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Choice set formation for outdoor destinations: The role of motivations and preference discrimination in site selection for the management of public expenditures on protected areas ☆

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ABSTRACT

Effective public expenditure currently dominates the management focus of many protected areas. This calls for explicit modeling of constraints and motivations that, respectively, obstruct and stimulate visits to selected outdoor destinations. Choice set formation is the result of screening and/or inclusion of specific sites (alternatives) to form the set of sites considered in real choices. Evidence shows that the omission of a structural representation of choice set formation is harmful to econometric inference. Yet, the literature has largely ignored the underlying behavioral phenomenon. We show, using a discrete choice experiment involving selection among seven recreational sites in an Italian national park, that choice set formation is behaviorally relevant, even after controlling for preference discrimination. Motivations (why visit?) are important determinants of preliminary site screening for choice set inclusion, as well as site selection, justifying the additional value of such modeling extension.

Introduction

This paper focuses on the additional insights that a multi-layered destination choice model can convey in driving effective public expenditure in the management of protected areas. While access fees are one means to raise funds for the conservation of protected areas, implementing such fees is often too costly, either administratively or politically. Inevitably, in these cases, the bulk of the management funds still comes from general taxation. With the on-going squeeze in public finances ensuing from the 2008 financial crisis, the management of conservation areas has increased its focus on making expenditures more effective. We show how destination choice models can be extended to address a variety of features that can inform public expenditures for the conservation of protected areas in two important aspects. The first is the selective spatial allocation of specific services, which is a form of site-specialization. The second is the increase in monitoring efforts

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on selected site attributes to trace out the effectiveness of expenditure. To adequately measure effectiveness we extend the conventional destination choice model with heterogeneous preferences to account for choice set formation and preference discrimination.

Since the early work by Bockstael et al. (1987a, 1987b), random utility models (henceforth RUMs) have been employed to study demand for outdoor recreation (amongst others, Morey et al., 1993; Herriges and Kling, 1997; Provencher and Bishop, 1997, 2004) and the associated demand for environmental quality. These models explain observed choices over a finite set of mutually exclusive outdoor destinations, but typical applications tend to ignore certain behavioral processes that may act as substantive determinants of choice. We focus on two such aspects, the first of which is choice set formation and its determinants; the second is the ability of the data to discriminate between preference signals over random noise from the idiosyncratic error component. This latter phenomenon is sometimes referred to as 'preference discrimination' (Swait and Erdem, 2007), 'choice uncertainty' and 'choice consistency'. In choice models it takes the form of heteroscedasticity in stochastic utility, a topic which has been explored before in an environmental or resource economics setting (e.g. DeShazo and Fermo, 2002), albeit not in conjunction with choice set formation. The omission of relevant variables leads to mis-specification and biased welfare estimates and so does the omission of relevant behavioral processes. Hence, the exploration of substantive behavioral issues is of interest on its own account in terms of adding insight and realism to conventional choice models.

The theoretical importance of "choice set generating processes" was emphasized by Manski (1977), who also alerted economists to the consequences of the curse of dimensionality: as the number of alternatives increases, latent choice set generation models become quickly intractable, posing an obstacle to their application in contexts with many alternatives. In practice, the problem of defining choice sets, or the subset actually considered (the so-called "consideration" set), has often been solved by appealing to assumptions (a process termed 'choice set imputation')[1], which have been supported by arguments with varying degrees of plausibility. This commonly held assumption of "exogeneity" of choice sets from survey data is in stark contrast with the behavioral framework of random utility maximization. Endogenizing this process, in the sense of "making it dependent on data", poses several challenges. Despite the paucity of formal econometric models for this important component of choice analysis, the random utility paradigm and its significant extensions to discrete-continuous demand analysis (e.g. Phaneuf et al., 2000) has been very effective in the profession, with literally hundreds of applications to date.

A review of the existing literature in environmental economics reveals that only a few attempts have been made to explore the policy implications of endogenous choice sets in recreation demand models. In particular, these have focused on the importance of alternative assumptions on choice sets for the estimates of interest and their consequent role in policy and management decision for outdoor activities. To date, substantially less emphasis has been placed on the determinants of inclusion of individual sites in choice sets; this is therefore the first topic to which we wish to contribute with this paper.

The dependence of welfare estimates and visitation share forecasts on the assumptions concerning the size and composition of choice sets has been well-documented in nonmarket valuation for some time (Peters et al., 1995; Haab and Hicks, 1997; Parsons and Hauber, 1998; Parsons et al., 2000a, 2000b; Hicks and Strand, 2000). Very early applications, such as Caulkins et al. (1986), made some efforts to individualize choice sets by including for each respondent only the sites actually visited. However, Peters et al. (1995) were the first to truly "endogenize" the choice set using data collected in the Southern Alberta Sportfishing survey in 1991. They compared MNL models and their welfare estimates from three separate choice set imputations: (1) the set of all sites known to the researcher, (2) the answer to the survey question "which of these sites they had visited in the past or would consider when choosing a site to go fishing", and (3) randomly generated choice sets. The last set was determined on the basis of the results from McFadden (1978)[2] and repeated in recreation demand by Parsons and Kealy (1992). Welfare change estimates for site closures, tree planting and trout stocking all showed substantial sensitivity to the definition of choice sets.

Haab and Hicks (1997) would seem to be the only paper published in environmental economics that actually makes an attempt at modeling the determinants of the probability of inclusion of a candidate site into a visitor's choice set. This probability is integrated in the computation of the site selection probability by using a variant of the Manski's model (1977). This method relies on the sequential decomposition of the choice probability into the probability of including the site in the choice set and the probability of the same site providing maximum utility. As recognized by the authors, this is a rather restrictive assumption that might not be generally applicable, but it is nevertheless similar to assumptions made in other fields (e.g., Swait and Ben-Akiva, 1987; Horowitz and Louviere, 1995). The curse of dimensionality forced Haab and Hicks (1997) to implement the model in choice studies with a small number of destination sites (5 beaches in New Bedford and 12

[1] We distinguish between "choice set imputation" and "choice set formation". The former is used to describe the exercise of assigning a specific set of alternatives to a decision maker (e.g., sites visited in the past year), whereas the latter is reserved for the modeling of a probability distribution reflecting the likelihood that members of a collection of choice sets is the true choice set.

[2] McFadden (1978) shows that the Independence of Irrelevant Alternatives (IIA) Property of MNL models allows for consistent (though not efficient) estimation of utility function parameters using random subsets of alternatives (plus the chosen one) from the full set. This result is often misunderstood since it does not in any way address the topics of choice set imputation or formation. In fact, the whole point of that result is that choice is assumed to be made from among all alternatives, but the parameters of the utility function can be consistently estimated using a subsample of all alternatives; the result in no way implies that the choice set can be imputed to be a random subset, nor can one estimate a choice set formation model using multiple random samples of alternatives.

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