



Value learning and the willingness to accept–willingness to pay disparity

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HIGHLIGHTS

- The WTA–WTP value disparity undermines the assumption of rational preferences.
- Institutional and value uncertainty contribute to the observed disparity.
- Experiment provides an opportunity for value learning holding institutional knowledge constant.
- Subjects in the value learning treatment display no value disparity.
- Value learning procedures within the lab may help subjects uncover rational preferences.

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ABSTRACT

The assumption that individual preferences are rational and consistent with standard economic theory is often appropriate, but may be optimistic if consumers are uncertain about either their preferences or how the market operates. Both sources of uncertainty may present themselves in lab experiments exploring the well-known disparity between individuals' willingness to accept and willingness to pay. This paper explores the role of value uncertainty in the observed disparity, and finds that providing subjects with a value learning opportunity can reduce the value disparity to insignificance.

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1. Introduction

Economic theory suggests that, given small income effects and available substitutes, an individual's willingness to pay (WTP) for a good will be roughly equivalent to his or her willingness to accept (WTA) compensation for the good (Hanemann, 1991; Randall and Stoll, 1980; Willig, 1976). Despite this theoretical expectation, a significant value disparity between WTP and WTA

is often observed in experimental tests (Horowitz and McConnell, 2002). The value disparity raises questions about the assumptions of modern economic consumer theory and undermines the validity of standard models of consumer preferences.

A possible explanation for the observed value disparity suggests that subjects are uncertain about the market within which they are asked to operate (an unfamiliar auction market) or about the value they place on the target good (Dubourg et al., 1997; Loomes et al., 2003). Uncertainty from either source may lead subjects to revert to basic market instincts, that is, a strategic bias to buy low and sell high (Plott and Zeiler, 2005; List and Shogren, 1999; Brown, 2005). Value uncertainty implies that one's value, at any instant, is a realization from an underlying value distribution (Li and Mattsson, 1995; Thurstone, 1927; Wang, 1997) and, in regards

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to the value disparity, suggests that one's value may be susceptible to strategic and other biases. Specifically, when subjects are asked to state WTA or WTP amounts, value uncertainty will contribute to the magnitude of the value disparity if uncertain buyers receive low draws from their valuation distribution while uncertain sellers receive high draws (Dubourg et al., 1997; Kolstad and Buzman, 1999).

Such concerns are in keeping with the intuition laid out in the *discovered preference hypothesis*, which suggests that rational preferences exist but need to be uncovered through a process that helps subjects discover both (1) new features of their own preferences and (2) how best to reach their goals within the new decision environment (Plott, 1996).³ Support for this intuition comes from field experiments wherein subjects who have ample experience with the market and with the target items display no value disparity (List, 2003, 2004).

Our experimental design holds the level of institutional knowledge constant across treatments, and varies only the opportunity for subjects to better learn their values for the item. In the value learning treatment, a paired comparison experiment is used to provide the opportunity for subjects to learn about their preferences. Research using paired comparison experiments suggests that, as respondents progress through a random sequence of paired choices across a variety of dissimilar goods, they become more consistent (i.e., exhibit fewer intransitive choices), apparently fine-tuning their preferences (Brown et al., 2008). This fine-tuning is accompanied by a significant reduction in the error variance of a random utility model fit to these data, which is interpreted as value learning (Kingsley and Brown, 2010).⁴

Consistent with much of the experimental literature, subjects in our baseline treatment displayed a significant value disparity. However, subjects in the value learning treatment did not display a significant disparity. In line with the discovered preference hypothesis, our results suggest that, given adequate institutional knowledge, rational preferences exist and can be uncovered through a process that allows subjects to explore their own preferences.

2. Experimental design and results

To isolate the effect of value learning on the value disparity, two treatments were implemented that differed only in whether or not the auction stage was preceded by a value learning exercise. Subjects were recruited from principles of economics courses at Westfield State University (WSU). They included 23 males and 19 females, were predominately freshmen and sophomores from a variety of majors, and ranged from 18 to 28 years of age. Subjects were offered a \$10 show-up fee to independently attend scheduled sessions in a computer lab on campus. The average session included 4–5 subjects and lasted approximately 45 min.

Upon arriving at the session, each subject was handed an instruction packet and a WSU coffee mug. Each treatment began with a general introduction wherein subjects were informed that

Table 1
Experimental design.

	Baseline treatment	Value learning treatment
Stage 1	Instructions	Instructions
Stage 2	Random price auction	Value learning exercise
Stage 3	Value learning exercise	Random price auction

they would be participating in an auction for the mug they had just been handed and that the results of the auction would either add to or subtract from the \$10 show-up fee, to be paid anonymously at the end of the experiment. The purpose of the instructions was to lessen the institutional uncertainty associated with the auction mechanism used: a list Becker–DeGroot–Marschak (BDM) random price auction. Each set of instructions included, for both the buying and selling tasks, one demonstration round and two hypothetical induced value practice rounds. Further, in both the buying and selling contexts numerical examples, similar to those used in Plott and Zeiler (2005), were used to demonstrate how subjects should determine the value (a WTP or a WTA) for the item on auction and further why it was in their best interest to offer that amount.⁵ The role of each subject (buyer or seller) was revealed only during the binding auction and remained the subjects' own private information.⁶

In the baseline treatment, subjects participated in the binding auction immediately after the instructions were completed. Each buyer (seller) was asked to indicate whether they chose to buy or not buy (sell or not sell) the mug at each listed price. The listed prices included all 21 prices from \$0 to \$10 in intervals of \$0.50. In the value learning treatment, the binding auction was preceded by a value learning exercise (Table 1). The value learning exercise was a paired comparison experiment that mimicked those found in the literature (Brown and Peterson, 2009). The exercise involved 21 items: six locally available private goods (including the WSU coffee mug), four locally relevant public goods, and 11 dollar amounts (\$1, \$3, \$5, \$7, \$10, \$15, \$20, \$25, \$30, \$40, and \$50). Participants were given a sheet of paper listing the ten goods, similar to the list in Table 2. Each participant was presented with all possible pairs of the ten goods (45 choices in all) plus all possible pairs of a good and a dollar amount (another 110 choices). They did not choose between monetary amounts. The exercise was completed on a computer, and each of the 155 pairs was presented one at a time in a unique random order for each participant. Participants were instructed to choose the item they would prefer to have if they could have either at no cost.⁷

The experimental design allows us to test for the significance of the value disparity in the presence and absence of the value learning exercise. A Wilcoxon rank sum test is used to test the hypothesis of equality of WTA and WTP. Results from lab experiments employing a BDM random price auction to elicit WTP and WTA values for familiar market goods suggest a significant value disparity in our baseline treatment (Kahneman et al., 1990; Bateman et al., 1997; Shogren et al., 2001; Kingsley and Brown, 2012).

In the baseline treatment, mean (median) WTA is \$4.46 (\$4.50) and mean (median) WTP is \$2.27 (\$2.00) (Table 3), yielding a WTA/WTP mean (median) ratio of 1.97 (2.25) (Table 4). Compared

³ These two processes have been termed institutional learning and value learning, respectively, by Braga and Starmer (2005), who present a large body of research supporting the discovered preference hypothesis (Braga and Starmer, 2005). This intuition was also advanced by Loomes et al. (2003) in what they term the market discipline hypothesis, which stresses that individuals learn to act rationally in order to avoid costly mistakes (Loomes et al., 2003).

⁴ Researchers commonly use the standard deviation of the error term, referred to as the scale of the model, as a measure of preference uncertainty. The literature asserts an inverse relationship between individual choice consistency and the scale of a random utility model. Greater levels of error variance are associated with respondent fatigue, confusion, or boredom (Deshazo and Fermo, 2002; Swait and Adamowicz, 2001), whereas lower levels are associated with value learning (Holmes and Boyle, 2005; Savage and Waldman, 2008).

⁵ Our baseline treatment does not replicate the procedures used in Plott and Zeiler (2005). For example, the design implemented here does not prompt subjects to reconsider their WTA and WTP offers before completing the binding auction. Recent research suggests that prompting subjects to revise their offers, as is done in Plott and Zeiler (2005), may introduce bias (Kingsley and Brown, 2012).

⁶ Complete experimental instructions are available upon request.

⁷ Analysis of the paired choices, available upon request, using the methods of Kingsley and Brown (2010) suggests value learning over the sequence of choices.

Table 2

Items included in paired comparison experiment.

1.	The Westfield State College (WSU) coffee mug you were each given at the beginning of this choice experiment which is available in the campus bookstore <i>WSU Coffee Mug</i>
2.	A WSU Valet Keytag available in the campus bookstore for \$6.95 <i>WSU Valet Keytag</i>
3.	A WSU T-Shirt available in the campus bookstore for \$12.95 <i>WSU T-Shirt</i>
4.	A WSU Hooded Sweatshirt available in the campus bookstore for \$36.95 <i>WSU Sweatshirt</i>
5.	A meal at a restaurant of your choice up to \$15 <i>Meal</i>
6.	Two tickets to a regular season Red Sox game (Approximate value \$60) <i>Tickets</i>
7.	Currently the only area available for students to park on campus is the commuter lot beside Wilson Hall. This option increases the parking capacity available for students on campus. This will involve the conversion of the parking lot along Davis Road adjacent to the current commuter lot from resident parking only. This lot includes an additional 48 spaces. <i>Parking Capacity</i>
8.	Between Wilson Hall and New Hall is a wooded patch of open space that is undeveloped. This option preserves this approximately 1.5 acres of wooded space which is the proposed location of a new administrative building on campus. <i>Open Space</i>
9.	Currently students enjoy free rides on PVRTA Route R-10 which runs from WSU to downtown Westfield and West Springfield. The current service runs every hour 7 AM to 10 PM Monday through Saturday and 10 AM–7 PM Sunday. This option expands this free service on Thursday, Friday and Saturday nights until 2 AM. <i>Bus Service</i>
10.	The United States is the only developed nation which has not signed up to the Kyoto Protocol. This protocol is an international commitment by member countries to reduce four greenhouse gases (carbon dioxide, methane, nitrous oxide and sulphur hexafluoride). Specifically, member countries have committed to reducing emissions by 5.2% of 1990 levels by 2012. This option will commit WSU to achieving this goal by pursuing renewable energy from Solar, Wind and Hydroelectric sources. <i>Renewable Energy</i>

Table 3

Auction results.

	Individual responses	Mean	Median	Standard deviation
Baseline treatment				
WTP ($n = 11$)	0.5, 0.5, 1, 1.5, 2, 2, 2.5, 3, 3, 4, 5	2.27	2.00	1.42
WTA ($n = 11$)	3, 3.5, 3.5, 4, 4, 4.5, 5, 5, 5, 5.5, 6	4.46	4.50	0.93
Value learning treatment				
WTP ($n = 12$)	0.5, 1, 1.5, 2, 2.5, 2.5, 3, 3, 3.5, 4, 5, 5	2.79	2.75	1.44
WTA ($n = 10$)	1, 1.5, 3, 3, 3.5, 4, 4, 5, 5, 5.5	3.55	3.75	1.48

Table 4Value disparity test results.^a

	Baseline treatment	Value learning treatment
WTA/WTP of means	1.97	1.27
WTA/WTP of medians	2.25	1.36
Wilcoxon rank sum test	(3.17) ^b	(1.30)

^a Test statistics reported in parentheses.^b Denotes that the coefficient is significant at the 95% probability level.

to the baseline treatment, WTP increased by 23% and WTA decreased by 20% in the value learning treatment, providing a mean (median) WTP of \$2.79 (\$2.75), mean (median) WTA of \$3.55 (\$3.75), and a mean (median) ratio of 1.27 (1.36). In the absence of the value learning exercise, a significant value disparity is present, but in the presence of the value learning exercise the null hypothesis of no value disparity cannot be rejected (Table 4).⁸

3. Discussion and conclusion

A paired comparison exercise was used to provide an opportunity for value learning in an experimental design where the WTA–WTP value disparity is observed. The disparity was not significant when bidding was preceded by the value learning exercise, in contrast to the significant disparity obtained in its absence. In comparison with the baseline treatment, WTP bids increased and WTA bids decreased when bidding was preceded by

the value learning exercise. We interpret this finding as indicating that the value learning exercise helped participants in both the WTP and WTA conditions settle on a more precise value for the target good, which resulted in preferences more consistent with standard economic theory. Results suggest that, given adequate institutional knowledge, rational preferences exist and can be uncovered through a process that allows subjects to explore their own preferences for familiar market goods. The institutional knowledge provided by the instructions was constant across treatments and appears, given the insignificance of the value disparity in the value learning treatment, to have provided subjects with adequate institutional knowledge. In the absence of adequate institutional knowledge, subjects would be unable to make choices that reflect even well-formed preferences (Plott, 1996).

It is notable that the value learning made possible within the paired comparison exercise was sufficient to reduce the disparity to insignificance. The paired comparison exercise consisted of hypothetical choices between pairs of dissimilar items. Our findings suggest that value uncertainty exists even for familiar market goods like the mug, but that such uncertainty can be reduced with a relatively simple value learning exercise. This does not imply that the paired comparison exercise increased subjects' familiarity with the target good, but rather that it increased subjects' awareness of their valuations of the target good. It is important to note, however, that the ability of this value learning exercise may be limited when subjects attempt to uncover preferences for unfamiliar goods, such as clean air or a reduction in asthma-related deaths. Future research should test the effect of value learning exercises with such goods.

⁸ Analysis, available upon request, confirms this result using a small- sample *t*-test using a bootstrapping procedure to estimate robust standard errors.

The research contributes to our understanding of the source and nature of the WTA–WTP value disparity and indicates the important role of value uncertainty. Together with recent exchange asymmetry experiments, this research suggests that lab experiments can induce behavior consistent with economists' predictions (Plott and Zeiler, 2007; Engelmann and Hollard, 2010).

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