Uncertainty and framing in a valuation task

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A R T I C L E   I N F O

A B S T R A C T

Many stated preference studies report framing effects in responses to valuation questions. Framing in stated preference studies occurs when respondents use irrelevant information contained in the question to help them value the good. This may occur because respondents are uncertain or do not hold well-formed preferences for the good in question. We investigate if respondent certainty explains framing effects in a contingent valuation study, using data from a double bounded dichotomous elicitation format and a follow-up certainty question. We investigate if respondent certainty influences anchoring and the shift effect. We find evidence that the anchoring effect is stronger for respondents who are less certain about their response to the contingent valuation question compared to respondents who are very certain. However, the shift effect is significant and negative only for respondents who are very certain. Our results indicate that certain respondents are more consistent with the predictions of rational behaviour than uncertain respondents.

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1. Introduction

Stated preference methods are widely applied in many areas of public decision making, such as the environment, health, and transport. Stated preference methods use questionnaires and ask individuals their preferences (for example, their willingness to pay – WTP) for goods. These goods are typically public goods that are not traded in the market. Microeconomic theory assumes that individuals *know* their preferences, but this is a strong assumption when individuals are asked to value non-market goods. Previous evidence has shown that individuals struggle to express their preferences for non-market goods (Diamond & Hausman, 1994; Hanley & Shogren, 2005; Hausman, 2012; Slovic, 1995). Many individuals will say they are uncertain about their WTP when given the opportunity in the questionnaire (Hanley & Shogren, 2005; Loomis & Ekstrand, 1998). Individuals may try to cope with their uncertainty by using irrelevant information from the questionnaire, such as the question's phrasing or the structure of the possible responses offered, to aid them in providing a valuation of the good (McFadden, 1994; Tversky & Kahneman, 1981). This behaviour is called framing, because the way in which the question is framed, or presented to respondents, influences responses. Framing is problematic in stated preference studies because much of the information presented in the questionnaire (such as the bids in a contingent valuation study, or the cost attribute in a discrete choice experiment) is not intended to convey information about the value of the good.

Several studies investigating framing in stated preference research have conjectured that if respondents' preferences are not well formed, and if respondents are uncertain of their WTP, they may be more susceptible to the question's framing

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(Herriges & Shogren, 1996; Mitchell & Carson, 1989). In this paper, we test empirically the link between respondent certainty and framing using a double bounded dichotomous choice (DBDC) elicitation format combined with a post-decision measure of respondents' certainty. To do so, we extend existing econometric models of heterogeneous framing by specifying two commonly reported DBDC framing effects (anchoring and shift) to be heterogenous. Our main finding is that respondents who are very certain about their WTP are less susceptible to framing when answering the contingent valuation questions.

The rest of the paper is organised as follows: Section 2 provides an overview of framing in contingent valuation studies. Section 3 discusses the study design and provides details of our data set. The econometric model of heterogeneous framing in DBDC data, which incorporates respondent uncertainty as an explanation for heterogeneity is presented in Section 4. Section 5 presents and discusses our results. We discuss the results and conclusions in Section 6.

2. Background and related research

The DBDC contingent valuation format was developed because of concerns that the single-bounded dichotomous choice (SBDC) format provided limited information about respondents' WTP, and required larger sample sizes than other contingent valuation formats, such as payment card or open-ended response, to obtain the same level of statistical precision (Hanemann, Loomis, & Kanninen, 1991). In the DBDC format, the initial dichotomous choice contingent valuation question (DC1) is supplemented with a second dichotomous choice contingent valuation question (DC2). Responses to DC1 determine the bid offered in DC2. If a respondent states 'yes' in DC1 a higher bid is offered in DC2, and vice versa. The addition of a second bid in DBDC reduces the variance of WTP estimates derived from DBDC when compared with those derived from SBDC questions (Hanemann et al., 1991). However, comparisons of WTP estimates from DBDC data find WTP derived only from DC1 is lower than WTP when both responses to DC1 and DC2 are used for the analysis (Cameron & Quiggan, 1994; Hanemann et al., 1991). This indicates that respondents' report different WTP across bounds, and is inconsistent with the elicitation of well-formed preferences.

One explanation for the difference in WTP is a framing effect. In general, a framing effect occurs when (irrelevant) information from the choice context influences respondents' decisions (Tversky & Kahnemann, 1974). In stated preference studies framing occurs when information in the questionnaire affects the valuations elicited from respondents. One of the most widely reported framing effects in stated preference research is that of anchoring, or starting point bias, in DBDC (Aadland, Caplan, & Phillips, 2007). This occurs when the information (the bid amount) provided in DC1 influences respondents' answer to DC2. Respondents' WTP may be influenced by the first bid presented because they do not have well-formed preferences and, when they are faced with this uncertainty about their true WTP, the bid presented at DC1 influences their answer to the DBDC questions. This may occur because respondents believe the questionnaire has been designed by experts and interpret the bid as a signal of an appropriate value for the good (Herriges & Shogren, 1996; Mitchell & Carson, 1989). Anchoring implies that responses to DC2 are dependent on the bid offered in DC1 (Cameron & Quiggan, 1994), and Herriges and Shogren (1996) propose a model of DBDC data in which respondents combine their prior WTP expressed at DC1 with the bid amount specified in DC1 and form a revised (posterior) WTP, which is the weighted average of both amounts.

In contrast, Carson and Groves (2007) state that the second bid in the DBDC format creates uncertainty for the respondent either about the cost of the good (to the respondent), or the quality of the good that will be provided. When DC2 is higher than DC1 respondents interpret this as the government (or provider of the good) attempting to raise additional revenue, and when DC2 is lower than DC1 this signals that a lower quality good, than was described, will be provided. Carson and Groves (2007) state that the DBDC format does not provide the incentive for respondents with well-defined preferences to truthfully reveal their WTP, instead the second bid encourages respondents to understate their WTP, which translates to a propensity to state 'no' to DC2. To test for this effect, studies have included a shift parameter in the econometric analysis of DBDC data, where a negative shift coefficient is empirical evidence of incentive incompatibility.[1]

Whitehead (2002) combines both anchoring and shift effects into one econometric model. Studies find empirical evidence of both anchoring and a shift effect (Whitehead, 2002; Watson & Ryan, 2007). Most empirical studies assume that framing effects are constant across the sample. Just as one does not expect all respondents to hold the same valuation for a good, one may not expect all respondents to 'frame' the contingent valuation exercise in the same manner.[2] There is some empirical evidence that anchoring is heterogenous. Aprahamian et al. (2007) find 25% of respondents do not anchor, 25% of respondents anchor perfectly, and the rest are between these two extreme cases when valuing a reduction in air pollution, but do not explain why some respondents anchor more than others. Flachaire, Hollard, and Luchini (2007) find that respondents who do not have an "elaborated view" of the good are more likely to anchor when valuing a natural park and Schwartzinger, Carrat, and Luchini (2009) find that patients are more likely than their asymptomatic spouse to anchor when valuing the alleviation of flu symptoms.

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[1] Studies also raise the possibility that a positive shift represents 'yea-saying' or acquiesence bias; a tendency for respondents to say 'yes' to any bid amount regardless of their true WTP (Alberini, Kanninen, & Carson, 1997). This implies that respondents are more likely to answer 'yes' to follow-up contingent valuation questions when they have answered 'yes' to the initial question. In this case, a negative or positive shift parameter coefficient is evidence that either incentive compatibility or yea-saying is the dominant effect in the sample.

[2] Using monte-carlo simulation, Aprahamian, Chanel, and Luchini (2007, 2008) show parameter estimates are biased and spurious shift effects occur if a homogeneous anchoring model is applied to data with a heterogenous anchoring data generating process.