



Methodological and Ideological Options

What are the consequences of ignoring attributes in choice experiments? Implications for ecosystem service valuation

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ABSTRACT

This paper investigates the sensitivity of choice experiment values 3AL for ecosystem services to 'attribute non-attendance'. We consider three cases of attendance, namely that people may always, sometimes, or never pay attention to a given attribute in making their choices. This allows a series of models to be estimated which addresses the following questions: To what extent do respondents ignore attributes in choice experiments? What is the impact of alternative strategies for dealing with attribute non-attendance? Can respondents reliably self-report non-attendance? Do respondents partially attend to attributes, and what are the implications of this? Our results show that allowing for the instance of 'sometimes attending' to attributes in making choices offers advantages over methods employed thus far in the literature.

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1. Introduction

Over the past few decades, non-market valuation techniques have increasingly been utilised in policy design and appraisal to assess the economic value of environmental goods and services. Amongst the valuation methods developed by economists, the choice experiment (CE) approach has proved to be one of the most adaptable and widely-applicable (Adamowicz et al., 1997; Carson and Louviere, 2011); although their use still excites much controversy (Hanley and Barbier, 2009). The attraction of CE lies in the ability of the researcher to estimate values for changes in a number of attributes (for example, a number of ecosystem services supplied by a biome), as well as compensating or equivalent surplus measures of multiple changes in attribute levels. The CE method is based on a fundamental assumptions that people are willing to make trade-offs between different levels of the included attributes in order to maximise utility, and that they 'pay attention' to all of these attributes in making their choices. However, since the work of Hensher et al. (2005), evidence is emerging that (i) at least some respondents in CE are not willing to make trade-offs between certain attributes; and (ii) that not all attributes are considered by all respondents in making their choices. This raises a concern that choices violate the continuity axiom which underlies the conventional framework for individual choice, and thus that the method cannot be relied on to produce reliable estimates of economic value.

In this paper, we use a CE focussed on a range of ecosystem services associated with UK habitats to test for the occurrence of attribute non-attendance (AN-A) and to examine the effects that allowing for non-attendance econometrically has for preference estimation and willingness to pay calculations. Unlike previous studies, respondents are allowed to select an option that they 'sometimes considered' an attribute in choosing a policy option, rather than just that they 'always considered' or 'never considered' the attribute. Data is collected in a valuation workshop setting (Christie et al., 2006), which we argue should reduce the likelihood of respondents ignoring attributes in their choices as a way of reducing the difficulty of choosing (that is, as a choice heuristic). Finding evidence of attribute non-attendance in such participatory contexts poses greater challenges to the standard compensatory choice paradigm and to the values derived from choice experiments, since it is more likely to reflect an unwillingness to make trade-offs, rather than mental difficulties in making trade-offs.

To preview our main results, we find that allowing people to state that they 'sometimes' ignore an attribute has significant effects on both estimated preferences and welfare measures. Unlike some of the existing literature, we do not find that price is the most ignored attribute. Ignoring prices would be especially troublesome, since this undermines the calculation of willingness to pay.

2. Attribute Non-attendance in Choice Models: What Do We Know, and Why Does This Matter?

The standard approach to choice modelling is to assume that respondents' utility is determined by a utility function which is defined over a

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clearly defined set of attributes or characteristics of a good, one of which is its price. Most typically, a linear, additively separable form of the indirect utility function is used. The random utility perspective means that the researcher is only able to observe and thus model the deterministic aspects of behaviour. A key assumption is that individuals are willing and able to make trade-offs between the attributes of a good within the deterministic part of their utility function over the entire range of values that each attribute can take, as specified in the experimental design. Thus, there is always an additional amount of attribute X_1 that will compensate for a reduction in another, positively-valued attribute X_2 and keep the respondent on a given indifference curve. Whilst it is not necessary to assume that indifference curves between any two attributes are smooth, it is necessary that indifference curves are continuous. If this is not the case, then willingness to pay for some changes in attributes is not defined (Scarpa et al., 2009). The degree of attribute non-attendance and its causal factors are both critical to the derivation of economic value estimates from choice experiments.

Several researchers have looked for evidence to suggest that this assumption of compensatory preferences is untenable. Within the contingent valuation literature, one group of early studies considered evidence for lexicographic preferences (e.g., Rekola, 2003; Spash and Hanley, 1995). Lexicographic preferences imply that certain attributes or goods are always preferred to other goods or attributes, no matter what level they are supplied at. Lexicographic preferences are often taken to be incompatible with the derivation of WTP or WTA measures of value, since, for example, such preferences would not allow a reduction in environmental quality in exchange for an increase in income. Within choice modelling, evidence for non-compensatory preferences has followed a different tack, focussing on attribute non-attendance. Studies of this type include Hensher et al. (2005), Campbell et al. (2008) and Carlsson et al. (2010). Before reviewing the empirical findings of this work, we first consider the possible implications of different responses to non-attendance questions.

Consider a choice experiment where the researcher assumes that the deterministic portion of utility depends on three non-price attributes for a good, X_1 , X_2 and X_3 , and a price attribute, X_4 . Choice tasks are constructed which combine these four attributes at various levels. Respondents are then asked whether they paid attention to all four attributes in making their choices. Four types of response are possible, with a range of implications for how the researcher can interpret the resultant choice data.

First, some individuals may state that they always pay attention to all of the attributes in making their choices. Such individuals are behaving according to the standard model of choice in the choice experiment approach. Second, people may state that they did not pay attention to X_1 , or perhaps to X_1 and X_2 , in making their choices. One interpretation of this is that they do not care about the levels of these attributes over the range specified in the design, and that the researcher was wrong in assuming this in her experimental design. In this case, a marginal utility of zero should be allocated for this respondent for this attribute in coding responses. If the individual says they paid no attention to X_4 (the price), then this is particularly serious, since it mitigates against the calculation of welfare measures for people who do not attend to this attribute (Hess et al., 2012; Scarpa et al., 2009). Such responses may imply that the researcher has done a bad job of constructing a credible payment scenario, or set price levels which are much too low. If many individuals do not care about X_1 , then the parameter estimated for X_1 in the choice model should be statistically insignificant. Hess et al. (2012) consider this issue as a potential mixing-up of not caring about an attribute (and thus ignoring it in choices), and not caring about it very much: that is, mixing-up low with no utility being attached to an attribute.

An alternative interpretation is that respondents are ignoring X_1 , and perhaps X_1 and X_2 , as a way of simplifying their task in choosing between alternatives (Carlsson et al., 2010). Use of this boundedly-rational heuristic complicates matters for the researcher, since it does not signal

that the individual places no value on X_1 . Failing to allow for this motivation for ignoring X_1 will mean that welfare measures for changes in X_1 are biased downwards. Note that the respondent may state that they ignored an attribute despite the statistical evidence of their choices suggesting otherwise.

A third possible response is that an individual says that they only paid attention to one attribute (X_3) in choosing. Again, this makes possible a number of interpretations. It may signal that the individual has lexicographic preferences with respect to X_3 , so that all bundles are ranked solely with regard to the amount of X_3 supplied. In such cases, WTP is undefined for this attribute (although see Rekola, 2003). Alternatively, this may suggest that the respondent uses X_3 to choose in order to simplify choices. This might be true of respondents who focus solely on the price attribute.

A final possible response is that the individual states that they 'sometimes' pay attention to X_3 . This could suggest that X_3 becomes relevant to choice only when its level is within certain bounds. This would suggest use of a cut-offs model to analyse choice data (Bush et al., 2009); or that the statistical modelling of choice should take such "sometimes consider" responses into account in some other way. Allowing people to state that they "sometimes" consider an attribute, as well as 'always' or 'never' consider it would seem appropriate if this better describes how people choose. This is the approach followed in the experiment reported here. Before explaining its design, however, we first review the main findings that have been reported so far in the literature on attribute non-attendance (Lanscar and Louviere, 2006).

Hensher et al. (2005) was the first contribution to the CE literature on attribute non-attendance. In a study of commuters in Sydney, Australia, they show that allowing for the fact that some respondents stated that they did not pay attention to some attributes changed their estimates of the value of travel time savings. Campbell et al. (2008) applied choice modelling to the valuation of landscape attributes in Ireland which were affected by implementation of an agri-environment scheme. Respondents were asked whether they paid attention to all attributes in making their choices. Those who did were labelled as having 'continuous' preferences, and those who said they did not were labelled as having 'discontinuous' preferences. The authors found that 64% of the sample considered all attributes and 34% did not, but around one-fifth focussed on one attribute alone, and thus did not engage in any trade-offs. Price was the attribute which was least-attended to, and only two-thirds of respondents were willing to trade off at least one attribute against price. Campbell et al. found that explicitly accounting for attribute non-attendance in the choice model improved its statistical fit, and also reduced estimated WTP, although it did not change the ranking of attributes in terms of their implicit prices. They found that adjusting for relative scale differences (that is, differences in error variance) between continuous and discontinuous preferences was also effective. In a related paper, Campbell et al. (2011) use a latent class model to analyse attribute non-attendance in the same data set. Again, accounting for possible non-attendance reduced estimates of willingness to pay for landscape improvements, partly because of the high degree of non-attendance to price.

Carlsson et al. (2010) questioned respondents as to which attributes they took into account in choosing between the design of three different environmental policies in Sweden (policy on freshwater quality in lakes and streams; policies on the marine environment; and policies on air pollution). They found that around one-half of respondents claimed to ignore at least one attribute in choosing, and around one-third claimed to ignore at least two attributes. Price was the attribute most ignored according to these responses. One interesting feature of this work is that the authors find evidence that what people say about whether they ignore an attribute or not is not a very robust predictor of whether it statistically impacts on their choices. They interacted dummy variables for stated ignoring of an attribute with the level of this attribute, and found that the parameter on this interaction was insignificant, implying no significant difference in estimated preferences between

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