Journal of Economic Behavior & Organization 97 (2014) 126–137

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

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

Bidding behavior given point and interval values in a second-price auction☆

Prasenjit Banerjee[a,*], Jason F. Shogren[b]

[a] University of Manchester, Economics, Oxford Road, Manchester M13 9PL, UK
[b] University of Wyoming, Economics, Laramie, WY 82072, USA

ARTICLE INFO

Article history:
Received 22 June 2012
Received in revised form 2 September 2013
Accepted 12 October 2013
Available online 23 October 2013

JEL classification:
C91
D44
D46
Q51

Keywords:
Preference elicitation
Interval values
Second price auction
Bidding behavior

ABSTRACT

Although rational choice theory presumes people have a point estimate of their willingness to pay (WTP) for a good or service, the idea of coherent arbitrariness suggests they have an interval of values. Herein we explore bidding behavior in a second-price auction in which bidders have point or interval values and point or interval bidding. We find bidders bid rationally: (i) when bidders have a point value but are asked to state an interval bid, they choose to bid as an interval with the point value as the mean of the interval; (ii) bidders who had a value interval but are asked to bid as a point estimate bid the expected value from the interval; and (iii) bidders with an interval value and who bid an interval such that expected bids equate expected values.

1. Introduction

Rational choice theory presumes people have a point estimate of their value for a good and service, and they can translate this value into a single monetary willingness to pay (WTP) statement (Marshall, 1890; Ciriacy-Wantrup, 1947; Bateman and Willis, 1999; Bockstael and Freeman, 2005). In contrast, work in behavioral economics has challenged this idea of a precise point estimate with a psychological notion codified as *coherent arbitrariness* (Ariely et al., 2003). Coherent arbitrariness suggests it is more likely that people have a range of acceptable values, such that asking for one single point estimate of WTP could well be biased due to the person anchoring on some arbitrary cue (e.g., Kahneman and Sugden, 2005; Manski and Molinari, 2010). As stated in Ariely et al.'s (2003) paper on the consequences of coherent arbitrariness: "rather than specific WTP values for products, consumers probably have some range of acceptable values." Their speculation on the question of point versus interval values matters for work on non-market valuation that elicits preferences for, say endangered species protection or water quality (see Hanley et al., 2009). A typical preference elicitation survey asks people to state their preferences for non-market goods presumes people have a well-formed point estimate of value. The reality, however, is

☆ We thank the Bugas and Stroock funds for the partial financial support, the reviewers and Nicolas Jacquemet for their useful comments, and Pritam Gupta and Amrita Mukherjee for laboratory assistance. Shogren thanks the Norwegian University of Life Sciences for the support.

* Corresponding author. Tel.: +44 01613066916; fax: +44 01612754812.
E-mail addresses: prasenjit.banerjee@manchester.ac.uk (P. Banerjee), jramses@uwyo.edu (J.F. Shogren).

0167-2681/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.jebo.2013.10.002

Table 1
Bidding behavior in auction experiments.

Article	Main findings
Ariely et al. (2010)	•An arbitrary hedonic anchor, annoying sound, was used to investigate bidding behavior in a second price auction. •Subjects could use other people's bidding behavior in choosing their bids. •Results show interrelation between bidding behavior and others' past bids even in a private value auction.
Chen et al. (2007)	• Bidders might not know the distribution of their private values in a first and second price auction in the lab. •Underbidding in the presence of ambiguity about private values.
Lange et al. (2011)	• First price and English auction. • Ex ante uncertainty over private values. • Bidder's behavior linked to the existence and structure of potential resale market. • Equilibrium bidding strategies depend on option values conveyed from the secondary market. • Results from lab and field experiments support risk-averse bidding behavior compared to risk neutral behavior.
Loewenstein and Issacharoff (1994)	• Valuation of a good depends on whether it is obtained by chance or through performance – value more if it is attributed to performance •This source dependent valuation is similar to the endowment effect – people value a good more when they posses it compared to no possession.
McGee (2012)	• In a lab experiment with uncertainty over final values, 18% and 27% of bids are above the expected value of the item in private-value first-price and English auction. • Results do not support any impact of risk preference on overbidding. Some people are prone to overbidding, similar to the 'auction fever' case.
Noe et al. (2012)	• Underbidding in 2nd price and 1st price auction given value uncertainty. However, this gets reduced in a 2nd price auction.

most people have little experience about how to form a point value or a range of values for these non-market goods, and then how to translate these values into a stated willingness to pay (see Shogren, 2005).

In response, several methods in the preference elicitation literature have emerged to address the general question of "value uncertainty" in different ways, including a fuzzy number approach to represent the vagueness of preference (Kooten et al., 2001), or adding a random number in the utility function (Hanemann and Kristrom, 1995), allowing subjects to state explicitly how certain or uncertain they are about their point estimate (Blumenschein et al., 2008), or asking people to take a truth-telling oath that commits them to their point estimate (Jacquemet et al., 2013). All this previous work, presumed the person still preferred to and could state a point estimate of value, albeit with a confidence interval to capture the uncertainty. In contrast, Hanley et al. (2009) explicitly examine whether people prefer to state a point over an interval value, or visa versa. They designed a survey to explore the empirical validity of these two polar viewpoints on preferences – point versus interval values – for an environmental good. Valuing improved water quality for a coastal town in Scotland, they allow people to choose how to state their WTP – either as a point estimate or as an interval of values. Their findings do not contradict coherent arbitrariness – many people preferred to express their value as an interval, especially those less familiar with the good (also see Flachaire and Hollard, 2007).

Herein we design an induced valuation experiment to explore bidding behavior in a second-price auction when bidders have interval values or interval bidding possibilities, or both (see Lusk and Shogren, 2007, for an overview on experimental auctions and preference elicitation). We follow the tradition of using experimental auctions that used demand-revealing (in theory) exchange institution for market goods (e.g., art, baseball cards, pollution permits) and non-market environmental goods (see for example Hoffman et al., 1993; Fox et al., 1998; Shogren et al., 1994; Plott and Zeiler, 2005). There is less experimental work, however, which has explored the behavioral underpinnings in stated demand when value is uncertain. Table 1 summarizes the work examining bidding behavior in auctions in the field and lab given value uncertainty.[1] Our work differs from this previous work given (i) we allow bidders to choose their bid in point estimate or in interval in a weakly demand revealing auction; and (ii) we consider uncertainties over private values (using interval value) and market prices (interval bids).

We develop a 2×2 experimental design – point or interval values, and point or interval bidding to address three main questions. First, how do rational bidders bid if we treat them like behavioralist with coherent arbitrariness when in fact they are not (point value/interval bid)? In rational choice theory, a bidder has a weakly dominant strategy of bidding a point equal to his or her induced point value – regardless of whether he or she is asked to state a point or an interval (an interval can

[1] Since our paper focused on preference elicitation (using an auction as the means, not the ends), we have chosen not to report the large common-value auction literature in this paper. Interested readers are referred to Kagel and Levin, 1986; McAfee et al., 1989; Haile, 2003; Kagel, 1995; Kagel and Levin, http://www.econ.ohio-state.edu/kagel/Auctions_Handbook_vol2.pdf).