The Role of Preference Uncertainty in the Willingness to Pay - Willingness to Accept Disparity: An Experimental Test

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Abstract

Economists assume that individual preferences are rational and consistent with neoclassical expectations. This assumption is often appropriate but may be misplaced when low experience goods are considered. A common point of exploration is the well known disparity between an individual's willingness to pay and willingness to accept. The persistent finding that WTA is significantly greater than WTP has prompted economists to explain this behavior outside of neoclassical theory and to investigate the formation of preferences. The constructed preference hypothesis (CPH) suggests that preferences do not exist prior to a particular choice occasion but rather are created at the moment of choice leaving preferences susceptible to the variants of the choice environment. Alternatively, the discovered preference hypothesis (DPH) suggests that preferences exist but need to be uncovered through a process involving practice, repetition and experience. This paper considers a conceptual model largely consistent with the DPH. Specifically, preferences or choices are considered realizations from an underlying value distribution - a process referred to as preference uncertainty. The model allows for preference learning which suggests that the variance of this value distribution will lessen with a discovery process consistent with the DPH. As preference learning takes hold preferences will increasingly appear consistent with economic expectations. This paper designs a split sample controlled experiment in order to test the following hypothesis. Does a reduction in preference uncertainty through preference learning eliminate the well known value disparity? Results suggest that preference uncertainty appears to exacerbate the value disparity and its reduction is enough to eliminate the disparity. Further, results suggest that the model of preference uncertainty allowing for preference learning, largely consistent with the DPH, accurately characterizes preference formation within this choice experiment. In other words uncertain preferences appear constructed while learned preferences appear consistent with neoclassical expectations. These results imply that choice experiments providing limited learning opportunities may not accurately reveal individual preferences.

Introduction

Economists often assume that individual preferences exist, are stable and, furthermore, are rational. Specifically, rationality defines preferences as complete and transitive while, intuitively, rationality simply implies that individuals make the best choices they can in order to make themselves as well off as possible. Research often supports this assumption when the goods in question are high experience market goods and decisions are made within incentive compatible market institutions. However, this assumption may not be appropriate when low experience nonmarket goods are concerned as is often that case in the valuation of environmental and public resources. The formation of such preferences has important implications for public policy. The benefit cost analysis, often required in public policy, depends on our ability to accurately measure the benefits associated with changes in environmental and public resources. Individuals must have and be able to reveal their preferences within choice experiments in order for researcher to have confidence in commonly used welfare measures. To understand the formation of preferences, this paper explores the role of preference uncertainty in the willingness to pay – willingness to accept disparity. The hypothesis tested is whether preference learning, a reduction in preference uncertainty, will eliminate this well known value disparity.

Neoclassical economic theory suggests that with small income effects and available substitutes an individual's willingness to pay will be roughly equivalent to their willingness to accept (Willig, 1976; Randall & Stoll, 1980; Hanemann, 1991). Despite this theoretical expectation a significant disparity between WTP and WTA is a common empirical reality (Horowitz & McConnell, 2002). The persistent finding of anomalous behavior has prompted economists to explain such behavior outside of neoclassical theory and to reconsider the formation of preferences. The constructed preference hypothesis (CPH) suggests that preferences do not exist prior to all choice occasions but rather may be created at the moment of choice (Slovic, 1995). This theory predicts that preferences will be malleable to the choice environment; susceptible to framing, anchoring or endowment (Kahneman and Tversky, 1979) effects. On the other hand, the discovered preference hypothesis (DPH) suggests that preferences do exist but that they need to be uncovered through a process involving practice, repetition and experience. This process of discovery will result in stable preferences that are consistent with economists' expectations (Plott 1996). However, as noted by Plott (1996) the DPH is more of a philosophy than a theoretical model capable of predicting behavior; it is in effect a starting point from which to account for anomalous behavior within neoclassical economics.

The model presented here represents a bridge between preferences that appear constructed (initially malleable and influenced by choice environment) to preferences that are stable and rational. This paper suggests that preferences are uncertain. Preference uncertainty implies that an individual's choice on a particular choice occasion represents a realization from some underlying valuation distribution (Thurstone, 1927; Li & Mattsson, 1995; Wang, 1997) or perceived utility (McFadden, 2001). In this model the realization may be influenced by the choice environment so that choices appear malleable. Further, the variance or dispersion of the value distribution is also influenced by the choice environment. Specifically, this distribution may be narrowed through a process of repetition, feedback and experience such that realizations will increasingly appear consistent. This process is referred to as preference learning. There is a growing literature on the effect that preference uncertainty may have on the value disparity (Dubourg, Jones-Lee, & Loomes, 1994, 1997; Mueser & Dow, 1997; Kolstad & Guzman, 1999). This literature predicts that preference uncertainty will bias WTP down and WTA up thus producing the value disparity. This *strategic bias* (Brown, 2005) assumes that uncertain buyers receive low draws from their valuation distribution while uncertain sellers receive high draws from their valuation distribution. Similarly, List (2004) states that preference uncertainty is the logical place to start investigating the decision making process underlying the value disparity.

In this paper a paired comparison experiment is used to isolate the impact that preference uncertainty and subsequent preference learning has on the value disparity. Paired comparison experiments involve simple choices between pairs of items and allow researchers to measure within individual choice consistency. Research using PCEs suggests that as respondents progress through a random sequence of paired choices they become more consistent, 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, a reduction in preference uncertainty, and is referred to as preference learning (Kingsley and Brown, *forthcoming*). A split sample controlled experiment is introduced to isolate the effect of preference learning on the value disparity. For consistency with past research a commonly available Westfield State College coffee mug is used within a random price auction modeled after Kahneman, Knetsch and Thaler (1990) with supplemental material provided by Plott and Zeiler (2005). This good is chosen to ensure choices are not influenced by risk preferences; the object of choice is the mug in their possession rather than a lottery or an unfamiliar public good. The paired comparison experiment described in this paper will provide the opportunity for respondents to refine their preferences among a set of Westfield State College (WSC) souvenirs, other private goods and locally relevant public goods.

Results are consistent with a *strategic bias* such that WTP bids increased and WTA bids decreased in the preference learning treatment. This effect is sufficient to eliminate the value disparity. Results suggest that the model of preference uncertainty allowing for preference learning, largely consistent with the DPH, accurately characterizes preference formation within this choice experiment. Short run preferences are accurately characterized as constructed while long run or more considered preferences are accurately described by neoclassical predictions. This result is consistent with List (2003) who found that those with explicit market experience display no disparity. What is unique and represents an important contribution to the literature is that this transition occurred outside of markets. The ability of researchers to induce preferences consistent with economists' predictions within choice experiments has important implications within both the environmental and public economic literatures. In particular, results suggest that methods relying on a single or few questions in unfamiliar contingent markets are unlikely to measure well defined preferences. Respondents appear to require opportunities to consider their preferences. Choice experiments providing respondents with preference learning opportunities are recommended in applied research.

The Willingness to Accept - Willingness to Pay Disparity

The nonmarket valuation literature began to see a pattern form in the relationship between WTP and WTA in the 1970's. For example, it was shown that duck hunters were willing to pay an average of $247 to prevent the loss of duck habitat but required $1044 in compensation for its destruction (Hammock & Brown, 1974). Since then the value disparity has been a common empirical reality see Horowitz & McConnell (2002) and Plott & Zeiler (2005) for extensive reviews.

The earliest criticism of these findings stated the lack of incentive compatibility and the stated preference nature of the choices. Using real choices over lotteries and items the disparity was found to persist (Knetsch & Sinden, 1984, Knetsch, 1989). Next, the single shot nature of the experiments was questioned. These experiments, it was argued, lacked the opportunity for respondents to learn the market, a process now referred to as institutional learning. This set off a flurry of research in repeated auction market experiments. Results of repeated auction experiments are mixed suggesting institutional learning alone does not remove the value disparity. Endogenous auctions (Second Price or N^{th} Price auctions) tend to eliminate the disparity over successive rounds (Coursey, Hovis, & Schulze, 1987; Harless, 1989; Shogren, Shin, Hayes, & Kliebenstein, 1994;

Shogren et al., 2001). Conversely, in the majority of studies using exogenous price auctions, such as the Becker - Degroot - Marschak (BDM) random price auction the disparity tends to persist (Knetsch, 1989; Kahneman, Knetsch, & Thaler, 1990; Boyce, Brown, McClelland, Peterson, & Schulze, 1992; Bateman, Munro, Rhodes, Starmer, & Sugden, 1997; Shogren et al., 2001). The anomaly in the exogenous price auction literature is the work of Plott and Zeiler (2005) who are able to eliminate the disparity using the BDM auction in an experimental design methodology that controls for each aspect of institutional uncertainty they identify. The focus of Plott and Zeiler's work is institutional learning, by providing extensive training and paid practice with the market they are able to remove this uncertainty.

Binmore (1999) argues that only behavior which persists in the market is consequential and of concern to economists. Critics argue that choices not subject to the discipline enforced by the market may not accurately reflect preferences. For instance, if preferences are modified by market experience then one-shot experiments provide little insight into market behavior (Knez, Smith, & Williams, 1985). Research has shown that individuals exposed to market like institutions behave according to neoclassical expectations. Rationality is, after all, a social phenomenon enforced by the market rather than an expectation of an isolated individuals' behavior (Cherry, Crocker, & Shogren, 2003). In the context of the current paper respondents with explicit market experience display no value disparity (List, 2003). Although ideal, market experience and preferences measured through market activity are not always feasible. Indeed, the stated preference nonmarket valuation literature was established because values of many environmental and public resources leave no behavioral trace in markets from which economists can infer value. Understanding the formation of preferences will guide the use of benefit-cost analysis. This paper argues that much insight can be gained using a model of preference uncertainty allowing for preference learning.

The Formation of Preferences

There is mounting evidence that individual preferences do not live up to the assumptions of neoclassical economics. This evidence implies that preferences cannot be accurately revealed by standard elicitation methods used in the choice experiments. For example, research indicates that choices are sensitive to the wording or framing of the question within the choice environment (Tversky and Kahneman 1974). Individuals have also been shown to anchor there expressed values to observed yet arbitrary values created by the researchers (Ariely, Loewenstein, & Prelec, 2003). The persistent finding of anomalous behavior has prompted economists to explain such behavior

outside of neoclassical theory and to reconsider the formation of preferences. Two broad theories of preference formation have developed: the constructed preference hypothesis (CPH) and the discovered preference hypothesis (DPH)

The constructed preference hypothesis (CPH) has its roots in behavioral psychology and suggests that preferences are created at the moment of choice leaving preferences susceptible to, previously thought to be inconsequential, choice environment variations (Slovic, 1995). Interestingly, there is evidence that once created they will remain internally consistent with this initial choice; a process that has been aptly termed *coherent arbitrariness* (Ariely et al., 2003). The CPH argues that individuals cannot optimize their choices in every potential choice set. As a result they use rules of thumb or heuristic methods in order to make choices quickly. As Heiner (1983) points out behavior is predictable because bounded rationality (Simon, 1957) forces individuals to limit their choice set in consistent ways.

On the other hand, the discovered preference hypothesis (DPH) suggests that stable preferences, consistent with economist's expectations, exist but need to be uncovered (Plott, 1996). In the DPH an individual is thought to progress through 3 stages of preference formation. In stage 1 limited experience with the choice task and good leads to preferences that are more heuristic and appear irrational to economists. In stage 2 repetition and experience has allowed individuals to hone in on a consistent set of preferences which economists can understand as rational. Finally, in stage 3 preferences become consistent with game theoretic preferences such that the individual considers not only individual rationality but also the rational choices of others.

The DPH has been extended on two fronts. Loomes et al. (2003) investigate, but are unable to differentiate, between two sources of discovery, simple repetition and feedback or more consequential market experience and market discipline as the underlying mechanism (Loomes, Starmer, & Sugden, 2003). The other thread developed by Braga and Starmer (2005) established two sources of uncertainty which may be the key to understanding the discovery process. Namely, *institutional learning* includes discovering how the market works and *value learning* involves determining one's own value for the good in question (Braga & Starmer, 2005). The present paper refers to value learning as preference learning and will use the terms interchangeably.

It is important to note that both the CPH and the DPH may allow preferences to be initially malleable. That is, the DPH does not restrict preferences from being anomalous initially. Indeed Plott (1996) suggests that the path of discovery may be influenced by the context within which the choice is made. The difference is the stability of the initially malleable preferences. The CPH, as

evidenced by Ariely et al (2003) predicts preferences are path dependent but stable such that they are easily influenced initially but will remain internally consistent thereafter. Interestingly, research suggests that the method of construction, meaning the choice environment within which they are elicited, may influence the stability of the resulting preferences (Simon et al., 2008). The DPH suggests that respondents become increasingly able to reveal their stable and rational preferences as repetition and experience increase.

In the context of this paper preference uncertainty allows preferences to be malleable and susceptible to the choice environment in the short run but preference learning implies that in the long run individuals will increasingly act on rational underlying preferences. In order to model this individual preferences are assumed to be uncertain. Therefore the experimental design or choice environment is thought to induce non-random draws from individual valuation distribution. For example, a high anchor may induce realizations on the high end of an individuals WTP distribution. However, as respondents learn to act on their underlying, consistent, preferences this distribution may narrow around a stable mean. A non-random draw still results but will systematically reflect preferences more closely (see below and Figures 1 and 2 for an example specific to the value disparity). An important assumption implicitly made in this conceptual model is that the preference learning narrows the valuation distribution around a stable mean, and, further that this stable mean represents rational preferences.

The Role of Preference Uncertainty

Preference uncertainty is an increasingly important topic being investigated within choice experiments and valuation studies. Researchers commonly use the error variance, the variance of the error term within the random utility model, as a measure of preference uncertainty. The standard deviation of the error term is referred to as the scale of the model. 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 & Fermo, 2002; Swait & Adamowicz, 1996) while lower levels are associated with preference learning (Savage and Waldman, 2008).

Environmental economists have been on the forefront of research investigating the impact preference uncertainty has on stated valuations. Hoehn and Randall (1987) noted that arriving at one's preferences for unfamiliar goods requires substantial effort. Under the assumption of risk

adverse agents any uncertainty will bias stated WTP downward (Hoehn & Randall, 1987). Ready et al. (1995) theorize an *ambivalence region* in which respondents must make difficult decision between tradeoffs. Depending on the heuristic decision rule the respondent's use this region may systematically bias stated valuations. In particular, under a conservatism strategy, moves away from the status quo are avoided which will bias WTA upward (Ready, Whitehead, & Blomquist, 1995). Practice expressing preferences is thought to reduce this *ambivalence region* and reduce this status quo bias. Li and Mattsson (1995) developed a model of preference uncertainty in which respondents have incomplete knowledge of their preferences. Incorporating expressed uncertainty into their choice model is shown to lower estimated WTP (Li & Mattsson, 1995).

There is a large body of research investigating the role that preference uncertainty has on the value disparity (Dubourg et al., 1994; Mueser & Dow, 1997; Dubourg et al., 1997; Kolstad & Guzman, 1999). The intuition in this literature is that uncertain buyers obtain draws on the lower end of their valuation distribution while uncertain sellers tend to obtain draws on the higher end of their valuation distribution resulting in a *strategic bias* (Brown 2005). This bias is intuitive to participants in used car markets; buyers are averse to paying too much while sellers are averse to selling for too little. The cumulative effect of this strategic bias results in a disparity between a buyer's WTP and a seller's WTA. See Figure 1.

In Figure 2 preference learning is assumed to narrow this distribution around the common mean. Although strategic bias still prevails, the non-random draws are systematically closer to this common mean resulting in higher WTP bids and lower WTA bids. The cumulative effect is an attenuated disparity.

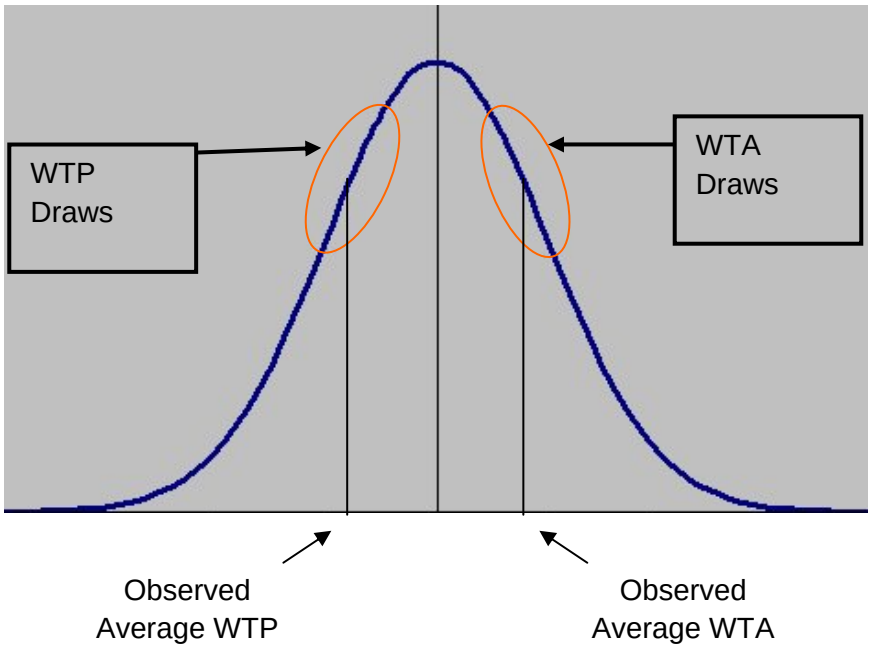

Figure 1: Strategic bias results in an observed value disparity

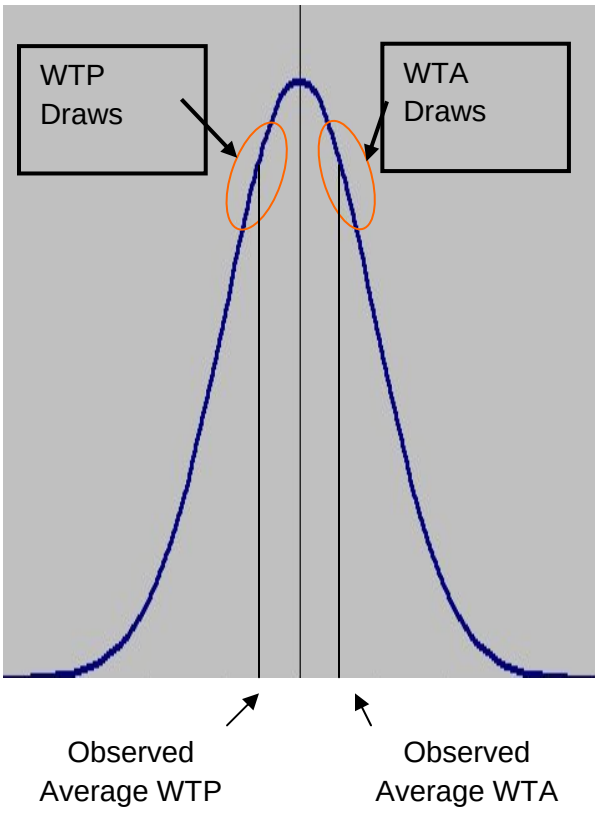

Figure 2: Preference learning lessens strategic bias attenuating value disparity

Paired Comparison Experiments

Research using paired comparison experiments suggest that as respondents progress through a random sequence of paired choices they become more consistent, apparently fine-tuning their preferences. Brown et al. (2008) conclude that respondents may begin a hypothetical value exercise with imprecise preferences and that experience expressing those preferences across a variety of dissimilar goods may help respondents to fine-tune their preferences. This fine-tuning is accompanied by a significant reduction in the error variance of a random utility model fit to this data, interpreted as preference learning in Kingsley and Brown (*forthcoming*). This implies that the data becomes less noisy over choice occasion and indicates that respondent's learn how to act on their underlying preferences. These experiments also show a large differential in choice reversals between originally inconsistent and inconsistent choice such that respondents do not maintain their initial choices when they are retested; a result inconsistent with *coherent arbitrariness*.

Given a set of t items, the paired comparison method presents them independently in pairs as $(t/2)(t-1)$ discrete binary choices. These choices yield a *preference score* for each item, which is the number of times the respondent prefers that item to other items in the set. A respondent's vector of preference scores describes the individual's preference order among the items in the choice set, with larger integers indicating more preferred items. In the case of a 21-item choice set, an individual preference score vector with no circular triads contains all 21 integers from 0 through 20. Circular triads (i.e., choices that imply A>B>C>A) violate the condition of transitivity necessary for rational choice and cause some integers to appear more than once in the preference score vector, while others disappear. For a given respondent, a pair's *preference score difference* (PSD) is simply the absolute value of the difference between the preference scores of the two items of the pair. This integer, which can range from 0 to 20 for a 21-item choice set, indicates on an ordinal scale the difference in value assigned to the two items.

The number of circular triads in each individual's set of binary choices can be calculated directly from the preference scores. The number of items in the set determines the maximum possible number of circular triads. The individual respondent's *coefficient of consistency* is calculated by subtracting the observed number of circular triads from the maximum number

possible and dividing by the maximum.[2] The coefficient varies from one, indicating that there are no circular triads in a person's choices, to zero, indicating the maximum possible number of circular triads. When a circular triad occurs, it is not unambiguous which choice is the cause of the circularity. This is easily seen by considering a choice set of three items, whose three paired comparisons produce the following circular triad: A>B>C>A. Reversing any one of the three binary choices removes the circularity of preference; selection of the one to label *inconsistent* is arbitrary. However, with more items in the choice set, selection of *inconsistent choices*, though still imperfect, effectively quantifies the degree of intransitivity present in the participants' revealed choices. Simulations show that the accuracy of this procedure in correctly identifying inconsistent choices increases rapidly as the PSD increases. In simulations with a set of 21 items and assuming normal distributions, the accuracy of the procedure rises quickly from 50 percent at a PSD of 0 to nearly 100 percent at a PSD of 5.[3]

Experimental Design

Students at Westfield State College were recruited through principles of economics courses. At WSC principles of economics courses are taken by a wide variety of students ranging across several years although predominantly freshman. Students were offered a $10 show up fee to attend scheduled sessions in a large computer lab on campus. The average sessions included 4-5 students and lasted between 30-45 minutes. A split sample experiment is used to isolate the effect of preference learning on the disparity. In the control group, the results of Kahneman Knetsch and Thaler (1990) are replicated using much of the script provided by Plott and Zeiler (2005). Recall that PZ were able to eliminate the value disparity; however, a significant disparity here is not unexpected as two changes were made to the PZ experimental design. Notably, this paper uses a closed-ended, rather than open-ended BDM auction and does prompt for revisions prior to bid commitment. It is unclear what the effect of open-ended BDM and prompting for revision would

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[2] The maximum possible number of circular triads, m, is $(t/24)(t^2-1)$ when t is an odd number and $(t/24)(t^2-4)$ when t is even, where t is the number of items in the set. Letting a_i equal the preference score of the i^{th} item and b equal the average preference score (i.e., $(t-1)/2$), the number of circular triads is (David 1988):

$$c = \frac{t}{24}(t^2 - 1) - \frac{1}{2}\Sigma (a_i - b)^2.$$

The coefficient of consistency (Kendall and Smith 1940) is then defined as: $1 - c/m$.

[3] A thorough explanation of the procedure for specifying inconsistent choices is found in chapter 4 of Brown and Peterson (2009) available at http://www.treesearch.fs.fed.us/pubs/31863.

have on bids[4]. The purpose of this design is to control for institutional learning within each group and to measure the impact of value learning through the treatment. Through the PCE value learning is provided only to the treatment group prior participating in a BDM auction for the WSC coffee mug.

The random price auction is used rather than an endogenous price auction for two reasons. First, endogenous price auctions, those allowing participants to determine the price, and in particular second price auctions create competition among bidders. This may induce individuals to win for winnings sake, an effect referred to as the top dog effect (Shogren et al. 2001). Second, random price auctions insure that even off the margin bidders, those whose value is substantially lower or higher than the determined price, have incentives to mark choices truthfully.

Each session followed the same procedure until Round 5 which was the binding mug auction. See Table 1 for the full experimental design and the Appendix for experimental script. First the buying task was explained stating that the experimenter will offer an item for sale and that they will have the opportunity to buy this item in an auction. It is explained that their best strategy to determine their maximum they are willing to pay and to offer that amount. This is because the price used is determined at random and that if they pay anything they will pay this random price. Immediately following this explanation an example is provided that replicates the BDM format they will encounter later. The outcomes are explained and further numerical examples are provided. After this explanation Round 1 begins and simulates a BDM auction of an item with known value in a hypothetical Buying task. These so called induced value experiments are commonly employed to provide instructional experience with unfamiliar auction mechanisms. A random price is generated and outcomes are determined – questions encouraged and explained.

The next 4 stages of the experiment provide the same experience with the Selling task leading to Round 2 which simulates the BDM auction in a Selling task of an item with known value. Again, this market is hypothetical and results are determined. The next two rounds provided additional hypothetical experience with both the Buying and Selling tasks. These first 4 rounds and numerical examples provide institutional learning to all respondents consistent with that available in Plott and Zeiler (2005). After Round 4 the control and treatment groups diverge. The control group goes immediately to the binding mug auction (Round 5) while the treatment group first participates in a paired comparison experiment designed to provide experience trading between the

[4] The data concerning changes in bids before and after this prompting was unavailable as this portion of the experiment was done with pencil and paper (correspondence with Charles Plott and Kathryn Zeiler).

Control	Treatment
General Instructions: $10 show up credit	General Instructions: $10 show up credit
Explanation of Buying Task	Explanation of Buying Task
Example of Buying Task	Example of Buying Task
Numeric Explanation of Buying Task	Numeric Explanation of Buying Task
Round 1: Hypothetical Buying Task	Round 1: Hypothetical Buying Task
Explanation of Selling Task	Explanation of Selling Task
Example of Selling Task	Example of Selling Task
Numeric Explanation of Selling Task	Numeric Explanation of Selling Task
Round 2: Hypothetical Selling Task	Round 2: Hypothetical Selling Task
Round 3: Hypothetical Buying Task	Round 3: Hypothetical Buying Task
Round 4: Hypothetical Selling Task	Round 4: Hypothetical Selling Task
Round 5: Binding Buying (Selling) Task	Paired Comparison Experiment
Paired Comparison Experiment	Round 5: Binding Buying (Selling) Task

Table 1: Experimental Design

WSC mug on auction and other familiar private, locally relevant public items as well as dollar amounts. See Table 2. In the Round 5 random price BDM auction buyers (sellers) chose to buy or not buy (sell or not sell) the mug at each listed price. The prices listed include $0.00 to $10.00 in intervals of $.50. Sessions were either buyer or seller sessions and were determined prior to the session beginning. The item involved in the WTP-WTA auction is a commonly available (WSC) coffee mug that retails for $5.95 in the bookstore.

The paired comparison experiment included 6 private goods, 4 public goods and 11 dollar amounts (1, 3, 5, 7, 10, 15, 20, 30, 40, and 50). Private items included a WSC Hooded Sweatshirt ($36.95), a WSC Basic T-shirt ($12.95), a WSC Valet Key Tag ($6.95) an unspecified meal at a restaurant of the respondents' choice not to exceed $15 and 2 tickets to a regular season Redsox game with an approximate value of $60. Public items included increased Parking Capacity, Open Space, Renewable Energy and Bus Service (See Table 2). Note that all private goods, except the

1.	The Westfield State College (WSC) coffee mug you were each given at the beginning of this choice experiment which is available in the campus bookstore **WSC Coffee Mug**
2.	A WSC Valet Keytag available in the campus bookstore for $6.95 **WSC Valet Keytag**
3.	A WSC T-Shirt available in the campus bookstore for $12.95 **WSC T-Shirt**
4.	A WSC Hooded Sweatshirt available in the campus bookstore for $36.95 **WSC Sweatshirt**
5.	A meal at a restaurant of your choice up to $15 **Meal**
6.	Two tickets to a regular season Red Sox game (Approximate value $60) **Tickets**
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. **Parking Capacity**
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. **Open Space**
9.	Currently students enjoy free rides on PVTA Route R-10 which runs from WSC 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. **Bus Service**
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 4 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 WSC to achieving this goal by pursuing renewable energy from Solar, Wind and Hydroelectric sources. **Renewable Energy**

Table 2: Items included in Paired Comparison Experiment

mug were provided with dollar amounts to encourage preference learning[5]. Respondents were told that after this PCE they would have the option to either buy or sell the WSC mug they currently had in their possession. Each participant made a total of 155 choices: 45 between two items and 110 between an item and a dollar amount. The experiment was completed online; each pair was presented in random order one at a time. Respondents were instructed to choose the item they would prefer if they could have either at no cost. This list of items was provided to respondents at the beginning of the experiment and was kept by them throughout. Additionally, 10 consistent and all inconsistent choice identified within individual were retested after this initial 155 choices were made.

Results and Discussion

The first three results refer to the extent of preference learning obtained in the PC experiment. Following the analysis in Kingsley and Brown (*forthcoming*) three subsections are included: the probability of an inconsistent choice, the probability of a preference reversal and the estimation of a preference learning parameter[6]. In sum, results support a model of preference uncertainty allowing for preference learning. The final section tests the hypothesis that preference learning afforded to respondents in the treatment group is sufficient to eliminate the value disparity. Taking the analysis a level deeper the paper investigates the determinants of WTP and WTA bids.

Probability of an Inconsistent Choice

A probit model is estimated to predict the probability of a choice being identified as inconsistent. The dependent variable, y_{ij}, equals 1 if the choice is identified as inconsistent and 0 otherwise, where i denotes the individual and j denotes the choice occasion. Exogenous variables include ln(choice occasion), preference score difference (PSD), a public good dummy and the amount of time in seconds required to make the choice. Demographic variables included are gender, age and education.

[5] Paired comparison experiments without specific dollar amounts have not been shown to induce learning to the same extent as those which do.

[6] It is worth noting that this analysis represents a subset of possible models and is a first pass at the data. Previous work showed that the models presented here fit the data best but the comparison of models has not yet been completed on this data

The variable choice occasion represents the order in which a given respondent encountered the pair. The ln(choice occasion) is presented to account for the reduction and leveling off of choice inconsistency over the sequence of choices. PSD is used as an approximate measure of the utility difference, the expectation being that respondents are less likely to commit an inconsistent choice the greater is this difference. The public good dummy represents any choice involving a public good (the public good may be paired with another public good, a private good, or a dollar amount). Respondents are assumed to face greater uncertainty when the choice involves a public good, as opposed to choices involving only private goods or a private good and a monetary amount. Greater uncertainty is expected to lead to greater choice inconsistency. Similarly, the amount of time required to make the choice reflects the difficulty of the choice and is expected to be positively related to choice inconsistency. All 6510 choices are pooled over individuals *i* and choice occasions *j*, so the likelihood function becomes

$$L\left(y_{ij};\beta\right)=\prod_{i}^{n}\prod_{j}^{J}\Phi\left(x_{ij}'\beta\right)^{y_{ij}}\left(1-\Phi\left(x_{ij}'\beta\right)\right)^{1-y_{ij}} \tag{1}$$

Results are shown in Table 3. Note that only marginal effects are reported and the error term is clustered to account for multiple observations across individuals. A negative and significant PSD indicates, as predicted, that inconsistency is less likely the greater the utility difference between the items. In this data the public good dummy is insignificant. Importantly, choice occasion is negative and significant, suggesting that the probability of an inconsistent choice decreases quickly and levels off.

LN(Choice)	-0.0118
	(.002)**
PSD	-.0076
	(.0011)**
Public	-.0032
	(.0024)
Time	-.0003
	(.0005)
Age	-.0003
	(.002)
Gender	.0025
	(.003)
Education	.0025
	(.0032)
N	6510

Table 3: Probability of an Inconsistent Choice

The dependent variable, y_{ij}, equals 1 if the choice is identified as inconsistent and 0 otherwise

Probability of a Preference Reversal

The experiment retested ten randomly selected consistent choices and all inconsistent choices made by an individual after the initial 155 choices were made. A probit model is estimated to test for the significance of factors hypothesized to affect the probability of a preference reversal. Two distinct sets of data were retested, the set of originally inconsistent choices and a random selection of ten originally consistent choices. For both sets of choices the dependent variable, y_{ij}, equals 1 if the choice was reversed and 0 otherwise. Six exogenous variables are included: PSD, the public good dummy, the choice occasion when the original choice was made, and the three demographic variables.

The results are presented in Table 4 and include the marginal effects of the estimated probit model adjusted for clustering within individual. Column 1 presents the probability of reversing a choice that was originally identified as consistent; column 2 presents the probability of reversing a choice which was originally identified as inconsistent. Results suggest that the greater the PSD between the items the more (less) likely an originally inconsistent (consistent) choice is reversed. Choice occasion has a significant and negative effect on the probability of reversing an originally inconsistent choice, showing that more recent inconsistent choices are less likely to be reversed. However, choice occasion has no significant effect on reversing an originally consistent choice.

	Consistent	Inconsistent
Choice	-8.94e-07	-.003
	(3.36e-06)	(.0008)**
PSD	-.00055	.217
	(.0007)**	(.015)**
Public	.0003	.0296
	(.0005)	(.055)
Age	-.00002	.013
	(.0001)	(.0234)
Gender	.00033	-.105
	(.0007)	(.053)**
Education	-.0004	-.012
	(.0007)	(.058)
N	420	365

Table 4: Probability of Preference Reversal

The dependent variable, y_{ij}, equals 1 if the choice was reversed and 0 otherwise

Preference Learning

This paper defines preference learning as a significant reduction in the error variance of the random utility model; that is, a significant narrowing of the estimated valuation distribution.[7] The valuation function for this analysis is as follows:

$$u_{ijk} = \alpha_k + \varepsilon_{ijk} \tag{2}$$

Again the index i denotes the individual and j denotes the choice occasion. Note that the data are set up in rows and columns; as such, the item index will be $k = r, c$ for row or column. For simplicity this early analysis assumes that all respondents are identical (that they have the same valuation on each α_k). The error term, ε_k, includes an alternative specific error constant and is normally distributed $N\left(0, \sigma^2_{\varepsilon_k}\right)$. The probability contribution to the likelihood function is denoted P_{rc} (P_{cr}) for the probability that the row (column) item is chosen over the column (row) item.

First consider the choice between an item and a dollar amount. Each bid amount only appears in the column and is denoted by t_{ijc}. The probability that the item is preferred to the dollar amount is:

$$P_{rc} = P(u_{ijr} > t_{ijc}) = P(\alpha_r + \varepsilon_{ijr} > t_{ijc}) \tag{3}$$

and thus

$$P_{rc} = 1 - \Phi\left(\left(t_{ijc} - \alpha_r\right) / \sigma_r\right) \tag{4}$$

Next, consider the choice between two items

$$P_{rc} = P(u_{ijr} > u_{ijc}) = P(\alpha_r + \varepsilon_{ijr} > \alpha_c + \varepsilon_{ijc}) \tag{5}$$

and thus,

$$P_{rc} = \Phi\left(\frac{\alpha_r - \alpha_c}{\left(\sigma^2_{\varepsilon_r} + \sigma^2_{\varepsilon_c}\right)^{1/2}}\right) \tag{6}$$

---

[7] The current paper sought to test for preference learning within a simple utility specification restricting the valuation to an alternative specific constant. A current working paper 'Contingent Valuation and the Method of Paired Comparisons' explores possible econometric specifications available to the nonmarket valuation practitioner using paired comparison experiments and is available at http://wwwbus.wsc.ma.edu/Dkingsley/.

where $\left(\sigma_{\varepsilon_r}^2 + \sigma_{\varepsilon_c}^2\right)^{1/2}$ is the standard deviation of $\varepsilon_c - \varepsilon_r$. The dependent variable, y_{ijk}, equals 1 if the column item is chosen and 0 otherwise. The likelihood function is written as follows:

$$L\left(y_{ijk}; \alpha_k, \sigma_{\varepsilon_k}\right) = \prod_i^n \prod_j^J P_{rc}^{1-y_{ijk}} P_{rc}^{y_{ijk}} \tag{7}$$

In order to test for preference learning, a heteroscedastic probit model is introduced that allows the standard deviation of the error term to adjust over choice occasion such that $\varepsilon_{ijk} \sim N\left(0, \sigma_{\varepsilon_{kj}}^2\right)$. In particular, a nonlinear functional form is presented so that $\sigma_{\varepsilon_{kj}} = \lambda_k + \beta\left(1/j\right)$. It has been shown that one can identify the error variance of choice models by exploiting the variation in monetary amounts (Cameron 1988; Cameron and James 1987). In particular, using the variation across dollar amounts in this paired comparison experiment the standard deviation is identified and changes to this error structure over the course of the experiment are explored.

Interpretation of these parameters is as follows. Researcher error as well as any error generated by the respondent unrelated to choice occasion will be picked up by λ_k. This term can be interpreted as an alternative specific error constant that is a measure of the error introduced into the model by each item. A significant β represents a significant change in the scale over choice occasion. A reduction in the scale is interpreted as preference learning, and an increase is interpreted as fatigue or boredom. The hypothesis to be tested is $H_o : \beta = 0$, implying that choice occasion has no effect on the scale of the model.

Results for the parameterized error structure are shown in Table 5. The important result is the significance of β which suggests that the scale of the choice model decreases as respondents progress through a sequence of randomly ordered choices. This implies that the data become less noisy as the respondent continues through the experiment. In order to believe that this reduction stems from researcher error, it would need to be the case that some unobservable characteristics of the choices became less significant to the respondent as the experiment progressed. This evidence supports the inverse relationship between choice consistency and the scale of random utility choice models (DeShazo and Fermo 2002; Savage and Waldman 2008).

	Alpha	Lambda
WSC Coffee Mug	7.97	8.87
	(.745)**	(.722)**
WSC Valet Keytag	7.73	6.10
	(.588)**	(.567)**
WSC T-Shirt	17.07	3.55
	(.468)**	(.439)**
WSC Sweatshirt	36.10	1.55
	(.572)**	(.401)**
Meal	18.05	6.10
	(.561)**	(.498)**
Tickets	41.48	6.15
	(.814)**	(.847)**
Open Space	22.49	5.65
	(.564)**	(.490)**
Parking Capacity	37.78	4.28
	(.636)**	(.629)**
Bus Service	28.35	6.78
	(.638)**	(.602)**
Renewable Energy	36.05	8.08
	(.769)**	(.759)**
Beta	70.73	
	(8.161)**	
N	6510	

Table 5: Preference Learning

The dependent variable, y_{ijk}, equals 1 if the column item is chosen and 0 otherwise

Value Disparity

To test the hypothesis that the preference learning experienced in the paired comparison experiment will eliminate the value disparity three test statistics are reported. A small sample t-test assuming unequal variances, a Wilcoxon rank sum test and a median test. The small sample t-test requires the assumption that both WTA and WTP are drawn from a normal distribution and is used to test the null hypothesis that the means are equal. The Wilcoxon rank sum test, alternatively known as the Mann-Whitney U-test, is a non-parametric test that requires no assumption on the underlying distribution. The null hypothesis in this test is that these values are drawn from the same distribution. Finally, the median test is another non-parametric test used to determine whether the data have a common median. The WTP is expected to increase in the treatment while the WTA is expected to decrease. The cumulative effect will reduce the value disparity. Rejection of the null hypothesis, in each case, implies a significant value disparity.

The results are in Table 6. In the control group the mean (median) WTA is $4.46 ($4.50) while mean (median) WTP is $2.27 ($2.00) providing a WTA/WTP mean (median) ratio of 1.97 (2.25). Compared to the control group the treatment WTP increased by 22.9% while WTA decreased by 20.4%, so that mean (median) WTP is $2.79 ($2.75) and mean (median) WTA is $3.55 ($3.75) providing a mean (median) ratio of 1.27 (1.36); results consistent with the proposed *strategic bias*. In the control group the null hypothesis is rejected using each of the three statistics reported. In the treatment the null hypothesis of equality cannot be rejected supporting the hypothesis that preference uncertainty exacerbates the disparity and that preference learning will attenuate the disparity.

Differences are also tested across the control and treatment groups to investigate whether there is a significant change in the WTP or WTA. Results in Table 7 suggest that the null hypothesis of equality cannot be rejected using any of the reported statistics in either the WTP or the WTA measures. The analysis in Table 7 can be refined by estimating WTP/WTA bids as functions of exogenous variables. The exogenous variables include the measured coefficient of consistency. This variable measures the percent of choices within individual which are identified as consistent and ranges from a low of 83% to a high of 98%. High levels of consistency imply knowledge of one's preferences and would be consistent with higher WTP bids and lower WTA bids within individual. The variable, *own*, represents an indicator variable that equals 1 if the respondent currently owns any WSC souvenirs. The *treatment* variable equals 1 if the respondent was in the treatment group. Results, shown in Table 8, indicate that more consistent individuals

offer higher WTP bids and lower WTA bids. No other exogenous variables were significant in the WTP group. However, the variable *own* was positive and significant indicating that those who own at least one other WSC souvenir require higher offer amounts indicating a preference for the good that those without souvenirs do not display. Importantly, controlling for other exogenous variables it can be seen that the *treatment* does significantly lower WTA offers, consistent with expectations. This result, suggesting that the treatment has a greater effect on WTA is not surprising. Many respondents are comfortable buying items and tend to be less comfortable selling items. Lastly, those with more education also appear to offer lower WTA bids.

	Control	Treatment
WTP		
Mean	2.27	2.79
Median	2	2.75
N	11	12
WTA		
Mean	4.45	3.55
Median	4.5	3.75
N	11	10
Mean WTA/WTP	1.97	1.27
Median WTA/WTP	2.25	1.36
t-test	(4.3)***	(1.3)
Rank sum test	(3.2)***	(1.2)
Median test	(4.5)**	(.67)

Table 6: Value Disparity Auction Results within Treatment

	WTP	WTA
Control/Treatment	0.81	1.25
t-test	(.87)	(-1.391)
Rank sum test	(.899)	(-1.656)
Median test	(.057)	(.481)

Table 7: Value Disparity Auction Results across Treatment

	WTP	WTA
Consistency	.17	-18
	(.093)*	(.549)**
Treatment	-.68	-1.22
	(.854)	(.357)**
Own	-.40	2.47
	(.69)**	(.474)**
Age	-.15	.15
	(.411)	(.102)
Gender	.21	-.55
	(.662)	(.360)
Education	.31	-.86
	(1.131)	(.360)**
N	21	21
R-squared	.352	.778

Table 8: WTA WTP Offer Determinants

Conclusion

This paper demonstrates that preference uncertainty exacerbates the value disparity and that reducing this uncertainty is enough to eliminate the value disparity. Specifically, respondents in the preference learning treatment WTP bids increased and WTA bids decreased consistent with a *strategic bias* (Brown 2005) resulting in the elimination of the value disparity. Taken together, results also suggest that the model of preference uncertainty allowing for preference learning, largely consistent with the DPH, accurately characterizes preference formation within this choice experiment.

Consistent with List (2003) this paper suggests that uncertain preferences are constructed and may appear irrational. However, through some process of discovery, market experience or within the experimental design, respondents are able to learn their preferences and these preferences adhere to neoclassical predictions. The importance of this contribution is that this transition occurred outside of markets. As the use of choice experiments within public policy research continues to grow the ability of researchers to induce preferences consistent with economists' predictions in such controlled environments will inform public policy decision making. Methods relying on a single or few questions in unfamiliar contingent markets are unlikely to measure well defined preferences. Choice experiments providing respondents with preference learning opportunities are recommended in applied research.

Two, related, limitations of this research must be considered in the future. Does the preference learning obtained within a paired comparison choice experiment positively affect the decision making of individuals when environmental and public goods are being considered? This paper used a commonly available WSC coffee mug as a starting point and to remove decisions making influenced by risk preferences. Second, the implicit assumption that the valuation distribution will narrow around a stable mean, and further, that this stable mean represents rational preferences must be thoroughly tested.

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Appendix

INSTRUCTIONS

This is an experiment in individual decision-making. You have received an information packet that includes instructions for each round; each sheet represents a single round. Do not tear or separate the pages until instructed to do so. Do not share the information or your decisions with any other participants. We ask you not to communicate with others during the experiment or to react verbally to events.

The experiment consists of a sequence of buying and selling tasks which will be explained in detail as we move along. Both numerical examples and practice rounds will be provided to explain how these tasks will take place.

We will conduct several hypothetical rounds in order to explain how the experiment is set up. If at any time the instructions are unclear do not hesitate to ask for clarification. You will need to understand the instructions in the final binding round. In this final round your decisions are binding and will influence your payout at the end of the experiment. The results of this round will either add or subtract from your $10 show up fee which will be paid out at the end of the experiment.

Your identification number is WSC TP 100. You will be asked to enter this number into the computer portion of this experiment. All transactions will require this number as no other identifying information is collected. Keep this first page with you until the end of the experiment; it will act as your identification.

Buying Task:

The buying task works as follows. The experimenter will offer an item for sale. Your task is to make an offer for the item and record it on your information sheet. You will be provided with a list of possible prices and asked to mark with an X whether or not you would like to buy or not buy the item at that price. Once recorded you will be asked to hand in this information sheet and a price will be randomly selected from this list.

As you will see, your best strategy is to determine the maximum you would be willing to pay for the item and offer that amount. It will not be to your advantage to offer more than this maximum, and it will not be to your advantage to offer less. Simply determine the maximum you would be willing to pay and make that amount your offer.

Your offer will be compared to the randomly determined price. The price will be completely unrelated to your offer and to the offers of all other persons in the room. If your offer is more than or the same as the fixed price then you buy the item. You had the high offer, so you are the buyer. But, here's the interesting part. You do not pay the amount you offered. Instead, you pay the fixed price, an amount equal to or less than your offer.

Example:

Assume that the experimenter has offered some item, say item A, for sale. If you would be willing to buy this item for $6 then you would mark your information sheet as follows. At prices less and up to $6 you mark that you will buy the item. At prices greater than $6 you mark that you will not buy the item.

For each price indicate your decision by marking an X in the appropriate column.

	I Will Buy Item A	I Will **Not** Buy Item A
If the price is $0.00	X	
If the price is $0.50	X	
…		
If the price is $5.50	X	
If the price is $6.00	X	
If the price is $6.50		X
If the price is $7.00		X
…		
If the price is $9.50		X
If the price is $10.00		X

If the random price drawn is $5 you have the high offer. You buy the item but pay only $5. You indicated that you would buy the item if the price were $5. You pay $5 for an item you would have paid $6 for so you are better off.

If on the other hand the random price drawn is $8 you do not have the high offer. Therefore, you do not buy the item. You keep your money. You indicated that you would not buy the item if the price were $8.

As a buyer, you should offer exactly the maximum amount you would be willing to pay in exchange for the item being sold. Remember, there are no advantages to strategic behavior. Your best strategy is to determine your personal value for the item and record that value on the list provided. There is not necessarily a “correct” value. Personal values can differ from individual to individual.

This portion of the script was read aloud by the experimenter. It explains how participant's should you arrive at their actual WTP amounts and why responding with actual WTP is the best strategy. The experimenter provided the following example and explanation: "Imagine that I am a buyer and Item A is up for sale. How do I know what amount is the maximum I'd be willing to pay for Item A?

Start with $.50. Would I be willing to pay $.50 cent for the item? If so, then increase the amount to $1. If I'm willing to pay $1, then increase further. I keep increasing until I come to an amount that makes me indifferent between keeping the money and getting Item A.

Example

Would I pay $1 for A? Yes. Would I pay $2 for A? Yes. Would I pay $5 for A? Yes. Would I pay $6 for A? No, not $6. So I need to decrease. Would I pay $5.50? Yes, I don't care whether I end up with $5.50 or the item. Then that is the maximum I'd be willing to pay for Item A. I'll record, with an X, that I will buy the item up to a price of $5.50 and that thereafter I will mark down that I will not buy the item.

The key to determining the maximum you'd be willing to pay is remembering that you will not pay the amount you bid. Instead, if you pay anything, you will pay the random fixed price.

Why is my best strategy to bid the maximum I'd be willing to pay? Let's go back to the example: Say that I decide that the maximum I'd be willing to pay for Item A is $5.50. What happens if I bid less than $5.50? Say I bid $4.50. If the random price is, say, $5.00, then I don't get the item. Had I bid $5.50, I would have received the item and had to pay only $5.00 for an item that I think is worth $5.50. I lose out. What happens if I bid higher than $5.50? Say I bid $6.50. If the fixed amount is $6, then I have to pay $6 for an item that I really think is worth only $5.50. I lose out.

Therefore it is always in my best interest to determine the maximum amount that I would be willing to pay for the item and to mark that amount down on my information sheet

ROUND 1-Hypothetical Buying Task

In this market the objects being traded are tokens. You are a buyer; you have an opportunity to buy a token, which has a value to you of $3.00. It has this value to you because I will give you this much money for it. The value of the token is the same for each of you.

For each of the prices listed below please indicate whether you prefer to: (1) Buy the token at this price, or (2) Not buy the token at this price.

After you have finished, one of the prices listed below will be selected at random and any exchanges will take place at that price. If you have indicated you will buy at this price you will receive a token and will pay this amount of money; if you have indicated that you will not buy a token at this price then no exchange will be made and you do not pay anything.

Notice the following two things:

(1) Your decision can have no effect on the price actually used because the price will be selected at random.

(2) It is in your interest to indicate the maximum you would be willing to pay for the token.

For each price indicate your decision by marking an X in the appropriate column.

	I Will Buy The Token	I Will **Not** Buy The Token
If the price is $0.00	_____	_____
If the price is $0.50	_____	_____
If the price is $1.00	_____	_____
…		
If the price is $9.00	_____	_____
If the price is $9.50	_____	_____
If the price is $10.00	_____	_____

Selling Task:

The selling task works as follows. The experimenter wishes to buy an item that you own. Your task is to make an offer for the item and record it on your information sheet. You will be provided with a list of possible prices and asked to mark with an X whether or not you would like to sell or not sell the item at that price. Once recorded you will be asked to hand in this information sheet and a price will be randomly selected from this list.

As you will see, your best strategy is to determine the minimum you would be willing to accept for the item and offer that amount. It will not be to your advantage to offer more than this minimum, and it will not be to your advantage to offer less. Simply determine the minimum you would be willing to accept and make that amount your offer.

Your offer will be compared to a randomly determined price. This price will be completely unrelated to your offer and to the offers of all other persons in the room. If your offer is less than or the same as the price then you sell the item. You had the low offer, so you are the seller. But, here's the interesting part. You do not receive your offer. Instead, you receive the randomly selected price, a price higher than or equal to your offer.

Example:

Assume that the experimenter has offered to buy from you some item, say item A, that you own. If you determine that you would be willing to accept $6 for this item than you mark your information sheet as follows. At prices below $6 you mark that you will not sell the item. At prices $6 and greater you mark that you will sell the item

For each price indicate your decision by marking an X in the appropriate column.

	I Will Sell Item A	I Will **Not** Sell Item A
If the price is $0.00	_____	X
If the price is $0.50	_____	X
…		
If the price is $5.00	_____	X
If the price is $5.50	_____	X
If the price is $6.00	X	_____
If the price is $6.50	X	_____
…		
If the price is $9.50	X	_____
If the price is $10.00	X	_____

If the randomly drawn price is $5 you do not sell and you keep item A. You indicated that you would not sell the item is the price were $5. You keep the item

If the randomly drawn price is $8 you sell the item and receive $8. You indicated that you would sell the item if the price were $8. You receive $8 for an item you would have sold for $6 so you are better off.

As a seller, you should offer the minimum amount you would be willing to accept in exchange for the item you own. Just as you saw in the case of the buying task, there are no advantages to strategic behavior in the selling task. Your best strategy is to determine your personal value for the item and record that value as your offer. There is not necessarily a "correct" value. Personal values can differ from individual to individual.

This portion of the script was read aloud. It explains how respondents should determine their actual WTA amounts and why responding with actual WTA is the best strategy. The experimenter provided the following example and explanation: "Imagine that I am a seller and I own Item A. How do I know what amount is the minimum I'd be willing to accept to give up Item A?

Start with $10. Would I be willing to give up Item A in exchange for $10? If so, then decrease the amount to $9.50. If I'm willing to accept $9.50 to give up Item A, then decrease further. I keep decreasing until I come to an amount that makes me indifferent between keeping Item A and getting the money.

Example

Would I accept $10 to give up Item A? Yes. Would I accept $8 for A? Yes. Would I accept $7 for A? Yes. Would I accept $6 for A? Yes. Would I accept $5. No, not $5. So I need to increase. Would I accept $5.50? I don't care whether I end up with $5.50 or Item A. Then that is the minimum I'd be willing to accept for Item A. I'll record that number on my information sheet.

The key to determining the minimum you'd be willing to accept is remembering that you will not receive the amount you ask for. Instead, if you receive anything, you will always get the random price.

Why is my best strategy to bid the minimum I'd be willing to accept? Let's go back to the example: Say I decide that the minimum I'd be willing to accept for Item A is $5.50. What happens if I ask for less than $5.50? Say I ask for only $4.50. If the random price is, say, $5.00, then I have to sell my item. I lose out because I have to give up Item A which I think is worth $5.50, but I only get $5.00 in exchange.

What happens if I ask for more than $5.50? Say I ask for $6.50. If the random price is $6.00, then I do not sell. But, had I bid $5.50, I would have sold the item and received $6.00 for an item that I think is worth only $5.50. I lose out."

ROUND 2-Hypothetical Selling Task

In this market the objects being traded are tokens. You are an owner; you have an opportunity to sell your token, which has a value to you of $3.00. It has this value to you because the experimenter will give you this much money for it. The value of the token is the same for each of you.

For each of the prices listed below please indicate whether you prefer to: (1) Sell the token at this price, or (2) Not sell the token at this price and cash it in for the amount of money indicated above.

After you have finished, one of the prices listed below will be selected at random and any exchanges will take place at that price. If you have indicated you will sell at this price you will sell the token and receive this amount of money; if you have indicated that you will not sell the token at this price then no exchange will be made but you will receive the amount of money indicated above.

Notice the following two things:

(1) Your decision can have no effect on the price actually used because the price will be selected at random.

(2) It is in your interest to indicate the minimum you would be willing to accept for the Token.

For each price indicate your decision by marking an X in the appropriate column.

	I Will Sell The Token	I Will **Not** Sell The Token
If the price is $0.00	_____	_____
If the price is $0.50	_____	_____
If the price is $1.00	_____	_____
…		
If the price is $9.00	_____	_____
If the price is $9.50	_____	_____
If the price is $10.00	_____	_____

ROUND 3-Hypothetical Buying Task

In this market the objects being traded are tokens. You are a buyer; you have an opportunity to buy a token, which has a value to you of $7.00. It has this value to you because the experimenter will give you this much money for it. The value of the token is different for each of you.

For each of the prices listed below please indicate whether you prefer to: (1) Buy a token at this price and cash it in for the amount of money indicated above, or (2) Not buy a token at this price.

After you have finished tear out this page and hand Round 3 to the experimenter. Once all of the Rounds have been collected one of the prices listed below will be selected at random and any exchanges will take place at that price. If you have indicated you will buy at this price you will receive a token and will pay this amount of money; if you have indicated that you will not buy a token at this price then no exchange will be made and you do not pay anything.

Notice the following two things:

(1) Your decision can have no effect on the price actually used because the price will be selected at random.

(2) It is in your interest to indicate the maximum you would be willing to pay for the Token.

For each price indicate your decision by marking an X in the appropriate column.

	I Will Buy The Token	I Will **Not** Buy The Token
If the price is $0.00	_____	_____
If the price is $0.50	_____	_____
If the price is $1.00	_____	_____
…		
If the price is $9.00	_____	_____
If the price is $9.50	_____	_____
If the price is $10.00	_____	_____

ROUND 4-Hypothetical Selling Task

In this market the objects being traded are tokens. You are an owner; you have an opportunity to sell your token, which has a value to you of $7.00. It has this value to you because the experimenter will give you this much money for it. The value of the token is different for each of you.

For each of the prices listed below please indicate whether you prefer to: (1) Sell the token at this price, or (2) Not sell the token at this price and cash it in for the amount of money indicated above.

After you have finished, tear out this page and hand Round 4 to the experimenter. Once all of the Rounds have been collected one of the prices listed below will be selected at random and any exchanges will take place at that price. If you have indicated you will sell at this price you will sell the token and receive this amount of money; if you have indicated that you will not sell the token at this price then no exchange will be made but you will receive the amount of money indicated above.

Recall the following two things:

(1) Your decision can have no effect on the price actually used because the price will be selected at random.

(2) It is in your interest to indicate the minimum you would be willing to accept for the Token.

For each price indicate your decision by marking an X in the appropriate column.

	I Will Sell The Token	I Will **Not** Sell The Token
If the price is $0.00	_____	_____
If the price is $0.50	_____	_____
If the price is $1.00	_____	_____
…		
If the price is $9.00	_____	_____
If the price is $9.50	_____	_____
If the price is $10.00	_____	_____

Choice Experiment

Before continuing to the final binding round of this experiment we will ask you to complete a simple choice experiment between pairs of items. These items will be compared to each other and to various dollar amounts. In each case you are asked to choose the item you would prefer if you could have either at no cost.

In the next round you will either be a buyer or seller of the WSC Coffee Mug you were each given at the beginning of the experiment. That is, you will have the opportunity to either buy the mug or to sell the mug. In this portion you will make many choices between this mug in other items on the list.

Simply click on the PC Program on your desktop to get started. When you are finished wait for further instructions.

On the following page there is a list of the 10 items included in this choice experiment, as you progress through this portion keep this list in front of you.

Items included in this choice experiment

1) The Westfield State College (WSC) coffee mug you were each given at the beginning of this choice experiment which is available in the campus bookstore

WSC Coffee Mug

2) A WSC Valet Keytag available in the campus bookstore for $6.95

WSC Valet Keytag

3) A WSC T-Shirt available in the campus bookstore for $12.95

WSC T-Shirt

4) A WSC Hooded Sweatshirt available in the campus bookstore for $36.95

WSC Sweatshirt

5) A meal at a restaurant of your choice up to $15

Meal

6) Two tickets to a regular season Red Sox game (Approximate value $60)

Tickets

7) Currently the only area available for students to park on campus is the commuter lot besides 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.

Parking Capacity

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.

Open Space

9) Currently students enjoy free rides on PVTA Route R-10 which runs from WSC 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.

Bus Service

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 4 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 WSC to achieving this goal by pursuing renewable energy from Solar, Wind and Hydroelectric sources.

Renewable Energy

ROUND 5 Binding Buying Task

In this market the objects being traded are Westfield State Coffee Mugs. You are a buyer; you have the option of buying this mug to take home by paying money for it.

For each of the possible prices listed below please indicate whether you wish to (1) Buy the mug at this price and pay that amount of money for it, or (2) Not buy a mug at this price.

After you have finished, hand Round 5 to the experimenter. Once all Rounds have been collected one of the prices listed below will be selected at random and any exchanges will take place at that price. If you have indicated you will buy at this price you will receive a mug and will pay this amount of money; if you have indicated that you will not buy a mug at this price then no exchange will be made and you do not pay anything.

Notice the following two things:

(1) Your decision can have no effect on the price actually used because the price will be selected at random.

(2) It is in your interest to indicate the maximum you would be willing to pay for the Mug.

For each price indicate your decision by marking an X in the appropriate column.

	I Will Buy The Mug	I Will **Not** Buy The Mug
If the price is $0.00	_____	_____
If the price is $0.50	_____	_____
If the price is $1.00	_____	_____
…		
If the price is $9.00	_____	_____
If the price is $9.50	_____	_____
If the price is $10.00	_____	_____