The Beijer Institute
of Ecological Economics

DISCUSSION PAPER
Beijer Discussion Paper Series No. 180

To Estimate Recreational Welfare Measures for International and Specialised Tourism

Jessica Andersson. 2003.

The Beijer Institute of Ecological Economics
The Royal Swedish Academy of Sciences
Box 50005 SE-104 05 Stockholm Sweden
Phone: +46 8 673 95 00 Fax: +46 8 15 24 64
E-mail: beijer@beijer.kva.se

To Estimate Recreational Welfare Measures for International and Specialised Tourism

Jessica Andersson[1]

jessica@beijer.kva.se
1. *Beijer International Institute of Ecological Economics*
The Royal Swedish Academy of Sciences
2. Department of Economics, Gothenburg University

Abstract
A model is developed that can estimate recreational welfare measures for access to and changes in quality attributes at long distance single-visited tourist sites with only on-site information available. By defining the good (a visit to the site) as indivisible in consumption welfare measures are derived by simply capturing or estimating the chokeprice(s). Stated and revealed methods suitable to derive and estimate chokeprices are presented followed by a theoretical discussion of the empirical alternatives and obstacles in using these methods for different scenarios present for long distance recreational decisions.

- There is no such place to take the last journey -
David Livingstone

Introduction

International tourism is one of the fastest growing industries in the world and one area that is growing in particular is specialized, nature based and activity oriented tourism. Typical for the behavior of these travelers is that they are willing to pay large amounts of money and travel long distances to carry out their activity and that they often search for new “unexplored” places (Davis and Tisdell, 1996, Andersson, 2003). The fact that these specialized tourist sites often are consumed (visited) only once by an individual in a given time period[2] and that consumers and substitute sites are randomly scattered all around the World makes many of the traditional valuation techniques difficult or inappropriate to apply. This paper investigates the possibility to define the good (the visit) as indivisible in consumption and based on this derive welfare estimates for the site and for changes in quality at the site. By defining the good as indivisible in consumption the necessary information for welfare estimations is reduced to the visitors choke price, which can be derived using either revealed or stated preferences. The paper makes a theoretical assessment of the implications of the definition. Consumption behavior is otherwise an empirical matter that cannot be predetermined in a theoretical model. It was found, however, that indivisibility in consumption best described the consumption behavior of these sorts of long distance “exclusive” travelers, mainly due to the single visit character and the restrictions imposed by defining the consumption as indivisible facilitated the estimation of welfare measures more than it constrained the description of reality.

The reason traditional behavioural models are difficult to apply for specialized long distance tourism is mainly the problems to derive a demand function due to the

[1] I am sincerely grateful to Karl-Göran Mäler and Olof Johansson-Stenman for numerous of invaluable discussions about consumer theory and tourist behaviour.
[2] In many instances this time period is a "life-time".

single visit character. With individual data, used within the framework of the Travel Cost Method (TCM) the dependent variable is missing since there is no frequency of visitation. This can be overcome by calculating the dependent variable as the probability of participation, in other words by estimating the rate of participation from a defined area. This sort of zonal data is less applicable for long-distance travellers where there is no given correlation between distance and price. The same distance can be travelled at great varieties of costs. Attempts have been made to counteract this by dividing the visitors into groups related to individual costs as opposed to geographical origin[3]. Navrud and Mungatana (1994) use individual data where each individual in the sample represents a certain number of people from the original country. This can be extended to account for other socio-economic variable but the way to deal with this is an empirical matter depending on the sample. The other difference compared to the classic TCM (travelling by car) is that there are not only individual differences but also national such as different vacation polices and taxation systems.

Discrete choice models such as the random utility model or the nested logit model is another alternative. The problem is how to model the individual's decision process when not only the consumers are scattered around the World but also the target and substitute sites. The sheer activity of identifying substitute sites becomes a major task since they are numerous and individually determined. Trekking in Nepal can be a substitute for diving in Australia or visiting Peru or simply going to the summerhouse in the own country. It is possible to apply RUM models for *post*-arrival decisions at international sites, *i.e.* the model is applied on decisions made when already at the site. This is an interesting approach to deal with multi-site and multi-attraction visitors, which are very prevalent among long distance visitors. Riera Font (2000) develops a travel cost model for international tourists based on this two-stage decision process. In the first stage the individual decides where to go and in the second stage what to do while at the site. This means that the decision of which site to visit and what to do when at the site are taken separately. The decision of what to do while at the site is similar to that of residents. Consequently, changes in the quality of activities or attractions selected in the second step do not have any impact on the choice of selecting the site in the first step. As the author points out this is probably best suited in the context of mass tourism and not for specialized or exclusive tourism, which is the focus in this paper. It is more likely that specialized and activity based tourists take the majority of the multi-attraction/site decisions *before* departing and not while at the site. The site is selected *because* it provides good diving for example.

Stated preference methods such as the contingent valuation method (CVM), which directly elicits individuals' willingness to pay for quality changes or access can also be applied. Again, the difficulty of identifying the sample remains, since the population is scattered around the world. It is in theory possible to conduct interviews at international airports or in connection with bookings at traveling agencies. The most realistic, however seem to be to conduct an on-site survey, which provides a more accurate representation of the visitors of a particular site, which would otherwise be hard to capture on a global scale. Since the intention is to capture the recreational value *i.e* the *use values* an application of the CVM must be formulated in such a way that use values are separated from possible non-use values. A method proposed in the latter section is to use the cost of the trip as a payment vehicle.

From the discussion above three problems come across as being the main restrictions for applying conventional valuation techniques on long-distance international, exclusive tourist sites; Firstly, the sites are single-visited mainly explained by

[3] See for example Navrud and Mungatana (1994).

the high fixed cost, both in time and money, attached to visiting them. Secondly, the most realistic due to the sample selection problems of international tourists seem to be to conduct on-site studies. Lastly, and related to the former, it is difficult to identify substitute sites since they are individually determined and scattered all around the world aggravating the use of RUM or nested logit models.

Indivisibility in recreational consumption

As an approximation to reality the good (a visit) is therefore assumed to be indivisible in consumption meaning that it is either consumed entirely once, or it is not consumed at all. This means that consumption is neither divided nor repeated. Although this sounds restrictive it very well describes the consumption behaviour of the visitors for these sorts of sites. By starting of with a definition of the consumption, a matter otherwise empirical, I am able to estimate welfare measures by simply capturing the individuals' chokeprices, as will be outlined below. A few issues will, however, be discussed before. The words "consumption" and "good" is used for tourists visiting recreational sites. This is in line with the traditional travel cost approach first developed by Hotelling in 1948 where the cost of going to a site is used as a proxy for the price of visiting that site. To say that a "good" is "a visit to the site" means that all trips are treated as they are homogenous. It is probably fair to say that the further away and the more exclusive, *i.e* the less standardized a trip is, the less homogenous we can expect it to be. The fact that the decision is indivisible in consumption does not meant that the actual trip can not carry different attribute in the sense that the visitors select different standards of accommodation, stays different number of days at the site or undertakes different activities. The decision to go (or not) is indivisible, but given a positive decision the individual selects the attributes of the trip. It is likely that these types of attributes (accommodation, way of transporting) would be similar given the decision to visit the next preferred substitute site instead. An individual staying in very luxurious hotels, paying extra for a room with a view would probably do this despite choice of site. Less obvious is that trips with different number of days would be treated as homogenous. The most obvious reason for accepting differences in the number of days at the site is the high fixed cost in going to the site. Consequently, the marginal cost of staying one extra day is small compared to the price of going there[4]. Adviceable is to be careful with samples having large deviations in number of visiting days at the site. It should be pointed out that what is discussed is of an empirical matter since the larger the sample the more of what is discussed above can be taken into account in the model.

One of the restrictions imposed is that the model should be applicable only using on-site information. The theoretical model use the fact that by visiting the site the individual reveals a preference for going to that site, rather than staying at home or visiting any other available site. McConnel *et.al.* (1999), used a similar approach where they then asked the visitors if they would still visit the site if the price was increased by a given amount. Inserting the assumption of indivisibility in consumption means that this price, the chokeprice, is the only additional information of people's preferences that is necessary for complete welfare estimations of the site.

The model does not provide solutions to some of the topics discussed in the literature despite being of relevance for long-distance tourists. Those include how to treat visitors who visit more than one site during the same trip[5]. Multiple site-trips is a

---

[4] It would be interesting to analyze how the decision of number of days to stay is related to the individual's length of available vacation (countries with different vacation policies) compared to costs.
[5] See for example Smith and Kopp (1980) Bell and Leeworthy (1990), Hof and King (1992), Riera Font (2000)

common phenomenon for long distance travellers. Since a restriction in the model is that it is based on on-site information multiple -site choices are not included in the analysis. It is theoretically possible to use the same model but instead include the choice of adding the target site to the overall trip and capture the marginal cost of going to that site but that it is not developed further in this paper. The main empirical problem with such an approach is how to estimate the marginal cost. An aspect to remember is that individual travelling habits, design of trip and consumer choice situation is highly case specific and most modelling issues are best adapted to the specific situation of each study. The approach presented in this paper provides a way to deal with international single site visitors who only visit the site of interest once during the specified time period. Other sorts of tourists, nearby residents for example, can visit the site frequently at a low cost, which allows for already existing methods to be applied. Those would accordingly be dealt with separately in a welfare analysis.

Theoretical Background

The model

Let individuals choose between a number of recreational services where each alternative has a unique combination of price and quality and where the price varies between individuals but quality is site specific. Let $j=0,1,\ldots n$ indicate the recreational opportunities available to the individual, including the alternative to stay at home. Define the visit to the site of interest as indivisible in consumption meaning that if δ_Z indicates the visit this site denoted z, $\delta_z = 1$ if the individual visits that site and $\delta_z = 0$ if the individual does not visit it. Further, if δ_k indicates the visit to another site k then $\delta_z \delta_k = 0$ meaning that the sites are mutually exclusive in consumption. The utility of visiting any site j is described in a utility function; $V_j = V(Y^i - \delta_j p_j^i, \delta_j q_j)$, $\forall j = 0,1 \ldots n$ where Y^i is individual income, p_j^i individual cost to visit site $j=0,1\ldots n$ and q_j quality at site j. Implicit is a numeraire with price 1.

Accordingly, each individual selects the site that provides the largest benefit; *i.e.* site z when;

$$V(Y^i - p_z^i, q_z) \geq \max_{j \neq z} \{V_0, V_1 \ldots V_n\} \tag{1}$$

For an on-site survey at site z, equation (1) defines the sample selection criterion since only people for who (1) holds are observed in the study. It seems realistic to assume that there exists a maximum price to visit site z, such that if the factual price exceeds this price the individual will decide not to go to site z and instead visit the next preferred site. This is the price where;

$$V(Y^i - \tilde{p}_z, q_z) = \max_{j \neq z} \{V_0, V_1 \ldots V_n\} \tag{2}$$

The individual will prefer site *z* as long as the factual price is less than the chokeprice $\tilde{p}_z$ being the price where the individual is indifferent between going to site *z* and undertaking the activity rendering the next best utility. The chokeprice is accordingly a function of prices at other sites, quality at the target site as well as other sites and income and the main information of relevance for the welfare estimations.

Lets for simplicity of the preceding presentation assume that the individuals choose between three recreational alternatives[6] **1)** visit site *z*, which is where the on-site study takes place, **2)** stay at home **3)** visit the (individually selected) next substitute site *s*. Site *z* is accordingly the same for all individuals in the sample while the choice of substitute site *s* differs between individuals.

The individuals' recreational consumption decisions are functions of the utility of taking a trip to the target site *z* *i.e.* $V_z = V(Y - p_z, q_z)$, the utility from staying at home, $V_0 = V(Y, q_0)$ [7] and the utility of visiting the individually determined substitute site $V_s = V(Y - p_s, q_s), z \neq s$. How does demand for these visits look?

Demand for indivisible goods

By defining this consumption as indivisible the Marshallian demand function is derived from maximizing $u(x, \delta_z, \delta_s, q)$[8] s.t. $x + p_z\delta_z + p_s\delta_s \leq Y$, where δ_z = 0 or 1, δ_s = 0 or 1 and *x* is a numeraire with price one representing an aggregate of "other" market goods and $\delta_z\delta_s = 0$. The Marshallian choke price $\tilde{p}_z^M = p_z^M(p_s, q, Y)$ is implicitly defined as in equation (2) that is:

$$u(Y - \tilde{p}_z^M, 1, 0, q_z) = \max\begin{Bmatrix} u(Y, 0, 0, q_0), \\ u(Y - p_s, 0, 1, q_s) \end{Bmatrix} \tag{3}$$

The ordinary demand functions are thus;

$$\delta_z(p_z, p_s, q, Y) = \begin{cases} 1 & if \quad p_z < \tilde{p}_z^M \\ 0 & if \quad p_z \geq \tilde{p}_z^M \end{cases}$$

$$x(p_z, p_s, q, Y) = \begin{cases} Y - p_z & if \quad p_z < \tilde{p}_z^M \\ Y & if \quad p_z \geq \tilde{p}_z^M, V_0 > V_s \\ Y - p_s & if \quad p_z \geq \tilde{p}_z^M, V_0 < V_s \end{cases}$$

[6] From here on the denotation that price and income are individually determined is taken out.
[7] The cost of staying at home is assumed to be zero.
[8] The indication for quality *q* is here and in the forthcoming text a vector of q_z, q_s, and q_0.

$$\delta_s(p_z, p_s, q, Y) = \begin{cases} 0 & if \quad p_z < \tilde{p}_z^M \\ 1 & if \quad p_z \geq \tilde{p}_z^M,\ V_0 < V_s \end{cases}$$

Demand for visiting site *z* and for the numeraire is illustrated in Graph 1. In the case of the numeraire it is illustrated such that $V_0 > V_s$ *i.e.* the individual prefers staying at home when switching away from site *z* (and not to visit site *s*).

Graph 1. The Marshallian demand for visiting site z and for the numeraire. The demand illustrated for the numeraire assumes that the individual prefers staying at home when exiting the market for *z*.

The compensated demand is derived by minimizing the objective function $x + p_z\delta_z + p_s\delta_s$ s.t. $u(x, \delta_z, \delta_s, q) \geq \bar{u}$ where again δ_z = 0 or 1, δ_s = 0 or 1 and *x* is a numeraire with price one. If we assume that the individual visits site *z* and the reference utility is $\bar{u} = u(x, 1, 0, q_z)$, then $x_z(q_z, \bar{u})$ indicates the compensated demand for the numeraire. This can also be written as the inverse of $u(x, \delta_z, \delta_s, q)$ with respect to the first argument *i.e.*; $x_z(q_z, \bar{u}) = u^{-1}(\bar{u} \mid 1, 0, q)$. Using these denotations the maximum willingness to pay to visit site *z*, $\tilde{p}(\bar{u})$, is defined as;

$$x_z(q_z, \bar{u}) + \tilde{p}(\bar{u}) = \min \begin{cases} x_s(q_s, \bar{u}) + p_s \\ x_0(q_0, \bar{u}) \end{cases} \tag{4}$$

The $\tilde{p}(\bar{u})$, in the forthcoming text referred to as the maximum compensation, has a different meaning compared to the Marshallian chokeprice defined in equation (3) but as the subsequent text will show they sometimes coincide.

The expenditure, conditional on the above given reference utility is then; $e_z = x_z(q_z, \bar{u}) + p_z$. Using a similar denotation the minimization generates the following unconditional compensated demand functions;

$$\delta_z^H(p_z, p_s, q, \bar{u}) = \begin{cases} 1 & if \quad x_z(q_z, \bar{u}) + p_z \leq \min \begin{cases} x_s(q_s, \bar{u}) + p_s \\ x_0(q_0, \bar{u}) \end{cases} \\ 0 & otherwise \end{cases}$$

$$x^H \ (p_z, p_s, q, \bar{u}) = \begin{cases} x_z(q_z, \bar{u}) & if \quad x_z(q_z, \bar{u}) + p_z \quad \leq \min \begin{cases} x_s(q_s, \bar{u}) + p_s \\ x_0(q_0, \bar{u}) \end{cases} \\ x_0(q_0, \bar{u}) & if \quad x_0(q_0, \bar{u}) \quad \leq \min \begin{cases} x_z(q_z, \bar{u}) + p_z \\ x_s(q_s, \bar{u}) + p_s \end{cases} \\ x_s(q_s, \bar{u}) & otherwise \end{cases}$$

$$\delta_s^H(p_z, p_s, q, \bar{u}) = \begin{cases} 1 & if \quad x_s(q_s, \bar{u}) + p_s \quad \leq \min \begin{cases} x_z(q_z, \bar{u}) + p_z \\ x_0(q_0, \bar{u}) \end{cases} \\ 0 & otherwise \end{cases}$$

The Hicksian demand for site *z* has the same shape as the Marshallian demand illustrated in Graph 1, with the exception that it is limited by the maximum compensation defined in equation (4). Since the maximum compensation is a function of utility it will depend on the reference utility attained. Similarly will the demand for the numeraire depend on the reference utility as well as the change that will take place. The relationship between the maximum compensation and the Marshallian chokeprice defined in equation (2) accordingly depends on the relation between the individual's factual price and chokeprice, before and after any change. As mentioned, the price level that induces the individual to switch site is what is used for the welfare estimations and accordingly this preoccupation with the maximum compensation and the chokeprice. The implications for the welfare measures depending on how the chokeprice is derived is analysed for different scenarios that are present for specialized international tourism. Before that some alternative methods to derive the chokeprice are presented.

Estimation methods

A revealed preference method to derive the chokeprice

Lets first consider the alternative to use revealed preference (R.P.) methods to capture the chokeprice. Remember that the only information that is revealed from an on-site study is people's actual cost of visiting the site *i.e.* the actual price of the good. The great advantage is that this price differs between individuals. Assume a simple scenario where $\tilde{p}_z$ is a function of prices at other sites and of quality at site *z* as well as other sites, and assume to start with, that all individuals have the same income. Also assume that individuals included in the sample have identical preferences. Given these assumptions and given that the on-site sample is large enough, the estimated chokeprice is simply equal to, or almost equal to, the price paid by the individual paying the highest price.

Denoting *A*, the set of all individuals included in the sample from the target site *z* and p^i the price paid by the respective individual in the sample, the chokeprice to visit site *z* is;

$$\tilde{p}_z(p_s, q\ ) = \sup\{p^i, \forall i \in A\} \tag{5}$$

Consequently, the fact that individuals travel to the same site but at different prices allows us to estimate the chokeprice by simply observing their behaviour despite the fact that the site is only visited once. The restrictions that all individuals are identical and that everybody has the same income are stringent. Let's relax the assumption that all individuals have equal income and assume that the individuals in the set can be grouped into different income intervals. Set *g*=numbers of income groups and $A = \bigcup_{m \in 1}^{g} A_m$ where $A_m \cap A_l = \emptyset,\ \forall m, l,\ m \neq l$ since each individual is included in an income group but never in more than one group. Then apply the same method described for the non-income case but for each group i.e.;

$$\tilde{p}_m(p_s, q_z, Y_m) = \sup\{p^i;\ i \in A_m\};\ m = 1 \ldots g \tag{6}$$

This means that all individuals in the same income group will have the same chokeprice and each group's chokeprice is equal to the price paid by the individual paying the highest price in the respective group. In terms of income affecting the decision of where to travel it might be different from disposable income. Possibly recreation is consumed from a special "traveling budget" meaning that individuals have saved for a longer time period to undertake these sorts of trips. If this sort of information was available the "traveling budget" can be separated from the consumption of other goods and discounted over time[9]. Another possibility is that the chokeprice is function of another variable than income or in combination with income. If what is valued is a resource used for some special interest some aspect of this interest might play a very large role in determining the individuals chokeprice. Divers are for example willing to pay large amounts of money and travel large distances to carry out their sport (Davis and Tisdell 1996, Andersson, 2003). Then the magnitude of this interest might play a larger role than income for the level of the chokeprice. If this is identified to be the case the groups can be designed based on this relation.

What can be said in general about this R.P. estimate of the chokeprice is that it is biased downward and that the magnitude of this bias is negatively related to the size of

---

[9] It would result in a budget; $\sum_{\tau} \frac{Y_\tau}{(1+r_\tau)^\tau} = \sum_{\tau} \left(\frac{Y_\tau^{non\ recreational\ goods}}{(1+r_\tau)^\tau} + \frac{Y_\tau^{recreational\ goods}}{(1+r_\tau)^\tau} \right)$

the sample[10]. Consequently, the more number of income groups (or other sorts of groups) created the larger the sample required. It is also likely to be related to the distribution of the individual incomes in the sample. The more evenly distributed in terms of number of individuals in each income group the more accurate the result[11].

To elicit information about the individuals preferred alternative when exiting the market for site *z* is not possible using this type of revealed preferences methods. That means that there will be no information of the individual's preferred next substitute site unless a questionnaire is administered.

A stated preference method to derive the chokeprice

Using the stated preference (S.P.) method means that the chokeprice is elicited directly from the on-site visitors using anything from a discrete choice or open-ended Contingent Valuation Method (CVM) question. Regardless of questioning mode, eliciting stated preferences requires that a questionnaire is administered to each individual or alternatively telephone interviews are collected *post* visit[12]. The visitors are in some form asked to state the price level that would induce them to change their decision to go to site *z* and instead stay at home/visit a substitute site[13]. It is in practice possible to elicit a compensated welfare estimate directly using a S.P. method.

An additional question in the questionnaire can readily collect information about substitute sites. The fact that the survey is conducted on-site, however, means that the response is based on actual experience of the site while the individual has no experience of the substitute site given the single-visit assumption. The decision to switch to site *s* is thus in reality not based on equal information about the trade-off between site *z* and the substitute site *s*.

Since stated information can deal with hypothetical changes in quality, the value of quality changes can be estimated by simply describing the changed scenario and asking the respondent to state his maximum payment level.

Since the R.P. derives its estimate from decisions made at home it is based on expectations of the site and not on perfect information. In a situation where the individual is "disappointed" of the recreational service this disutility will not be revealed. The risk for this sort of bias is study specific and is probably best dealt with uniquely for each case. The S.P. method is equipped to capture these sorts of "disappointments" since the individual is able to state a chokeprice below the factual price of the visit to the site resulting in a zero welfare estimate. Consequently, the estimate derived with the R.P. method is based on the individual's decision before visiting the site while the S.P response is based on having experienced the site.

Are there situations where the R.P. method is more apt than the S.P. method and vice versa? The main difference seems to be the availability of data. The R.P. requires a

---

[10] The following proof can be presented; Assume an income group A_m where in accordance with equation (6) $\tilde{p}_m$ equals the price paid by the individual paying the highest price in group *m*. Then assume that one more individual is included in the sample. This individual can increase the chokeprice but never decrease it.

[11] If, for example, higher income groups are less represented, might the fact that smaller groups are biased downward result in that their chokeprice is lower than lower incomer groups that are much better represented.

[12] Telephone interviews might be a bit cumbersome considering that people come from all over the world.

[13] McConnel et al (1999) used a double bounded dichotomous choice question where they asked the visitors if they would still visit the site if the price increased by X. If the individual said yes they asked the individual if he/she would still come if the price was increased by X+ΔX.

large sample to arrive at a reliable estimate for the chokeprice. If this is easily accessible it is probably less expensive compared to a S.P. study that requires that a questionnaire is administered and that personal interviews take place, but on the other hand only requires a smaller sample. In terms of estimating the value of a quality change the R.P. method is not able to do this without additional information. Only if two identical sites with different quality levels are compared, or the chokeprice for the same site at two different time periods, can a measure for the value of a change in an attribute be estimated. Below further pros and cons of the respective methods will be discussed in relation tho the different values and situations that might arrive.

Estimating welfare measures

Four different scenarios are identified to together depict the full picture of the behaviour of non-participants, potential participants and actual participants for changes in price and quality at the international (exclusive) single visited site z. Throughout the welfare estimation weak complimentarity is applied as a restriction on the consumers' preferences. Since the value of interest for the welfare estimations are only use-values the assumption is considered fully realistic.

First the possible reference utilities need to be identified. The reference utility depends on the relation between the factual cost of the trip and the individual chokeprice providing two alternative scenarios;

1) $p_z \geq \tilde{p}_z$ and $\bar{u}^0 = \max\{u(Y - p_s, 0, 1, q), u(Y, 0, 0, q)\}$
2) $p_z \leq \tilde{p}_z$ and $\bar{u}^1 = u(Y - p_z, 1, 0, q)$

The first alternative implies a person who is not at the site and the second a person who is. If a change in price or quality induces this person to enter a welfare change takes place. The problem is how to describe the individual's change of mind since it is assumed that the site is only visited once. It is unlikely that an individual who is at the site (on his one and only visit to the site) decides to exit the market due to changes in an attribute. One can imagine that the individual *has taken/not taken the decision to…* and not that the individual is/is not at the site. This provides a more realistic decision situation.

Four different changes in p_z and q_z result in a change in recreational welfare. Those can be divided into two groups incurring the same sign on utility;

a) $p_z \uparrow$ or $q_z \downarrow \Rightarrow u \downarrow$
b) $p_z \downarrow$ or $q_z \uparrow \Rightarrow u \uparrow$.

Combining *1* and *2* with *a* and *b* creates four different scenarios. Note that the on-site individuals are represented by group 2 while group 1 are potential participants that might enter the consumption of site z due to changes in price and quality. Below the theoretical restrictions imposed on the empirical applicability of the model is outlined given on-site data. First the four scenarios are applied for price changes. Next the value for having access to site z is estimated followed by the welfare result of a quality change at the site.

The welfare effects of a price change

Thus, scenarios *1a* and *2a* depict a price *increase* and scenarios *1b* and *2b* depict a price *decrease*. In both cases a uniform change is assumed meaning that the price is changed with the same amount for all individuals. This could for example be a situation where all flight prices increases at an equal rate due to, for example, higher oil prices. In situations where only a certain section in the sample is affected by the price change and the R.P. method is applied the chokeprice can be estimated from the part of the sample that is affected by the change using equation (6). In the presentation below the assumption is however a *uniform* price change.

Let p_z^0 and p_z^1 represent two prices at site *z* where p_z^0 is always the initial price and p_z^1 the price after the change. The compensated variation (CV) [14] of a price change is defined as;

$$CV = e(p_z^0, p_s, q_z, \bar{u}\ ) - e(p_z^1, p_s, q_z, \bar{u}\ ) \tag{8}$$

Note that individuals have different actual prices as well as different chokeprices. The exception is the special case where the chokeprice is estimated assuming that all individuals have identical preferences such as in equation (5). In the first scenario ***1a)*** where $p_z^0 > \tilde{p}_z$ and $p_z \uparrow$ there will be no welfare effect since people will simply be even less attracted by visiting the site. For scenario ***1b)*** where $p_z^0 > \tilde{p}_z$ but $p_z \downarrow$ there are two alternative. If $p_z^1 > \tilde{p}_z$ there will be no welfare effect but if $p_z^1 < \tilde{p}_z$ non participants will be induced to enter consumption of good *z*.

Thus, if $\bar{u}^{0_0}$ and $\bar{u}^{0_s}$ indicates the individuals initial utility meaning that the original decision was to stay at home respectively to visit site *s*, equation (8) can be rewritten.

$$\begin{aligned} CV_{p_z\downarrow} &= x_0(q_0, \bar{u}^{0_0}) - x_z(q_z, \bar{u}^{0_0}) - p_z^1 \\ &or \\ CV_{p_z\downarrow} &= x_s(q_s, \bar{u}^{0_s}) + p_s - x_z(q_z, \bar{u}^{0_s}) - p_z^1 \end{aligned} \tag{9}$$

Since $x_0(q_0, \bar{u}^{0_0}) = Y$ and $x_s(q_s, \bar{u}^{0_s}) = Y - p_s$ equation (9) yields;

$$\begin{aligned} CV_{p_z\downarrow} &= Y - p_z^1 - x_z(q_z, \bar{u}^{0_0}) \\ &or \\ CV_{p_z\downarrow} &= Y - p_z^1 - x_z(q_z, \bar{u}^{0_s}) \end{aligned} \tag{10}$$

[14] The compensated variation is delineated here but the equivalent variation (EV) could be analogously estimated given that the “new” utility level is used as a reference point in the different scenarios. The CV will for consistency be used throughout the text.

For simplicity of presentation lets denote $\bar{u}^{0_0}$ and $\bar{u}^{0_s} = \bar{u}^0$. From the definition of the maximum compensation in equation (4) we know that;
$x_z(q_z, \bar{u}^0) = Y - \tilde{p}_z(\bar{u}^0)$ and the welfare measure in equation (10) becomes;

$$CV_{p\downarrow} = \tilde{p}_z(\bar{u}^0) - p_z^1 \tag{10a}$$

This maximum compensation in (10a) is theoretically identical to the Marshallian chokeprice (see proof in Appendix).

What does this mean empirically? The on-site sample does not contain information about the price at which non-participants will switch consumption. In addition, to be able to estimate an aggregate welfare measure for this group the number of individuals entering the consumption of site *z* needs to be identified. In sum, the number of non-participants with $p_z^1 < \tilde{p}_z$ and their respective chokeprice level needs to be identified.

In scenario ***2a)*** where $p_z < \tilde{p}_z$ and $p_z \uparrow$ two alternative outcomes might take place. If $p_z^1 > \tilde{p}_z$, the individual will switch recreational site and the welfare measure is defined as;

$$CV_{p_z\uparrow} = \min \begin{cases} Y - x_0(q_z, \bar{u}^1) \\ Y - p_s - x_s(q_z, \bar{u}^1) \end{cases} \tag{11}$$

The last terms in the respective equations in (11) are unknown. By inserting the definition of the maximum compensation in equation (4) the estimate is equal to $CV = p_z^0 - \tilde{p}_z(\bar{u}^1)$. The maximum compensation is in this situation *not* identical to the Marshallian chokeprice [15]. The maximum compensation defines the price level where the individual is indifferent between being or not being at the site keeping utility constant, in this case the utility of being at the site and having paid the factual price.

Stated preference methods[16] can capture this value by asking the individuals who are at the site (and have paid p_z^0 to get there) to state the amount they would require in compensation for being dismissed from the site. Intuitively does this estimate not seem very applicable for the decision situation of interest in this paper. Empirically the Marshallian chokeprice seem more relevant being the price where the individual is indifferent between going to the site or not as defined in equation (2). Thus;

$$w\Delta = p_z^0 - \tilde{p}_z^M \tag{12}$$

[15] For a proof of this see Appendix.
[16] Here we ignore inherent biases and other doubts connected to the use of stated preference method. This does not at all mean that I do not consider them relevant but that they can be discussed in another forum.

A stated preference survey can acquire this price level by asking the individual to state the price that would induce the individual to switch site. The welfare loss from the increase in price is then equal to equation (12), which is the consumer surplus (CS).

In the revealed preference case the Marshallian choke price is estimated as in equation (5) and (6). The chokeprice estimate is then inserted in equation (12).

In terms of an empirical study the number of individuals with a chokeprice below the new price level needs to be identified. For a stated preference study this cause no problem since it can deal with hypothetical scenarios. For the R.P. study a study *after* the price change has taken place needs to be carried out.

In the case where $p_z^1 < \tilde{p}_z$, the individual will not switch site but experience a welfare loss[17]. This welfare loss is thus;

$$CV_{p_z \uparrow} = p_z^0 - p_z^1 \tag{13}$$

The aggregate value is simply the estimate in equation (13) multiplied by the number of visitors with $p_z^1 < \tilde{p}_z$.

Lastly, scenario ***2b)*** where $p_z < \tilde{p}_z$ and $p_z \uparrow$ implies that the individual will not switch site but experience a welfare gain. This welfare measure is identical to expression (13) but with opposite signs compared to the result in scenario *2a*.

In conclusion, for individuals with a chokeprice above their factual price the chokeprice defined in equation (2) can be estimated using either the revealed or stated preference method. Based on this estimate of the chokeprice the individuals who will switch site can be identified and their welfare measure estimated from equation (12). Those who will stay but experience a utility decrease can similarly be identified and the welfare measures can be estimated from equation (13).

The value of having access to site z

It is common to estimate the value of having access to the site in recreational valuation studies. The compensated variation for access (CV_a) is defined as;

$$CV_a = e(\tilde{p}_z, p_s, q, \bar{u}\ ) - e(p_z^{'}, p_s, q, \bar{u}\ ) \tag{14}$$

where $p_z^{'}$ denotes the individuals actual price of visiting the site. Assuming that non-participants have zero WTP for access, non-participants described in scenario *1a* and *1b* above do not need to be considered. The assumption seems plausible since the estimation only includes use-values.

Inserting the expenditure functions as defined in (4) into equation (14) thus result in;

[17] From $CV_{p_z \uparrow} = u^{-1}(\bar{u}^{-1}|1,0,q) + p_z^0 - u^{-1}(\bar{u}^{-1}|1,0,q) - p_z^1$

$$CV_a = \tilde{p}_z(\bar{u}^1) - p_z^{'} \tag{15a}$$

We now face the same situation as above where the maximum compensation and the chokeprice in theory are not identical. For an on-site S.P. study that wants to capture the value in (15a) the individual who is at the site then needs to state something in line with "*what do you require in compensation if being dismissed from the site?"*. An individual who is not at the site but on the way to go there (because $p_z^{'} < \tilde{p}_z$ since otherwise $CV_a = 0$) would then respond to, "*what do you require in compensation if being denied access to the site?*". Using the Marshallian chokeprice the welfare measure is defined in the same way as (15a) except for the chokeprices, thus;

$$CV_a = \tilde{p}_z^M - p_z^{'} \tag{15b}$$

This measure can also be captured directly in a stated preference question by requesting the individual to state how much more the individual is willing to pay before leaving the site. If this stated cost is added to the factual price the Marshallian chokeprice is acquired, defined as the price where the individual is indifferent between going to the site and doing the next preferred activity.

Similarly can the revealed preference be used to derive the chokeprice as described before. The individual's factual price is then simply subtracted from the estimated chokeprice. To aggregate, the result is added over individuals.

The value of a change in quality at site z

Lets consider a discrete change in quality at site *z*. Assume that the individual has full information about the quality of the site and all other substitute sites before taking the decision to visit site *z*. This simply means that for the people in the sample $p_z^{'} \le \tilde{p}_z$ also after experiencing the site *i.e.* expectations fit reality and there are no "surprises" at arrival[18]. This assumption is more relevant for the R.P. method since the S.P. method in principal can capture the estimate of a chokeprice that is below the actual price meaning that the individual would not have participated given the quality level. As was discussed earlier the individual does not have equal information about the target site and the substitute site given the assumption of indivisibility in consumption and the fact that the individual have experienced site *z* but not site *s*. This accordingly results in biased information also for the S.P. method.

Assume that the initial quality at site *z*, $q_z = q_z^0$ changes to a new quality level $q_z = q_z^1$. The welfare measure for this quality change (CV_q) is defined as;

$$CV_q = e(p_z, q_z^0, \bar{u}) - e(p_z, q_z^1, \bar{u}) \tag{16}$$

[18] The model can theoretically be extended to include expectations, but the discussion here is confined to a situation of perfect information.

As before the assumption of weak complementarity between visiting the site and site quality is assumed[19]. The main difference for a quality change compared to a price change is that the choke price is a function of site quality. This means that, given that all other variables are fixed, the change in q_z will alter the individuals' choke price for visiting site *z*. Consequently, welfare estimates for changes in quality will involve the estimation of the additional chokeprice for the new quality level, $q_z = q_z^1$. The fact that there are two quality levels and that utility is a function of quality means that there are additional reference utility levels to consider. Denote $\bar{u}_{q^0}^1$ to be the reference utility level attained at $\delta_z = 1$ and for $q_z = q_z^0$ and equivalently $\bar{u}_{q^1}^1$ the reference utility attained at $\delta_z = 1$ and for $q_z = q_z^1$. The weak complementarity assumption reduces the increased number of reference utilities by cancelling out some terms. For example;

$$x_s(q_z^0, \bar{u}_{q0}^0) = x_s(q_z^1, \bar{u}_{q0}^0) = x_s(q_z^0, \bar{u}_{q1}^0) = x_s(q_z^1, \bar{u}_{q1}^0) = y - p_s \tag{17}$$

Equivalently is $x_0(q_z, \bar{u}) = Y$ despite changes in quality or choice of quality reference level for individuals where $V_0 > V_s$.

Lets now go through scenarios *1a-2b* for a discrete change in quality at site *z* and include the above assumptions and assume that all other variables remain fixed.

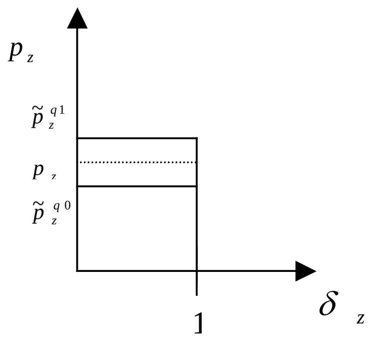
In ***1a)*** $p_z > \tilde{p}_z^{q0}$ and $q_z \downarrow$. Given the weak complementarity condition this scenario will not result in any conditional welfare effect for a change in quality at site *z*.

In scenario ***1b)*** where $p_z > \tilde{p}_z^{q0}$ and $q_z \uparrow$ there are two possible outcomes. If $p_z > \tilde{p}_z^{q1}$ the result is similar to above with zero welfare effect due to the weak complementarity assumption. On the other hand, if $p_z < \tilde{p}_z^{q1}$ non-participants are induced to enter the market. Applying equation (16) for this situation gives a similar result to the price change in equation (10);

$$CV_{q\uparrow} = Y - p_z - x_z(q_z^1, \bar{u}_{q0}^{0_s})$$
or (18)
$$CV_{q\uparrow} = Y - p_z - x_z(q_z^1, \bar{u}_{q0}^{0_o})$$

---

[19] This implies that when δ_z =0 then:
$\dfrac{\partial u(Y,0,0,q)}{\partial q_z} = 0$ and $\dfrac{\partial u(Y - p_s, 0,1,q)}{\partial q_z} = 0$.



Graph 2. The shift of the demand curve when quality increase as described in 1b) ii).

From the definition of the maximum compensation in equation (4) and the weak complementarity condition the respective last terms in (18) equals $Y - \tilde{p}_z^{q1}(\bar{u}_{q0}^{0_s})$ and $Y - \tilde{p}_z^{q1}(\bar{u}_{q0}^{0_0})$. Analogous to the case of a price decrease, the welfare measure is thus;

$$CV_{q\uparrow} = \tilde{p}_z^{q1}(\bar{u}_{q0}^{0}) - p_z \tag{19}$$

where the maximum compensation is either $\tilde{p}_z^{q1}(\bar{u}_{q0}^{0_s})$ or $\tilde{p}_z^{q1}(\bar{u}_{q0}^{0_0})$ depending on the individuals reference activity. Analogue to the price change the maximum compensation and Marshallian chokeprices are identical here.

In terms of capturing these values only the S.P. method is able to do this since the on-site users can be asked to state their chokeprice or required compensation for a *hypothetical* discrete increase in quality. As discussed earlier, it is not that easy to infer those estimates on the non-participants since the S.P method does not assume identical preferences. With a large enough sample it would, however, be possible to infer estimates for different groups that can be identified.

From one on-site study the R.P. method cannot derive measures for quality changes because the estimate for the chokeprice in (5) and (6) does not contain any information about people's preferences for quality. The only situation when a R.P. study is applicable is if an *ex ante* and *ex post* quality changes study is conducted at the same site. Alternatively if two identical sites with different quality variables are surveyed the value for quality can be captured using the R.P method.

Next, scenario ***2a)*** where $p_z < \tilde{p}_z^{q0}$ and $q_z \downarrow$ also has two possible scenarios. If $p_z > \tilde{p}_z^{q1}$ the individual will change his mind and not visit site *z*. Applying equations (16) on the group exiting the market;

$$CV_{q\downarrow} = \min \begin{cases} Y - x_0(q_z^1, \overline{u}_{q0}^1) \\ Y - p_s - x_s(q_z^1, \overline{u}_{q0}^1) \end{cases} \tag{20}$$

Similarly to the previous scenario the last two terms are unknown. By inserting the definition of the maximum compensation from equation (4) and applying the weak complementarity condition the estimate is equal to;

$$CV_{q\downarrow} = p_z - \tilde{p}_z^{q0}(\overline{u}_{q0}^1)\,. \tag{21}$$

The maximum compensation is *not* identical to the Marshallian chokeprice. The compensated price defines the price where the individual is compensated for being dismissed from the site keeping utility constant, in this case the utility of being at the site and having paid the factual price at the original quality level.

If instead $p_z < \tilde{p}_z^{q1}$ the individual will remain with the decision to visit site *z* but experience a welfare loss;

$$CV_{q\downarrow} = x_z(q_z^0, \overline{u}_{q0}^1) - x_z(q_z^1, \overline{u}_{q0}^1) \tag{22}$$

Inserting the definition of the maximum compensation in (4);

$$CV_{q\downarrow} = \tilde{p}_z^{q1}(u_{q0}^1) - \tilde{p}_z^{q0}(u_{q0}^1) \tag{23}$$

In words this is the difference in the respective compensation required for being dismissed from the site for the different quality levels. Formulating this into a stated preference question would be very awkward. The underlying reason being that the consumer has "done" or is just undertaking his one and only consumption of the good. The stated preference method is more useful in capturing the respective chokeprices defined in equation (2) asking the individuals to state the price where they will exit the market for *z*. The welfare estimate for this sort of question is thus defined as;

$$w\Delta = u(Y - p_z, q_z^0) - u(Y - p_z, q_z^1) \tag{24}$$

which after some manipulations result in[20];

---

[20]
$$\begin{aligned} w\Delta &= u(Y - p_z, q_z^0) - u(Y - \tilde{p}_z, q_z^0) - u(Y - \tilde{p}_z, q_z^0) - \\ &\quad - u(Y - p_z, q_z^1) - u(Y - \tilde{p}_z, q_z^1) - u(Y - \tilde{p}_z, q_z^1) = \\ &= (p_z - \tilde{p}_z^0) - (p_z - \tilde{p}_z^1) \\ &= \tilde{p}_z^1 - \tilde{p}_z^0 \end{aligned}$$

$$w\Delta = \tilde{p}_z^{q1} - \tilde{p}_z^{q0} \tag{25}$$

which are the respective Marshallian chokeprices. As mentioned in the previous scenario only the S.P. method can be applied since it can elicit the value for a *hypothetical* quality change. In order to use the R.P. method an *ex post* study has to be conducted.

For scenario ***2b)*** where $p_z < \tilde{p}_z^{q0}$ and $q_z \uparrow$ the individual will not switch consumption but experience a welfare gain. This welfare measure is identical to the expression in (23) and (25), but with opposite signs compared to scenario *2a*.

An issue to consider is the potential income effects. Unless the CV_a is very large the income effect is likely to be small but nevertheless. For a sample where the income is known this can be tested. What is of concern is how large $p_z^{'} - \tilde{p}_z$ is in relation to income. If small it is possible to assume that the marginal utility of consumption is constant and the change in quality does not affect the marginal utility of income.

The path dependency problem that might occur when the price of the commodity is used as a payment vehicle to elicit welfare measures is not presented here. The underlying reason for this problem is that the question format causes a simultaneous change in both price and quality. For this model it is not a problem since consumption is fixed given the indivisibility condition.[21]

Conclusions

In the paper the possibility to define long distance and specialized recreation as indivisible in consumption is assessed. Assessments of welfare estimations for all scenarios and changes identified to exist for this market is undertaken, mainly to identify the empirical and theoretical constraints that the invoked assumptions cause. The assumptions invoked are that only on-site information is available and that the good is defined as indivisible in consumption.

As a general conclusion, the fact that information by assumption is restricted to on-site data is a limitation only in the case of a price decrease and quality increase since then non-participants might enter. In the case of a price decrease the R.P. method outlined in the paper can capture the value by assuming that all individuals have identical preferences. This is not possible for a quality change since the derived chokeprice does not contain any information about the visitors preferences for quality.

When valuing access of the site those restrictions do not cause any problems. The reason for this is the assumption that individuals not included in the sample have zero willingness to pay (since we are only estimating use values)

In line with what was stated above S.P. methods are superior when valuing quality changes since it can make estimates of hypothetical changes that the R.P method is not able to. The R.P. method can only be applied given that there is *ex ante* and *ex post* information of the same site. Alternatively a value for quality can be captured if there is information from two different sites that are identical but with different quality levels.

Using the price of the trip as the payment vehicle means that useful policy relevant information about choke prices is captured. It was also found that due to indivisibility in consumption situation were S.P. questions awkward to pose and it made more sense to ask the individual to state their chokeprice.

---

[21] For further readings in this subject consult Johansson (1996).

The fact that the model can be extended to estimate the value of changes of attributes also makes it suitable for the estimation of welfare measures of natural, cultural and social recreational services.

The situation where there is an empirical problem, in terms of available information is when the change causes the individual to switch site.

Appendix

In scenario *1)* $p_z \geq \tilde{p}_z$ i.e. $\bar{u}^0 = \max\{u(Y - p_s, 0,1,q), u(Y,0,0,q)\}$ the individual is not at the site and the inverse of the respective utility functions are then;

$$u^{-1}(\bar{u}^{0_s} | 0,1,q) = Y - p_s \quad \text{(A1)}$$

or

$$u^{-1}(\bar{u}^{0_0} | 0,0,q) = Y \quad \text{(A2)}$$

Substituting (B1) and (B2) respectively into the following definition of the maximum compensation[22];

$$\tilde{p}_z(p_s, q, \bar{u}^{0_s}) = p_s + u^{-1}(\bar{u}^{0_s} | 0,1,q) - u^{-1}(\bar{u}^{0_s} | 1,0,q) \qquad if \qquad V_0 < V_s \quad \text{(A3)}$$

or

$$\tilde{p}_z(p_s, q, \bar{u}^{0_0}) = u^{-1}(\bar{u}^{0_0} | 0,0,q) - u^{-1}(\bar{u}^{0_0} | 1,0,q) \qquad if \qquad V_0 > V_s \quad \text{(A4)}$$

this yields:

$$\tilde{p}_z(p_s, q, \bar{u}^{0_s}) = Y - u^{-1}(\bar{u}^{0_s} | 1,0,q) \quad \text{(A5)}$$

or

$$\tilde{p}_z(p_s, q, \bar{u}^{0_0}) = Y - u^{-1}(\bar{u}^{0_0} | 1,0,q) \quad \text{(A6)}$$

Equation (A1) and (A5) together and (A2) and (A6) together imply that;

$$u(Y - \tilde{p}_z, 1,0,q) = \max\begin{Bmatrix} u(Y - p_s, 0,1,q) \\ u(Y,0,0,q) \end{Bmatrix} \quad \text{(A7)}$$

Which is identical to the definition of the Marshallian chokeprice defined in equation (4) . Consequently, $\tilde{p}_z(\bar{u}^0) = \tilde{p}_z^M$ and the ordinary and compensated demand curves are identical. This is when $\delta_z = 0$ in the reference utility. In alternative *2)* $p_z \leq \tilde{p}_z$ and the reference utility $\bar{u}^1 = u(Y - p_z, 1,0,q)$ which means that individual has decided to visit site *z*. The situation looks differently here because then;

$$u^{-1}(\bar{u}^1 | 1,0,q) = Y - p_z^{'} \quad \text{(A8)}$$

Where *p'* indicates the factual price of visiting site *z*. Then the chokeprice in (A3) can be written as;

$$\tilde{p}_z^H = p_z^{'} - Y + p_s + u^{-1}(\bar{u} | 0,1,q) \quad \text{(A9)}$$

[22] This definition is derived from the fact that $x_z(q_z, \bar{u}) + \tilde{p}_z^H = x_s(q_s, \bar{u}) + p_s$

and accordingly $\tilde{p}_z^H \neq \tilde{p}_z^M$. The exception is if the utility function has the quasi linear form. Hanemann (1999) shows that $\tilde{p}_z^H = \tilde{p}_z^M$ independently of $(p_z^{'}, p_s, q, Y)$ if and only if this is the case[23].

References

Andersson J. (2003), The Recreational Cost of Coral Bleaching – a Stated and Revealed Preference Study of International Tourists. *Unpublished dissertation paper*

Arrow K. Solow R. Portney P. Leamer E. Radner R. Shuman H. 1993, Report of the NOOA panel on Contingent Valuation, Resources for the Future, Washington.

Adamowicz W., Louvert J. Williams M., 1994, Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities, Journal of environmental Economics and Management, Vol 26 Nr. 2, 271-292.

Brown T.C. Champ R.C. Bishop R.C. McCollum D W. 1996, Which Response Format Reveals the Truth about Donations to a Public Good? Land Economics May, Vol. 72 (2) pp. 152-66

Cameron T. A., (1992), Combining Contingent Valuation and Travel Cost Data for the Valuation of Nonmarket Goods, Land Economics, (Aug) 302-317.

Carson R. T. Hanemann W. M. Kopp R.J. Krosnick J.A. Mitchell R. C. Presser S. Ruud P.A. Smith K. Conaway M. Martin K, 1997, Temporal Reliability of Estimated from Contingent Valuation, Land Economics, May, 73 (2) pp 151-63.

Davis D. Tisdell C., 1996, Economic Management of Recreational Scuba Diving and the Environment, Journal of Environmental Management, **48**, 229-248.

Dave T. Mendelsohn R., 1991, "Valuing Ecotourism in a Tropical Rain-Forest Reserve", AMBIO, **20**:91-93 pp. 91-93

Gregory R. 1986, Interpreting measures of economic loss: evidence form contingent valuation and experimental studies, Journal of Environmental Economics and Management **13**, 325-37.

Gregory R. Lichtenstein S. Brown T.C Peterson G.L. Slovic P. 1995, How precise are Monetary Representations of Environmental Improvements? Land Economics, Nov. 71 (4) pp 462-73

Hanemann M., 1984 Discrete/Continuous Models of Consumer Demand, Econometrica Vol 52, pp 541-61

Hanemann M.W. (1999) Welfare Analysis with Discrete Choice Models. In Valuing Recreation and the Environment. Eds. Herriges J.A and Kling C.L:

Hanemann M. 1999,The Economic Theory of WTP and WTA in Valuing Environmental Preferences; Theory and Practice of the Contingent Valuation Method in the US,EU and Developing Countries. Eds. Bateman I., Willis K.Oxford University Press.

Hellerstein D. Mendelsohn R. 1993, A theoretical Foundation for count Data Models. American Journal of Agricultural Economics, 75 pp 604-611.

Johansson P-O, 1996, Commodity Prices as Payment Vehicles in Valuation Experiments, Environmental and Resource Economics 8: 247-254.

Kling C.L. 1997, The Gains from Combining Travel Cost and Contingent Valuation Data to Value Nonmarket Goods, Land Economics August pp 428-39.

McConnel K.E. (1985) The Economics of Outdoor Recreation, in handbook of Natural Resources and Energy Economics, vol II, edited by A.V. Kneese and J.L. Sweeney. Elsevier Science Publishers B.V.

McConnel K. (1986) The Damages to Recreational Activities from PCBs in New Bedford Harbor. Cambridge , Mass: Industrial Economics

McConnel K.E. Weninger Q. Strand I E. (1999) Joint Estimation of Contingent Valuation and Truncated Recreational Demands. In Valuing Recreation and the Environment. Eds. Herriges J.A and Kling C.L:

[23] see proof of proposition in Hanemann (1999) Appendix pp. 62-63.

Mercer E., Kramer, R., Sharma N. (1995) Impacts on tourists, Eds. Kramer, Sharma and Munashinge, in Valuing Tropical Forests Methodology and Case Study of Madagascar, The World Bank, Wahsington , DC

Mitchelle R.C., Carson R. (1989) Using Surveys to Value Public Goods: The Contingent Valuation Method, Resources for the Future, Washington D.C.

Mäler K.-G. 1974 Environmental Economics: a Theoretical Inquiry. Baltimore: John Hopkins University Press.

Mäler K.-G. 1985, Welfare Economics and the Environment, in Handbook of Natural Resources and Energy Economics vol. 1, edited by Kneese and J.L. Sweeney, Elsevier Science Publishers BV

Navrud S. Mungatana E.D. and (1994), Environmental Valuation in Developing Countries. The Recreational Value of Wildlife Viewing. Ecological Economics Vol **11**, N.O. 2 pp. 135-151

Randall A. Stoll J.R. 1980, Consumer's Surplus in Commodity Space, American Economic Review 70:449-455

Ready R.C. Navrud S. Dubourg W. R. (2001) How Do Respondents with Uncertain Willingness to Pay answer CV Questions, Land Economics Vol. 77 (3) pp.315-326

Small K.A., Rosen H.S. 1981 Applied Welfare Economics with Discrete Choice Models , Econometrica 49, pp.105-30

Riera Font A. 2000, Mass Tourism and the Demand for Protected Natural Areas: A Travel Cost Approach, Journal of Environmental Economics and Management, **39**, pp 97-116

Whitehead J. Blomquist G. Hoban J. Clifford W. (1995) Assessing the Validity and Reliability of Contingent Values: A Comparison of On-site Users, Off-Site Users, and Non-users. Journal of Environmental Economics and Management 29, 238-251.

Welsh M.P., Poe G.L. 1998 Elicitation Effects in Contingent Valuation: Comparisons to a Multiple Bounded Discrete Choice Approach, Journal of Environmental Economics and Management 36, pp. 170-185.

Woodward R.T. Gillig D. Griffin W.L. Ozuna Jr. T. 2001 The Welfare Impacts of Unanticipated Trip Limitations in Travel Cost Models, Land Economics, August 77 (3) pp. 327-338