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The influence of place attachment on recreation demand

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Abstract

The travel cost model is a common tool economists use to estimate non-market values associated with recreation. Very rarely are social psychological variables used in the estimation of these models. Recent recreation literature proposes an important role for psychological attachment to place in recreation settings. The model developed in this paper combined typical variables used in travel cost models with place attachment attitudinal constructs in a structural equation model. The information used in the analysis came from a sample of recreationists who were interviewed at camping sites and completed a mail survey. The combination of these two approaches to study recreation demands resulted in a richer empirical treatment of recreation economic behaviour. The results suggest that recreation habits and social psychological constructs such as place attachment formed through previous trips influence recreation demand and have potential impacts on consumer surplus estimates.

JEL classification: Q20; Q26
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Keywords: Travel cost model; Recreation demand; Place attachment; Structural equation models

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1. Introduction

The travel cost model (TCM) is a tool economists use to estimate recreation demands. Following the now famous letter by Hotelling (1947), the TCM employs the assumption that the costs of travelling between an individual's residence and a recreation site are a proxy for the price of a recreation trip. The model relies on actual behaviour in that the site choices of individuals must be observed by the researcher, and that market purchases associated with this behaviour (travel costs) are weakly complementary to the choice of a recreation site (Fletcher, Adamowicz, & Graham-Tomasi, 1990). If there is sufficient variation in the distances between visitors' residences and the recreation sites, and in the number of trips taken over a particular time period, then a demand function can be estimated that explains the number of trips (quantities) taken as a function of the travel costs (prices). The TCM is commonly used to derive estimates of consumer surplus associated with the visitation of recreation sites.

Early empirical research on TCMs utilized regional or zonal approaches where trips per capita from defined zones such as counties or postal sorting areas represented the unit of analysis (Fletcher et al., 1990). More recent research, however, focuses on individual level TCMs where the unit of analysis represents the annual or seasonal trips taken by an individual recreationist (Fletcher et al., 1990). The individual TCM is now the most common approach employed.

The focus of TCMs on individual recreation trips raises a number of behavioural issues that underpin using the travel cost approach. Previous empirical research has (and still is) attempted to address these issues through assessing the impacts of directly measurable socio-economic attributes such as age, gender, income, and education levels on the frequency of trips (Ward & Beal, 2000). Economists have paid little attention to the effects of social psychological components of consumer behaviour affecting recreation demand; for example the importance of emotional ties to recreation sites. More specifically the economic modelling of recreation demand typically ignores the causal effect of the place-specific symbolic meanings and values associated with recreation sites. Furthermore, recreation demand models frequently ignore the effect of levels of visitation to sites in prior time periods on current trip levels. It would seem quite straightforward to link the existence of emotional ties to recreation places to previous trip levels to those sites.

One possible avenue to link emotional ties with previous consumption is the economic literature on habit formation and variety seeking. These linkages can take a number of forms. Recreationists may enjoy variety in site choices to experience an array of recreation attributes at sites. In this case one would expect emotional ties to specific sites to be quite weak. Conversely, recreationists may "learn-by-doing" when repeatedly visiting a particular site in which case one would expect habits to form and stronger emotional ties with the site. [1] Contrary to the formal economic model of habit formation (e.g., Pollak, 1970), this view suggests that past consump-

[1] Munley and Smith (1976, 1977) utilize this feature by including indicators of past experience with recreation activity in an empirical demand model.

tion (i.e., visits) increases the utility from current consumption. [2] There may indeed be other reasons why emotional ties to recreation sites form and have a significant effect on current trip behaviour. Regardless of the linkage mechanism, however, travel cost models seldom contain previous experience *with the site* nor have they included psychological variables as explanators of recreation trip behaviour.

A developing literature in recreation social psychology involves place attachment whereby individuals assign emotional and symbolic meanings to recreation settings (Moore & Graefe, 1994; Williams, Patterson, Roggenbuck, & Watson, 1992). The concept of place attachment to recreation settings is relatively new and takes its foundations from the environmental psychology, human geography, and consumer behaviour literatures (Williams et al., 1992). Place attachment to recreation settings has been described as consisting of at least two psychological dimensions; place dependence and place identity (Bricker & Kerstetter, 2000; Moore & Graefe, 1994; Williams et al., 1992). Place dependence refers to the functionality of a site for a particular recreational activity. Dependence is a function of how the setting compares with alternatives in the achievement of recreation goals. When the activity being performed at the site is the dominant characteristic of the experience, the setting is viewed in terms of its functionality. The site is valued for its attributes (such as stocked lakes for fishing) that facilitate participation. In contrast, place identity captures the emotional bond between an individual and a recreational site (Moore & Graefe, 1994; Williams et al., 1992). It encompasses an emotional attachment to the site such that the site becomes part of one's self-identity.

Despite the efforts to conceptualize, quantify, and demonstrate the usefulness of place attachment from a management perspective (Kaltenborn, 1997; McCool & Martin, 1994; Stedman, 2002; Williams et al., 1992), the effect of place attachment on recreation behavior remains unclear. Williams et al. (1992) postulated that as individuals become attached to a site they perceive fewer suitable substitutes for the site and are less willing to substitute alternate sites. In terms of site choice, we hypothesize that as attachment increases, the number of trips to the site increase because recreationists perceive fewer sites as adequate substitutes.

Recreationists will focus their choice on sites to which they have an emotional attachment or on sites that facilitate recreation goal achievement. In order to incorporate these long run emotional attachments into traditional recreation demand models, we utilize a structural equation model to estimate recreation demands. The conceptual and empirical merits as well as the limitations of this approach are discussed and the welfare measures it generates are compared with that from a traditional TCM.

2. A conceptual model

The goal in this paper is to develop a recreation demand model that incorporates place attachment. Although the factors influencing the intensity and form

[2] McConnell, Strand, and Bockstael (1990) developed a trip demand model in which these features were formally incorporated.

of attachment to recreation sites are not well established, exposure and repeated visits to a site are generally considered to be prerequisites to the development of an emotional bond. The model proposed by Moore and Graefe (1994) comes close to our goal. They developed a conceptual model of place attachment formation that included use history, place dependence, and place identity. They proposed that the more frequent the visitation to a site, the more an individual perceives fewer suitable alternative sites, and that he or she comes to depend on that site to facilitate participation in a recreational activity. As recreationists become dependent on a site they visit it many times and are likely to develop emotional-symbolic meanings for the site. Thus, the length of time a person has been associated with a site and how dependent they are on it influence place identity (Moore & Graefe, 1994).

The development of place attachment to recreation settings becomes stronger with repeated visits (Eisenhauer, Krannich, & Blahna, 2000; Moore & Graefe, 1994; Williams et al., 1992). Thus, place attachment is probably a function of use history such as the length of time an individual has been associated with a site, and the frequency of their visits to it. Repeated visits over time to a site should also have an important role on current visitation as predicted by the habit formation literature. Thus, a key component of the recreation demand model with place attachment must be the central role that habits or past trips play in the determination of current trip levels.

At the outset it must be acknowledged that economists and social psychologists may be measuring effects on recreation that differ in terms of the temporal scale of analysis. For instance, the economic recreation demand literature typically involves short run analysis where the data involve annual or seasonal trips and the welfare measures that arise are rather short term in nature. Most TCMs may not incorporate medium or long run behavioural adjustments that may occur in response to changes in the recreation setting. On the other hand, the focus in the place attachment literature explicitly involves past behaviour and therefore these models would be more long run in nature.

In Fig. 1 we pose a model of place attachment and recreation demand that attempts to merge the features of the traditional single site TCM with some long run features of the place attachment literature. The model proposes that the frequency of use of a site (habits) influences both place dependence and place identity positively, and that place dependence has a positive influence on place identity. These three endogenous concepts (η_1, η_2, η_3) are hypothesized to have both direct and indirect effects on current trip levels (η_4).

Our model includes exogenous concepts such as costs and individual specific characteristics. It is well established in the recreation literature that the frequency of visits to a specific recreational site is influenced by the distance from home, the number of alternative sites, demographic characteristics of the recreationist, and importance of the activity at the site to the recreationist. The greater the distance and the more alternative sites become available, the less frequent the use. Younger users, men, and members of recreation or conservation-related organizations tend to be more frequent users of natural resource oriented areas such as national parks (Manning, 1999, pp. 16–48). Moore and Graefe (1994), in their analysis of place attachment, found that importance of the activity performed at the site is associated with more frequent use of a site.

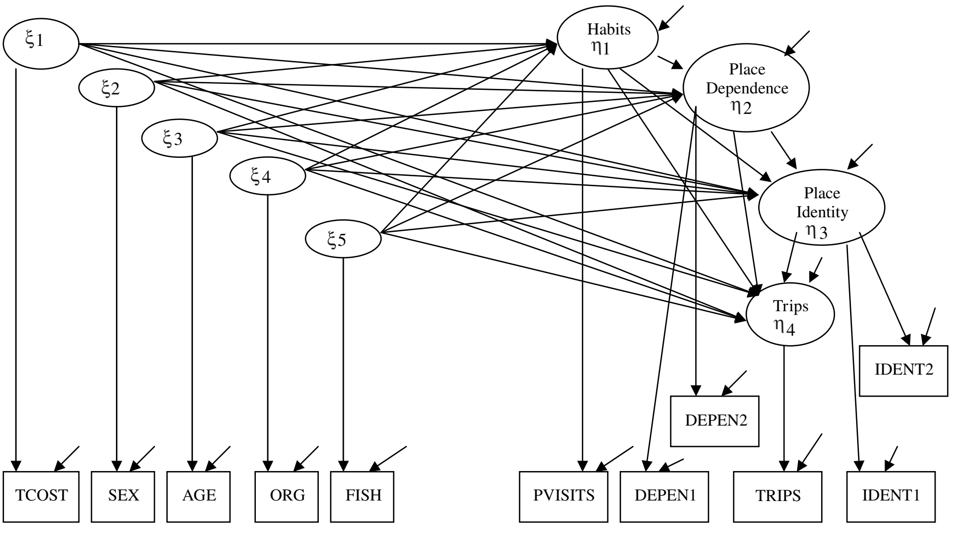

Fig. 1. The postulated model of recreation demand and place attachment.

Place attachment is related to the activities performed at a site, length of stay, group size and type, mode of travel, distance from a user's home to the site, social–cultural experiences, and user demographics (Eisenhauer et al., 2000; Moore & Graefe, 1994; Williams et al., 1992). Men, older users, and members of outdoor recreation or conservation-oriented organizations exhibit stronger attachment to recreation sites (Williams et al., 1992). Social–cultural experiences are often shared through formal organizations such as outdoor clubs or conservation-oriented organizations that convey norms, standards, and beliefs and may shape the perceptions of an individual's relationship with a recreational site (Bryan, 1977). Organizations, for example, may serve to convey meanings to places by communicating what is unique, special, and important about them. Thus, it is expected that belonging to an outdoor recreation or conservation-oriented organization will have a positive influence on place attachment.

Sport fishing is a prominent recreational opportunity available at many of the sites in this Canadian study, attracting many anglers. Hence, visitors to these sites may be dependent upon them for the quality of the fishing experience (place dependence). Recreational activities are also important in the development of emotional attachment to place because they allow an individual to acquire knowledge of the place through direct experience and repeated visits allow time for bonds to form with the site (Eisenhauer et al., 2000; Moore & Graefe, 1994). Hence, it is expected that individuals who visit sites in this study primarily to participate in sport fishing will exhibit stronger place dependence and place identity.

Individuals living near a site will have more opportunity to visit and hence develop emotional attachments to it (Moore & Graefe, 1994). Thus, we expect place attachment to have a negative association with distance traveled to the site. Conversely some individuals who develop attachment to a particular site may actually move closer to it so they can access it more frequently (e.g., see Parsons, 1991).

Based on the discussion above there are a number of candidate exogenous concepts that would influence a model of current trips to a site. These include an individual's travel costs from their residence to the site, their gender and age, recreational activities conducted at the site, and whether they are members in conservation organizations. These exogenous concepts are hypothesized to directly affect all four of the endogenous concepts in Fig. 1 and thus have direct and indirect effects on current trip levels.

In addition to exploring whether the model would be consistent with empirical data, a number of specific hypotheses based on the extensive recreation demand literature can be developed from this model. First, one would expect that travel cost has a direct negative causal effect on the current number of trips – the higher the travel costs the fewer the trips taken. This effect would be similar to the regression parameter on travel costs estimated in a typical travel cost model (e.g., Boxall, McFarlane, & Gartrell, 1996). By incorporating place attachment, however, one would also expect travel costs to have negative indirect causal effects on current trip demands via the individual's place attachment. These arise from the hypothesized negative effects of travel costs on place attachment found by Moore and Graefe (1994). Indirect effects, if present, would affect measures of the impacts of costs on the current number of trips and suggest that the travel cost parameter in typical TCMs may be biased. As a result measures of the economic benefits of recreation using traditional TCMs may also be biased.

Second, we hypothesize that the formation of recreation habits will have direct positive effects on place attachment and current trip levels and an indirect effect on current trip levels through place attachment. These linkages come from the theory discussed above. The effect of travel costs on habits is uncertain. This comes from the possibility that recreationists may choose residential location based on their recreation visitation patterns and thus they may choose to live close to sites to which they are attached (e.g., Parsons, 1991). If the influence of travel costs on habits is statistically significant, the potential bias in the consumer surplus estimate using only the direct effect of travel costs on current trips (as current most TCMs employ) becomes more complex to examine. Unless TCMs include variables for habits, place identity and place dependency, measuring the simple relationship between travel costs and visits incorporates direct and indirect effects of travel costs in a biased manner because other important variables which influence visits through the place attachment variables are not formally considered.

The hypothesized relationships identified in Fig. 1 were tested with a set of empirical recreation data using structural equation models. If the data support the model, then examination of consumer surplus estimates derived from the model can be compared with those from a traditional TCM estimated using the same data. If the data does not support the model, then adjustments to the model would be justified.

3. Methods

The study area was located in the Foothills Model Forest (FMF) of Alberta Canada. The FMF consists of 2.75 million ha located in the foothills of the Rocky Mountains in west-central Alberta. Interviews ($N = 1436$) were conducted with Alberta residents at campsites in 12 provincial recreation areas, William A. Switzer Provincial Park, and 29 car-accessible unmanaged (random) sites in the FMF during the summer of 1996. Information collected from the interviews included camping characteristics, activities, place attachment, and collected names and addresses of campers for a follow-up mail survey (see McFarlane, Fisher, & Boxall (1999) for sampling details). A total of 1307 respondents agreed to receive a mail survey. Because of the amount of information and variety of topics to be addressed, two mail surveys were designed. The first survey was mailed in November 1996 and the second in May 1997. The second survey was sent to only those who had returned the first. Both surveys consisted of an initial mailing, followed by a reminder postcard about one week later, and a second survey was sent about one month after the initial mailing to those who had not responded. Adjusting for questionnaires that could not be delivered, a response rate of 78% was attained on the first survey and 82% on the second. Combining responses from all three surveys resulted in 570 observations for the analysis.

3.1. Variables in the analysis

Table 1 describes the variables used in the analysis. Place attachment was measured as attachment to the campground where the interviews with respondents were conducted. Place attachment was measured using 11 statements from Moore and Graefe's (1994) study of attachment to trails, modified to suit a camping setting. Three statements were hypothesized to represent place dependence and eight were hypothesized to represent place identity. Respondents rated the statements on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. Where there are multiple indicators of an endogenous concept Hayduk (1996, p. 25) recommends using the best two or three indicators in a structural equation model. Assessing which are the best indicators is based on appropriate wording of the question, sufficient variance, etc. We used principal components to assess which variables to use as indicators. The principal components with varimax rotation identified two factors corresponding to place identity and place dependence: nine statements loaded on place identity and two on place dependence. The two statements with highest loadings on the place identity factor and the two that loaded on place dependence were used as indicators of the place attachment concepts in the structural equation model. The following statements were used to represent place identity: "You are very loyal to this camp ground" (IDENT1) and "This campground means a lot to you" (IDENT2). Place dependence was represented by "The activities you do at this campground you would enjoy as much at another place" (DEPEND1) and "The activities you do at this campground could just as easily be done elsewhere" (DEPEND2).

Travel cost (TCOST) was calculated using the formula in Table 1 which is the standard approach in the applied economic literature (e.g., Englin, Boxall, Chakraborty, & Watson, 1996). The foundation of this variable is the distance between the site at which a respondent was interviewed and their residence. A road map was used to calculate the round trip distance each respondent was expected to travel from their residence to the campground where they were interviewed. Expenses of

Table 1
Information on the variables used in the analysis ($N = 275$)

Variable name and origin	Description	Mean	SD
Mail surveys			
AGE	Respondent's age in years	41.76	11.68
SEX	1 = male; 0 = female	0.41	0.49
ORG	1 = member of a recreation or conservation-related organization 0 = else	0.23	0.42
TRIPS	Number of trips to the campground in 1996	2.41	3.36
Onsite survey			
PVISITS	Number of trips taken to the campground in the previous 10 years	12.91	35.81
FISH	1 = primary onsite activity was fishing 0 = some other activity	0.31	0.47
IDENT1	You are very loyal to this campground 1 = strongly disagree 5 = strongly agree	2.95	1.08
IDENT2	You get more satisfaction out of visiting this campground than from visiting any other camping place 1 = strongly disagree 5 = strongly agree	3.74	0.97
DEPEND1	The activities you do at this campground you would enjoy as much at another place 1 = strongly disagree 5 = strongly agree	3.65	0.93
DEPEND2	The activities you do at this campground could just as easily be done elsewhere 1 = strongly disagree 5 = strongly agree	3.50	0.97
Derived variable			
TCOST	Estimated travel costs from respondent's residence to the campground (\$) using the following formula: $(\$0.5\ \mathrm{km}^{-1}) * \mathit{Distance} + (\frac{\mathrm{Distance}}{80\ \mathrm{km/h}} * \frac{\mathrm{Income(\$)}}{2040\ \mathrm{h}}) * \frac{1}{3}$	112.77	78.84

$0.50 km^{-1} were used as an estimate of the out-of-pocket costs for vehicle expenses (e.g., gas, oil, etc.). The opportunity cost of travel time was estimated using respondents' estimated wage rates and average travel speeds of 80 km/hr. Wages were estimated using household income (before tax) in 1996 [3] and assuming each respondent worked 2040 h in the year.

3.2. Structural equation models

Structural equation models (SEMs) are multivariate regression (i.e., multi-equation) models. The response variables in one regression equation in an SEM may ap-

[3] There were 11 income categories ranging from less than $10,000 to more than $100,000 per year (in $10,000 intervals). Midpoints of the categories were used in the travel cost calculation.

pear as a predictor in another equation. Variables in an SEM may influence one-another reciprocally, either directly or indirectly or through other variables as intermediaries. In general, a SEM is used to capture the causal influences of the exogenous variables on the endogenous variables and the causal influences of endogenous variables upon one another.

An SEM incorporates several different approaches to representing these models. The general SEM and measurement sub-models for Fig. 1 are given as follows (Jöreskog & Sörbom, 1996, p. 870):

$$\text{Structural equation model:} \quad \eta = B\eta + \Gamma\xi + \zeta, \tag{1}$$

$$\text{Measurement model for } y\text{:} \quad y = \Lambda_y\eta + \varepsilon, \tag{2}$$

$$\text{Measurement model for } x\text{:} \quad x = \Lambda_x\xi + \delta. \tag{3}$$

The first equation represents the formal model relationships where η is a $m \times 1$ random vector of latent dependent or endogenous variables, ξ is a $n \times 1$ random vector of latent independent or exogenous variables, and ζ is a $m \times 1$ vector of equation errors (random disturbances) in the structural relationship between η and ξ. The two coefficient matrices estimated in the SEM are B which is a $m \times m$ matrix of coefficients (each individually designated β_{mm}) of the η variables in the structural relationship, [4] and Γ which is an $m \times n$ matrix of coefficients (each individually denoted γ_{mn}) of the ξ variables in the structural relationship. The additional equations represent the measurement models for the SEM. y is a $p \times 1$ vector of observed indicators of the dependent latent variables η; x is a $q \times 1$ vector of observed indicators of the independent latent variables ξ; ε is a $p \times 1$ vector of measurement errors in y; δ is a $q \times 1$ vector of measurement errors in x; Λ_y is a $p \times m$ matrix of coefficients of the regression of y on η; and Λ_x is a $q \times n$ matrix of coefficients of the regression of x on ξ. In order to identify the model, many of the parameters in the equations above must be constrained, typically by setting parameters to 0 or 1, or by defining certain parameters to be equal.

One aspect of SEMs of interest is that the indicator variables (i.e., y and x) can be allowed to have measurement error (ϵ and δ). This feature of SEMs is of interest in this study since travel costs, an important component of recreation demand models (including this one), cannot be measured with certainty (Randall, 1994). There are also theoretical issues regarding the opportunity costs of travel time that plague the accurate measurement of travel costs. The degree of measurement error of any indicator can be imposed in an SEM and this allows the researcher to examine the sensitivity of parameters to the degree of measurement error. Following Hayduk's (1987) recommendations error values of about 5% were imposed for all indicator variables in the model except the travel cost indicator which was set at 15% and the gender indicator which was 1%. This variation in the travel cost indicator was imposed to examine its effect on the estimation of consumer surplus (see below). For testing model fit the SEM with travel cost indicator measured with 15% error was used.

[4] Note that B has zeros in the diagonal and that $I - B$ is required to be non-singular.

To estimate the parameters of the SEM the following fit function (F) is minimized so that the discrepancy between the covariance matrix (S) observed in a set of empirical data and the model-implied covariance (Σ) matrices is zero or very low or "nearly zero."

$$F = \left[\mathrm{tr}(S\Sigma^{-1}) + \log(\Sigma) - \log(S) - (p+q)\right]. \tag{4}$$

In this function, p is the number of observed indicators of the endogenous concept and q is the number of observed exogenous concepts.

Although there is no consensus about the criteria required to assess model fit, the chi-square fit index is the most commonly reported. For a good model fit, the χ^2 value should not be significant. A number of additional goodness of fit measures can also be used to assess model fit. The root mean-square error of approximation (RMSEA, also called discrepancy per degree of freedom) provides an indication of the discrepancy between the observed and model generated covariances (Byrne, 1998; Jöreskog & Sörbom, 1996). A RMSEA value below 0.05 indicates a good fitting model and values up to 0.08 indicate a reasonable fitting model; values ranging from 0.08 to 0.10 indicate a poor fit; and those greater than 0.10 indicate a very poor fit (Byrne, 1998; de Jong, 1999).

The adjusted goodness of fit index (AGFI) measures how much better the model fits compared to no model at all (Jöreskog & Sörbom, 1996). Values should be between 0 and 1, with a negative number indicating the model fits worse than no model at all. Hayduk (1996, p. 219) found that a value <0.95 on the AGFI indicates a poor fitting model. AGFI values greater than one imply just identified models with almost perfect fit; a value larger than 0.90 suggests an acceptable good fit (Byrne, 1998; de Jong, 1999).

Other model test criteria used in this study include the Akaike Information Criterion (AIC) and Expected Cross-Validation Index (ECVI). AIC [5] is a goodness-of-fit measure reflecting the discrepancy between model-implied and observed covariance matrices. AIC values close to zero suggest a good model fit. If one estimates two competing models, a model with lower AIC is more preferable. ECVI [6] is also used to measure the discrepancy between model-implied and observed covariance matrices. Lower values of ECVI also suggest better model fit.

4. Results and discussion

4.1. Model tests

LISREL 8.54 software (Jöreskog & Sörbom, 1996) was used to estimate the parameters of the SEM shown in Fig. 1. The variance–covariance matrix used to fit the SEM was calculated using SPSS based on half of the data ($N = 275$). The other

[5] $\mathrm{AIC} = ((\frac{\chi^2}{n}) + (\frac{k(k+1)-2\,\mathrm{df}}{n-1}))$ where k is number of variables, df is degrees of freedom and n is the number of observation (Branham & Anderson, 1998).

[6] $\mathrm{ECVI} = F(S, \sum(\hat{\theta})) + \frac{2k}{N-1}$ where $F(S, \sum(\hat{\theta}))$ is the minimum of the fit function, k is the number of parameters estimated, and N is the number of observation (Browne & Cudeck, 1989).

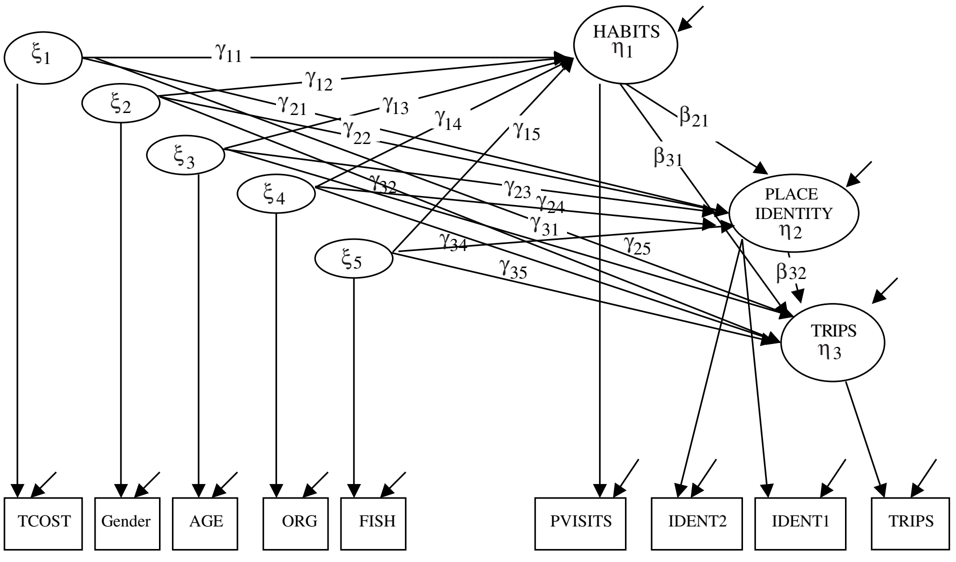

Fig. 2. A revised model of recreation demand and place attachment.

half of the data was used to test the model. The first step in the analysis was to test for the initial hypothesized recreation model (Fig. 1). For the initial structural model $\chi^2 = 31.78$; df = 17; $p = 0.016$. This significant χ^2 value, along with the descriptive model fit measures and tests (RMSEA = 0.056, AGFI = 0.920, AIC = 129.782, ECVI = 0.474), implied that the proposed model failed to fit the empirical data.

The next step was to find the best fitting model by adding or removing relationships that are consistent with the underlying theory using a nested model approach. Modification indices suggested that the place dependence concept should not be included in the model. One probable reason could be the absence of variability in site-specific attributes or activities that would cause most recreationists in the sample to perform the same activities. As a result, the place dependence construct may not have enough variation across the sample of users. The model was then re-formulated by removing the place dependence variable, resulting in a second model that was clearly nested in the original model (Fig. 2). The fit criteria suggest that the empirical data fit this adjusted model ($\chi^2 = 4.83$, df = 7, $p = 0.681$, RMSEA = 0.000, AGFI = 0.975, AIC = 80.827, ECVI = 0.303).

To further support the use of this adjustment to the original model, the covariance matrix from the remaining portion of the dataset was found to fit this second model ($\chi^2 = 10.4237$, df = 10, $p = 0.4041$, RMSEA = 0.01329, AGFI = 0.9570, AIC = 80.4237, and ECVI = 0.3351).

4.2. Best fitting model results

The parameter estimates of the best fitting SEM (model 2) are shown in Table 2. All parameter estimates have the expected signs. Habits (past trips) have both direct

Table 2
Maximum likelihood estimates of structural path coefficients for the travel cost model with habits and place identity ($N = 275$)

Variables	Habits ($\eta 1$)			Place identity ($\eta 2$)			Current trips ($\eta 3$)		
	Parameter label	Coefficient (t ratio)	Standardized coefficient	Parameter label	Coefficient (t ratio)	Standardized coefficient	Parameter label	Coefficient (t ratio)	Standardized coefficient
Travel costs	γ_{11}	-0.2215^{**} (-5.4822)	-0.3695	γ_{21}	-0.0007 (-0.6245)	-0.0445	γ_{31}	-0.0102^{**} (-4.1576)	-0.2645
Gender	γ_{12}	-5.2793 (-0.9460)	-0.0600	γ_{22}	0.2347^{*} (1.7533)	0.1068	γ_{32}	1.0612^{**} (3.4086)	0.1869
Age	γ_{13}	0.2849 (1.1345)	0.0728	γ_{23}	0.0078 (1.2870)	0.0794	γ_{33}	-0.0061 (-0.4340)	-0.0240
Organizational membership	γ_{14}	14.0620^{**} (2.0748)	0.1348	γ_{24}	0.0062 (0.0374)	0.0024	γ_{34}	0.7489^{**} (1.9757)	0.1114
Primary activity	γ_{15}	7.7080 (1.2003)	0.0786	γ_{25}	0.1130 (0.7329)	0.0462	γ_{35}	0.5981^{*} (1.6788)	0.0946
Habits				β_{21}	0.0095^{**} (5.2899)	0.3817	β_{31}	0.0164^{**} (3.6328)	0.2545
Place identity							β_{32}	0.3578^{**} (2.2157)	0.1385
R^2		0.1673			0.182			0.322	

** and * refer to 5% and 10% levels of significance, respectively.

and indirect effects, mediated by place identity, on current trip levels. Fixing the mechanism providing indirect effects, a unit increase in the number of previous visits in the past 10 years (i.e., habit formation) is expected to increase the number of current trips by 0.0164. The magnitudes of the standardized parameter estimates (Table 2) suggest that habits have a stronger direct effect on current trips levels than does place identity. However, the habits concept has a very strong effect on place identity; stronger than any of the exogenous concepts examined in the model. Based on these results, we cannot reject the hypothesis that habit formation and place identity have direct effects on recreation demand. This strongly suggests that the inclusion of habits and place identity in a traditional travel cost model of these data is warranted.

We also fail to reject the hypothesis that travel costs have a direct negative effect [7] on the current number of trips, as suggested by the significant negative parameter. Holding mechanisms providing indirect effects fixed, a hypothetical dollar increase in travel cost is expected to decrease the number of current trips by 0.0102 units. The standardized parameters, also shown in Table 2, suggest that travel costs have a stronger effect on habits than on current trip levels. Therefore, travel costs have significant indirect effects on current trip levels that operate through habits. These include the effect from travel cost via habits to current trips, and the effect from travel cost via habits to place identity to trips as indicated in Fig. 2. Thus, counting the direct effect of travel cost, there are three routes through which travel costs influence recreation demand in the model. These results support our initial hypothesis that travel cost has both direct and indirect effects on the demand for recreation.

The influence of respondent characteristics on number of current trips, habits and place attachment are also investigated using the structural parameters. The results in Table 2 suggest that organizational membership has a statistically significant influence on habit formation and number of current trips. Being male has a significant influence on number of trips at the 5% significance level and a significant effect on place identity at the 10% level. Age and fishing appear to have no effect on any of the endogenous variables.

4.3. Estimation of consumer surplus from the model

Having shown that place identity and habits play a role in this recreation demand data, a natural question is the effect of incorporating these variables in the estimation of the economic value of trips to the recreation sites. The derivation of these values is an important use of TCMs. It is straightforward to prove that the consumer surplus for the simple linear demand curve can be estimated using the formula $(-\frac{Q^2}{2\beta_{\mathrm{TCOST}}})$, where Q represents the number of trips and β_{TCOST} is the parameter on the travel cost variable (e.g., Ward & Beal, 2000). This formula simplifies to $(-\frac{1}{2\beta_{\mathrm{TCOST}}})$ when

[7] The total effect of exogenous concepts on endogenous concepts is given by $T_{\eta\xi} = (I - B)^{-1}\Gamma$. The indirect effect of exogenous concepts on endogenous concepts is $T_{\eta\xi} = ((I - B)^{-1} - I)\Gamma$ (Hayduk, 1987). Thus, the total effects of travel cost on the number of trips can explicitly be obtained from: $T_{\eta_3\xi_1} = \gamma_{11}(\beta_{32}\beta_{21} + \beta_{31}) + \gamma_{21}\beta_{32} + \gamma_{31}$ where $\gamma_{11}(\beta_{32}\beta_{21} + \beta_{31}) + \gamma_{21}\beta_{32}$ is the indirect effect and γ_{31} is the direct effect.

calculating the consumer surplus for a single trip. First, we estimated the following traditional single site TCM using OLS where trips was the dependent variable and the exogenous variables in model 2 were the independent variables. The resulting equation was:

$$\underset{(\mathrm{SE})}{\mathrm{TRIPS}} = \underset{(0.685)}{2.795} - \underset{(0.002)}{0.0126}\,\mathrm{TCOST} + \underset{(0.324)}{1.059}\,\mathrm{SEX} + \underset{(0.014)}{0.002}\,\mathrm{AGE} + \underset{(0.368)}{0.948}\,\mathrm{ORGS} + \underset{(0.348)}{0.743}\,\mathrm{FISH}$$

Using the model coefficient, a surplus estimate ($\mathrm{CS_{OLS}}$) of \$39.69 CDN per trip to the sites in the study was calculated from this simple TCM. The mean and standard deviation of this measure, derived using Monte Carlo simulation procedures with 1000 draws yielded a mean (SD) of \$40.67 (7.20). This surplus estimate is similar to those from other travel cost studies that have examined the value of trips to camping sites in the region (e.g., Boxall et al., 1996; McFarlane & Boxall, 1998).

Computing the surplus estimate from the structural equation model is a more complex process, however. Essentially the analyst must consider whether to use the direct effects of travel costs in computing the welfare measure or the total effects of travel costs (i.e. direct and indirect effects). This decision involves consideration of the effects of travel costs on the endogenous concepts on trip levels and since these involve long run time horizons (habits and place attachment), the SEM has the potential to provide two surplus measures. To place this decision in context, consider a price change, such as increase in an entry fee which increases the travel cost variable. As these costs increase, the number of trips would fall and holding habits and attachment constant, the short run surplus/trip would only involve the direct effects. This measure is labelled $\mathrm{CS^{DE}_{SEM}}$. The second surplus measure, $\mathrm{CS^{TE}_{SEM}}$, utilizes the total effect of travel costs since as the number of trips falls, habits and attachment could also change.

For the model in Fig. 2 considering only the direct effect of travel costs on trips using the estimated parameter in the SEM with an assumed 15% measurement error, $\mathrm{CS^{DE}_{SEM}}$ is \$49.02 and for the total effect $\mathrm{CS^{TE}_{SEM}}$ is \$33.70 per trip. The simulated means (SD) are \$52.99 (17.84) and \$34.86 (6.19) per trip respectively. Comparing these measures to $\mathrm{CS_{OLS}}$ would be misleading, however, since travel costs in the SEM were measured with an assumed 0% error in the OLS model and a 15% error in the SEM. Thus, the parameters of the SEM were estimated a second time with the travel cost indicator measured with 0% error. [8] Calculating the SEM surplus measures using the parameters for the 0% measurement error model, $\mathrm{CS^{DE}_{SEM\,0\%}} = \$58.82$/trip and $\mathrm{CS^{TE}_{SEM\,0\%}} = \$39.68$/trip. The $\mathrm{CS^{TE}_{SEM\,0\%}}$ is the same as $\mathrm{CS_{OLS}}$; and $\mathrm{CS^{DE}_{SEM\,0\%}} > \mathrm{CS_{OLS}}$. The mean surplus measures (SD) for $\mathrm{CS^{DE}_{SEM\,0\%}}$ and $\mathrm{CS^{TE}_{SEM\,0\%}}$ using the Monte Carlo simulation procedures with 1000 draws are \$61.65 (16.89) and \$40.31 (6.61) respectively. Using the procedures for measuring the difference between empirical distributions outlined by Poe, Giraud, and Loomis (forthcoming) the $\mathrm{CS^{DE}_{SEM\,0\%}}$

[8] This model is not reported in the paper, but the parameter signs, model fit, and general results are not different than those for the 15% error model. The parameter estimates and other information for the 0% model are available from the authors upon request.

and CS_{OLS} are statistically different ($\alpha = 0.0794$; $P < 0.10$) and the CS_{OLS} and $CS^{TE}_{SEM\,0\%}$ measures are statistically similar ($\alpha = 0.507$; $P > 0.50$).

These surplus estimates provide some interesting insights. First, in the presence of price changes we argue that the direct effects of travel costs would provide the correct welfare measure. In this empirical example, the welfare effect of a price change in the presence of habits and attachment to the site is higher than that provided by the simple single site TCM. Thus, for short run policy changes the simple TCM would underestimate the welfare impact of the price change. However, for other policy changes (i.e. site closures), or to understand the long run welfare effects, the habits and attachment concepts would adjust over time to also affect the welfare measure. In the empirical case examined in this study the TCM estimate and the SEM estimate using total effects provided the same result. Thus, the travel cost parameter from the simple TCM estimated using OLS incorporates the effects of adjustments in habits and place attachment. The advantage of estimating the TCM using the SEM with place attachment and habits offers analysts the ability to clarify the nature of the effect of costs on trips.

Second, the issue of the accuracy of the measurement of travel costs appears to be an important consideration in the estimation of welfare measures. While this is not a novel finding (e.g., Common, Bull, & Stoeckl, 1999; Randall, 1994) the imposition of measurement error in the SEM model allowed some understanding of how critical this consideration may be. We initially considered the measurement of travel costs to be accurate within an arbitrarily chosen 15% error. To compare this with the simple TCM (which assumes 0% error) a second SEM was estimated with travel costs measured with 0% error. Comparing the various mean SEM estimates, $CS^{TE}_{SEM\,15\%} < CS^{TE}_{SEM\,0\%}$ and $CS^{DE}_{SEM\,15\%} < CS^{DE}_{SEM\,0\%}$. This information suggests increasing measurement error in the travel cost variable may reduce the resulting welfare measure. Of course determining the accuracy with which travel costs are measured is a complex undertaking and will require considerable future empirical research.

5. Summary and conclusion

This empirical study suggests that place attachment variables could play an important role in recreation demand models. Estimating a travel cost model which included these attitudinal indicators suggested some interesting improvements. In the SEM model estimated in this study including habits (frequencies of past trips to sites) and the place identity construct of place attachment were statistically significant features in determining the number of current trips. Furthermore, the analysis uncovered that travel costs have significant influence on recreation habits and place identity as well as the current number of trips. Thus, formal inclusion of recreation habits and place attachment in consumers' recreation trip choices sheds additional light on the relationship between trips and costs and has thus the potential to affect the estimation of per trip consumer surplus. This potential may be related to the policy context; short run affects of price changes have different welfare affects than long run policy changes where habits and place attachment can adjust.

While this study is instructive, there are a number of caveats that represent avenues for future research. First, the TCM structure examined in this study was a single site framework. There was no formal consideration of the availability of substitute sites. The omission of substitutes in the traditional travel cost framework has been found to affect the benefit estimates (e.g., Rosenthal, 1987). Including substitutes more formally in the SEM developed in this paper would be a complex undertaking. For example, recreationists may also have various degrees of attachment to various substitutes and these degrees of attachment may affect the relevant set of substitutes available in cases of site closure or price changes. Thus, substitutes could allow for more interesting but complex patterns of habits and place attachment considerations. Gathering the data to uncover these factors would permit the development of richer models of recreation behaviour, but probably at the cost of a significantly higher data collection effort. This effort was beyond the scope of the current study. To illustrate, the data required for the SEM reported in this paper involved the administration of on-site surveys and mail questionnaires to a small sample of recreationists. The on-site interview was necessary to gather the place attachment information relevant to the site currently visited, while the questionnaire was required to gather data on the seasonal trip locations and frequencies. This involved a data collection exercise that was not a trivial undertaking. Collecting the social psychological information for a set of sites from each individual recreationist would be a significant undertaking.

Second, the functional form of the SEM employed in this study was linear and the regression residuals were assumed to have a multivariate normal distribution. It is well known that recreation demand is often characterized by non-linear relationships among current trips, costs and other explanatory variables and that recreation data frequently is inconsistent with the assumptions of the traditional OLS model (e.g., Ward & Beal, 2000). SEMs estimated using maximum likelihood procedures (which were utilized in the present study) have been found to perform well under conditions of misspecification and non-normality (Olsson, Foss, Troye, & Howell, 2000). Whether formal consideration of non-linear functional forms would affect the conclusions reported in this paper is uncertain, however.

Finally, the development of the recreation demand model with place attachment and habits in this study raises the question of temporal dynamics in recreation settings. Except for Adamowicz (1994) and McConnell et al. (1990) this is an area that has not been explored to a large extent in the travel cost literature. Understanding how habits and attachment to sites develop over time would be an important contribution to the recreation demand literature.

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