



Potential of Choice Experiments in Valuing Ecotourism Resources

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ABSTRACT

In this paper we examine some potential of choice experiments approaches to valuing ecotourism resources, which can be considered as alternative to valuation technique based on stated preferences such as the contingent valuation method. Thus, in this article, we seek to identify the best available of choice experiments alternative and investigate its potential to solve some of the weaknesses associated with contingent valuation method. An application to the ecotourism demand in Redang Island Marine Parks is provided as an illustration.

Keywords: Choice Experiment, Contingent Valuation Method, Ecotourism, Marine Park

Introduction

Over the years, the research into valuation of non-market goods such as ecotourism has developed into two branches; revealed preference methods and stated preference methods. The first branch, the revealed preference methods, infers the value of a non-market good by studying actual or revealed behaviour on a closely related market. The most well known revealed preference methods are the Hedonic Pricing Method and the Travel Cost Method (TCM). Meanwhile, the second branch of valuation method, stated preference method includes a number of different approaches such as Contingent Valuation Method (CVM) and Choice Experiment (CE). Stated preference methods assess the value of non-market goods by using individual stated behaviour in a hypothetical setting. In most applications, CVM has been the most commonly used approach (Bateman and Willis, 1999). However, another type of stated preference technique which appeared at the same time as CVM developed is Choice Experiments. This approach originated in the fields of transport and marketing, where it was mainly used to study the trade-offs between the characteristics of transport projects and private goods (Louviere *et al.*, 2000). The Choice Experiments method has only recently been applied to non-market goods in environmental and health economics. The first study to apply this approach to non-market valuation was by Adamowicz *et al.* (1994). Since then, there have been an increasing number of studies, Adamowicz *et al.* (1998), Boxall *et al.* (1996), Layton and Brown (1998) for applications to the environment.

In Malaysia, most of the evaluation studies on ecotourism and recreational resources adopt Contingent Valuation (CVM) as the valuation tools. Most of them studied the economic value of recreational benefits based on forest resources. However, a few studies were found that used CVM regarding the marine park. Such examples are Mohd Rusli *et al.* (2008) and Yeo (1998) who used CVM to estimate the WTP for recreational benefits in Pulau Payar Marine Park, and Alias and Shazali (2002) employed dichotomous choice CVM to estimate the recreational value in Manukan Island, Sabah. At present, only few studies adopt Choice Modelling (CM) or CE in Malaysia, Jamal's (2002) application of CM on Matang Mangrove Forest and Jamal's (2002) study of household preferences for solid waste management in Malaysia and Mohd Rusli (2007) study of ecotourism attributes in Redang Island Marine Parks (RIMP). From this information, it would seem that this method is still new to apply CE to ecotourism sites in particular in Malaysia. According to

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Adamowicz *et al.*(1998), there are several reasons for the increased interest in CE in valuing non-market goods such as ecotourism: reduction of some of the potential biases of CVM, more information is elicited from each respondent compared to CVM and the possibility of testing for internal consistency.

The objective of this paper is to examine the advantages of CE approach to valuing ecotourism resources. This paper is organised as follows. Section one discussed about the non-market valuation practices in Malaysia. Section two contains a discussion about the CVM. Section three discussed about the applications of CE. Section four summaries the advantages of CE and compares its performance with CVM. The last section discusses the potential to use CE techniques in valuing ecotourism resources.

Contingent Valuation Method

Contingent valuation is defined as '*any approach to valuation of a commodity that relies upon individual responses to contingent circumstances posited in an artificially structured market*' (Seller *et al.* 1985: page 386). In the studies for marine parks, individuals were asked directly to reveal how much they were willing to pay to avoid some assumed levels of decline in the provision of a group of services representing a certain quality of marine parks resources as a marine ecotourism destination.

CVM uses survey question to elicit the society's preference for public goods by creating a hypothetical market. CVM questionnaires can be designed to elicit willingness to pay (WTP) or willingness to accept (WTA) estimates for a change in the level of provision of a public good. Eventually, the decision to use WTP or WTA depends on the property rights of the good. However, WTA estimates are often biased upwards; therefore most of CV studies are designed to elicit WTP estimates (Mitchell and Carson, 1989).

In a CV study, there are four types of elicitation technique used, namely bidding game (BG), payment card (PC), open ended (OE) and dichotomous choice (DC). The DC is also called the referendum format approach and is further divided into two types, dichotomous choice and double bounded DC (Mitchell and Carson, 1989).The process and design of the CVM study, as highlighted by Hanley and Spash (1993), can be looked at according to its four main key phases; design and development of the survey, administration of the survey, evaluation of the survey and interpretation of the results. The detailed design of the CVM study can be achieved by following these steps:

- Begin with the set-up of the CV or hypothetical market;
- Obtain WTP or WTA amounts;
- Estimate mean and median WTP or WTA amounts;
- Aggregate the WTP or WTA amount; and
- Assess the validity of the CV exercise.

A dichotomous choice question offers just two answer choice, yes or no. Meanwhile, the multiple categories question has more than two answers. Dichotomous choice is a single, "take it or leave it" (TIOLI) bid offer presented to each respondent. This technique is simple and inexpensive to administer by mail. However, the information derived from the responses must be transformed into WTP or WTA estimates based upon a utility theoretic method which predicts the probability of a yes response. Each of the respondents was told regarding the details on the purpose of conservation of ecotourism resources in marine parks. Respondents were asked the following question and required to respond either 'Yes' or 'No':

'If the conservation fees are increased by RM x, would you willing to pay so that you could continue to use this ecotourism site?'

Where x ranged from RMx to RMy, representing a 'reasonable' additional amount of conservation fee to many privately managed marine parks in Malaysia.

Choice Experiments

Choice Experiment¹ was originally proposed by Louviere and Worthworth (1983) in order to avoid some of the problems and *ad hoc* assumptions associated with rank order or rating scale data. It involves the design of experiments in which choice situations described by a combination of attributes, referred to in the

¹ Choice Experiment sometimes, or more recently, called in literature by variety of names 'choice based conjoint', choice modelling', and 'discrete choice modelling'.

literature as choice or attribute profiles, are presented to individuals in a hypothetical market. Respondents are then asked to make choices between the different profiles which implicitly reveal their preferences. The choice responses are directly translated into marginal values through the estimation of a discrete choice model reflecting the trade-offs respondents make between the attributes in a manner consistent with random utility theory (Bateman *et al.*, 2002).

According to Bateman *et al.* (2002), a CE study involves five important stages: selecting attributes, determining levels, choosing experimental design, constructing choice sets, and measuring preferences. The first task involves identification of the attributes which are most important in the market investigated. The list of attributes needs to be carefully established, preferably using prior exploratory research backed by a mixture of experience and knowledge of the particular research problem. Once the attributes are identified they are partitioned into generic groups with each group defined by elemental levels.

Too many attributes at once can greatly increase the burden on respondents, while if there are too few, this can severely reduce the accuracy of the results because key pieces of information may be missing. Batsell and Louviere (1991) report that it has proved difficult to design practical CE involving more than four to six choice alternatives that can be administrated in a field setting unless the number of attributes associated with each alternative is small. The chosen attributes and levels should be realistic and as close to the actual choice situations faced by individuals as possible. The example of the attributes and levels is shown in Table 1.

Table 1. Illustrative of attributes and levels

Attribute	Description	Levels	Description
Ecological Management	Refers to solid waste disposal, sanitation and sewage system. Example: waste disposal and untreated sewage dumped directly into the ocean will pollute the beaches.	Not Satisfactory	Open burning for rubbish and waste. Some used septic tank for sewage system but sometime direct dumped into the sea
		Satisfactory	Used a standard waste disposal system; open burning for waste and rubbish. Some used a septic tank for sewage system.
		Very good	Clean environment and schedule managed, effective waste management, used recycling system and septic tank for sewage system; shipping to mainland.
Recreational activities congestion	Congestion at the certain places and during enjoying recreational activities: picnic places, beach areas, snorkelling areas and scuba diving.	Less	No queue, no encounter by other. Less disturbed from other persons
		Some	Crowding in a few areas, but others overcrowded. Crowded and close with other persons.
		Very	Long queues and very close to other people
Employment to local people	Job opportunities to local people; works with hotels, own business, tourist guides and boatmen	No change	Maintain the current level of jobs and involvement with 10 %.
		Increase 10%	Increase jobs and involvement of local people in ecotourism sectors to 20%.
		Increase 20%	Increase jobs and involvement of local people in ecotourism sectors to 30%.
		Decrease 5%	Decreasing jobs opportunity and involvement in ecotourism sector to 5%.

Conservation charge	The current revenue collection system in RIMP for maintenance, management and operation expenses. The collection will be channel to Marine Park Trust	RM 5	The current conservation charge; RM 5 for adult and RM 2.5 for children; visitors
		RM 7.5	Conservation charge higher than current level; RM 7.5 for adult and RM 5 for children; visitors.
		RM 10	Conservation charge higher than current level; RM 10 for adult and RM 7.5 for children; visitors.

Source: Mohd Rusli et al., 2006

In the CE visitors are asked to choose a single preferred combination of attributes from the alternatives in the set provided. This approach has a format with combinations of attributes that make up specific situations selected from the universe of possible situations (Adamowicz, 1995). This is analogous to the problem of decision-making by visitors, who have to assess a variety of potential attributes in the alternatives before finally deciding to choose the best of the alternatives. The example of the alternative or choice option is shown in Table 2.

Table 2. Illustrative of CE Question

Q1. Suppose Management Option 1 and 3 below are the only possible alternatives to the Current management Option for Marine Park and Areas (MPA), which option do you prefer? (Please choose ONE and simply tick in the box)

	MANAGEMENT OPTION 1	MANAGEMENT OPTION 3
Ecological Management	Satisfactory	Less Satisfactory
Recreational Activities Congestion	Less Congestion	Less Congestion
Employment to Local People	No Change	5% Decrease
Conservation Charge	RM7.5	RM 5
OPTION	X	

Or would you prefer NO CHANGE with current management practice for PRMPs with Ecological Management, Recreational Activities Congestion, Employment to Local People and Conservation Charge?

Source: Mohd Rusli et al., (2006)

Contingent Valuation Versus Choice Experiments

The theoretical basis of CVM can be traced to the Hicksian measure of welfare. The ultimate aim of a CVM survey is to obtain an estimate of the positive or negative changes in individual welfare or utility as a result of a change in the quantity or quality of the public good. These positive or negative changes, if expressed in monetary terms, can then be used in cost benefit analysis. Changes in utility can be measured by the Hicksian compensating surplus which is a refinement of Marshallian consumer surplus.

Even though the CVM is potentially used to measure the ecotourism values, however, the weaknesses, limitations and biases encourage the employment of another branch of stated preference method, the choice modelling approach. Bateman et al. (2002) point out the increased attention among environmental economists in applying choice modelling rather than CVM with the purpose of reducing some of the potential biases in CVM.

Although the application of CVM is capable of resulting estimates of all types of or ecotourism values or environmental values, it is less flexible in estimating the values of multiple changes in individual attributes that make up a resource. Table 3 shows the results of CVM for example. However, decision makers are more interested to know the marginal values of changes in the level of attributes such as ecological management, recreational activities congestion, number of species etc. Even though the application of CVM is technically possible to examine multiple resource use options, it might be costly to apply.

Table 3: Illustration of CVM Results

Estimating of Mean WTP for Redang Island Marine Park		
Model	Tourist Origin	WTP (RM)
Logit Model	Local tourist	7.84
	International tourist	10.63
Probit Model	Local tourist	7.11
	International tourist	9.81

Source: Mohd Rusli et al. (2008)

Alternatively, the application of the choice experiment approach has the capacity in terms of estimates ecotourism values with their advantages for alternative multi-attribute resource use options and marginal changes in each individual attribute. In addition, the application of CM has the ability to estimate the range of alternatives resource management option with a single application. In this case, Table 4 shows an example of the choice experiment results.

The CE approach allows trade-offs between goods in the choice set or attribute profile, as well as monetary compensation (Hanley et al., 2001). This implies that the environmental policy makers can examine the number of environmental quality factors that the visitors are willing to trade off for one another. In this study, for example, the marine parks manager or decision makers can examine the numbers of attributes related to ecotourism development in RIMP that the visitors are willing to trade-off for one another. This information could improve the efficing of management in ecotourism resources.

Table 4. Illustration of CE results

Marginal values for RIMP ecotourism attributes and levels		
Attributes and Levels	Coefficient	t-value
Satisfactory in ecological management (EM2)	16.624	4.582***
Very good in ecological management (EM3)	10.823	4.740***
Very Congested in recreational activities (RAC1)	0.425	0.315
Less congestion in recreational activities (RAC3)	-0.146	-0.094
20% increase in employment to local people (ELP20)	2.511	1.557
10% increase in employment to local people (ELP10)	4.776	3.293***
5% decreased in employment to local people (ELPD5)	1.078	0.624
Summary statistics		
No. of observations	1047	
Log Likelihood(L(β))	-995.831	
Log Likelihood(L(0))	-1150.247	
Pseudo-R ²	0.1342	
Adjusted Pseudo-R ²	0.1309	

Source: Mohd Rusli et al. (2006)

CE minimizes strategic behaviour and 'yes-saying' biases common in CVM (Hanley et al., 2001 and Bateman et al., 2002). Visitors are said to exhibit such behaviour when they deliberately shape their answers to influence the outcome of the study - and thus the policy - in a way that serves their potential interest. Since the CE approach asks respondents to choose from various scenarios, it is difficult for them to behave strategically. With respect to 'yes-saying', attribute levels change over the sets of choices, and hence respondents are rid of the moral dilemma of choosing between the status quo and an alternative.

Potential CE for Valuing Ecotourism Resources

Because of the biases and disadvantages in CVM and advantages of the CE especially in producing of the multiple options as discussed in the previous section, especially when CVM attempts to value environmental goods like RIMP, there are strong recommendations and suggestions from environmental researchers to use and explore the another method such as CE. According to Alpizar (2001) there are several reasons for the increased interest among researchers in using CE as against to CVM such as;

- CE can reduce of some of the potential biases of CVM;
- CE elicits more information from each respondent; and
- CE has more potential for the possibility of testing for internal consistency.

Table 5 show examples of empirical studies comparing CE and CVM in their studies.

Table 5. Example of empirical studies comparing between CE and CVM

Year	Researcher	Subject of study
1994	Adamowicz et al.	Water based recreational sites
1996	Boxall et al.	Recreational moose hunting in Alberta
1998	Adamowicz et al.	Woodland caribou habitat in Alberta
1998	Morrison et al.	Wetland quality
1998	Hanley et al.	Forest landscape in the UK
2000	Blamey et al.	Value of remnant vegetation
2004	Christie et al.	Valuing changes in biodiversity in farmland
2004	Bateman et al.	Ranworth Broad Nature Reserve in the UK

As we know, choice modelling has four formats or approaches; choice experiments (CE), contingent ranking (CR), contingent rating (CRt) and pair-wised comparison (PC). Even though all these approaches come under the same umbrella of choice modelling, not all these formats have all same theoretical foundation. Hanley *et al.* (2001) in their review study the theoretical aspects of choice modelling, state that only CE is always consistent as regards with utility maximizing behaviour and consumer theory where a compensating variation WTP measure can be derived for each attribute.

Hanley *et al.* (2001) also mentioned that the CR approach does not conform to the consumer theory, if the ranking procedure continues right after the base line alternative is chosen, in which case the subsequent choices cannot result in a real demand curve, but in a curve conditional on the remaining alternatives. They also argue that the CRt approach is always inconsistent with consumer theory, in the sense that ratings should be transformed into utilities by relying on a strong assumption about the comparability or cardinality of the rating scale.

In terms of welfare estimates, only CE gives a significant and consistent result (Bateman *et al.*, 2002). They explained and give concrete reasons such as;

- This method forces the visitors to trade off changes in attribute levels against the costs of making this change;
- If the *status quo* is included, the visitors can opt for the *status quo* that is no increase in environmental change at no extra cost to them;

- The econometric technique is used in a way which is parallel to the theory of rationality and probability of choice; and
- CE can derive estimates of compensating and equivalent surplus from the output of the technique.

Several studies have compared the consistency and relative performance of CE with other choice modelling approaches. Ben-Akiva *et al.* (1992) estimated discrete choice models on data from a survey of commuters to study the consistency of using CR versus choice-based performance methods. They found that, even with the various corrections that have been proposed to allow pooling of choices' different ranks; the ranking was not consistent with choices.

Elrod *et al.* (1992) conducted an empirical study of comparison between discrete choice model (CE) and contingent rating (CRt) among students in order to evaluate the rental apartments of university off-campus housing. In their results, they concluded that the CE fits at the aggregate level and stated a few advantages compared to CRt; firstly, in CE, the value and statistical significance of all parameters are easily reported. Secondly, in CE, market share predictions for new brands are easily produced, and thirdly the researcher has the added assurance that choice data were used to calibrate the model. Meanwhile, they stated that CRt models are well suited to segmentation studies, but the estimation results are difficult to summarize, tests of statistical significance of attributes in aggregation are cumbersome and simulation of choice shares is awkward. Based on the description on the advantages of the CE compared to other suitable methods include CVM, the CE is most suitable.

Summary and Conclusions

Generally, no doubt there are several approaches that are suitable and can be used for valuing non-market environmental goods like ecotourism. In looking at this technique it has been possible to select the best approach to be used to value ecotourism resources such as in RIMP. In this case, ecotourism is strongly related to non-market based elements, thus a valuation method which allows these approaches is among the stated preference methods, which are categorically the only suitable methods for non-use value; which meant contingent valuation or choice experiments.

Even though, CVM technically can be used to value multiple ecotourism attributes, to value specific attributes and anticipated attribute changes, however, their application requires a very complicated model, very costly and time-consuming to apply. In addition, has explained in detail the weaknesses and limitations in applying the ecotourism development. In fact, Bateman *et al.* (2002) point out that many environmental economists changed their intention in applying an alternative method (such as choice modelling) rather than CVM with the reason of reducing some potential biases in CVM in valuing non market-goods.

The application of the CE provides the best alternative among other choice modelling approaches and CVM in this case. The consistency of the results, flexibility of information produced and good performance has been widely cited in valuing non-market goods. In addition, CE is firmly grounded in the behavioural foundations of random utility theory rather than other choice modelling approaches. Thus, based on the their potential and advantages, especially in producing multiple ecotourism attributes, CE method also allows for attributes changes which are demanded by policy makers.

Nowadays, just a few researchers are trying to value ecotourism resources especially in marine parks by using CVM in Malaysia. In facts, the application of CVM is common. Based on the literature, nobody is using choice modelling to value ecotourism in Malaysia. Thus, the application of a new approach such as CE is greatly needed, not only to increase the knowledge of the method in use but also so that the results, when compared with the variety of other methods used, can be used to price the non-market goods like ecotourism resources.

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