The Non-Market Value of Abel Tasman National Park, New Zealand: A Choice Modelling Application

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Abstract

National parks and protected areas form the basis of global conservation initiatives and provide a raft of benefits in the form of various consumptive and non-consumptive uses. However, it is extremely difficult to express these benefits in monetary terms. The lack of economic values for these protected areas often results in sub-optimal conservation outcomes. Non-market valuation techniques can be used to estimate monetary values for these key environmental assets. This research applied the choice modelling approach to assess the value of non-market goods and services associated with Abel Tasman National Park in New Zealand. A standard multinomial logit model was used to analyse visitor preferences and derive welfare measures. The results indicate park users were willing to pay an actual cash value for the ecological and recreational attributes of the park. These monetary values can be used to guide future development, inform resource allocation decisions and ensure adequate conservation financing.

Keywords: Choice experiments, stated preference, willing to pay

1. Introduction

National parks and protected area networks play an integral role in the conservation of biodiversity and the provision of other benefits associated with the maintenance of ecological integrity (Chape, et al., 2008; Stolton & Dudley, 2010). However, the economic benefits associated with national parks and protected areas have always been difficult to quantify in monetary terms. As an economic good, the provision of protected areas by the market is often subject to a number of market failures. These failures primarily stem from the fact that protected areas exhibit varying degrees of non-rivalry and non-excludability and generate positive consumptive externalities (Dixon & Sherman, 1990; Turner, 2002).

As a consequence of these market failures, the benefits associated with protected areas are typically not subject to economic valuation by the price mechanism, often resulting in an implicit zero value. This leads to protected areas being undervalued and underfunded relative to other government fiscal and budgetary considerations (Dixon & Sherman, 1991). However, national parks and protected areas provide a range of benefits including education, recreation and tourism, ecosystem services and various non-use values (Putney, 2003; Stolton & Dudley, 2010). An expression of these benefits in dollar terms would help to ensure the efficient allocation of conservation resources. Specifically, monetisation of these benefits can be used to justify continued public investment in protected areas and provide an impetus for the continuation of conservation activities in the face of competing development interests (Dixon & Sherman, 1990).

The increasing importance of non-market valuation for protected areas must also be seen in the global context of a declining funding base for conservation and increasing calls for the adoption of a consumer-oriented approach to protected area management. Within this context, non-market valuation can play an increasingly important role by providing protected area managers with information regarding visitor preferences, the goods and services provided by these areas and how these benefits are able to be captured (WCPA-IUCN, 1998, 2000).

Currently, New Zealand's conservation estate faces a number of challenges in terms of declining budgetary allocations, calls for increasing commercialisation and renewed pressure from development interests (Haque, 2006; Office of the Parliamentary Commissioner for the Environment, 2010). Consequently, the application of non-market valuation techniques to protected areas in New Zealand is of particular relevance given the urgent need to ensure the efficient allocation of conservation resources.

Despite this, only a handful of non-market valuation studies have been conducted in New Zealand's national parks. These studies have typically utilised either the contingent valuation or travel cost methods to estimate recreational values for these critical elements of natural capital. One emerging stated preference technique which shows considerable merit in its application to non-market valuation is the choice modelling (CM) approach. This paper makes a contribution to the valuation literature by applying the CM technique to a New Zealand national park case study.

Several studies have used the CM approach to derive economic values for the various attributes which characterise national parks and protected areas in other locations. Hearne and Salinas (2002) elicited tourist preferences for the provision of recreational infrastructure in Braulio Carrillo National Park in Costa Rica. In a similar context, Hearne and Santos (2005) analysed tourist preferences for the development of the Maya Biosphere in Guatemala. In another nature-based recreation study, Naidoo and Adamowicz (2005) assessed the benefits associated with biodiversity conservation in Uganda's protected areas. Within the developed country context, Juutinen et al. (2011) elicited visitor preferences for the development of Oulanka National Park in Finland. The study combined both ecological and recreational attributes of the park and assessed the welfare impacts of alternative management options. This study most closely resembles the type of choice model which this research intends to apply within the New Zealand setting.

The aim of this study is to determine the economic value of some of the non-market goods and services associated with Abel Tasman National Park (ATNP) in New Zealand. This paper is structured as follows. Section two will provide a brief description of the selected national park case study. Section three will provide an overview of the CM technique. Section four will detail the methodology employed in the development of the choice experiment. Section five will present the results of the choice model. The final section will discuss these findings and conclude the paper.

2. Case Study

ATNP is the smallest national park in New Zealand and is located in the Tasman region of the South Island. The park covers approximately 230 km^2 and falls under the definition of a category II protected area as developed by the International Union for Conservation of Nature (Department of Conservation, 2008). The park is administered by the New Zealand Department of Conservation (DOC) and was established in 1942 as a result of concerns regarding the loss of native flora and fauna in this area. Prior to this, the area had been subject to a range of land use activities including agriculture, quarrying, mining and timber milling. Pre-European Maori also used the area for settlement and subsistence agriculture (Department of Conservation, 1997).

Currently, the park is experiencing a period of ecological recovery and rehabilitation as a result of the cessation of previous land use activities. This is evident from the rapid changes in the structural composition of the park's ecosystem, with regenerating bush giving way to more dominant forms of native vegetation. The geographical coverage of the park includes a diverse array of physical landforms which provide a habitat for a range of threatened and at risk native flora and fauna. However, these biological communities face ongoing threats from both the presence of invasive alien species and visitor induced pressures (Department of Conservation, 2008).

ATNP is also highly regarded for its scenic values and recreational opportunities and has been used to promote New Zealand as a premier tourist destination. The key characteristics of the park include a rugged, forested interior, golden beaches and a pristine marine environment. The coastal track is the most popular walking track in New Zealand with 151,000 visitors annually. Visitor activity is heavily concentrated in the coastal region with 95% of visitor use being within 500m of the coastline. For several decades, there has been a perception among visitors that ATNP suffers from overcrowding, particularly along the coast during the summer months (Department of Conservation, 2008).

A major constraint on DOC's ability to develop ATNP is whether additional development would compromise the values which the national park is intended to protect. Further development has the potential to negatively impact on wilderness values and ecologically sensitive areas (Department of Conservation, 2008). Accordingly, management of the park is largely dictated by the need to reconcile development pressures with the intrinsic values enshrined in ATNP. This provides a unique context in which to undertake a non-market valuation study.

3. The Choice Modelling Approach

The relatively recent development of CM has largely been in response to criticism directed towards the contingent valuation method and traditional conjoint analysis (Bennett & Blamey, 2001). The conceptual microeconomic foundations of the CM approach are based on Lancasterian consumer theory. The *characteristics theory of value* states that consumers derive utility from the characteristics or attributes of a good as opposed to the actual good *per se* (Lancaster, 1966). Accordingly, the fundamental premise of the CM approach is that an environmental good can be decomposed into a number of attributes and associated levels. A payment vehicle attribute is usually included to facilitate the calculation of welfare estimates. Consumers are presented with a series of choice sets which consist of several hypothetical management alternatives characterised by different attribute levels. Respondents are required to select their most preferred management alternative in each choice set (Hanley & Barbier, 2009).

In order to explain consumer choice within a utility maximising framework, CM has integrated the Lancasterian model of consumer behaviour with random utility theory (RUT) developed by McFadden (1974). RUT presupposes that an individual's utility can be divided into an observable deterministic component (V_i) and an unobservable random stochastic component (ε_i) (Holmes & Adamowicz, 2003). Assuming these two components are additive, a generalised utility expression for each alternative i can be expressed by equation 1 (Boxall, Adamowicz, Swait, Williams, & Louviere, 1996).

$$U_i = V_i + \varepsilon_i \tag{1}$$

The deterministic component of utility can be explained by the attributes included in the CM study. The random component is a result of the analyst having imperfect information regarding all the determinants of utility (Holmes & Adamowicz, 2003). This leads to the inclusion of an error term which is able to capture the effect of these unobserved influences (Louviere, 2001). The deterministic component of utility can be further decomposed and expressed as (Hensher, Rose, & Greene, 2005):

$$V_i = ASC + B_{1i}f(X_{1i}) + B_{2i}f(X_{2i}) + \ B_{3i}f(X_{3i}) + \cdots + \ B_{Ki}f(X_{Ki}) \tag{2}$$

Where there are K attributes and B_{1i} represents the parameter coefficient relating to attribute X_1 alternative i and ASC is an alternative specific constant. The ASC captures the average influence of all unobserved factors on utility. This representative portion of utility is often assumed to be linear in attributes for computational ease but can also be represented in quadratic or logarithmic form. The coefficients show the relative importance of each attribute and their effect on utility (Hensher, et al., 2005).

With regard to the error component, as the analyst has practically no information about the unobserved elements a number of maintained assumptions exist. Collectively, these assumptions are referred to as the independently and identically distributed (IID) condition. The IID condition assumes that all error terms are derived from the same underlying distribution and are uncorrelated with other error terms (Hensher, et al., 2005).

Applying RUT specifically to the choice model, each individual selects an alternative which maximises their utility. The inherent uncertainty caused by the random element ensures the analyst is restricted to modelling the probability of an individual choosing a particular alternative (Hensher, et al., 2005). The probability of an individual selecting alternative i over alternative j can be expressed as (Hensher, et al., 2005):

$$\text{Prob}_i\text{=Prob}\left[\, (V_i + \varepsilon_i) \geq \left(V_j + \varepsilon_j\right) \forall\, j\, \in J = 1\,, \dots, J; i \neq j\right] \tag{3}$$

Where J represents the entire choice set. The fact the error term cannot be measured, transforms a consumer's standard utility maximisation rule to a random utility maximisation rule. Equation 3 can be rearranged to express this as (Hensher, et al., 2005):

$$\text{Prob}_i\text{=Prob}[(\varepsilon_j - \varepsilon_i) \leq (V_i - V_j) \forall\, j\, \in j = 1, \dots, J; i \neq j] \tag{4}$$

Expression 4 states that the probability of an individual choosing alternative i is equal to the probability that the difference in the unobserved sources of utility is less than or equal to the difference in the observed sources of utility (Hensher, et al., 2005).

Assuming the error term exhibits an extreme value type 1 or Gumbel distribution, a standard multinomial logit (MNL) model can be used for CM purposes. The probability of a respondent selecting alternative i is given in equation 5 (Hensher, et al., 2005).

$$\text{Prob}_i\text{=} \frac{exp\, V_i}{\Sigma_{\text{j=1}}^{\text{J}}\, exp\, V_i}\ ; j = 1, \dots, i, \dots, \text{J}\ i \neq j \tag{5}$$

The probability of an individual selecting an alternative is modelled as a function of the key design attributes and respondent socioeconomic, demographic and attitudinal variables. Alternatives with higher levels of desirable attributes have a higher probability of being selected (Bennett & Adamowicz, 2001).

One restriction or assumption embodied in the MNL model is the behavioural condition known as the independence of irrelevant alternatives (IIA). This condition states that the probability of a respondent selecting an alternative is independent of the presence or absence of other alternatives in a choice set. A result of the IID assumption, the IIA condition implies that the unobserved attributes are identical for each alternative (Hensher, et al., 2005).

The results of the choice model can be used to derive Hicksian consistent welfare estimates. The CM approach can provide two forms of welfare estimates. First, implicit prices for individual attributes can be obtained by estimating the marginal rate of substitution between the non-monetary and monetary attribute as shown in equation 6 (Hanley & Barbier, 2009):

$$IP = -\left(\frac{\beta_k}{\beta_c}\right) \quad (6)$$

Where IP is the implicit price, β_k is the parameter coefficient for the non-market attribute and β_c is the parameter coefficient for the monetary payment vehicle. Implicit prices should be interpreted as the marginal willingness to pay for an attribute *ceteris paribus*. Measures of willingness to pay can also be obtained for situations involving changes to multiple attributes.
Compensating surplus can be calculated by multiplying the difference in utility between two states of the world with the negative of the monetary coefficient.

$$CS = -\frac{1}{\beta_c}(V_1 - V_0) \quad (7)$$

Where CS is the compensating surplus, V_1 is the utility associated with the alternative management option, V_0 is the utility associated with the status quo option and β_c is the parameter coefficient for the monetary payment vehicle.

4. Methodology

A choice model was developed to assess visitor preferences and derive non-market values for ATNP. The first major design stage involved defining the attributes and associated levels which characterise the environmental and recreational aspects of the park. A comprehensive literature review was carried out in order to compile an initial list of attributes. This list was presented to a focus group with previous recreational experience in New Zealand's conservation estate. Participants were asked to indicate which attributes played an important role in determining consumer choice and were given an opportunity to add additional attributes. A refined list of attributes was then provided to DOC staff for comment and final approval. All the attributes identified in the focus group were considered to be relevant by park managers ensuring there was little divergence between public and policy perspectives.

The number of attributes included in the model was restricted to five in order to minimise task complexity. The final list of attributes included the number of native bird species present (as an indicator of biodiversity), onsite information, accommodation facilities and the number of visitors. These attributes are designed to capture the unique recreational and ecological benefits which ATNP is well-regarded for.

In terms of the selected monetary attribute, ideally the payment vehicle should be coercive, credible and acceptable to respondents (Bateman, et al., 2002). Within a national park context, an entrance fee appears to satisfy this criteria. With regard to acceptability, the concept of paying for access to a national park would be foreign to many New Zealanders. Conservation funding is sourced from general tax revenues and legislation prohibits the use of financial mechanisms which restrict access. This may result in a high level of protest responses from New Zealanders. However, alternative payment mechanisms suffer from a number of disadvantages which could act to exacerbate hypothetical bias. Accordingly, an entrance fee was chosen as the monetary payment vehicle.

With the attributes defined, the levels which describe the potential future management options were developed. The status quo levels were primarily obtained from various management plans and documents. The other attribute levels were developed in consultation with park managers to ensure realistic management outcomes. The final list of attributes and associated levels are given in Table 1.

Table 1. Attributes and Levels

Attribute	**Definition**	**Level 1**	**Level 2**	**Level 3**
Native Bird Species	Number of native bird species present	50 species	60 species	70 species
Onsite Information	Onsite information available to visitors	Interpretive signs	Interpretive signs, brochures	Interpretive signs, brochures and visitor centre
Accommodation Facilities	Accommodation available to visitors	Campgrounds and huts	Cabins	Lodges
Number of Visitors	Expected number of visitor interactions	50 people over a 1 km walk	40 people over a 1 km walk	30 people over a 1 km walk
Entrance Fee	Entrance fee ($ NZ)	$10	$20	$30

The combination of five attributes each with three levels, results in 243 unique treatment combinations. As it is simply not practical for respondents to evaluate such a large number of alternatives, a fractional factorial design was used. An orthogonal main effects plan for six variables each with three levels was obtained from a design catalogue (Hahn & Shapiro, 1966). The additional attribute was included as a blocking variable to reduce the number of choice sets presented to each respondent. The design consisted of 18 treatment combinations which were blocked into three different segments.

The resulting choice sets were screened for dominated alternatives and implausible attribute combinations. One of the management profiles was excluded from the final design since it combined the status quo attribute levels with a non-zero entrance fee. This alternative would be dominated in every choice set and could be perceived by respondents as implausible. The deletion of this alternative ensured the experimental design did not exhibit perfect orthogonality. Each choice set contained a status quo option describing the current situation and two alternative park management options with an associated cost. Figure 1 provides an example of a choice set.

	Option A Current Situation	**Option B**	**Option C**
Presence of native birds	50 species	70 species	60 species
Onsite Information	Interpretive signs	Interpretive signs, brochures, visitor centre	Interpretive signs
Type of accommodation	Campgrounds and huts	Campgrounds and huts	Lodge type accommodation
Number of visitors	50 people over a 1 km walk	40 people over a 1 km walk	50 people over a 1 km walk
Entrance fee ($ NZ)	$0	$20	$10
Your most preferred option (tick ONE box)			

Figure 1. Example Choice Set

With regard to the design of the survey instrument, the first section presented respondents with a series of general questions about their current visit to ATNP and an attitudinal rating question. This was followed by an information sheet which provided an overview of potential future management options framed in terms of the selected attributes and levels. Examples of management actions which could result in these outcomes were given to enhance the plausibility of the choice scenarios. The second section introduced the choice sets and asked respondents to make a number of choices between competing management options for ATNP. A cheap talk script was used to remind respondents of the limitations imposed by their budget constraint and the presence of substitute goods. A set of debriefing questions was also included in order to gain greater insight into the decision strategies employed by participants. The final section of the survey was concerned with the collection of socioeconomic, demographic and attitudinal data.

The questionnaire was administered onsite at the southern (Marahau) entrance of ATNP during November 2011. Visitors aged 18 years and older were approached and provided with a brief outline regarding the purpose of the survey. Individuals who agreed to participate were presented with a self-administered questionnaire. The survey was administered to park users immediately after their visit to the park to ensure they had a reasonable degree of familiarity with ATNP.

5. Results

In total, 183 questionnaires were collected, 9 of which were subsequently discarded due to either payment vehicle protests or respondents being uncertain of their answers. In these surveys, respondents always selected the constant base alternative but revealed through debriefing questions that they had not utilised an optimising decision strategy. With regard to non-response rates, 24 individuals declined the invitation to participate in the survey which corresponds to a response rate of 88.4%. The presence of language barriers and time constraints were the primary reasons given for non-participation. Four surveys were handed back only partially completed. Despite the missing socioeconomic and demographic information, the individual choice observations were retained for the analysis. Overall, 174 valid responses were received which provided 986 choice observations. A full breakdown of respondent demographic and socioeconomic characteristics is provided in Table 2. Currently, DOC does not collect detailed statistical information about park visitors. As a result, it is impossible to gauge the extent to which this sample of park visitors is representative of the wider visitor population.

Table 2. Respondent Characteristics

	Number of Respondents	Percentage of Respondents (%)
Gender		
Male	78	44.8
Female	96	55.2
Age		
18-24	51	29.3
25-34	73	42.0
35-44	13	7.5
45-54	13	7.5
55-64	17	9.8
65-74	6	3.4
75+	1	0.6
Educational Attainment		
Primary school	0	0
Secondary school	27	15.5
Tertiary diploma/certificate	25	14.4
University degree	120	69.0
Not specified	*2*	*1.1*
Child Status		
Children	39	22.4
No children	135	77.6
Residency Status		
NZ Permanent Resident	41	23.6
Visitor to New Zealand	133	76.4
Annual Household Income ($ NZ)		
<$30,000	72	41.4
$30,001-60,000	24	13.8
$60,001-90,000	31	17.8
$90,001-120,000	17	9.8
$120,001-150,000	7	4.0
$150,001-180,000	10	5.7
$180,001+	11	6.3
Not specified	*2*	*1.1*
Environmental Organisation Membership		
Member	42	24.1
Non-member	132	75.9
Previous Visit to ATNP		
Yes	36	20.7
No	138	79.3
Intended Future Visit to ATNP		
Yes	94	54.0
No	80	46.0
Length of Current Visit		
Day trip	40	23.0
Overnight trip	134	77.0

5.1 Model Specification

The indirect utility functions which were used to estimate the discrete choice model are provided below. The first utility specification (Option 1) represents the constant base option or status quo situation. The two remaining specifications (Option 2 and 3) represent the two other management alternatives. For the purpose of computational ease, the utility functions are specified as linear in parameters. Table 3 provides a description of the variables used in the model specification.

Option 1:

$$V_1 = \beta_1 * NBS + \beta_2 * MED + \beta_3 * FUL + \beta_4 * CAB + \beta_5 * LOD + \beta_6 * NMV + \beta_7 * ENF$$

Option 2:

$$V_2 = ASC + \beta_1 * NBS + \beta_2 * MED + \beta_3 * FUL + \beta_4 * CAB + \beta_5 * LOD + \beta_6 * NMV + \beta_7 * ENF + \Sigma\, \beta_i * ASC * (\textit{socioeconomic and demographic variables})$$

Option 3:

$$V_3 = ASC + \beta_1 * NBS + \beta_2 * MED + \beta_3 * FUL + \beta_4 * CAB + \beta_5 * LOD + \beta_6 * NMV + \beta_7 * ENF + \Sigma\, \beta_i * ASC * (\textit{socioeconomic and demographic variables})$$

Table 3. Choice Model Variables

Variable	Definition
ASC	Alternative specific constant (1 if option B or C selected, 0 if otherwise)
NBS	Native bird species
MED	Medium onsite information (interpretive signs and brochures)
FUL	Full onsite information (interpretive signs, brochures and visitor centre)
CAB	Cabin type accommodation
LOD	Lodge type accommodation
NMV	Number of visitors
ENF	Entrance fee
ASC_GEN	Respondent gender (1=male, 0=female)
ASC_AGE	Respondent age bracket (coded 1-7, youngest to oldest)
ASC_EDU	Respondent education level (1= university degree, 0 if otherwise)
ASC_BEQ	Respondent child status (1= child, 0 if otherwise)
ASC_VIS	Respondent visitor status (1= visitor to New Zealand, 0 if otherwise)
ASC_INC	Respondent income bracket (coded 1-7, lowest to highest)
ASC_ENV	Respondent environmental organisation membership (1=member, 0 if otherwise)
ASC_OPT	Respondent future visit within 5 years (1=yes, 0 if otherwise)

With regard to the socioeconomic and demographic characteristics, a set of dummy variables was created to allow these factors to be included in the model through interactions with the alternative specific constant (see Table 3). In terms of the coding of the dataset, the two qualitative attributes (accommodation and onsite information) were effects coded. In both cases, the status quo attribute levels were utilised as the designated reference points and hence are not directly estimated in the resulting model. The full coding structure that was used in the regression analysis is shown in Table 4.

Table 4. Attribute Coding Structure

Attribute	Levels	Coding Structure
Native bird species (NBS)	50 native bird species 60 native bird species 70 native bird species	50 60 70
Onsite information (MED, FUL)	Interpretive signs Interpretive signs and brochures Interpretive signs, brochures and visitor centre	MED=-1; FUL=-1 MED=1; FUL=0 MED=0; FUL=1
Accommodation facilities (CAB, LOD)	Campgrounds and huts Cabin type accommodation Lodge type accommodation	CAB=-1; LOD=-1 CAB=1; LOD=0 CAB=0; LOD=1
Number of visitors (NMV)	50 people over a 1 km walk 40 people over a 1 km walk 30 people over a 1 km walk	50 40 30
Entrance fee (ENF)	$10 $20 $30	10 20 30

5.2 Model Results

The results of the CM application are presented in Table 5 which includes the parameter estimates for two separate MNL models. The first model (Model 1) uses a basic specification to demonstrate the effect of the key design attributes on respondent choice. The second model (Model 2) utilises a more comprehensive specification which includes the design attributes and various socioeconomic, demographic and attitudinal variables. Several of these factors including gender, education and membership of an environmental organisation were found to be statistically insignificant. Accordingly, Model 2 was estimated excluding these variables.

Table 5. Model Results

Variables	Model 1		Model 2	
	Coefficient	***Standard error***	***Coefficient***	***Standard error***
ASC	0.07306	0.23721	-0.75179**	0.33562
Native bird species	0.04734***	0.00688	0.04931***	0.00702
Basic information	-0.20258**	0.08092	-0.21079**	0.08280
Medium information	0.06915	0.07228	0.06204	0.07355
Full information	0.13343*	0.07207	0.14874**	0.07345
Campgrounds and huts	0.43320***	0.07599	0.42922**	0.07787
Cabin accommodation	-0.04318	0.08302	-0.05169	0.08546
Lodge accommodation	-0.39003***	0.08179	-0.37753***	0.08325
Number of visitors	-0.04532***	0.00726	-0.04773***	0.00748
Entrance fee	-0.07282***	0.00734	-0.07686***	0.00762
ASC_AGE			0.24886***	0.07568
ASC_BEQ			-0.84591***	0.26033
ASC_VIS			-0.47668**	0.18639
ASC_INC			0.21776***	0.04436
ASC_OPT			0.46757***	0.15129
Summary Statistics				
LL (at convergence)	-919.336		-875.593	
Pseudo-R^2	0.13		0.17	

Note: ***significant at 1% level, **significant at 5% level, *significant at 10% level

From the results in Table 5, the basic model shows that all of the key design attributes are statistically significant. The signs on the coefficients for the three quantitative attributes conform with *a priori* expectations. Namely, the presence of native bird species contributes positively to utility while the number of visitors and the proposed entrance fee have a negative impact. Whilst effects coding does not directly measure the impact of the status quo attribute level, the coefficient is equal to the negative sum of the two estimated parameters (Bech & Gyrd-Hansen, 2005). The expected signs for the information and accommodation coefficients are somewhat ambiguous. For example, some park visitors may have a greater preference for greater park development in terms of more onsite information and upgraded accommodation facilities. Other park users may prefer lower levels of development and a more basic experience. The coefficients for the information attribute show that additional information is preferred with the status quo level having a negative impact on utility. In contrast, the provision of upgraded accommodation facilities such as cabins and lodges had a detrimental impact on respondent well-being. While the overall model fit as measured by

McFadden's pseudo-R^2 is relatively low, the test statistic was of similar magnitude to other applications which utilise a simple MNL model (Juutinen, et al., 2011; Rolfe, Bennett, & Louviere, 2000; Thang Nam & Bennett, 2009).

The use of the MNL model is only valid if the underlying IIA behavioural condition is satisfied. The IIA condition states that the ratio of choice probabilities of any two alternatives is independent of the presence of other alternatives (Alberini, Longo, & Veronesi, 2007). If the behavioural condition is violated then the resulting welfare estimates will be biased (Birol, Karousakis, & Koundouri, 2006). A Hausman test was performed which indicated that the model was consistent with the IIA property. This confirms that the MNL model is appropriate for the purposes of analysing visitor preferences and deriving welfare measures.

In order to account for observed respondent heterogeneity, Model 2 incorporates a range of socioeconomic, demographic and attitudinal variables through interactions with the constant term. All of the key design attributes are statistically significant and have their expected signs. The alternative specific constant is both statistically significant and negative which suggests that moving away from the status quo option was a source of disutility for respondents.

The pseudo-R^2 value for Model 2 indicates the more comprehensive model specification was superior in terms of parametric fit and explained a higher proportion of respondent choice. The results show that the interaction term for respondent age was positive indicating that older respondents were more likely to choose one of the alternative park management options. Furthermore, the interaction terms for respondent income and future visit were positive indicating that these factors increased the probability of respondents selecting an alternative management option. However, visitors to New Zealand and park users with children were more likely to choose the status quo management option.

Economic theory can provide some guidance with respect to the expected signs of these socioeconomic and demographic coefficients. For example, one would expect the income coefficient to be positive as respondents with higher household incomes have a greater ability to pay for alternative management options. With regard to future visits to ATNP, option value motivations dictate that the expected sign should be positive. In terms of child status, the expected sign is somewhat ambiguous. Whereas bequest motivations may increase the probability of respondents selecting a new management option, the presence of children can decrease disposable household income (Morrison, Bennett, & Blamey, 1999). The results from Model 2 indicate that the coefficient signs conform with the expectations derived from economic theory.

5.3 Welfare Measures

The implicit price for a particular attribute can be calculated as the marginal rate of substitution between the non-monetary and monetary attribute. Implicit prices should be interpreted as the marginal willingness to pay for an attribute, *ceteris paribus*. Confidence intervals (CIs) for the implicit prices were estimated using the delta method. The implicit prices and associated CIs derived from Model 2, are presented in Table 6.

Table 6. Implicit Price Estimates

Attribute	Implicit Price ($ NZ)
Native bird species	0.64 (0.30 ~ 0.98)*
Basic information	-2.74 (-4.96 ~ -0.52)*
Medium information	0.81 (-2.78 ~ 4.39)*
Full information	1.94 (-1.49 ~ 5.36)*
Campgrounds and huts	5.58 (3.41 ~ 7.75)*
Cabin accommodation	-0.67 (-4.08 ~ 2.73)*
Lodge accommodation	-4.91 (-8.99 ~ -0.84)*
Number of visitors	-0.62 (-0.98 ~ -0.27)*

*95% confidence level

Based on the results of the survey sample park visitors were on average willing to pay (WTP) $0.64 for the presence of an additional native bird species. Visitors were also WTP $0.81 for the provision of medium levels of onsite information consisting of interpretive signs and brochures. In addition, park visitors would be WTP $1.94 for a comprehensive level of information which includes interpretive signs, brochures and a visitor centre. In contrast, the current level of information resulted in a negative willingness to pay, indicating visitors would require $2.74 in compensation for the provision of interpretive signs only. With regard to accommodation, visitors were WTP $5.58 for campgrounds and huts (the current situation) but would require compensation for the development of cabin and lodge accommodation facilities. It is important to note that these welfare estimates relate to the development of these facilities and not actual usage. In terms of visitor interactions, park users would require $0.62 in compensation for each additional visitor encountered over a 1 km walk.

However, implicit prices alone cannot be used to provide an estimate of the average willingness to pay for a particular management option. Table 7 presents the WTP estimates for a range of hypothetical future management options for ATNP. These estimates are derived from the parameter coefficients from Model 2, using the sample means for the socioeconomic and demographic variables.

Table 7. WTP for Alternative Management Options

Scenario	**Attributes**				**WTP ($ NZ)**
	Native Bird Species	*Onsite Information*	*Accommodation Facilities*	*Number of Visitors*	
Current situation	50	Basic	Campgrounds and huts	50 people over a 1 km walk	-
Low development impact	60	Basic	Campgrounds and huts	40 people over a 1 km walk	$14.18
Moderate development impact	60	Medium	Cabin type accommodation	40 people over a 1 km walk	$11.47
High development impact	70	Full	Lodge type accommodation	30 people over a 1 km walk	$20.99
Optimal development scenario	70	Full	Campgrounds and huts	30 people over a 1 km walk	$31.48

The results in Table 7 can be interpreted as the amount respondents would be WTP in order to secure the welfare gains resulting from an environmental improvement (Hanley & Barbier, 2009). In general, respondents were WTP for management options which improved the recreational and ecological attributes of ATNP. Specifically, respondents were on average WTP $14.18 for a low development scenario which consists of modest enhancements to the number of native bird species and visitor interactions. For moderate levels of development, respondents were WTP less, at $11.47. In contrast, respondents were WTP $20.99 for high levels of park development consisting of increasing native bird species to 70, providing full information (interpretive signs, brochures and a visitor centre), lodge accommodation and fewer visitor interactions. The decompositional approach inherent in the CM technique can also be used to develop management alternatives which are Pareto optimal. Management options which maximise the net benefits to respondents can be created using the implied attribute rankings from the implicit price estimates. The optimal development scenario for ATNP was constructed using the marginal WTP values. In this case, respondents preferred the presence of 70 native bird species, full information, campgrounds and huts and fewer visitor interactions. On average, respondents were WTP $31.48 for this bundle of attributes. All WTP estimates are calculated on a per entry basis and therefore include both overnight and day trip visits.

6. Discussion

Despite the lack of appropriate markets and relevant price signals, this study has demonstrated that park users hold tangible economic values for the recreational and ecological attributes of ATNP. The results also indicate that there is significant demand among visitors for improved park management.

The welfare measures indicate that visitors to ATNP placed the greatest value on the continued provision of campground and hut accommodation facilities. Visitors perceived the development of cabin and lodge type accommodation to be incompatible with the natural and wilderness values of the park. Another important attribute identified by park users is the level of onsite information provided. Visitors generally regarded the current level of information as inadequate. Respondents expressed a positive preference for additional information in the form of detailed information packages and a visitor centre with interactive displays and audiovisual presentations. This result indicates that park visitors valued the onsite educational experience provided by interpretive services and structures. With regard to the management of ATNP, whilst the provision of more comprehensive levels of onsite information is recommended, the development of upgraded accommodation facilities is unnecessary.

Visitors had a positive preference for the number of native bird species present in the park. As a result of New Zealand's unique evolutionary history, native bird species fill an important ecological niche in many terrestrial ecosystems (Craig, et al., 2000). Furthermore, ATNP encompasses a wide variety of habitats which allows the park to support a range of bird life (Department of Conservation, 2008). Native bird species are therefore likely to be the most prominent example of native flora and fauna encountered by park users. Accordingly, measures of avian species richness are an appropriate means of estimating biodiversity values associated with the park. The positive WTP figure elicited for this attribute suggests that park visitors are concerned with the biodiversity of ATNP. In terms of the implications for park management, the investment of additional resources into biodiversity conservation would have a positive impact on visitor welfare.

One management issue of particular relevance to ATNP is the high level of visitor usage during certain times of the year. The results showed that park users preferred fewer interactions with fellow visitors as defined by the expected number of people encountered over a 1 km walk. The implication is that the appreciation of natural wilderness and the desire to experience solitude are an integral part of the recreational experience at ATNP. This creates a particularly challenging management issue given DOC's dual mandate of protecting both wilderness and natural values while facilitating recreational use. The findings indicate that management strategies aimed at reducing the level of crowding would have a positive impact on visitor welfare.

One interesting feature of the choice model is that although there is significant demand for improved park management, the alternative specific constant is negative and statistically significant. This indicates that the act of moving away from the status quo was a source of disutility for respondents, *ceteris paribus*. Adamowicz, Boxall, Williams and Loviere (1998) attribute such a phenomenon to the existence of a status quo bias. While this is one possible interpretation, another explanation is that respondents either did not view the hypothetical market as credible or were recording payment vehicle protests. Alternatively, the preference for the status quo could be a result of task complexity and the use of simplifying heuristics. However, all of these factors were taken into account during the appropriate design stages of the choice model and pilot testing of the survey instrument. In the case of protest responses, the use of follow-up questions was designed to provide greater insight into respondent decision strategies. Nine surveys were discarded due to either payment vehicle protests or respondents being uncertain of their choices.

The expression of these economic benefits in monetary terms can provide valuable information to policy-makers. First, these welfare estimates can be used to guide resource allocation decisions at both the macro and micro level. Decisions regarding the allocation of resources within specific conservation units are often carried out in an informal, *ad hoc* manner resulting in the inefficient use of existing conservation funding (Wu & Boggess, 1999). The implicit price estimates can be used by policy-makers to determine how scarce resources should be allocated amongst competing management priorities. Accordingly, these results can be used to ensure that conservation resources are allocated in manner which maximises the net benefits to park visitors. At the macro level, these monetary values can be used to justify continued public sector funding for ATNP. The often ambiguous link between additional investment in protected areas and the resulting economic returns can act as a barrier towards the sourcing of conservation funding (Dixon & Sherman, 1990). However, by demonstrating these returns in dollar figures, this information can be used by policy-makers to argue for continued conservation financing.

In terms of business and financial planning, the estimated values can be used to provide park managers with an indication of the goods and services demanded by visitors to ATNP (WCPA-IUCN, 2000). This can be used to identify sources of consumer surplus which could potentially be appropriated by park managers and transformed into economic rent. The welfare estimates presented here could be used as guidelines by park managers to develop suitable pricing policies. While there may be some issues regarding the acceptability and feasibility of entrance fees, these mechanism could potentially be used as an additional source of conservation finance. In this manner, the results of the choice model could be used to enhance the financial sustainability of ATNP.

Overall, the research has demonstrated that the CM approach is a suitable means of identifying visitor preferences and deriving non-market values for national parks and protected areas. In general, park users were found to hold significant non-market values for the recreational and ecological attributes associated with ATNP. The findings of this study can be used to inform various aspects of park management and operational planning. In this manner, choice experiments are able to provide vital information which can be used to enhance park management and conservation outcomes.

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