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Journal of Forest Economics

journal homepage: www.elsevier.com/locate/jfe



Information and visual attention in contingent valuation and choice modeling: field and eye-tracking experiments applied to reforestations in Spain

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ARTICLE INFO

Article history:

Received 27 March 2015

Accepted 21 September 2015

JEL classification:

C91

Q23

Q51

Keywords:

Stone pine

Stated preferences

Elicitation formats

Information processing

Visual attention

ABSTRACT

We test convergent validity of contingent valuation and choice modeling with field and eye-tracker data in an application for stone pine reforestations. Field results yield significantly different structural models and higher willingness to pay values in choice modeling. Eye-tracker results show that respondents devote relatively more time to attributes and the bid in choice modeling and that there are no significant differences in the total time used to answer. Divergences remain for modified formats that minimize visual and cognitive differences between methods. Using an attribute-stimulus format in contingent valuation or including dominant alternatives in choice modeling does not change results.

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Introduction

Contingent valuation (CV) and choice modeling (CM) are widely employed stated preference methods for environmental valuation. They pursue the same and do so by employing different formats and

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procedures. In CV respondents are asked whether or not they are willing to pay a given amount of money to receive an environmental good. CM uses an attribute-stimulus format and indicates not only whether a specific alternative is preferred to the status quo, but also whether it is preferred over other alternatives with different attribute levels.

Use of the CV method is a long-standing tradition in the environmental valuation field, while CM has become a competitor in recent years. This has resulted in several applications to the valuation of forest non-market benefits such as landscape (Hanley et al., 1998a,b), afforestations (Mogas et al., 2006; Caparrós et al., 2008), and recreation (Christie et al., 2007). Both methods derive from the same theoretical framework, the random utility model (McFadden, 1973), and should yield similar underlying preferences and willingness to pay (WTP) estimates. However, comparison studies generally find the opposite, with higher WTP values elicited with CM in most cases (Hanley et al., 1998a,b; Foster and Mourato, 2003; Scarpa and Willis, 2006; Christie and Azevedo, 2009). Although existing comparisons provide valuable information, there is not yet a clear conclusion about which method is more appropriate for estimating an economic value for an environmental good (see Literature review section). Consequently it is not surprising that both methods are still used in forest valuation (Lindhjem and Mitani, 2012; Varela et al., 2014).

One limitation from previous comparisons is that the models focus on decision outcomes (convergent validity of WTP and/or structural models); this likely does not provide enough information for the practitioner to discern which method to use. If results converge, any method can be used. If they diverge it is hard to know which one is more valid unless additional analyses are carried out. In this context, we explore in this paper two areas of research that can contribute to explain divergences between CV and CM results: the comparison of visual attention as part of the decision process and the effect of information on decision outcomes.

We start with a field study where we test, using split-samples, whether a standard CV and a standard CM exhibit similar structural models and WTP estimations. This sets up the baseline for our subsequent comparisons. The empirical context involves the valuation of a stone pine (*Pinus pinea*) reforestation project in the southwest of Spain. This tree species is widespread on the Iberian Peninsula, particularly in the southwest, and is recognized both for its commercial uses and for its environmental benefits (Ovando et al., 2010).

Then, we perform the same comparison in the lab, also with split-samples, using an eye-tracker, which is a screen that incorporates technology for measuring eye position, eye movement, gaze direction, and gaze points. We record with the eye-tracker respondents' visual attention to the different elements shown in the CV and CM valuation scenarios. Attention has been highlighted as an important aspect in decision making and a key element in some decision theories (Krajbich et al., 2010; Orquin and Mueller Loose, 2013). Only recently have some authors shown interest on the role of visual attention in stated preferences (Balcombe et al., 2014; Yang et al., 2015). Balcombe et al. (2014) distinguish between attention and attendance, indicating that a respondent may pay attention to the information provided in a CM exercise but may not attend that information. The reason is that attendance is related to the processing of the information and to the influence of information on respondent choices, while attention is a direct measure of the time devoted to the information. We focus on visual attention because this is the measure directly recorded by the eye-tracker; although attention is a necessary condition for attendance (zero attention leads to nonattendance).

The main motivation of the eye-tracking experiment is to test whether visual attention to the attributes is different in our CV and CM exercises and whether this could explain divergences in decision outcomes from our field study. Our hypothesis is that respondents pay less attention to the bid in CM because this format provides more information and emphasizes attribute and alternative trade-offs, while CV emphasizes the trade-off between the bid and the environmental good as a whole. Cameron and DeShazo (2010) argue that lack of attention could lead to attenuated utility parameters and therefore to biased WTP results; less attention to the bid would imply a smaller utility parameter and higher WTP estimates. If this were the case, it could partly explain the higher WTP values from CM (found in previous studies but also in our field application), possibly suggesting a potential bias in these estimates. Although our main interest is on the bid, we also compare the attention paid to the other attributes and the time used to answer the valuation questions. In addition, as different visual attentions do not necessarily have to impact utility, we test whether the attention to the attributes has

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