportunities as well as the preservation of natural resources (Loomis and Walsh, 1997). The object of CVM is to measure consumer surplus for the environmental attributes of a tourism product at a specific destination (i.e. National Park or Reserve). To remain consistent with consumer choice theory, the elicitation of WTP needs to propose hypothetical or contingent changes and improvements to the parks or other tourism product being valued (Shultz et al., 1998).

Herath (2002) argues that in cases where revealed preference methods (e.g., travel cost method) are not appropriate, stated preference methods, such as CVM, are the most useful analytical approach. There are two advantages of using the contingent valuation method. First, CVM is able to assess not only an individual's WTP of the present conditions of a park, but it also values their WTP with hypothetical changes to the park. Secondly, CVM is able to value trips with multi-destinations by asking hypothetical questions for each specified destination (Lee and Han, 2002). Since the Eduardo Avaroa Reserve is not a tourist's sole destination in Bolivia, CVM is a good valuation measure in this case.

3.2. *Contingent behavior method*

While the contingent valuation method elicits a value statement for a non-market good, contingent behavior is used to estimate changes in behavior for a non-market good. The contingent behavior method asks respondents about their intended visitation behavior given a proposed change to the site (Chase et al., 1998). Specifically, the contingent behavior method is used to measure the current number of days the respondent plans to spend at REA with the current fee level and the number of days they would plan to spend at REA with hypothetical changes to the park under a new fee level that is randomly chosen among respondents. The hypothetical changes proposed under the contingent behavior scenario

are identical to those proposed under the contingent valuation scenario.

Chase et al. (1998) use the contingent behavior method to generate experimental data and assess the effects of differential pricing of entrance fees on the demand of park visitation in Costa Rica. Specifically, park visitation demand functions and price and income elasticities are estimated for three parks in Costa Rica. Further, applications of differential pricing to the parks are discussed. It is concluded that WTP estimates for park entrance fees act as a "reference point" from which judgments are based (Chase et al., 1998). Grijalva et al. (2002) tested the validity of data obtained via the contingent behavior method, while valuing the demand for rock climbing at Hueco Tanks Texas State Park (USA). Their results indicate that climbers do not appear to overstate their behavioral changes when presented with a hypothetical situation (Grijalva et al., 2002).

In the case of REA, there is no differential pricing strategy under consideration in determining optimal entrance fee levels. However, the contingent behavior method is also applicable to non-differential pricing of entrance fees. Here, the contingent behavior method is used to measure the current number of days the respondent plans to spend at REA with the current fee level and the number of days they would plan to spend at REA with hypothetical changes to the park under a new fee level chosen from a range of feasible changes that is randomly exposed to respondents.

3.3. *Contingent valuation and contingent behavior combined*

The contingent valuation method is not a perfect substitute for having revealed preference information, and will not provide all the answers for valuing ecotourism, but it is among the very few methods available to measure economic value where there is no market information. However, Herath (2002) contends that diversity in CVM applications is required to suit different circumstances, particularly in an ecotourism context. Adamowicz et al. (1994) argue that the strength of the contingent valuation method as a natural resource valuation tool is improved if it is implemented in combination with another non-market valuation technique. Here, we explore this contention by including both contingent valuation and contingent behavior estimates.

Relative to contingent behavior, the contingent valuation method might be a more common method for valuing non-market goods such as National Parks or Reserves; however, it has one limitation that the contingent behavior method can overcome. In using standard survey techniques for CVM, it is not possible to collect data necessary to estimate an unrestricted system of demand equations that can be used in designing effective pricing policies. In order to accomplish this, the contingent behavior method needs to be applied in conjunction with contingent valuation (Chase et al., 1998).

The contingent behavior method is viewed as controversial due to its intrinsically hypothetical nature; however, since there is only minimal focus of nonuse values using CB, the limitations of the contingent valuation method might not hold for data obtained through its combination with the contingent behavior method (Grijalva et al., 2002). Grijalva et al. (2002) find that methods of augmenting revealed preference data with stated preference data show promise as a tool for estimating demand for a choice-based sample.

To date, no literature combining the contingent valuation method and the contingent behavior used to value a National Park or Reserve in a developing country has been identified. This is among the contributions of this study to the body of natural resource economic valuation literature. Our study of entry fee policy of the REA compares and contrasts CV data with CB data and then pools them in helping us to understand the use of these methods within a developing country setting.

4. Methodology

Deriving an accurate non-consumptive use value is dependent on the survey method and the direct face-to-face interview is the most commonly used approach at recreation sites. Similar to our approach in the REA, Lee and Han (2002) used the face-to-face interview method in valuing multi-destination trips and, logically, use entrance fees as their payment vehicle. Lee and Han (2002) conclude that an increase in entrance fees is justified in order to maintain the quality of the environment being valued.

4.1. *Data*

Visitation to the Eduardo Avaroa Reserve is valued through cross-sectional data obtained from a combination of in-person interviews and self-administered surveys collected at the reserve during April 2003. The survey was administered in English, French, and Spanish to accommodate REA park visitors from abroad. A randomized design was employed to distribute the referendum format elicitation question in the contingent valuation and contingent behavior treatments.

4.2. *Question format*

Creating a market for the non-market good being valued requires an appropriate question format. Among the several types of question formats, the dichotomous choice format follows the recommendation of the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) report on CVM (Leon, 1997). In a dichotomous choice format, the respondent is asked whether they would accept or reject a suggested price, which varies randomly among respondents, under a hypothetical situation. Loomis and Walsh (1997) state that it is easier for respondents to make their decisions in using this format because discrete choices are similar to choices made in market transactions. Lee and Han (2002) use the dichotomous choice question format to value five different National Parks in Korea. Leon's (1997) study in the Canary Islands found that the single-bounded dichotomous choice method produced higher values than the double-bounded and open–ended methods, implying the single-bounded method might overestimate consumer surplus, while the double-bounded method obtained more consistent results. Dichotomous choice produces more valid responses than open–ended and iterative bidding question formats (Loomis and Walsh, 1997; Leon, 1997; Fredman and Emmelin, 2001).

Our survey was distributed to current visitors of the Eduardo Avaroa Reserve by intercepting them at the entrance

and exit of the park. The contingent scenario provided to the respondents was the same for both the contingent behavior and the contingent valuation surveys. The contingent scenario was defined as the following:

> In Eduardo Avaroa, the Bolivian Park Service charges visitors US $4/person to pay for protecting the reserve (the fee is only paid once, regardless of how many days you stay). The Park Service may decide to charge a higher fee — with money being used to improve visitor services and facilities. For example, the income would be used to build and maintain a visitor center and to train local naturalist guides.
>
> This fee would increase the cost of your visit, as operators would add it to your tour price. We would like to know how this would affect your trip. Please assume that the fee changes only at Eduardo Avaroa — not at other parks.

The difference between the two valuation methods lies with the willingness to pay question. The contingent valuation question was a dichotomous choice question and was stated as the following:

> If the trip price had been US $X higher than what you paid, would you still have come to the reserve?

The respondents could either state yes, they would still come to the reserve (coded as 1) or no they would not have come to the reserve (coded as 0).

For the contingent behavior question, the respondents were given three options to respond to the question, which was stated as the following:

> If the price had been US $X higher than what you paid, what would you have done?

The three options the respondents could choose from were indicated as follows:

1. I would have kept the same itinerary of visiting parks.
2. I would have made a different itinerary of visiting parks.
3. I would not have visited any parks.

If the respondents stated that they would have kept the same itinerary of visiting parks it was coded as a 1. If the respondents stated that they would have made a different itinerary, they were further asked the days they would spend at the Eduardo Avaroa Reserve along with other parks in Bolivia and in other countries. If the respondent stated that they would spend 0 days at the Eduardo Avaroa Reserve after the fee increase, their response was coded as a 0. If the respondent stated that they would spend at least 1 day at the reserve after the fee increase, their response was coded as a 1. Lastly, if the respondents chose the option of not visiting any park, their response was coded as a 0.

4.3. *Model*

Using non-market valuation and a dichotomous choice question format, the binomial logit regression is an appropriate statistical analysis tool for this study. The binomial logit is an estimation technique for equations with a dichotomous qualitative dependent variable. The dependent variable is the log of the odds that the choice in question will be made (Studenmund, 1997). Under both scenarios, the dependent variable is 1 if the respondent would continue to visit the Eduardo Avaroa Reserve and 0 if the respondent would not continue to visit the Eduardo Avaroa Reserve, given a site improvement.

4.4. *Hypotheses*

The objective of this study is to test whether there is a statistical difference between two non-market valuation elicitation methods and a pooled model incorporating both techniques. In addition, the willingness to pay for visiting the park is compared between the contingent valuation and the contingent behavior methods. The following logit regression was used for these analyses:

$$\text{Vote} = \beta_0 - \beta_1\ \text{Bid Amt} + \beta_2\ \text{Europe} + \beta_3\ \text{Income} + \beta_4\ \text{TourPackage}$$

The variables used for the analysis were fee amount (Bid Amt), European country of origin (Europe), annual household income (Income) and tour package inclusion (Tour Package). The entrance fee bid amounts took on the following values: $5, $10, $20, $30, $50, and $75. The bid amounts were evenly distributed among respondents and between the two valuation techniques. The European country of origin variable is a dummy variable based on the country where the respondent lives and was coded as: 1=European Country and 0=Non-European Country. The countries classified as European countries were: United Kingdom, France, Germany, Netherlands, Switzerland, and Ireland. The countries classified as non-European countries were: Israel, Australia, United States, and Canada. There was also a category of "Other Countries" that fell under the non-European category. The income variable was the respondents' median annual household income. Further, any questions pertaining to specification of a monetary level (i.e. annual income) allowed for answers in foreign currencies. Currency amounts were normalized to United States dollars. The tour package inclusion variable is a dummy variable on whether the respondent traveled as part of tour package (coded as 1) or whether the respondent traveled independently (coded as 0) during his or her time in Bolivia (Table 1).

The gender variable was coded as 1 for female respondents and 0 for male respondents. The age variable was divided into the following categories: 1=Under 18 years, 2=18–29 years, 3=30–39 years, 4=40–49 years, 5=50–59 years and 6=60 years or over. The education level of the respondents was defined as: 1=Primary school, 2=High school (diploma), 3=Undergraduate college or university (e.g. Bachelor's), and 4=Graduate school (e.g. Master's or Ph.D.). The sample size between the two scenarios was 187 and 194 for the contingent behavior and the contingent valuation scenarios, respectively.

In order to compare the difference between contingent valuation and contingent behavior, descriptive statistics and demand elasticities were calculated. Econometric tests were also conducted to evaluate the statistical difference between the two models as well as the statistical difference between willingness to pay under the contingent valuation scenario

versus the contingent behavior scenario. In order to evaluate the statistical difference between the two models, the following null hypothesis was tested:

$$H_0 : \beta_{\text{Contingent Valuation}} = \beta_{\text{Contingent Behavior}}$$

The vector of coefficients for each valuation method is denoted as β. In order to test for the coefficient equality, a likelihood ratio (LR) test needs to be performed. The LR test involves taking the difference of the restricted log likelihood function (log likelihood of the pooled model) from the unrestricted log likelihood function (summation of log likelihood for each ethnicity model) and multiplying the difference by negative two. The result is the calculated chi-square and if it is greater than the critical chi-square statistic then the coefficients across the two methods are statistically different from each other (Gujarati, 2003). The three models used for this analysis were the contingent behavior model only, contingent valuation model only and a pooled model of all the data. In addition, a pairwise *t*-test was conducted to test for significant difference between the contingent behavior and contingent valuation models. The *t*-test is used to test for significance across coefficients between the two models (Stephenson). The equation for the *t*-test is as follows:

$$SE(\beta_{CVM}-\beta_{CB}) = S_P \sqrt{[(1/n_{CVM}) + (1/n_{CB})]}$$

It is, essentially, the standard error between the two coefficients, where n is the number of observations for each sample and β is the coefficient value for the willingness to pay for each sample. The pooled standard error, denoted as S_P, is calculated as follows:

$$S_P = \sqrt{\{[(n_{CVM}-1)*S^2_{CVM} + (n_{CB}-1)*S^2_{CB}]/(n_{CVM} + n_{CB}-2)\}}$$

Where, S^2 is the variance of the willingness to pay coefficient for the contingent valuation logit regression and the contingent behavior logit regression, respectively.

It is hypothesized that the willingness to pay for the Eduardo Avaroa Reserve will vary across valuation methods. In order to test the difference in willingness to pay across elicitation methods, the following hypothesis is tested:

$$H_0 : \text{WTP}_{\text{Contingent Valuation}} = \text{WTP}_{\text{Contingent Behavior}}$$

To test for statistical difference between willingness to pay across non-market valuation methods, the confidence intervals for the mean willingness to pay values for each scenario were derived.

Further, the differences in the price elasticities and the differences in the expected value of revenue among the two elicitation methods are compared. The hypothesis is that the price elasticities will not be equal under each valuation scenario. The following null hypothesis is examined:

$$H_0 : \text{Price Elasticity}_{\text{Contingent Valuation}} = \text{Price Elasticity}_{\text{Contingent Behavior}}$$

Table 1 – Explanation of variables

Variable	Explanation
Age	Age of the respondent. Coded as: 1=Under 18 years, 2=18–29 years, 3=30–39 years, 4=40–49 years, 5=50–59 years, and 6=60 years or over
Bid amount	Bid amount, with the following values: $5, $10, $20, $30, $50, and $75
Days in Bolivia	The number of days the respondent will spend in Bolivia on his/her current trip
Days in Eduardo Avaroa Reserve (REA)	The number of days the respondent will spend in the Eduardo Avaroa Reserve on his/her current trip
Days in Latin America	The number of days the respondent will spend in Latin America on his/her current trip
Days in other Bolivian parks	The number of days the respondent will spend in other nature reserves or parks in Bolivia on his/her current trip
Days in other countries' parks	The number of days the respondent will spend in other nature reserves or parks in other countries on his/her current trip
Education	Education level of the respondent. Coded as: 1=Primary school, 2=High school (diploma), 3=Undergraduate college/ university (e.g. Bachelors), and 4=Graduate (e.g. Masters or Ph.D.)
European	Dummy variable: 1 if the respondent lives in a European country, 0, if the respondent lives in a non-European country
Gender	Dummy variable: 1 if the respondent is female, 0 if the respondent is male
Income	Median household income of the respondent (converted into US dollars)
Total days on trip	The number of days the respondent will spend in total on his/her current trip
Total amount spent in Bolivia	The amount of money the respondent will spend in total for his/her time in Bolivia, including airfare, accommodations, food, souvenirs and other expenses
Tour package	Dummy variable: 1 if the respondent is traveling as part of a tour package during his/her time in Bolivia, 0 if the respondent is traveling independently during his/her time in Bolivia

Table 2 – Descriptive statistics

Mean values	CB	CV	Pooled
Gender	0.47	0.46	0.47
Age	2.44	2.38	2.41
Education	2.92	2.86	2.89
Income	$36,684.49	$37,886.60	$37,296.59
Travel Statistics			
Days in Latin America	126.3	111.2	118.6
Days in Bolivia	26.5	26.2	26.4
Days in REA	3.0	3.0	3.0
Days in other Bolivian parks	3.2	3.0	3.1
Days in other countries' parks	11.0	12.3	11.7
Total days on trip	174.1	177.2	175.7
Tour package	0.56	0.58	0.57
Avg. amt. spent in REA	$83.52	$72.19	$77.70
Avg. amt. spent in other Bolivian parks	$89.23	$72.07	$80.26
Total amount spent in Bolivia	$730.43	$637.09	$682.66
Number of observations	187	194	381

Table 3 – Respondents' countries of origin

Country count	CB count	CB %	CV count	CV %	Pool count	Pool %
United Kingdom	65	34.6%	72	36.7%	137	35.7%
France	19	10.1%	21	10.7%	40	10.4%
Germany	14	7.4%	17	8.7%	31	8.1%
Netherlands	12	6.4%	14	7.1%	26	6.8%
Switzerland	12	6.4%	6	3.1%	18	4.7%
Ireland	4	2.1%	4	2.0%	8	2.1%
Total European countries	*126*	*67.0%*	*134*	*68.4%*	*260*	*67.7%*
Israel	17	9.0%	26	13.3%	43	11.2%
United States	14	7.4%	6	3.1%	20	5.2%
Australia	6	3.2%	7	3.6%	13	3.4%
Canada	8	4.3%	1	0.5%	9	2.3%
Other	17	9.0%	22	11.2%	39	10.2%
Total non-European countries	*62*	*33.0%*	*62*	*31.6%*	*124*	*32.3%*
Total	188	100.0%	196	100.0%	384	100.0%

In addition, it is hypothesized that the total expected value of revenue impact for each fee level will be different under each valuation scenario. Therefore, the null hypothesis to be evaluated is:

$$H_0 : \text{Expected Revenue}_{\text{Contingent Valuation}} = \text{Expected Revenue}_{\text{Contingent Behavior}}$$

The method used to calculate the price elasticities and total expected value of revenue impacts will be described in detail in the next section.

4.5. *Elasticity and expenditure calculations*

A logit regression model has a dependent variable that is the log of the odds ratio instead of the actual variable; therefore, it is difficult to calculate price elasticity. However, through some mathematical manipulation, elasticities can be derived. By using the forecasting command in EViews, an econometric software package, one can expand the sample. The reason for expanding the sample is to forecast the willingness to pay values, given our estimates, for each bid amount level. From this one can derive the elasticity estimates. The sample size was expanded by six observations to account for each bid amount level. Next each bid amount was entered into the forecast sample. With the expanded sample size, the logit regression was run with the dependent variable as is in our previous model and the only independent variable was the bid amount. Once the regression was run, the forecasted dependent variable for each given bid amount was obtained from the dependent variable data series.

Since all of the respondents were currently visiting the park at the current fee level of $4.00, it was assumed that all the respondents would attend the park at this fee level. It can then be assumed that the mean dependent variable would be equal to one at the $4.00. With this assumption and the forecasted dependent variables for each bid amount, the elasticity can be calculated. The elasticity was calculated by dividing the percentage change in the dependent variable by the percentage change in the bid amount. The elasticity was calculated for each given bid amount: $5, $10, $20, $30, $50 and $75.

With the elasticity calculations, the average amount spent in the Eduardo Avaroa Reserve obtained from the survey and the annual visitation obtained directly from REA, the expected value of revenue can be calculated. Since the elasticities were calculated for each proposed new bid amount, then the annual expected expenditure levels for REA based on each given fee level can also be calculated. The average amount spent in REA per visitor was derived by multiplying the number of days spent at the park by the respondents' average daily expenditure in Bolivia. The total visitation for REA in 2000 was 26,150 visitors, which will be used in the expected expenditure impact calculation.

Before the expected value of revenue can be derived, the expected probability of the number of visitors to REA needs to be determined for each bid amount. The expected probability of number of visitors was calculated by multiplying the number of visitors in 2000 by one minus the elasticity associated with each bid amount. This calculation displays how responsive park visitation is relative to a change in the entrance fee level. The expected value of revenue can then be determined by multiplying the expected probability number of visitors by the daily average amount spent in REA for each fee level.

Table 4 – Contingent behavior, contingent valuation and pooled logit regressions

Dependent variable: whether (coded as 1) or not (coded as 0) the respondent would visit REA with a fee increase

	Contingent behavior				Contingent valuation				Pooled model			
Variable	Coeff.	Std. error	z-stat	Prob.	Coeff.	Std. error	z-stat	Prob.	Coeff.	Std. error	z-stat	Prob.
Constant	0.516	0.588	0.877	0.381	0.949	0.466	2.037	0.042	0.770	0.342	2.254	0.024
Bid amt.	−0.034	0.008	−4.329	0.000	−0.069	0.010	−6.626	0.000	−0.045	0.006	−8.023	0.000
European	0.681	0.399	1.707	0.088	1.534	0.430	3.568	0.000	0.918	0.268	3.429	0.001
Income	0.000	0.000	2.491	0.013	0.000	0.000	0.812	0.417	0.000	0.000	2.637	0.008
Tour package	0.926	0.395	2.345	0.019	0.385	0.384	1.002	0.316	0.592	0.259	2.288	0.022
Mean dep. var.	0.7647				0.5825				0.6719			
S.E. of regression	0.3846				0.3835				0.4026			
Log likelihood	−83.1764				−86.5862				−186.7190			
Restricted log likelihood	−102.0262				−131.8193				−241.1019			
LR statistic (3 df)	37.6995				90.4663				108.7658			
Probability. (LR stat.)	0.0000				0.0000				0.0000			
Mc Fadden R^2	0.1848				0.3431				0.2256			
Number of observations	187				194				381			

5. Results

Pairwise *t*-tests were performed comparing the mean values of the respondents' demographics across both valuation samples. The demographics under both scenarios were not significantly different from each other with the exception of the number of days the respondents spend in Latin America, which was significant at the 90% level. The mean values of the descriptive statistics for the contingent behavior sample, the contingent valuation sample and the samples pooled together can be seen in Table 2.

In summary, the survey sample was split evenly between male and female respondents. The average respondent ranged in ages from 18 to 29 and completed a Bachelor's degree as their highest level of education. They spent an average of 26 days in Bolivia, while 3 days were spent at the Eduardo Avaroa Reserve and 3 days were spent at other national parks within Bolivia. Approximately 60% of the respondents spent their time in Bolivia through a tour package. The respondents from the contingent behavior sample spent roughly $100 more on their trip than did the respondents from the contingent valuation sample. On average, the respondents from the contingent behavior sample spent $10 more/day in REA than did the respondents from the contingent valuation sample. In addition, the respondents traveled from a variety of countries for their trips to Bolivia (Table 3).

Approximately 67% of the respondents traveled from European countries. The top three countries the respondents traveled from in descending order was United Kingdom, Israel, and France, consisting of over half the sample size.

The majority of these variables were used to evaluate the data, however, the only variables that were significant were the increased entrance fee level (Bid Amt), whether the respondent originated from a European country or not (European), the respondents annual median household income (Income), and whether the respondent did his or her traveling through a tour package or not (Tour Package) (Table 4).

As can be seen in Table 4, the direction of the estimated coefficients of both elicitation methods are consistent with economic theory, resulting in theoretical convergent validity. Further, the coefficients can be compared to determine if they are significantly different from one another for the CB and CV regressions through a likelihood ratio test. Also, a pairwise *t*-test on the mean dependent variable for both models can be performed in order to determine if the two regressions are statistically different from one another. Since the Bid Amt variable is significant in the contingent behavior and contingent valuation models, the willingness to pay extracted from each model can be evaluated to see if they are significantly different from one another.

Table 5 – Mean WTP and confidence intervals for the two elicitation methods

Mean willingness to pay		
	Mean	90% confidence interval
Contingent behavior	$76.50	$62.58–$104.37
Contingent valuation	$36.73	$32.38–$42.68

Table 6 – Price elasticities for each proposed fee level across valuation techniques

Elasticities			
Bid amt	CB	CV	Pool
$5	−0.421	−0.538	−0.514
$10	−0.081	−0.115	−0.103
$20	−0.040	−0.068	−0.054
$30	−0.032	−0.062	−0.045
$50	−0.029	−0.060	−0.043
$75	−0.029	−0.051	−0.041

In order to test for the coefficient equality, a likelihood ratio (LR) test was performed. The resulting calculated chi-square is 33.91. With 5° of freedom, the critical chi-square value is 15.09 at the 99% confidence level. Therefore, we can reject the null hypotheses and conclude that the contingent valuation and contingent behavior regressions are significantly different at even the 99% level.

In order to further analyze the statistical difference among regressions, a pairwise *t*-test on the mean of the dependent variables was used. The calculated *t*-statistic was 4.63 and the corresponding critical *t*-statistic was 2.33 at the 99% confidence level. This provides further evidence that the contingent behavior model is significantly different from the contingent valuation model.

Since the bid amount variable is statistically significant for both models, the confidence intervals on the mean willingness to pay values need to be calculated in order to test for significant difference between the willingness to pay across the valuation methods. The mean willingness to pay was calculated using the following formula:

$$\text{Mean WTP} + (\ln(1+\exp(\alpha)))/\beta$$

The product of the coefficient and mean values for all independent variables (constant, income level, European country, tour package) excluding the bid coefficient is denoted by α and β is the absolute value of the bid coefficient (Park et al., 1991). The mean willingness to pay values and the respective confidence intervals for each valuation technique is in Table 5.

The mean willingness to pay under the contingent behavior scenario is more than double the mean willingness to pay under the contingent valuation scenario. The confidence intervals for each scenario do not overlap with each other; therefore, the willingness to pay under the contingent behavior scenario is significantly different from the willingness to pay under the contingent valuation scenario.

Table 7 – Total expected expenditure impact for each proposed fee level across valuation techniques

Total expected expenditure impact			
Bid amt	CB	CV	Difference
$5	$2,174,856	$1,877,617	$297,239
$10	$2,182,283	$1,885,597	$296,687
$20	$2,183,178	$1,886,479	$296,698
$30	$2,183,353	$1,886,595	$296,758
$50	$2,183,421	$1,886,640	$296,781
$75	$2,183,405	$1,886,805	$296,600

Further, by calculating the price elasticities for each scenario, it reveals that we are in the inelastic portion of the demand curve. If entry fees to the park increased by 25% to $5.00, the contingent behavior analysis predicts a 0.43% decrease in the likelihood the respondent would visit the park, whereas our contingent valuation analysis is slightly more elastic; The contingent valuation analysis predicts a 0.54% decrease in the likelihood of a visit given a 25% increase in the entrance fee. The combined analysis predicts a 0.51% decrease in the likelihood of a visit, given a 25% increase in the entrance fee. The elasticities for each corresponding bid amount under each scenario can be seen in Table 6.

Therefore, it can be seen that the results of the contingent behavior model are significantly different than the results generated from the contingent valuation model. Further, it is important to note that the respondents to the contingent valuation scenario are more price sensitive to changes in the entry fee than the respondents to the contingent behavior scenario. As a result, the optimal entry fee pricing strategy will differ across the valuation technique employed.

The total expected expenditure impact can be evaluated from these elasticities combined with the 2000 visitation level and the average REA expenditures. The total impact for each bid amount under the two elicitation methods can be seen in detail in Table 7.

The expected annual impact under the contingent behavior scenario is approximately $300,000 greater than the expected impact under the contingent valuation scenario. This result illustrates that there is a financially important difference in interpreting the results from among non-market valuation techniques and therefore any potential compensatory policy alternatives. Hence, it is important to incorporate both of these models when performing non-market valuation as they produce differing results.

6. Conclusion

Ecotourism has grown in importance during the past decade and it has become a major asset to the economies of developing countries (Chase et al., 1998). Our results show that visitors' willingness to pay contingent on park management improvements is greater than what they are currently being charged. Chase et al. (1998) suggest that as fees are increased, the reference point from which judgments of WTP are based will shift and cause the current level of WTP to increase. This occurs in the case of valuing the three parks in Costa Rica and if more countries follow the format of increasing entrance fees tourists may become accustomed to paying more substantial fees (Chase et al., 1998).

In order to put a value on goods where there is no market available, such as a national park, one needs to use a form of non-market valuation to obtain a measure of willingness to pay for the national park. Two forms of non-market valuation are the contingent valuation method and the contingent behavior method. The logit model is used to determine the likelihood of the respondent visiting the park, contingent on a hypothetical scenario and a given bid amount.

In order to examine the difference between the two samples (contingent valuation and contingent behavior), the likelihood ratio test was used to compare the significance between the coefficients of the regressions. It was determined that the regressions between the two samples were theoretically similar but statistically different. It was concluded that there was a significant difference between willingness to pay for the contingent behavior scenario versus contingent behavior scenario. The willingness to pay under the contingent behavior scenario is greater than the willingness to pay under the contingent valuation scenario. Further, the elasticity with respect to the bid amount is less inelastic in the contingent behavior scenario than the contingent valuation scenario, which leads to a $300,000 annual difference in total expected expenditure impacts.

Theoretically, both valuation techniques provide similar results. However, with further econometric testing it was shown that the two non-market valuation techniques provide different statistical results. Further research needs to be conducted in order to determine whether one valuation technique is superior. In the case of valuation of Eduardo Avaroa Reserve, the statistical differences in willingness to pay responses lead to financially important differences in predicted fee levels, visitation levels and revenues. The results produce a large divergence in expected economic impacts across the two non-market valuation methods. Therefore, in developing countries, it is advisable to employ more than one non-market valuation technique toward the support of any protected area.

Acknowledgement

The authors would like to acknowledge Kreg Lindberg, Oregon State University–Cascades Campus, Andy Drumm and the staff at The Nature Conservancy Worldwide Office, Arlington, Virginia 22203 and John Loomis, Colorado State University and two anonymous reviewers for their comments and suggestions.

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