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Analysis

Distal order effects in stated preference surveys

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ABSTRACT

Stated preference researchers have previously demonstrated that a good's placement among a sequence of goods in a set of valuation questions (i.e. proximal order effects) can have a substantial impact on people's valuations of these different goods. However, the economic consequences of potential order effects stemming from other questions in a survey, prior to the valuation tasks, have received surprisingly little attention. Using an online climate change survey, we identify order effects created by prior attitude-elicitation questions, and we assess the potential impact of these distal order effects on willingness to pay (WTP) estimates for stylized climate change policies. We find that the order used in prior questions may change people's opinions toward various attributes of the good to be valued, and thereby change WTP by a substantial amount. This paper emphasizes the significance of order effects stemming from preliminary survey questions, and supports a call for diligence in the random ordering of all potentially influential preliminary information in stated preference surveys to minimize inadvertent effects from any single arbitrary ordering.

1. Introduction

In stated preference (SP) surveys, order effects are said to occur when responses *to a given question* vary in a theoretically unexpected manner due to the positioning *of that question* or item relative to others (as defined by Powe and Bateman (2003), with emphasis added). A large number of SP studies have certainly found that a good's placement in a sequence of goods in a valuation exercise can have a substantial impact on people's valuation of the different goods in question (as in Carson et al., 1998; Stewart et al., 2002; Dupont, 2003; Powe and Bateman, 2003; Clark and Friesen, 2008). Goods are likely to evoke higher values if they appear earlier in a sequence, as noted by Payne et al. (2000) or Veisten et al. (2004).[1]

These various studies tend to focus on types of order effects which stem from the sequence of questions about different goods within the valuation portion of the survey. We will refer to these as *proximal* order effects, since the ordering issue pertains to the valuation questions themselves. However, other sources of order effects in surveys are also possible. In particular, *distal* order effects in a valuation task can be caused by the arrangement of information elsewhere in the survey, prior to the valuation questions. These order effects may be present even if just one type of good, in one amount, is to be valued by all survey respondents. Distal order effects can be created by the sequence in which information is presented or elicited during the preamble to a valuation exercise, anywhere between the beginning of the survey and the valuation task itself.

Order effects in general survey research have been studied extensively in the psychological and survey design literatures by Carpenter and Blackwood (1979), Crespi and Morris (1984), Bishop et al. (1985), Krosnick and Alwin (1987), Mitchell and Carson (1989), Colasanto et al. (1992), Dillman (2000), Tourangeau et al. (2000), Bishop and Smith (2001), and Moore (2002), among others. These studies document a considerable amount of evidence to suggest that the order effects of some kind are likely to be the norm, rather than the exception, in most surveys.

Among economic studies, the empirical literature concerning distal order effects is rather thin. Of course, if respondents' inherent attitudes toward the good in question are already well-formed, and therefore less vulnerable to being swayed by information ordering, the problem can be ignored. However, distal order effects cannot be overlooked if respondents adjust their opinions in the later valuation portion of the survey in response to the ways in which the researcher has chosen to organize some of the prior information or attitude-elicitation questions in the survey. If respondent opinions are affected by design decisions in a survey's preamble, their modified opinions may further affect their choices in the stated preference portion of the survey and thus lead to distortions in the eventual WTP estimates.

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[1] Order effects have sometimes been treated as synonymous with "embedding effects," according to Boyle et al. (1993). The term "embedding" stems from Kahneman and Knetsch (1992), where term is used to describe a wide variety of nesting and sequencing issues, also reviewed in Dupont (2003). Since the term has been applied to distinct phenomena, it has been criticized as being ill-defined, as in Kahneman and Knetsch (1992) or Loomis et al. (1993). Hanemann (1994) provides a useful categorization of the sequencing effect (order effect), the scope effect, and the sub-additivity effect identified in Carson and Mitchell (1995).

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Prior to our analysis in this paper, only Boyle et al. (1993) seem to have specifically addressed distal order effects in a stated preference survey. Using a contingent valuation survey concerning Grand Canyon white-water rafting, they find that the sequencing of the prior elicitation questions does matter to the valuation of public goods, and inexperienced rafters are more susceptible to ordering effects than experienced rafters.[2] The scarcity of distal order effect studies in a valuation context unfortunately means that non-market valuation survey researchers tend to pay too little attention to the potential for this problem during survey design.

Using an online climate change survey, we identify significant distal order effects stemming from attitudinal questions prior to the stated choice exercise, and then examine the consequences of these effects for willingness to pay estimates. The modeling framework within which we demonstrate these effects is borrowed from Cai et al. (2010). In that paper, we rely on the extensive randomization of all possible orderings in the survey to prevent any distortions that might have been induced by the use of just one ordering in each case. Here, however, we make use of these randomizations specifically to explore what could have been the consequences, had we relied upon just one particular ordering. Our results suggest that the sequencing of information in preamble questions can alter people's apparent preferences for climate changes policies inferred from a subsequent conjoint choice task. These distortions have the potential to be non-trivial. These differences in estimated marginal utilities translate into differences in the resulting implied WTP for climate change mitigation. This sensitivity to information order suggests strongly that survey researchers should be careful to randomize the preliminary information in stated preference surveys in order to minimize inadvertent effects on the resulting valuation estimates.

2. An Online Climate Policy Survey

Our full dataset consists of 1850 responses to a comprehensive online survey about climate change mitigation policy. The sample used here consists primarily of college students – recruited by 114 different instructors from classes at 92 different colleges and universities throughout the U.S. and Canada – who responded to the survey over the internet. This survey employs a multi-campus analog to a conventional classroom convenience sample, and uses a remotely administered Web-based questionnaire (http://globalpolicysurvey.ucla.edu). The key climate policy choice question included in each dynamically randomized survey instrument is a hypothetical vote involving either one or two climate change mitigation policies versus business-as-usual. The survey is designed to provide conjoint choice data which will allow us to infer the size of (and systematic variation in) people's willingness to incur the potential costs of climate change mitigation and adaptation.

As in any stated preference survey, there is an automatic concern about whether respondents viewed their choices as being consequential. The "consent to participate" portion of the survey stated explicitly: "Your answers on this survey, when combined with those of other participants, will help decision-makers formulate better policies." Respondents are thus assumed to interpret the survey exercise as an advisory referendum on alternative possible climate policies. We rely on the results of Carson et al. (2008) and Herriges et al. (2010) which suggest that as long as there is some non-zero chance that the respondent's answers will have some bearing on outcomes they care about, they will take the choice task seriously.[3]

Importantly, the design of the questionnaire also incorporates an unusually wide range of dynamically randomized elicitation formats for an unusually large share of its information. In the design phase, we were especially concerned about the possibility of unintended order effects. Thus we randomly shuffled the order of almost everything for which randomization was possible. This extreme degree of randomization permits us to assess the sensitivity of respondents' stated policy preferences to different survey formats. For many SP studies, the researcher's choice between numerous information formatting alternatives may have been assumed to be arbitrary and inconsequential. Empirically, however, ordering decisions throughout a survey questionnaire may have systematic effects upon subsequent stated choices.[4]

2.1. Preliminary Attitudinal Questions

It is now widely accepted that climate change has the potential to pose major threats to agriculture, weather, human health, and ecosystems (see for example Kinnell et al., 2002; Kelly et al., 2005; Bosello et al., 2006). In our survey, we elicit respondents' subjective levels of concern about climate change impacts across five broad categories, which we label as "Agriculture&Water," "Ecosystems," "HumanHealth," "Oceans&Weather," and "Equity." We also elicit respondents' subjective ratings of the likely magnitudes of climate change impacts for each of the five categories, by thirty years in the future, if a policy of "business-as-usual" is followed. Respondents are invited to rate climate change impacts either as single values or as intervals on a simple nine-point scale (ranging from −4 for extremely negative impacts, to +4 for extremely positive impacts). In this paper, we bundle the point values (or interval midpoints) for these ratings into three categories. Ratings below −2 are classed as "severe (negative) impacts"; ratings of −2 or greater, but less than zero, are classed as "moderate (negative) impacts"; and ratings of zero or more (no effects or even positive impacts) are the omitted category.[5]

The order for the five categories of climate change impacts is constant throughout the survey instrument for any one respondent, but it is randomized across respondents (except "equity", which is always last in the list).[6] This order does affect respondents' stated levels of concern about each impact and their expected severity of impacts. However, to avoid confusing our respondents, we used the identical order for this list in (a) the preliminary questions about the individual's concern about these issues and in (b) the display of these impacts in the main conjoint choice table which summarized the policy alternatives. Thus it is not possible to discriminate between *proximal* order effects stemming from the order of climate impacts in the choice sets and *distal* order effects due to the order of climate impacts when they are first discussed prior to the choice task.

Given that full randomization was implemented for the order of climate change impact categories, we will assume that the *average* WTP for climate change mitigation is *not* biased by order effects from this source. We will concentrate, in this paper, on three cases where uniquely *distal* order effects can potentially be identified, to be discussed in the following three sections.

2.1.1. Individuals' Concerns about Various Global Issues including Climate Change

Individuals' stated levels of concern about climate change could play an important role in their willingness to incur the costs of

[2] Their work indicates that experience and familiarity about the environmental goods in question play an important role in reducing order effects. Evidence has also been found that the magnitude of order effects differs by age and education (Hanemann (1994) and Dupont (2003)), and by type of user (active, potentially active and passive) as described in Knauper (1999).

[3] Consequentiality of a choice, of course, is not the same thing as incentive compatibility, so there may still be a divergence between the WTP estimates derived in this study and those that might be produced if a fully incentive compatible choice exercise could be designed.

[4] If a survey has just one format, it is impossible to know the extent of either proximal or distal order effects. Information order must be varied across questionnaires to address these problems.

[5] Appendix Fig. 2 depicts one version of the survey screen which elicited subjective climate change impacts.

[6] It seemed appropriate to address the four physical impacts of climate change first, and then how these disruptions would be distributed across the world's population. These subjective ratings are then inserted dynamically, later in the survey, to summarize expected conditions under the business-as-usual "status quo" policy option.