

The Offer/Asking Price Gap and Term of Possession – an Experiment

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1. Introduction.....	3
2. Empirical Evidence of the Offer/Asking Price Gap	4
3. Possible Explanations for the Offer/Asking Price Gap	5
3.1 Income effects.....	6
3.2 Strategic bargaining mistakes	8
3.3 Substitutability.....	11
3.4 Loss aversion	14
3.5 Closing transactions	15
3.6 Dignity hypothesis.....	16
3.7 Property for personhood.....	18
3.8 Imprecise Preferences and Regret Theory	19
3.9 Our Own Hypothesis.....	22
4. The Experiment.....	24
4.1 Overview of Method and Design	24
4.2 Procedure	25
4.2.1 Value Token Markets.....	25
4.2.2 Consumption Good Markets.....	26
4.3 Subjects	29
4.4 Results	30
4.4.1 Results from the Value Token Markets	30
4.4.2 Results from the Consumption Good Markets	31
4.5 Discussion	38
4.5.1 Discussion of the Results from the Value Token Markets	38
4.5.1 Discussion of the Results from the Consumption Good Markets	38
4.5.2 Summary of Discussion and Conclusion	43

1. Introduction¹

I would certainly never pay \$50 for a ticket to a Wolverines football game (sorry, die-hard Wolverines fans). However, although I most probably could have sold my ticket for something close to \$50, I went and watched the homecoming game against Purdue this Fall. Now, a lot of students probably behave about the same way. But why? Isn't it irrational to ask for more to sell your ticket than you would ever be willing to pay for it in the first place?

Well, if you think that behavior in accordance with the standard economic model is rational, then asking for more to sell your ticket than you would ever be willing to pay for it is irrational. Willingness to pay and willingness to accept for the same good should be close, controlling for income effects.² However, dozens of experiments conducted over the last 30 years, with goods as different as chocolates, pens, mugs, movie tickets, hunting licenses, visibility, nuclear waste repositories, nasty-tasting liquids, pathogen-contaminated sandwiches and many others³ show that people have a substantially higher willingness to accept (WTA) after owning an entitlement than willingness to pay (WTP) prior to ownership of the same good. This observed difference between WTA and WTP has been labeled by Richard Thaler, according to its apparent cause, as the "endowment effect".⁴

The endowment effect has received so much attention because it obviously contradicts the invariance proposition of the venerable Coase Theorem.⁵ The invariance proposition posits that, assuming low transaction costs, it makes no difference from an efficiency perspective who initially receives a legal entitlement. As long as transaction costs are negligible, a series of transactions will take place until the party with the highest value for the entitlement owns it. If, however, the endowment with a good changes the value the person endowed with it attributes to

¹ I would like to thank the John M. Olin Center for Law and Economics at the University of Michigan for its generous support of this work.

² See Robert Willig, *Consumer's Surplus Without Apology*, 66 *Am. Econ. Review* 589-97 (1976); Alan Randall and John R. Stoll, *Consumer's Surplus in Commodity Space*, 70 *Am. Econ. Rev.* 449-457 (1980).

³ John K. Horowitz and Kenneth E. McConnell, *A Review of WTA/WTP Studies*, *Journal of Environmental Economics and Management* 1-22, published electronically January 31, 2002 (the article can be downloaded from <http://www.idealibrary.com>. The paper version has not yet been published).

⁴ Richard Thaler, *Toward a Positive Theory of Consumer Choice*, 1 *J. Econ. Behav. & Org.* 39, 44 (1980). Whether the label is correct is another question, to be explored in the section about the possible causes of the WTA/WTP gap.

⁵ Ronald H. Coase, *The Problem of Social Cost*, 3 *J.L. & Econ.* 1 (1960).

that good, the initial allocation of the entitlement will obviously influence the final allocation of the entitlement.

The offer/asking price gap also raises the problem of how one is to decide who values a good most: the one who has the highest WTA or the one who has the highest WTP? This poses interesting policy questions.⁶

While the existence of the endowment effect has been comprehensively proven, no consensus has been reached so far as to what causes it. There has also been no study, as far as I can tell, that has examined whether the endowment effect is a phenomenon that is stable over time, or whether the endowment effect increases or diminishes as a function of the time someone owns an entitlement. This paper tries to answer the latter question and might provide some insight into the former (the cause of the endowment effect).

I will start with a short summary of the empirical evidence of the endowment effect gathered so far. Then I will briefly explain and assess the various possible causes of the offer/asking price gap. The description of the method of the study, the presentation of the results and the discussion of them will constitute the second part of this paper.

2. Empirical Evidence of the Offer/Asking Price Gap

The empirical evidence of the disparity between WTP and WTA is, to put it mildly, overwhelming. One observer has noted that the endowment effect by now “must be accepted as a stylized fact”.⁷

Elk hunters in Wyoming were willing to pay an average of \$54 per year to increase their elk sightings per expedition from one to five, but they would demand \$142 each before allowing environmental degradation to reduce sightings from five to one.⁸ Similarly, residents of the Four Corners region of the south-western United States offered an average of \$4.75 per family, per month, to maintain seventy-five miles of air visibility in their region rather than allowing

⁶ See Russell Korobkin, *Policymaking and the Offer/Asking Price Gap: Toward a Theory of Efficient Entitlement Allocation*, 46 *Stan. L. Rev.* 663 (1994).

⁷ Steffen Huck, Georg Kirchsteiger and Joerg Oechssler, *Learning to Like What You Have – Explaining the Endowment Effect*, (1997), available from <http://papers.ssrn.com> (visited March 9, 2002).

⁸ William D. Schulze, Ralph C. d’Arge and David S. Brookshire, *Valuing Environmental Commodities: Some Recent Experiments*, 57 *Land Econ.* 151, 165-166 (1981).

pollution that would decrease visibility to fifty miles. On the other hand, they demanded an average of \$24.47 per month to sell the right to pollute the extra twenty-five miles of visibility.⁹ While the above mentioned experiments involved hypothetical questions and no real payoffs, Kahneman, Knetsch and Thaler (KKT) report a median seller reservation price of \$5.25 for a Cornell coffee mug, while the median buyer reservation price was \$2.25, in an experiment that involved real payoffs (subjects had to pay for the mugs using their own money and received the market price if they sold their mug) and repeated markets to permit learning.¹⁰

In a meta-analysis of 45 studies of the offer-asking price gap, Horowitz and McConnell conclude that ratios of mean WTA/mean WTP in real experiments are not significantly different from hypothetical experiments, and that incentive-compatible elicitation yields higher ratios, not lower (which is rather surprising).¹¹ Public or non market goods, defined as goods that involve a collective decision¹², elicit a ratio of mean WTA/mean WTP of 10.41, health and safety one of 10.06, ordinary private goods¹³ one of 2.92 and lottery tickets one of 2.10. The farther a good is from being an ordinary private good, the higher the ratio.¹⁴ The closer the good comes to being actual money, the smaller the ratio.¹⁵

3. Possible Explanations for the Offer/Asking Price Gap

While the existence of the offer/asking price gap can hardly be disputed, disagreement remains as to what causes it. One can divide the explanations offered in the literature roughly into two categories: explanations that seek to explain the disparity in terms of the standard neoclassical

⁹ William D. Schulze, Ralph C. d'Arge, David S. Brookshire, An Experiment on the Economic Value of Visibility, 7. *J. Environ. Econom. Management*, 1-19, 10 (1980).

¹⁰ Daniel Kahneman, Jack L. Knetsch and Richard H. Thaler, Experimental Tests of the Endowment Effect and the Coarse Theorem, 98 *J. Polit. Econ.* 1325, (1990), reprinted in *Behavioral Law and Economics*, Cass R. Sunstein ed. (2000), 211.

¹¹ Horowitz and McConnell, *supra* note 3, at 2.

¹² *Id.* at 5. Examples are a government program that increases the density of trees in the neighbourhood, like the one proposed in David S. Brookshire and Don L. Coursey, *Measuring the Value of a Public Good: An Empirical Comparison of Elicitation Procedures*, 77 *Am. Econ. Rev.* 554-566 (1987) or the adoption of a program that increases visibility, Schulze et al, *supra* note 7.

¹³ E.g. coffee mugs, binoculars, chocolate bars or pens.

¹⁴ Horowitz and McConnell, *supra* note 3, at 8 (table IIIA).

¹⁵ *Id.* at 9.

economic model and psychological explanations which acknowledge that human behavior might not be in accordance with the economic model. The wealth (income) effect, substitutability and strategic bargaining mistakes in one-shot transactions belong in the former category, although for different reasons. The notion of strategic mistakes assumes that *true* WTP and WTP are equal, but subjects state inflated compensation demands (or understate bids) for strategic purposes. The substitutability argument accepts that WTP and WTA differ for goods without close substitutes, but shows that this is to be expected according to standard consumer theory.

Loss aversion, the “closing” hypothesis, the “dignity effect”, “property for personhood” and regret avoidance combined with imprecise preferences are among the psychological explanations advanced. I will briefly explain each of these theories and examine whether they predict a stable, diminishing or increasing offer/asking price gap over time. I would like to add a word of caution regarding the economic models: I do not have the mathematical/economical background to fully understand the models advanced in some of the papers, and I will concentrate on their predictions and assumptions, rather than the mathematical modelling.

3.1 Income effects

The subjects in the WTA group of a classic endowment effect experiment – i.e. those subjects that have been endowed with a good – are systematically wealthier than those subjects in the WTP group. They are wealthier by the value of the good they have been endowed with. Hence, given the diminishing marginal utility of money, they can be expected to place a higher monetary value on the good than the subjects not endowed with it, which would explain the offer/asking price gap without resorting to any psychological explanations.

Given the low value of the goods used in most experiments – mugs, pens, chocolate bars – compared to the overall income of the subjects, it appears rather silly to think income effects play a major role in the disparity of the offer and asking price. Even with student subjects, who likely have relatively low incomes and wealth, it seems implausible that the additional income in the amount of a couple of dollars would significantly alter the monetary value they assign the good in question.

Empirical evidence supports this intuition. Experiments controlling for income effects still report a substantial disparity between offer and asking price. Kahnemann, Knetsch and Thaler (KKT)

divided their subjects into three groups: in the “Seller” group, each subject received a mug and was asked to indicate whether or not they would sell the mug at series of prices ranging from \$0 to \$9.25. The “Buyer” group was not given a mug and its members indicated whether they were willing to buy a mug at each of these prices, while the third group, the “Choosers” were asked to choose, for each of the possible prices, between receiving a mug or cash. The median valuations were: Sellers, \$7.12; Choosers, \$3.12; and Buyers, \$2.87.¹⁶ These results eliminate any form of income effect as explanation of the discrepant valuations since the positions of Sellers and Choosers were strictly identical.

Franciosi et al. also conclude that income effects play no role. Subjects traded value tokens before they traded mugs, and earnings in the induced value experiments varied from zero to \$34. Franciosi et. al. regressed the submitted bids (offers) for the mugs on earnings for buyers and for sellers in the previous induced value markets and reported that no significant effect of earnings on subject WTP and WTA for a mug was found.¹⁷

Boyce et. al. also controlled for the income effect: the subjects in the WTP condition (the potential buyers) were given an initial balance of \$40 with which to bid, while the subjects in the WTA condition were given a balance of only \$30 and a Norfolk Island pine tree with an approximate retail value of \$6. The difference in the initial balance should more than compensate for the value of the tree, in fact, one would expect an income effect in favour of the WTP group. At the end of the experiment, subjects kept any remaining balance as payment for participation in the experiment.¹⁸ The mean WTA for the pine tree was \$8, the mean WTP \$4.81, resulting in a ratio of mean WTA/WTP of 1.66.¹⁹ Again, controlling for the income effect did not eliminate the offer/asking price gap.

Morrison compensated her subjects in the WTP condition – i.e. those subjects that did not receive a mug and were asked to indicate what they were willing to pay for one – with a voucher that had an assigned value equal to the mean stated WTA from the subjects endowed with a mug. This

¹⁶ Kahneman, Knetsch and Thaler, *supra* note 10 at 223.

¹⁷ Robert Franciosi, Praveen Kujal, Roland Michelitsch, Vernon Smith and Gang Deng, Experimental test of the endowment effect, 30 *J. Econ. Behavior & Org.* 213, 222 (1996).

¹⁸ Rebecca R. Boyce, Thomas C. Brown, Gary H. McClelland, George L. Peterson and William D. Schulze, An Experimental Examination of Intrinsic Values as a Source of the WTA-WTP Disparity, 82 *Am. Econ. Rev.* 1366, 1368 (1992).

¹⁹ *Id.* At 1370.

design should compensate for the different income levels as closely as possible (it would be desirable to compensate each individual with her or his own WTA value, but practical difficulties in obtaining WTA and WTP from the same people for the same good prohibit such a procedure). Even compensating for the income from the mug, the reported mean WTA for the mug was, in repeated trials to allow for learning, at least twice the mean WTP for the same mug.²⁰

I think it is fairly safe to conclude that the income effect cannot adequately explain the observed differences in WTA and WTP.

3.2 Strategic bargaining mistakes

Another source of the offer/asking price gap may be strategic bargaining mistakes on behalf of the subjects. In a non-competitive market setting – like a bazaar or a flea-market – it makes strategic sense for sellers to overstate their WTA. They can hope to sell to the individual who is willing to pay their inflated reservation price, and refuse to sell to individuals that offer them more than their true WTA, but only slightly more. This is profit-maximizing as long as the gain from the trade with the individual that is willing to pay the inflated reservation price outweighs the loss of trade opportunities with very small gains. In fact, a modest toughness in bargaining, resulting in a stated WTA that is higher than the true WTA and a stated WTP that is lower than the true WTP, is evolutionary viable.²¹

While overstating the WTA²² makes sense in a bilateral bargaining setting with repeated interactions, it is self-harming in a one-shot or single transaction, as it results in loss of opportunities for profitable trade. Given the fact that most people are more familiar with bilateral bargaining than with one-shot transactions, one would expect them to overstate their WTA in a one-shot transaction when they first experience it. They should, however, learn that their strategy backfires in this environment, and adjust their WTA accordingly – i.e. to reflect their true WTA – in subsequent market trials. Over repeated trials, WTA and WTP should converge, if strategic mistakes are the only cause of the discrepancy.

²⁰ Gwendolyn C. Morrison, Willingness to pay and willingness to accept: some evidence of an endowment effect, 29 *Applied Econ.* 411, 415 (1997).

²¹ Aviad Heifetz and Ella Segev, *The Evolutionary Role of Toughness in Bargaining*, (July 2001); Steffen Huck, Georg Kirchsteiger and Jörg Oechssler, *Learning to Like What You Have – Explaining the Endowment Effect*, (April 1997), both papers are available from <http://www.ssrn.com> (visited March 9, 2002).

²² And understating one's WTP. I use the WTA as an example since referring to both WTP and WTA in each sentence makes comprehension more difficult.

The evidence on whether learning and familiarity reduce the offer/asking price gap to zero is mixed.²³ KKT explicitly tested for the learning hypothesis and conducted five repeated market trials, giving the participants feedback about the market clearing price, yet the gap persisted.²⁴ Morrison reports that subjects were indeed learning over the course of the repeated trials, but the gap nonetheless persisted.²⁵

On the other hand, Brookshire and Coursey reported that the ratio decreased.²⁶ However, even in a market setting and over five repeated trials the gap did not completely disappear, in fact, the ratio between compensation demanded and willingness-to-pay measures of value was still approximately five to one after five trials.²⁷ The evidence does show that the WTA declined more over the five trials than the WTP increased.²⁸ Coursey, Hovis and Schulze conducted an experiment where they let subjects taste a bitter-tasting, but harmless, liquid (sucrose octaacetate, SOA).²⁹ Subjects in the WTA condition were offered payment to taste SOA. In the WTP condition, subjects offered to pay to avoid having to taste SOA. Using a Vickrey auction with the added twist that all winners had to accept the outcome, otherwise another trial was to be conducted, Coursey, Hovis and Schulze conducted several market trials. They report that WTA greatly declined over the several trials, while WTP increased somewhat, but not nearly as much as WTA decreased. Final auction measures of WTA and WTP were “statistically similar”.³⁰ The experiment by Coursey, Hovis and Schulze has been criticized by Knetsch and Sinden on various grounds: removing an extreme outlier, the disparity between WTP and WTA remains statistically significant.³¹ Since subjects probably had no firm notion of the monetary equivalence of the

²³ Horowitz and McConnell, *supra* note 3, at 15.

²⁴ Kahneman, Knetsch and Thaler, *supra* note 10, at 226.

²⁵ Gwendolyn C. Morrison, WTP and WTA in repeated trial experiments: Learning or leading?, 21 *Journal of Economic Psychology* 57-72 (2000). She reports a ratio of WTA:WTP of 2.188 after five trials for mugs, *id.* at 63. See also Morrison, *supra* note 20 (gap persists over five trials).

²⁶ David S. Brookshire and Don L. Coursey, Measuring the Value of a Public Good: An Empirical Comparison of Elicitation Procedures, 77 *Am. Econ. Rev.* 554-566 (1987).

²⁷ *Id.* at 562.

²⁸ *Id.* at 563.

²⁹ Don L. Coursey, John L. Hovis and William D. Schulze, The Disparity Between Willingness to Accept and Willingness to Pay Measures of Value, 102 *Q.J. of Econ.* 679-690 (1987).

³⁰ *Id.* at 688.

³¹ Citing Robin Gregory and Lita Furby, Auctions, Experiments and Contingent Valuation, 55 *Pub. Choice* 281 (1987).

unusual experiment, they may have simply observed what others seemed to think was a reasonable, or socially acceptable, sum to compensate them for undertaking or avoiding the tasting of SOA. Paying the subjects in the WTP condition \$10 upfront may have reduced the loss-aversion, because they are likely to code a subsequent payment out of these \$10 as a reduction in the gain rather than an outright loss. Finally, even after several trials, there remained a substantial undertrading (sixteen transactions were expected, only nine trades occurred).³²

Stronger evidence that learning and a competitive market environment reduce the offer/asking price gap comes from Shogren et al.³³ who report that, when using a Vickrey auction to elicit WTA and WTP, the discrepancy between the two disappears after five trials for both chocolate bars and mugs. The initial ratio WTA/WTP for the mug experiment of 2.74 was reduced to 1.03 by the fourth trial.³⁴ In a further experiment, Shogren et al. tested three different elicitation procedures, and conclude that the use of a second price (Vickrey) auction or a nth-price auction lead to the disappearance of the endowment effect, while use of the Becker-DeGroot-Marschak auction does not lead to this result.³⁵ The auction mechanism itself seems to account for the conflicting observations by KKT (1990) and Shogren et al (1994). This result is puzzling since theoretically, all three auction mechanisms used should be incentive compatible.³⁶

In sum, while the picture is far from clear, there seems to be evidence that subjects are learning and adapt their bidding according to the incentives a competitive market setting provides. The learning in iterated trials seems to decrease WTA more than it increases WTP. The question of whether WTP and WTA converge completely after repeated market trials remains open.

³² Jack L. Knetsch and J.A. Sinden, *The Persistence of Evaluation Disparities*, 102 *Q.J. of Econ.* 692 (1987).

³³ Jason F. Shogren, Seung Y. Shin, Dermot J. Hayes, James B. Kliebenstein, *Resolving Differences in Willingness to Pay and Willingness To Accept*, 84 *American Econ. Rev.* 255-270 (1994).

³⁴ *Id.* at 265.

³⁵ Jason F. Shogren, Sungwon Cho, Cannon Koo, John List, Changwon Park, Pablo Polo, Robert Wilhelmi, *Auction mechanisms and the measurement of WTP and WTA*, 23 *Resource and Energy Economics* 97, 108 (2001). They used a total of 78 subjects, and a candy bar as well as a coffee mug as experimental goods.

³⁶ Empirically, it is far from clear whether responses in incentive-compatible auctions represent true values. See e.g. Elizabeth Hoffman and Matthew L. Spitzer, *Willingness to Pay vs. Willingness to Accept: Legal and Economic Implications*, 71 *Wash. U.L.Q.* 59-114, 73 (1993). Assessing the vices and virtues of different auction mechanisms is a science by itself, and I do not intend to venture further into this terrain.

3.3 Substitutability

The intuition behind the substitutability argument makes a lot of sense: no one is willing to give up possession of a unique good – a good for which there are no substitutes available, like the Yosemite National Park, or your own life – for a finite amount of money, since no money in the world can buy a “replacement” for the sold good. The good is, quite literally, priceless. On the other hand, every individual’s willingness to pay even for a unique good will always be constrained by that individual’s necessarily finite income. Hanemann shows that the fewer the available substitutes for the public good are, the greater the disparity between WTP and WTA, holding income effects constant. The easier a given public good can be substituted by privately marketed commodities, the smaller the expected disparity between WTP and WTA. Convergence of WTP and WTA can only be expected when the good in question has a very close substitute.³⁷

Shogren et al. tested Hanemann’s substitutability hypothesis in a nonhypothetical experimental auction market. They used a brand name candy bar as a good with very close substitutes and the risk to suffer food poisoning from eating a possibly infected sandwich as a good without a close substitute. More precisely, subjects were given \$15 income as payment for their participation in the experiment and either a regular sandwich purchased from a local source with a typical chance of being contaminated with a food-borne pathogen, or a sandwich that had been stringently screened for food-borne pathogens by the University’s meat-testing laboratory. The subjects had to eat the sandwich at the end of the experiment to receive their payment. The subjects were informed of the probability of contracting food poisoning from the non-screened sandwich and the probability of contracting food poisoning from the screened sandwich, which was much lower. They were also told what the symptoms of various kinds of food-poisoning were.³⁸ They had then the opportunity to pay to “upgrade” their sandwich to a screened sandwich, or were asked to state their compensation demand to trade their screened sandwich for a non-screened sandwich. Shogren et al. report that the WTP and WTA in the markets for the candy bars converged over repeated trials (the WTA was actually lower than the WTP after the third trial), while the difference for WTP and WTA in the market for the health-risk (food poisoning) persisted even after 20 trials, remaining at threefold to fivefold level for various bacteria.³⁹

³⁷ W. Michael Hanemann, *Willingness To Pay and Willingness To Accept: How Much Can They Differ?*, 81 *Am. Econ. Rev.* 635 (1991).

³⁸ Jason F. Shogren, Seung Y. Shin, Dermot J. Hayes, James B. Kliebenstein, *supra* note 33, at 259.

³⁹ *Id.* at 264.

Shogren et. al. conclude that the hypothesis that WTP and WTA will converge over repeated trials for goods with close substitutes cannot be rejected, and that the results of their experiments support Hanemann's substitutability hypothesis.⁴⁰

One problem with the substitutability argument is that Shogren et al. assume that the relevant elasticities of substitution are smaller for non-market than for market goods. Absent any direct measure of elasticities in substitution, however, this remains conjecture. The problem is that elasticities of substitution are exceedingly difficult to measure, and virtually no data exists. Hence, Hanemann's substitution argument does not allow us to predict how strong the endowment effect will be for a given good.

The controversial part of Shogren's et al. results is of course the reported convergence of WTP and WTA in the repeated markets for chocolate bars, since it is at odds with so many results from other studies which report a persistent WTP/WTA gap – namely the classic study by KKT, which used repeated trials and found no convergence.⁴¹ Morrison criticizes Shogren's et al. rejection of the endowment effect as premature, since their experiment did not test whether both endowment effect *and* substitutability cause the offer/asking price gap, working together.⁴² Her main contention is that the endowment effect may be present when WTP and WTA for goods with close substitutes are elicited, but at a statistically insignificant level.⁴³ Shogren and Hayes point out that Morrison's main argument is that the endowment effect might be "lurking behind the substitution effect, refusing to show its head separately from the substitution effect",⁴⁴ which begs the question why one should not call it the substitution effect in the first place, since substitutability seems as good an explanation for the observed WTA/WTP gap as endowment. They also assert that their elicitation technique – sealed-bid, second price Vickrey auctions repeated over several market trials⁴⁵ – provides more incentives to state competitive bids than

⁴⁰ Id. at 266.

⁴¹ Kahneman, Knetsch and Thaler, *supra* note 10.

⁴² Gwendolyn C. Morrison, Resolving Differences in Willingness to Pay and Willingness to Accept: Comment, 87 *Am. Econ. Rev.* 236 (1997).

⁴³ Id. at 239.

⁴⁴ Jason F. Shogren and Dermont J. Hayes, Resolving Differences in Willingness to Pay and Willingness to Accept: Reply, 87 *Am. Econ. Rev.* 241 (1997).

⁴⁵ William Vickrey, Counterspeculation, Auctions and Competitive Sealed Tenders, 16 *Journal of Finance* 8-37 (1961). In a Vickrey auction, the highest bidder wins, but he pays an amount equal to the second highest bid. Since individuals in Vickrey auctions do not pay or receive what they bid, incentives for false (strategic) bids are not present.

elicitation methods used in other WTA/WTP experiments.⁴⁶ They tested this hypothesis and report that while a WTA/WTP discrepancy exists in the first trial for both Vickrey and Becker-DeGroot-Marschak⁴⁷ (BDM) auctions, it disappears over repeated trials in the Vickrey auction, but not in the BDM auction.⁴⁸

The fact that the offer/asking price gap is significantly higher for non-market and public goods than for ordinary private goods⁴⁹ also lends support to the substitutability hypothesis. But the evidence remains mixed, as there are studies that explicitly controlled for substitutability, yet still report a significant endowment effect.

Morrison reports explicitly that WTA and WTP did not converge over repeated market trials for mugs, even when a compensated WTP was elicited.⁵⁰ However, WTA and WTP were equal for chocolate bars, although WTP was not compensated in this part of the experiment. This suggests that there might be a threshold value at which the endowment becomes relevant, and experiments should use goods more valuable than chocolate bars to test for the endowment effect.⁵¹

Other studies that controlled for substitutability and yet reported an endowment effect are Bateman et al.,⁵² Knetsch and Sinden⁵³ and Knetsch⁵⁴.

In sum, substitutability seems to have a profound impact on the size of the offer/asking price gap. This makes intuitive sense, can be theoretically shown, and is supported by empirical evidence. However, it is not yet clear that substitutability is the only cause of the observed disparity. Results from experiments that control for substitutability, but still report a significant WTA/WTP gap, contradict the hypothesis that substitutability is the *only* cause of the gap.

⁴⁶ Shogren and Hayes, *supra* note 44, at 242.

⁴⁷ Gordon Becker, Morris DeGroot and Jacob Marschak, Measuring Utility by a Single Response Sequential Method, 9 *Behavioral Science* 226-236 (1964).

⁴⁸ Jason F. Shogren, Sungwon Cho, Cannon Koo, John List, Changwon Park, Pablo Polo and Robert Wilhelmi, *supra* note 35.

⁴⁹ Horowitz and McConnell, *supra* note 3, at 8 (table IIIA).

⁵⁰ Morrison, *supra* note 20, at 416.

⁵¹ *Id.* at 416.

⁵² Ian Bateman, Alistair Munro, Bruce Rhodes, Chris Starmer, Robert Sugden, A Test of the Theory of Reference-Dependent Preferences, 112 *Q.J. of Econ.* 479-505 (1997).

⁵³ Jack L. Knetsch and J.A. Sinden, Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value, 99 *Q.J. of Econ.* 507-521 (1984).

⁵⁴ Jack L. Knetsch, The Endowment Effect and Evidence of Nonreversible Indifference Curves, 79 *Am. Econ. Rev.* 1277-84 (1989).

3.4 Loss aversion

The most commonly invoked “psychological” explanation for the offer/asking price gap is loss aversion.⁵⁵ The basic intuition concerning loss aversion is that losses (outcomes below the reference state) loom larger than corresponding gains (outcomes above the reference state).⁵⁶ People value gains from a reference point less than equal losses. Values are, according to this model, depending on the reference to a baseline, and the value function is steeper in the negative than in the positive domain.⁵⁷

The phenomenon of loss aversion explains the “instant endowment”⁵⁸ effect observed in so many mug experiments: the subjects endowed with the mug and asked for willingness to accept to give up possession of the mug see giving up the mug as a loss, relative to their current state. The subjects not in possession of a mug see the opportunity to own a mug as a potential gain, compared to their current state. Loss aversion leads the subjects endowed with a mug to view their potential loss as greater than the subjects not endowed with the mug view their gain. Hence, subjects will demand greater monetary compensation to give up possession of the mug than subjects are willing to pay for the mug. This explains the observed disparity between WTA and WTP.

Loss aversion predicts a stable discrepancy between WTA and WTP over time. There is no reason to think that the loss of an entitlement one has had in possession for a longer period of time should loom larger – or smaller – than the loss of an entitlement one has only recently acquired. Loss aversion does not assume a sentimental attachment to the good in possession which might grow over time.

Of course loss aversion, and any other psychological explanation of the offer/asking price gap, assumes that there is a genuine difference between offer and asking price, and that this difference is not merely due to strategic bargaining mistakes. If loss aversion is the cause of the observed

⁵⁵ See generally Daniel Kahneman and Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk*, 47 *Econometrica* 263-291 (1979).

⁵⁶ Amos Tversky and Daniel Kahneman, *Loss Aversion in Riskless Choice: A Reference-Dependent Model*, 106 *Q.J. of Econ.* 1047 (1991).

⁵⁷ *Id.* at 1039.

⁵⁸ *Id.* at 1041.

disparity, the disparity should remain stable over repeated market trials, since the endowment itself induces a different valuation of the good in question. The loss aversion hypothesis is not falsified by a showing of *some* decline of the WTP/WTA difference over iterated market trials, since it is well possible that both strategic mistakes and an endowment effect play a role. I have already exposed the mixed evidence concerning the learning/familiarity hypothesis.

Prospect theory is a strictly positive (descriptive) theory of human behavior. It does not explain *why* people value losses more than gains. Sociobiology offers one possible explanation: it could be that when humans were living at the edge of survival, losses threatened death and thus failure to transmit one's genes to the next generation. Gains, on the other hand, might not have improved one's chance to transmit genes to the same extent.⁵⁹ Another sociobiological explanation is that loss aversion is a form of territorial defense. Biological studies show that territorial animals fight much harder to defend a territory than they do to reacquire it, once it has been transferred to another. This makes most probably sense, since the incumbent animal has a higher payoff from staying in the territory which is already well-known to it (the intruder basically has to pay the price of acquiring the relevant information to the territory which the incumbent animal has already paid, hence the payoffs are asymmetrical.)⁶⁰ What makes sense defending a territory does not necessarily make sense when selling an entitlement in a modern-day market economy.⁶¹ I would like to add that sociobiological explanations are always to be taken "cum grano salis". They are fascinating, but most of them remain stimulating intellectual exercises that cannot be verified (or falsified, if you prefer).

3.5 Closing transactions

People may simply not want to think about conducting a transaction. The hypothesis is that people have a psychic aversion to bargaining and have "a desire to withdraw spheres of activity

⁵⁹ Hoffman and Spitzer, *supra* note 36, at 89.

⁶⁰ See Owen D. Jones, Time-Shifted Rationality and the Law of Law's Leverage: Behavioral Economics Meets Behavioral Biology, 95 *Northwestern U.L.Rev.* 1141-1205, 1185 (2001).

⁶¹ It *can* make sense, however. When a used car owner is asked to state his WTA to sell his car, his WTA will most likely exceed the WTP of most buyers. This can be rationally explained by the information advantage the owner has: he knows the history of the car as well as all the car's kinks. The buyer has to acquire the information, which is costly, and will reduce his WTP.

from the realm of marginalism and calculation.”⁶² Once a transaction is completed, or closed, people loathe to be bothered by someone telling them that they could be slightly better off selling the asset. If they are willing to sell the asset, then only at a premium that compensates them for the “psychic cost” of re-opening the transaction. So the owner of an entitlement exhibits a higher WTA than his WTP not because the entitlement increases in value when he possesses it, but rather because the act of selling it creates a cost.

The closing hypothesis is consistent with empirical evidence that the discrepancy between WTA and WTP is due to reluctance to sell (exchanging the good for money) rather than reluctance to buy (exchanging money for the good).⁶³

It is unclear whether the closing hypothesis predicts a stable, increasing or declining reluctance to sell the longer someone has been in possession of an entitlement. On the one hand, one could argue that re-opening a transaction closed a long time ago causes greater psychological costs (“Now that’s ancient history, I don’t want to think about that again.”). On the other hand, a request to re-open a transaction that has just been closed recently may seem obtrusive (“I’ve just been through this, give me a break.”). Lastly, one could argue that the psychic aversion to bargaining should in no way depend on the time of possession.

3.6 Dignity hypothesis

The “dignity hypothesis”⁶⁴ is a close relative of the theory of psychic aversion to bargaining. The dignity hypothesis advances a sociological explanation for the endowment effect. It supposes that our society teaches us that we should not sell certain things, although buying them is socially acceptable. The standard example for such a good is sex, but environmental goods may also fall into this category.⁶⁵ Selling such a good is considered morally wrong, and the person doing it will, having internalized society’s value system, experience psychological discomfort. His WTA will be higher to compensate him for the experienced discomfort.

⁶² Mark Kelman, *Consumption Theory, Production Theory, And Ideology in the Coase Theorem*, 52 *Sth. Cal. L. Rev.* 669-698, 691 (1979).

⁶³ Kahneman, Knetsch and Thaler, *supra* note 10, at 223.

⁶⁴ Don L. Coursey, Elizabeth Hoffman and Matthew L. Spitzer, *Fear and Loathing in the Coase Theorem: Experimental Tests Involving Physical Discomfort*, 16 *J. Legal Stud.* 217, 220 (1987).

⁶⁵ John V. Krutilla, *Conservation Reconsidered*, 57 *Am. Econ. Rev.* 777-86 (1967).

The most persuasive empirical evidence for the dignity hypotheses comes from a study where subjects were given a small Norfolk Pine tree. Subjects revealed a mean WTP of \$4.18 and a WTA of \$8 for the tree. The same study was then conducted with different subjects, who were told that all trees either not purchased or sold back would be killed. This caused the mean WTP to raise to \$7.81 and the WTA to \$18.43.⁶⁶ The fact that WTA rose far more than WTP might be evidence that owners felt a greater moral responsibility for the tree's fate than nonowners. It could also be attributable to the fact that people feel more responsible for acts of commission (selling the tree) than acts of omission (failing to buy a tree), although the distinction is irrelevant in the case.⁶⁷

While the dignity hypothesis may well explain the offer/asking price gap for environmental goods, it is not very convincing when it comes to everyday goods such as coffee mugs or folding binoculars. Some suggest that a weaker version of the dignity effect may be at work in an even broader range of situations. The assumption is that our culture suggests that it is somehow unseemly for an individual to sell anything at all, unless he is in the business of selling that good for a living.⁶⁸ However, the phenomenal success of EBay⁶⁹ seems to contradict this assumption. The observation that relatively few people hold garage sales⁷⁰ is more convincingly explained by transaction costs: for most people with a decent job, the opportunity cost of sitting in their front-yards selling rusty lawnmowers simply outweighs any profit that can be reasonably expected from such an activity. Now that electronic auctions drastically reduce the cost of selling used items, we can see an increase in the trade of used goods.

The dignity hypothesis, in other words, can explain while the offer/asking price gap is larger for environmental goods than for ordinary market goods, but it fails to explain while we still observe a disparity even with ordinary market goods. It is also hard to discern the disparity caused by the uniqueness of the good (substitutability explanation) from the disparity caused by the feeling of hurt dignity, since most environmental goods also happen to have few substitutes.

⁶⁶ Boyce et al., *supra* note 18, at 1370.

⁶⁷ See generally M. Spranca, E. Minsk and J. Baron, Omission and Commission in Judgment and Choice, 27 *J. Exper. Soc. Psychol.* 76 (1991).

⁶⁸ Korobkin, *supra* note 6, at 693.

⁶⁹ New York Times, *Ebay's Rapid Growth Beats Expectations*, April 19, 2002, Section C Page 4.

⁷⁰ Korobkin, *supra* note 6, at 693.

3.7 Property for personhood

In an adaptation of Hegel's theory of property, Margaret Radin posits that property may become bound up with an individual's personality to such an extent that the person regards the property as part of herself.⁷¹ She distinguishes between two forms of property: personal and fungible property. Personal property is so closely related to one's personhood that its loss causes pain that cannot be relieved by the object's replacement (the classic example is the wedding ring).⁷² Fungible property is perfectly replaceable with other goods of equal market value, and is held merely for the purpose of exchanging it for other goods. The quintessential fungible good is, of course, money.

The philosophical concept of property as part of personhood can explain the difference of WTP and WTA in many cases, and also explains why no difference is observed with goods that are merely held for exchange (the value tokens in the KKT experiment).⁷³ But to explain the disparity of WTA and WTP observed in most laboratory experiments, the integration of marketplace goods into one's personality must take place almost instantaneously, because in most experiments – for example in the KKT study – the subjects are in possession of the goods for only a few minutes before the experimenters asked them to reveal their WTA/WTP. This seems at least counter-intuitive.

The other problem with the theory is that it will predict results that are almost indiscernible from the results predicted by the substitutability hypothesis: to say that a good has become bound up with one's personality is saying that the good has become unique, and therefore one can expect WTA to exceed WTP in Hanemann's model. So the theory will be hard to falsify experimentally, as most results obtained can be interpreted to support both the substitutability hypothesis and the concept of property as part of personhood.

⁷¹ Margaret J. Radin, *Property and Personhood*, 34 *Stan. L. Rev.* 957 (1982).

⁷² *Id.* at 959.

⁷³ Kahneman, Knetsch and Thaler, *supra* note 10, at 213.

The theory of goods as part of personhood predicts a willingness to accept that increases over time, as the good becomes more part of the individual's personhood the longer she is in possession of the good.⁷⁴

3.8 Imprecise Preferences and Regret Theory

Combine imprecise preferences and regret theory, and you have yet another explanation for the offer/asking price gap.

Traditionally, it is assumed that a decision maker is subjectively uncertain about the *probability* of an event, but knows his own subjective utility, that is his preferences and tastes. However, it is quite possible that decision makers are not only unsure about the probability of a certain outcome, but also about their own subjective utility. Richard M. Cyert and Morris H. DeGroot propose an adaptive utility function in which the utility that will be received by the individual from specified values of the variables is to some extent uncertain, and the expected utility from these values will change as a result of learning.⁷⁵ The expected utility function in this model is probabilistic, rather than certain. Once a decision is made, and the individual experiences the consequences, the actual utility experienced is compared with the expected utility, and there can be a gap between these utilities.⁷⁶ The decision maker learns his preferences from the experienced utility and will adapt his behavior in the future. For example, when buying a new product, the prior expectation may not be realized, and the actor will either refrain from buying the product in the future or offer a lower price.

The assumption that people are somewhat uncertain about the subjective utility they get from the use of a good is particularly appealing in a laboratory setting such as that of many endowment effect experiments. When I walk into the lab and I am given a folding binocular or a Cornell coffee mug, I most probably have not given these products a lot of thought before. It is therefore quite likely that I am somewhat uncertain about the subjective utility I can get out of these products – more so than when I decide to go to a store and buy a mug, in which case I have probably given the purchase some thought beforehand. The same is true about questions regarding

⁷⁴ Oliver Wendell Holmes, *The Path of the Law*, 10 Harv. L. Rev. 477 (1897): “A thing which you have enjoyed and used as your own for a long time, whether property or an opinion, takes root in your being and cannot be torn away without your resenting the act ...”

⁷⁵ Richard M. Cyert and Morris H. DeGroot, *Adaptive Utility*, in *Adaptive Economic Models* (Richard H. Day and Theodore Groves, eds.) 223 (1975).

⁷⁶ *Id.* at 226.

how much I was willing to pay for an increased density of trees in my neighbourhood⁷⁷ or a 25 mile increase in average visibility.⁷⁸

Regret theory was first developed by Graham Loomes and Robert Sugden as a – in their view – simpler and more intuitively appealing alternative to Kahneman’s and Tversky’s prospect theory.⁷⁹ Loomes and Sugden discern between *choiceless* utility and “chosen” utility. Choiceless utility is the utility that an individual derives from a consequence *without having chosen* that consequence.⁸⁰ An example is the \$300 an individual got from President Bush’s tax rebate plan. The chosen utility is the utility that a person gets from a consequence she intentionally chose. An example is winning \$300 on a bet on a horse race.

Loomes and Sugden posit that the chosen utility will be modified by the psychological experience of regret or rejoice. The individual will compare the state she is in after she experienced the consequences of the chosen action with the state she would be in had she not made that choice. If the state she is in having made the choice is better than the position she would be in having not made the choice, she will rejoice. If, on the other hand, the position she is in after having made the choice is worse than the position she would be in having not made the choice, she experiences regret: she will reflect on how much better her position would have been, had she chosen differently, and this reflection will reduce the pleasure she derives from the consequences of her chosen action.⁸¹

The theory predicts, as is probably empirically true, that a person will get more utility from a \$300 win on a horse bet than from a \$300 tax rebate, because in the case of the horse bet, she will get the additional pleasure of rejoicing because she made the right choice. Loomes and Sugden’s theory proposes that actors maximize their *modified* utility, i.e. they are aware of their feelings of regret and rejoice and will take them into account when making a choice.⁸²

⁷⁷ See Brookshire and Coursey, *supra* note 12.

⁷⁸ see Schulze et al., *supra* note 9.

⁷⁹ Graham Loomes and Robert Sugden, *Regret Theory: An Alternative Theory of Rational Choice under Uncertainty*, 92 *Econ. J.* 805 (1982).

⁸⁰ *Id.* At 807.

⁸¹ *Id.* at 808.

⁸² *Id.* at 809.

Applied to the offer/asking price gap, the story goes as follows:⁸³ since the subjects are somewhat uncertain about their preferences, they will have a bandwidth of possible monetary values they attach to the good in question. To take the famous coffee mug as an example once again, both buyers and sellers might value the mug somewhere in the range of \$2 to \$4. However, sellers will ask for \$4 to give up possession of the mug: because they are uncertain about their preferences, it might turn out that they actually would have valued the mug at \$4 after they've sold it. To avoid any regret, they will ask for a price that will certainly compensate them for the loss of utility they suffer from not owning the mug.⁸⁴ Buyers, on the other hand, will not pay anything more than \$2 to own a mug, since it may turn out that after they bought it, they realize that this is the maximum utility they get out of it. So if they had paid any more, they would regret it. Imprecise preferences and regret theory can therefore explain why we may observe an offer/asking price gap although both sellers and buyers value the good in question the same.

Empirical evidence does not support the regret theory/imprecise preferences hypothesis. While people undoubtedly do have imprecise preferences, the range of their preferences is reference dependent. Dubourg et. al. examined within subject WTP and WTA for, respectively, reducing or increasing (by the same amount) the risk of incurring a particular road injury. Each respondent stated the maximum amount that they were sure they would pay and the minimum amount they were sure they would not pay to reduce their risk by a given amount; they also stated the minimum amount of money compensation for increased risk that they were sure they would accept and the maximum amount they were sure they would not accept.⁸⁵ Respondents' estimates of the minimum that they would be prepared to accept for a risk increase frequently exceeded the maximum that they would be prepared to pay for an equivalent risk reduction, in other words, the two ranges are not overlapping, or, if so, only to a small extent. Imprecise preferences alone cannot explain the observed gap.

⁸³ William Rankin seems to propose this theory in his unpublished Ph.D. dissertation (University of Michigan), as far as I understand the summary of his theory in Hoffmann and Spitzer, *supra* note 36, at 94. Rankin also gives more weight to regret than to rejoicing. I don't think this is a necessary assumption for the theory, but I may be wrong.

⁸⁴ Of course, one can argue that *not* selling the mug just as much a choice as selling it. This is a valid critique, and a fundamental problem of regret theory: which consequences are regarded as the choiceless consequences is rather arbitrary in many instances. However, it is probably true that human beings will not experience the same amount of regret from a choice that is framed as an omission rather than a commission, since they don't feel as responsible for acts of omission, see Spranca, Minsk and Baron, *supra* note 67.

⁸⁵ Richard W. Dubourg, M.W. Jones-Lee and Graham Loomes, Imprecise Preferences and the WTP-WTA disparity, 9 *J. of Risk and Uncertainty* 115 (1994).

Morrison conducted an experiment using yet another set of coffee mugs to test whether imprecise preferences cause the WTP-WTA disparity. She obtained three responses for each WTP or WTA question: a lower-bound, and upper-bound, and a “best estimate” of how much the subjects value the good. Her results show that even lower-bound WTA exceeds the upper-bound WTP, in fact, lower-bound WTA is always more than one and a half times upper-bound WTP.⁸⁶ So again, imprecise preferences alone cannot explain the offer/asking price gap. They may increase the gap, but they’re not the only cause.

The notion of imprecise preferences allows a prediction of what happens to WTA the longer someone is in possession of a good: since the possessor will be learning his preferences regarding the good, the WTA will be lower, the longer he was in possession of the good. Once the actor is certain about his preferences, he doesn’t need to “err on the side of caution” and state a WTA that is on the high side of his WTA range. WTP, on the other hand, should not significantly change, as the person not in possession of the good does not learn how the good fits into his set of preferences.

3.9 Our Own Hypothesis

Our hypothesis, which grew out of the discussion of KKT’s classic endowment effect study in the seminar “Behavioral Law and Economics” at the University of Michigan Law School, is relatively simple and straightforward. It is based on an observation of human behavior best summed up in the proverb “the other grass is always greener”.

Our intuition is that WTA will decrease the longer someone is in possession of a good, at least for ordinary private goods. The fact that the people in possession of the good initially value it higher than those not in possession might well be due to a novelty effect inherent in most laboratory research of the endowment effect. People overestimate the utility they get from a good they have just been endowed with, and we suspect that the attraction a good had when initially allocated weakens as time goes by and other goods seem more desirable – one could call this the “other grass is always greener effect”. The fact that particularly high WTA is observed when people are asked to put a value on a public good which they possessed for a long time (like clean air, density

⁸⁶ Gwendolyn C. Morrison, Understanding the disparity between WTP and WTA: endowment effect, substitutability, or imprecise preferences?, 59 *Economics Letters* 189 (1998).

of trees in the neighborhood or elk-sightings on hunting expeditions) only seemingly contradicts this hypothesis. I would simply argue that most people are unaware of goods they take for granted, and only when asked to sell them, realize their endowment. The same novelty effect then kicks in as with a newly received consumer good.

The experiment also allows to test predictions generated by other common explanations of the offer/asking price gap:

- (1) The substitutability hypothesis leads to the prediction of a stable WTP/WTA gap. If anything, the gap should increase, since a good one has owned for an extended period of time becomes less fungible (“heirloom effect”).
- (2) The most widely accepted explanation of the endowment effect, which is that the endowment effect is a manifestation of loss-aversion, leads to the prediction of a stable WTP/WTA gap.
- (3) If the endowment effect was due to some sort of emotional attachment to the good (“property for personhood”), then one would expect the WTA to increase the longer someone is in possession of the good.
- (4) If regret avoidance and imprecise preferences cause the offer/asking price gap, then one expects the gap to disappear, or at least become smaller, the longer someone is in possession of the good, as she or he becomes more certain of her preference for the good.

Neither the dignity hypothesis nor the closing transactions hypothesis generate falsifiable predictions. The dignity hypothesis fails to explain the offer/asking price gap for ordinary private goods altogether, while the closing transaction hypothesis is insufficiently developed to predict the influence of time of possession on WTA.

4. The Experiment

4.1 Overview of Method and Design

Our study was designed to test the effect time has on the willingness to accept and the willingness to pay for a good. Briefly stated, the experiment consisted of two parts: part one was a systematic replication of the classic experiment by KKT (1990).⁸⁷ Half of the subjects were endowed with a good and became potential sellers in each market, the other half of the subjects were potential buyers. Four market trials were then conducted for the good during the same one hour session. In each trial, the owners of the good were asked to state their willingness to accept, while the nonowners were asked to state their willingness to pay. After each trial, the market clearing price and the number of trades was announced to provide feedback for a maximum learning effect. The trades of the fourth trial were implemented, and the owners of the good then kept the good in their possession until the second part of the experiment, which was conducted seven weeks later (the first session took place Friday February 15, 2002, the second session Friday April 5, 2002).

In the second part, the same subjects traded the same good using the same mechanism as in the first part. A comparison of the mean WTA/WTP of the first part to the mean WTA/WTP of the second part allows to see whether there is any change, and if so, in which direction the WTA/WTP changed.

To exclude any influence of depreciation of the good on the WTA and WTP, we chose a good that does not depreciate over the course of two months. The good was a porcelain pig, a good that has no other use than to display its appearance, and thus will not be worn out by use. The material is also very durable, and will not deteriorate in two months.

To control for other possible sources of the WTP/WTA gap and to familiarize the subjects with the experimental design, two trial markets with induced value tokens were conducted prior to the trials with the porcelain pigs. The market mechanism was the same as the one used for the porcelain pig, but the objects traded were “value tokens”, snippets of paper that only had a value because the experimenter would exchange them for cash.

⁸⁷ See Kahneman, Knetsch and Thaler, *supra* note 10.

4.2 Procedure

4.2.1 Value Token Markets

While an endowment effect is expected for a consumption good, no endowment effect is expected for goods that are held exclusively for resale. A particularly clear case of a good that is held exclusively for resale is the notional token (in our case, simply a snippet of paper with the inscription “Value Token”) typically traded in experimental markets commonly used to test the efficiency of market institutions.⁸⁸ The objects of trade are tokens to which private redemption values that vary among individual participants have been assigned by the experimenter.⁸⁹ Subjects can obtain the prescribed value assigned for the tokens when redeeming them at the end of the trading period; the tokens are otherwise worthless pieces of paper.

The instructions for the sellers were as follows (differences for buyers in brackets):

During this trading period, the objects being traded are tokens. You are an owner, so you now own a token which has a value to you of \$X.⁹⁰ [You are a buyer, so you have an opportunity to buy a token which has a value of \$X for you.] This means that the experimenter will give you \$X for token. [This means that the experimenter will give you \$X if you obtain a token and exchange it for cash.] The value of the token is different for different individuals.

You have now the opportunity to sell the token. [buy a token.]

What is the minimum price you are willing to sell your token for? \$ ____

[What is the maximum price you are willing to pay for a token? \$ ____]

The sellers were also informed about the pay-off structure:⁹¹

If you indicate that you are willing to sell the token *at or below the market price*, you will receive the market price in exchange for the token. If the price you are asking for the token is *above the market price*, you can exchange your token for cash at the originally assigned value.

⁸⁸ See Vernon L. Smith, *Microeconomic Systems as an Experimental Science*, 72 *Am. Econ. Rev.* 923 (1982); Charles R. Plott, *Industrial Organization Theory and Experimental Economics*, 20 *J. Econ. Literature* 1485 (1982).

⁸⁹ See Vernon L. Smith, *Experimental Economics: Induced Value Theory*, 66/2 *Am. Econ. Rev.* 274 (1976).

⁹⁰ The assigned values ranged from \$1.50 to \$7.50, in \$0.50 increments.

⁹¹ The instructions for the buyers were: “If you indicate that you are willing to pay *the market price or more than the market price* for a token, you will have purchased a token. You will have to pay for the token with your own money. You can then exchange the token for cash at the assigned value. If your offer does not meet the market price, you will not be able to buy a token.” The subjects were told in the invitation to the experimental session that they should bring some money to the session. Change was provided by the experimenter.

Two market trials were conducted with induced value tokens. After the first trial, buyers and sellers swapped roles, so that each participant had the experience of both being a buyer and a seller before the trials with the experimental good. After each trial, the bids of buyers and sellers were entered into a spreadsheet, and the resulting supply and demand curves displayed using a data projector. The subjects thus were informed about the market clearing price and the number of trades after each trial.

To save time and money, only one buyer and one seller in each round was randomly chosen to be paid off according to his or her preference; i.e. she could either sell her token at the market price, if she was willing to accept a price below the market price, or she could redeem her token for cash at the assigned value if she was asking for more than the market price. The subjects were informed about this procedure and truthfully told that it was in their best interest to state their true value. The randomized pay-off should not distort the incentives in the induced value token markets and was also used by KKT.⁹²

The markets for induced value tokens serve as a control condition to test whether differences between the values of buyers and sellers in other markets could be attributable to transaction cost, misunderstandings, or habitual strategies of bargaining. If the discrepancy of buying and selling price is attributable to any of these causes, it should show up in the value token markets.⁹³ If, on the other hand, the difference between WTP and WTP in the value token markets is zero or insignificant, then an observed difference in the markets for the consumption good must be attributable to something else.

4.2.2 Consumption Good Markets

After the two trials with the value tokens had been conducted, half the subjects were endowed with a porcelain pig. The experimenter then informed the subjects that four markets for the porcelain pigs would be conducted, and that the owners of the pigs could keep the pig, but had to bring the pig with them for the second session of the experiment on April 5, 2002.⁹⁴ The same

⁹² Kahneman, Knetsch and Thaler, *supra* note 10, at 215.

⁹³ *Id.* at 213.

⁹⁴ The owners of the pigs were reassured that they would not be forced to give up possession of the pig at the second session.

mechanism to elicit WTP and WTA was used as in the market trials for the value tokens, with the following exceptions: (1) One of the four market trials would subsequently be selected at random and only the trades made in this trial would be executed. (2) On the binding market trial, *all* trades would be implemented, unlike in the value token markets, where only one seller and buyer per trial were actually paid off. (3) The subjects kept their initially assigned roles as either buyers or sellers for all four trials.

The instructions for the sellers were as follows:

You now own the porcelain pig in your possession and you may take it home, *but you have to bring the (undamaged) porcelain pig with you for the second session of the experiment on Friday, April 5.*

You have now the option of selling the pig. Please give the potential buyer of the porcelain pig the opportunity to examine it.

We will conduct four trading periods for the pigs. After all four trading periods have been conducted, one of the periods will be chosen at random to count. The trades of the trading period that counts will be implemented. You have sold your porcelain pig at the market price if the price you indicate on this form is at or below the market price. You will receive the market price in exchange for your pig.

What is the minimum price you are willing to sell your porcelain pig for? \$ ____

The instructions for the buyers were as follows:

You do not own one of the porcelain pigs that you see in possession of some of your neighbors.

You have now the option of buying a porcelain pig. You may examine the pig before you make your decision.

We will conduct four trading periods for the pigs. After all four trading periods have been conducted, one of the periods will be chosen at random to count. The trades of the trading period that counts will be implemented. You have purchased a porcelain pig at the market price if the price you indicate on this form is at or above the market price. If you buy one of the pigs, you own it and you take it home, *but you have to bring the (undamaged) porcelain pig to the second session of the experiment on April 5.* You have to pay for the porcelain pig using your own money.

What is the maximum price you are willing to pay for a porcelain pig? \$ ____

This design allows to test whether strategic bargaining mistakes cause the offer/asking price gap: if it does, the repeated exposure to the market setting and the feed-back provided by announcing the market price and the number of trades after each trial should allow the subjects to learn that overstating their WTA (or understating their WTP) will not result in any strategic advantage in a one-shot transaction, but simply result in a loss of profitable trade opportunity. So one should

observe a convergence of WTA and WTP over the four trials if the discrepancy is attributable to strategic bargaining.

The reason the binding trial was chosen at random, rather than to make the last of the trials the binding market, is to ensure that all four market trials are equal: since the subjects do not know in advance which of trials will be binding, they cannot change their behavior in the binding market. Rather, they have to assume that any of the markets could be the binding one, and should behave in every trial as if it was in fact the binding market.

As a matter of fact, the determination of the binding market in the first session of the experiment was rigged. The last trial was deliberately chosen to be the binding one. I wanted to make sure that the trades that were implemented were the ones of the market in which the subjects have had the maximum learning experience. The bids stated in the last market trial are most likely to represent the true WTP/WTA, rather than an overstated WTA (or understated WTP). Thus, after the trades of the fourth market trial have been implemented, those subjects who value the porcelain pig the most should own a porcelain pig. If nothing changes in the valuation of the pigs, then no trades should occur at the second session, seven weeks later. The rigging of the procedure to choose the binding market in the first session was the only deception involved in the design of this experiment.

The prediction of no trades is not true for the first session, of course. If transaction costs are insignificant – and the value token markets were designed to test for that – half the goods provided should change hands. If we call those half of the subjects that like the pigs more than the average “pig lovers” and the half who like the pigs less than average “pig haters”,⁹⁵ and we distribute the porcelain pigs at random among the subjects, on average half of the pig lovers will be given a pig, and half will not. This implies that in the market, half of the porcelain pigs should trade, with pig haters selling to pig lovers. Given that 21 pigs were distributed randomly, 10.5 trades are expected.

The experimental good was a porcelain pig, about 4 inches long. The reason such a rather unusual good was chosen was to exclude any influence of depreciation on the price of the good

⁹⁵ Most subjects did not find the pigs particularly appealing, to say the least. However, while this results in a low market price, it does not change the fact that some will find them somewhat more appealing (at a low level) than others, and that those fifty percent of the subjects who find the pigs more appealing than the rest of the subjects should buy the pigs from them.

over the period of the seven weeks the subjects were in possession of the goods. The pigs have no other use than to convey their appearance, and looking at them does not cause any wear or tear. One could, of course, also have endowed the subjects with a useable good such as a coffee mug used in so many experiments and simply told the subjects not to use it before the second part of the experiment was conducted. This design would, however, have been vulnerable to the critique that the subjects were not really endowed with the good, as they could not put the good to its supposed use. So if WTA did in fact decrease over the course of the seven weeks, this could have been attributable to the fact that the good seemed rather worthless because it didn't fulfill the purpose it was designed to serve. If, on the other hand, the WTA had increased, one could have argued that the subjects were less willing to sell the good at the second session since they had invested seven weeks of safeguarding in the coffee mug and wanted to finally put it to use.

Finally, porcelain is a very durable material, known to last for centuries, and seven weeks is a negligible time period in the life span of a product made of porcelain. No aging of the material that would deteriorate the good could rationally be expected.

At the second session, conducted seven weeks after the first session, the same mechanism was used to elicit WTP and WTA as in the first session on February 15. Again, four market trials for the porcelain pigs were conducted, one of them chosen at random – this time this was actually true – to count, and all trades in the counting market were implemented. The instructions were exactly the same as the ones in the first session, with the exception that the participants did not have to bring back the porcelain pigs for another session, but could rather keep them for good. The potential buyers had the opportunity to examine the porcelain pigs for any damage; there did not seem to be any damaged pigs. The value token markets were not repeated at the second session.

4.3 Subjects

The subjects were 42 J.D. and LL.M. candidates from the University of Michigan Law School. 16, or 38%, of them were female. The subjects were divided into two groups, one consisting of 22, the other consisting of 20 people. One group met at 2pm, the other one at 4pm on the same afternoon. In both groups, 19 subjects returned for the second part of the experiment in April, so that only four subjects were lost over the course of the seven weeks.

Subjects were paid \$8 for their participation in each session, a total of \$16. They were paid after completion of each session. The February sessions lasted about one hour each, the April sessions, slightly shorter because the value token markets were not repeated, about 45min each.

4.4 Results

4.4.1 Results from the Value Token Markets

If transaction costs are negligible and the subjects understand the experimental design, they should be willing to sell their value token at the assigned value, and be willing to pay the value assigned to them to buy a value token. So the hypothesis is $WTA = \text{assigned value as seller (AVS)}$, and $WTP = \text{assigned value as buyer (AVB)}$.

If this hypothesis is proven false, then one can test whether transaction cost or something else is causing the discrepancy between WTA (or WTP) and the assigned value. If transaction cost is the cause, then $AVB - WTP = WTA - AVS$, or $(WTA - AVS) - (AVB - WTP) = 0$. Because if transaction cost is the cause of the discrepancy, then the discrepancy should be the same for WTA and WTP . After all, the effort involved in selling the token is the same as the effort involved in buying it, so the premium demanded should be the same, too.

	Mean	Median	Std. Dev.	Significance
AVB - WTP	0.27	0.25	0.88	p=0.055 (t=-1.98)
WTA - AVS	0.48	0.50	1.12	p=0.007 (t=2.84)
$(WTA - AVS) - (AVB - WTP)$	0.21	0	1.40	p=0.339 (t=0.99)

The result reported is the mean difference between AVB and WTP (same goes for WTA and AVS). The design of the study allowed to identify each subject as buyer and seller, as the participants were asked to put their first name and the initial of their last name on the answer forms. The significance indicates whether the reported values are statistically significantly different from zero, using a two-tailed t-test.

A regression of $(WTA - AVS) - (AVB - WTP)$ on group, gender and whether subjects acted first as a buyers⁹⁶ showed that all beta-coefficients were statistically insignificant. This allows to conclude that neither the group the subjects were in nor their sex had any significant influence on $(WTA - AVS) - (AVB - WTP)$.

4.4.2 Results from the Consumption Good Markets

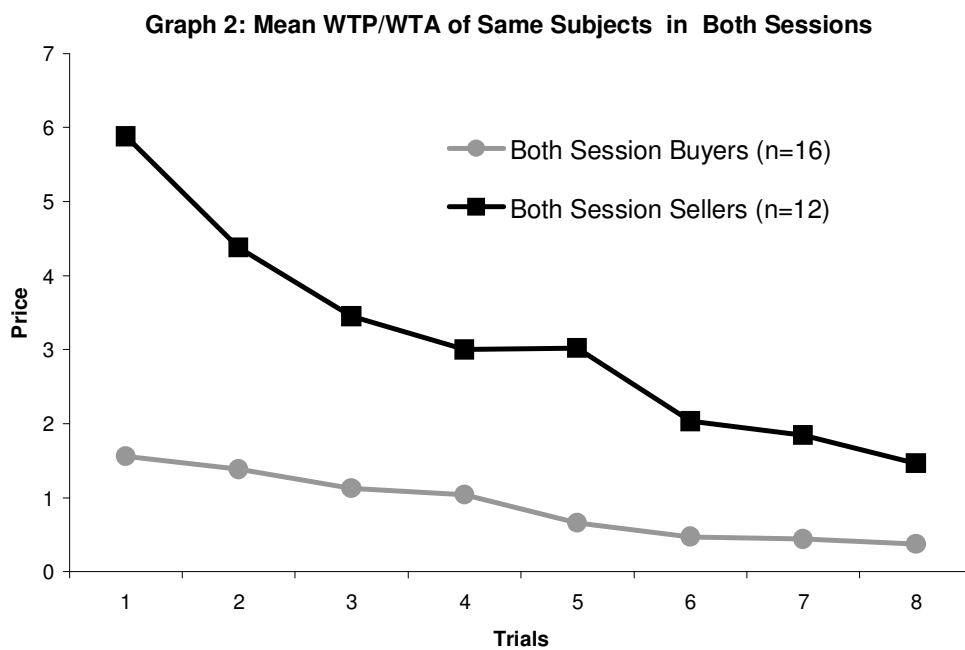
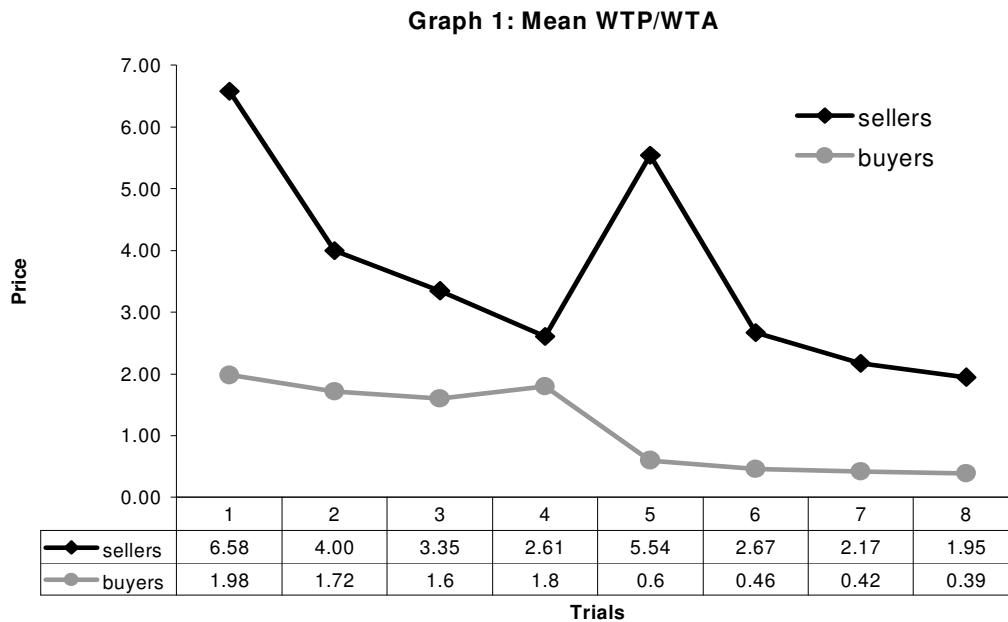
The F-statistic from a Linear Mixed Model in SPSS showed that the two groups did not have statistically significantly different average WTA or WTP. Adjusting for gender and session (February or April), group (2pm or 4pm) did not have a significant effect on average WTA or WTP ($F=1.615$, $p=0.236$ when WTA is the dependent variable; $F=1.449$, $p=0.250$ when WTP is the dependent variable). I will therefore collapse the two groups into one for the further analysis.

Graph 1 shows the mean WTP and mean WTP over the eight trials. The seven week interval occurred between trial four and five. It is important that the reader keeps in mind that the subjects who were sellers in trial one to four are not completely identical with the subjects that were sellers in trials five to eight. There were a total of five trades in trial four – considerably less than the expected number of 10.5 trades –, and these trades were implemented. That means that the five buyers in trial four who valued the porcelain pigs most and were able to buy a pig were potential sellers of the pig in trial five, while the five sellers who valued the pig the least and sold their pig in trial four are buyers in trial five. So one would expect the mean WTA to be higher in trial five than in trial four, and the mean WTP to be lower, absent any influence of time on WTA or WTP. The expected WTA for trial five is \$3.30, the expected WTP is \$1.15. This is assuming that a participants' WTA and WTP does not change when she or he gets (or gives up) possession of the good. I simply swapped the buyers with the highest WTP with the sellers with the lowest WTA and then recalculated the means. The expected values are higher than the ones observed in trial four (obviously) but WTA in trial five is a lot higher (\$5.54) than the expected value (\$3.30), and the observed WTP (\$0.60) a lot lower than the expected WTP (\$1.15).

Graph 2 shows the means for the WTP and WTA of those buyers and sellers that stayed in the same group for both sessions and attended both sessions, i.e. those sellers who did not sell their porcelain pig and those buyers who did not buy a porcelain pig. All the people who did not show

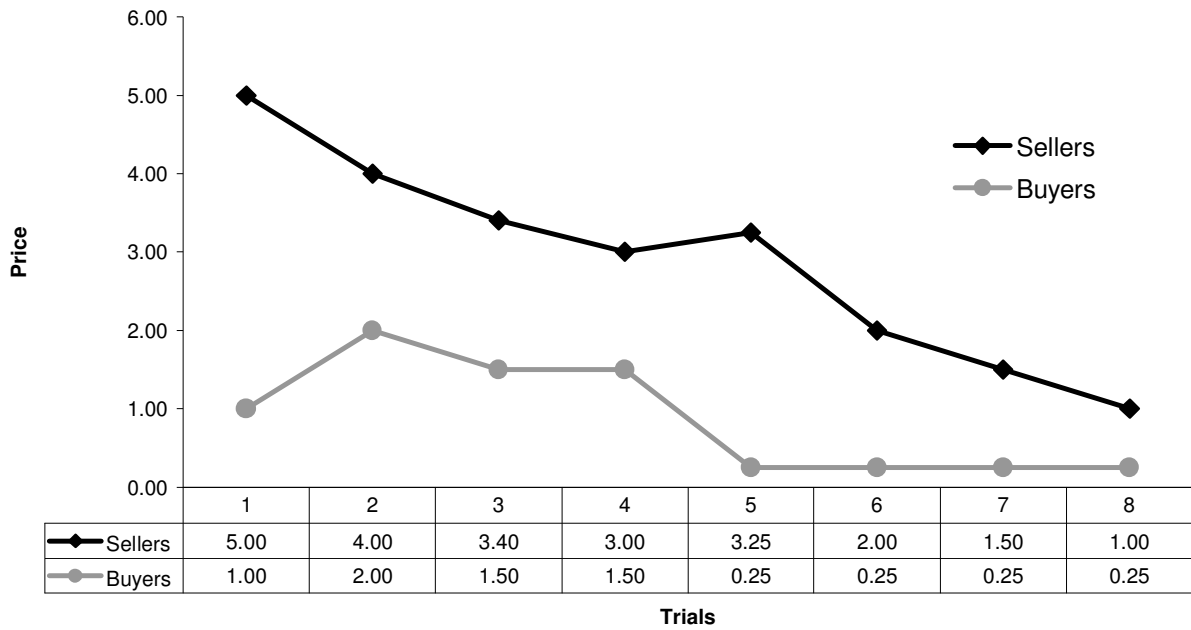
⁹⁶ The hypothesis was that subjects who were buyers in the first round, and had already seen the market price and number of trades when they acted as sellers for the first time in the second round, would not exhibit a WTA as inflated as subjects who did not have this added experience. The hypothesis was proven wrong.

for the second session were sellers – maybe some sellers lost or damaged their pig and chose not to attend the second session for that reason. This explains why the number of sellers is lower than the number of buyers (sellers n=12, buyers n=16).

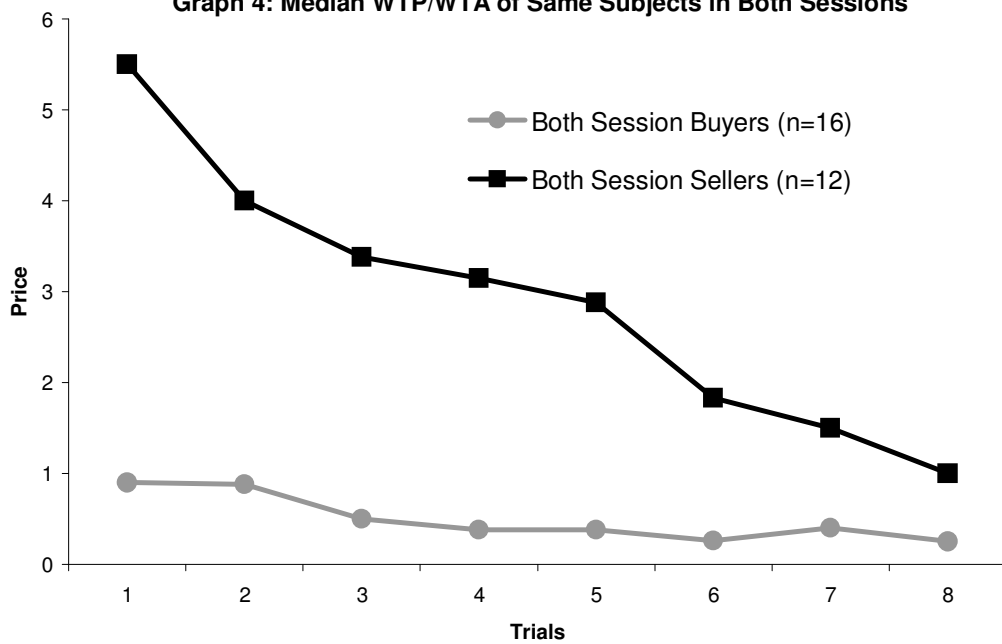


Graphs 3 and 4 show the median WTP and WTP over the eight trials, again first for all subjects (graph 3) and then for only the subjects that were either seller or buyer in both sessions (graph 4).

Graph 3: Median WTP/WTA



Graph 4: Median WTP/WTA of Same Subjects in Both Sessions



The next table shows the mean and median WTP and WTA, the standard deviation from mean WTP and WTA and the ratio of mean - respectively median - WTP and WTA for all eight trials. The numbers in brackets are the ones from the buyers and sellers that were either buyers or sellers in both groups – basically the values reported in graph 2 and 4.

	1 st Trial	2 nd Trial	3 rd Trial	4 th Trial	5 th Trial	6 th Trial	7 th Trial	8 th Trial
Mean WTP (same subjects)	1.98 (1.56)	1.72 (1.38)	1.60 (1.13)	1.80 (1.04)	0.60 (0.66)	0.46 (0.47)	0.42 (0.44)	0.39 (0.39)
Median WTP (same subjects)	1.00 (0.90)	2.00 (0.88)	1.50 (0.50)	1.50 (0.38)	0.25 (0.38)	0.25 (0.26)	0.25 (0.40)	0.25 (0.25)
Std. Dev WTP (same subjects)	1.93 (1.83)	1.35 (1.32)	1.51 (1.25)	1.34 (1.23)	0.78 (0.77)	0.62 (0.57)	0.48 (0.40)	0.42 (0.34)
Mean WTA (same subjects)	6.58 (5.88)	4.00 (4.38)	3.35 (3.45)	2.61 (3.02)	5.54 (3.02)	2.67 (2.03)	2.17 (1.84)	1.95 (1.46)
Median WTA (same subjects)	5.00 (5.50)	4.00 (4.00)	3.40 (3.38)	3.00 (3.15)	3.25 (2.88)	2.00 (1.83)	1.50 (1.50)	1.00 (1.00)
Std. Dev. WTA (same subjects)	5.42 (1.99)	1.64 (0.96)	1.29 (1.15)	0.98 (0.76)	5.69 (1.59)	2.19 (0.95)	2.00 (1.55)	1.85 (1.13)
Ratio mean WTA / mean WTP (same subjects)	3.32 (3.76)	2.33 (3.17)	2.09 (3.05)	1.45 (2.90)	9.23 (4.58)	5.80 (4.32)	5.17 (4.18)	5.00 (3.74)
Ratio median WTA/median WTP (same subjects)	5.00 (6.11)	2.00 (4.54)	2.26 (6.76)	2.00 (8.29)	13.00 (7.58)	8.00 (7.04)	6.00 (3.75)	4.00 (4.00)

I was further interested in whether the subjects were learning over the course of the eight trials. If respondents do not modify their answers with experience, it is reasonable to conclude that they have not gained anything from that experience. A response being changed in every trial and yet not following any recognisable pattern might be interpreted this way as well. However, if an individual does modify their answer after the first trial, and they eventually hone in on another

answer, then it would appear that they have refined their response in the light of the experience – that is, they have learned. If a person is converging on their value for a good, then one would expect that the (absolute value of the) difference between their responses in the first and second trial would be larger than that between the seventh and eight trial. This should hold regardless of whether WTA or WTP is used, so one can calculate the mean differences for both WTP and WTA answers and combine them. The mean difference in stated values from trial one to trial two is 1.37, the mean difference from trial three to trial four 0.64 and the mean difference between trial seven and eight is 0.19. The finding that individual subjects change their stated WTA or WTP by a smaller magnitude between the last two trials (of both sessions) suggests that they have some degree of increased confidence in the value they assign the good. One may interpret this as learning.

Another possible indicator that people are learning would be if the number of respondents that stated the same WTA (WTP) in subsequent trials increased with each completed trial. That is, if individuals stick with the same value in consecutive trials, it would seem that they are confident in their response; if they keep changing their responses then it would seem that they are not yet sure of the value they place on the good. The next table shows the number of subjects who stated the same value in two consecutive trials. In brackets is the percentage of total buyers (sellers) that stated the same value. There are 21 buyers in all eight trials, but while there were 21 sellers in trial one to four, there's only 17 sellers in trial five to eight, due to the subjects that did not return for the second session.

	1 st -2 nd	2 nd -3 rd	3 rd -4 th	4 th -5 th	5 th -6 th	6 th -7 th	7 th -8 th
WTP=WTP _{T-1}	8 (38%)	9 (42%)	11 (52%)	6 (28%)	11 (52%)	8 (38%)	10 (47%)
WTA=WTA _{T-1}	2 (9%)	7 (33%)	4 (19%)	2 (12%)	1 (6%)	5 (29%)	11 (64%)

Comparing the number of buyers that stated the same value in trial one and two with the buyers stating the same value in trials seven and eight, one notices only a moderate increase from 8 to 10. Sellers, on the other hand, increased from 2 to 11. One could argue that people are more

confident initially with their WTP responses than they are with their WTA responses since people regularly decide whether or not to purchase goods.⁹⁷

Finally, I was interested in whether the subjects were just following the posted market price. It is well known that an individual's reported valuation of a good can be influenced by cues which carry suggestions about the good's real value.⁹⁸ Posted prices transform independent private values into affiliated values when prices signal commonly perceived, but unknown, characteristics of the product.

The next table shows how many buyers and sellers announced bids that were within +/- \$0.25 of the market price announced in the *previous* trial.

The number in brackets indicates how many bids one can expect to be within +/- \$0.25 of any given value, if the bids were evenly spread out over the range of bids. Example: if there are 21 sellers, and the WTA ranges from \$0.25 to \$4.50 (as was the case in trial four), there would be a bid every \$0.20, so 2.5 bids would be within +/- \$0.25 of any given value. This number becomes very high for the buyers in trial five to eight, because the range of WTP was very small in the second session. I have taken the liberty to remove outliers when calculating the range of bids. The values for the first trial are in brackets, because obviously there is no previously announced market price. They can serve as a comparison value.

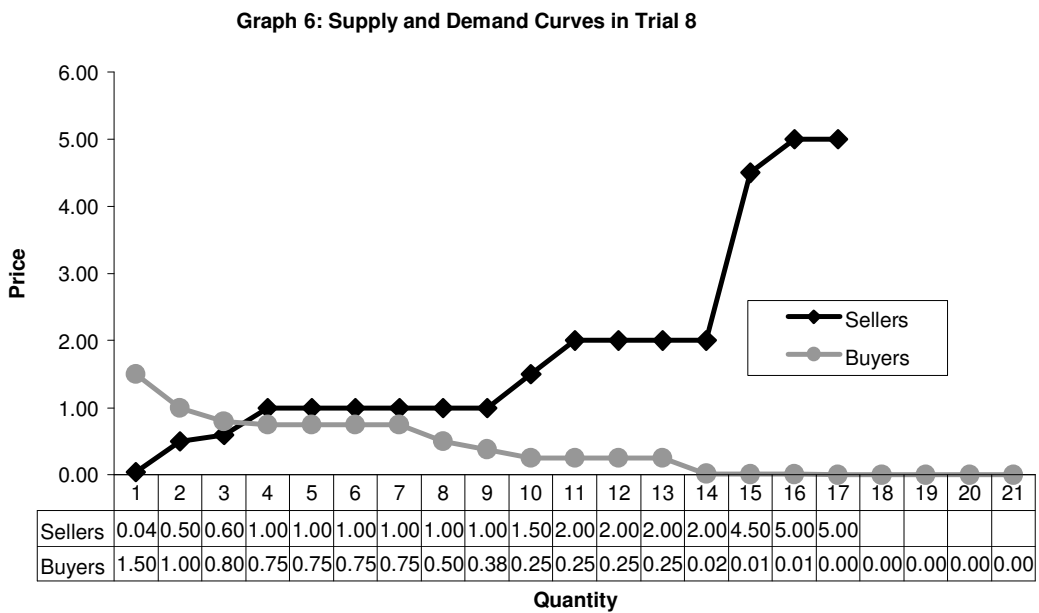
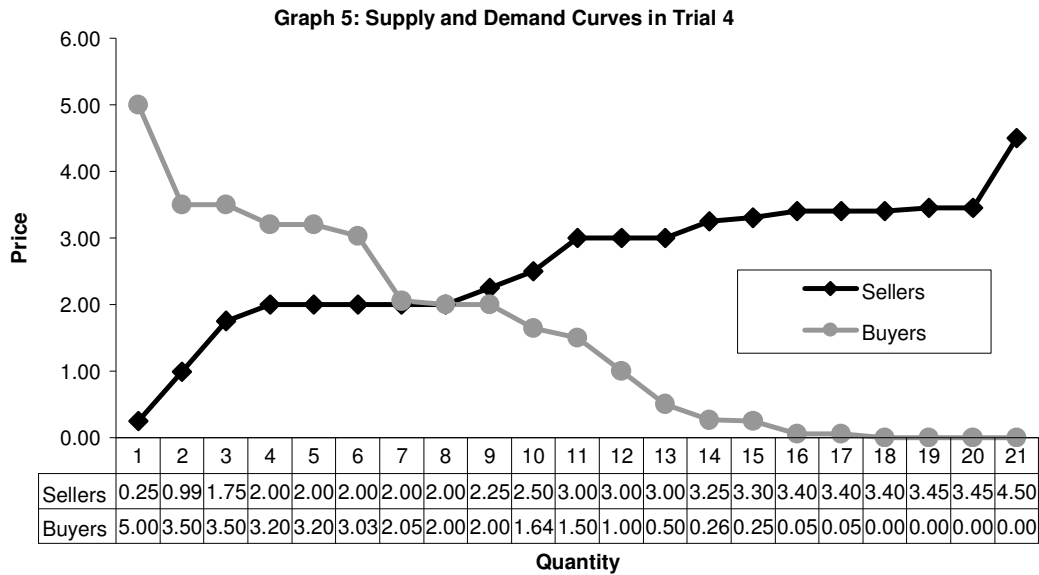
	Sellers	Buyers
1 st Trial	[2 (0.70)]	[2 (2.16)]
2 nd Trial	6 (1.34)	4 (2.84)
3 rd Trial	9 (1.86)	3 (2.16)
4 th Trial	13 (2.50)	6 (3)
5 th Trial	4 (1.56)	2 (4.66)
6 th Trial	5 (2.5)	1 (5.26)
7 th Trial	2 (1.5)	1 (6)
8 th Trial	3 (1.66)	4 (7)

The last two graphs show the supply and demand curves in trials four (graph 5) and trial eight (graph 6). I've taken the liberty to reduce an outlier of a WTP \$10 to \$5 in trial four. This is only to avoid a distortion of the y-axis of the graph, the WTP of \$10 is included in the calculations of

⁹⁷ Gwendolyn C. Morrison, WTP and WTA in repeated trial experiments: Learning or leading?, 21 J. of Econ. Psychology 57, 65 (2000). Morrisons' results are roughly comparable to the ones obtained here: in her experiment, the number of WTP respondents that stated the same value increased from 6 between round one and two to 7 (70% of the sample) in round four and five, while the number of WTA respondents that stated the same value in consecutive rounds increased from 3 to 9. However, since her sample only consisted of 10 sellers, this means that 90% of the sellers stated the same value in rounds four and five.

⁹⁸ Robert C. Mitchell and Richard T. Carson, Using Surveys to Value Public Goods: The Contingent Valuation Method 240-246, Washington, DC: Resources for the Future (1989).

the means and medians in the respective table. The same is true for the reduction of the highest WTA value in graph 6, which reduced from \$7 to \$5 purely for the readability of the graph.



4.5 Discussion

4.5.1 Discussion of the Results from the Value Token Markets

The results from the value token markets show that subjects perceived some sort of transaction cost when trading the value tokens or did not understand the concept of the value tokens fully. Both sellers and buyers asked for a premium which is statistically different from zero for the sellers ($p=0.007$), and only narrowly not so for buyers at the 5% confidence interval ($p=0.055$). While it appears that the premium demanded by the sellers (\$0.48) is higher than the premium demanded by the buyers (\$0.27) – which would indicate an endowment effect – the difference is not statistically significant (the hypothesis that $(WTA - AVS) - (AVB - WTP) = 0$ could not be rejected, $p=0.34$).

The results are obviously different from the ones reported by KKT, who did not observe any undertrading with the value tokens,⁹⁹ while the observed disparity here leads to undertrading.

The most plausible explanation is transaction cost. This is not only supported by the statistical analysis, but also by anecdotal evidence obtained in the pilot test. When I asked subjects after the pilot test why their WTA exceeded their assigned value (or their WTP was lower than their assigned value), quite a few of them said that if they couldn't make a profit, selling the token seemed not worth the effort ("I might as well keep it.").

4.5.1 Discussion of the Results from the Consumption Good Markets

The first noticeable feature of the results is the sharp decline of mean WTA from trial one to trial two (from \$6.58 to \$4.00, median WTA declined from \$5.00 to \$4.00). This is inconsistent with the results from experiment one of KKT, for which they report a Median Seller Reservation Price that stays at \$5.25 for the coffee mug over all four trials. However, KKT do report a decline of the Median Seller Reservation Price when they used pens instead of coffee mugs, holding all other parameters equal. In experiment one, conducted with pens, the Median Seller reservation Price dropped from \$2.50 in the first market to \$1.75 in the second market.¹⁰⁰ KKT do not report the WTP and WTA for their experiment four, which was the experiment systematically replicated

⁹⁹ Kahneman, Knetsch and Thaler, *supra* note 10, at 216.

¹⁰⁰ *Id.* at 216.

in session one of the present experiment. However, they do report that the ratio of Seller Mean Value to Buyer Mean Value was reduced from 3.8 to 2.8 from trial one to trial two.¹⁰¹ This is roughly comparable to the drop of the ratio in the present experiment from 3.32 in trial one to 2.33 in trial two. In KKT's experiment, the ratio was further reduced to 2.2 in trial three and to 1.8 in trial four, where it stayed for trial five. In our experiment, the ratio was reduced to 2.09 in trial three and further to 1.45 in trial four. Since KKT don't report the mean WTA and WTP associated with the ratio, I don't know whether the reduction of the ratio in their experiment was caused by an increase of WTP or by a decline of WTA.

In our experiment, it is clear that the decreasing ratio is caused by the declining WTA, while WTP was pretty stable over the course of the first four trials. This is consistent with the results reported by Coursey, Hovis and Schulze (the bitter-tasting liquid experiment), which report a sharply declining WTA and a relatively stable WTP.¹⁰²

Similar results are also reported by Shogren et al. with coffee mugs; the ratio of mean WTA to WTP dropped from 2.74 in trial one to 1.04 in trial four, with WTP increasing from \$2.37 to \$2.80, while WTA dropped from \$6.55 to \$3.06.¹⁰³ However, both studies just mentioned used a Vickrey auction (second price auction) to elicit WTP and WTA values. If the elicitation procedure has a fundamental influence on the elicited WTA and WTP, then the results from our experiment should be comparable to those obtained by KKT, and not to those obtained by Shogren et al.

One possible explanation for this unexpected result is that in our experiment, the subjects were given more feedback about the markets than in KKT's experiment. While KKT simply announced the market clearing price, the number of trades and whether there was excess demand or supply at the market price, I actually displayed the supply and demand curves using an overhead projector. This might have inspired more aggressive bidding depressing WTA, but this is really just conjecture.

¹⁰¹ Id. at 219.

¹⁰² Coursey, Hovis and Schulze, *supra* note 29, at 686.

¹⁰³ Shogren, Shin, Hayes, Kliebenstein, *supra* note 33, at 266.

The more plausible explanation is probably that the sellers did not really value the porcelain pigs as much as their stated WTA, but rather hoped to drive up the market price by overstating WTA. When they realized that this didn't work, they reduced their WTA in subsequent trials.

It is interesting to see that there was an endowment effect in all eight trials, even though the pig was rather undesirable. While from the very beginning four buyers valued the pig at \$0, and this number increased to seven in the last trial, no seller put a value of zero on the pig (one seller in the second session was willing to sell it for 4 cents, though). The difference between mean WTP and mean WTA was statistically significant for all eight trials at a level of $p < 0.01$. Even in trial eight, where the difference was smallest, and in the subset of only the subjects who were sellers or buyers in both sessions (which is the smallest sample), the difference is significant at the level of $p = 0.008$ ($t = 3.198$, using a paired t-test).

WTA (WTP) in the fourth trial of session one and in the fourth trial of session two should most accurately reflect the true WTA of the subjects, since they had maximum learning opportunities in those trials. Mean WTA in trial four of the February session is \$3.02, in trial four of the April session \$1.46 (median WTA was \$3.15 and \$1.00 respectively, both mean and median WTA include only those subjects who were sellers in both sessions). The F-statistics from a linear mixed model show that term of possession has a statistically significant influence on average WTA in trial four of each session. Adjusting for gender and group, the influence of the term of possession is significant at the level of $p = 0.004$ ($F=13.27$).

The influence of the time of possession on mean WTP in trial four, which fell from \$1.04 to \$0.39 (median WTP was \$0.38 and \$0.25, respectively) is not significant ($p=0.17$, $F=7.139$), again adjusting for gender and group (the analysis included only the data from the subjects who were buyers and sellers in both sessions, $n = 16$ for buyers; $n = 12$ for sellers). This nicely confirms the hypothesis that time of possession should have a significant influence on WTA, but not on WTP. The decrease of WTP readily apparent in Graph 3 (median WTA/WTP) is caused by the successful sellers, who value the porcelain pig very little and are buyers in the second session. If they are removed, WTP stays at \$0.38 between trial four and five, and then drops to \$0.25 for trial eight (see graph 4). What also lends support to the hypothesis that time of possession decreases WTA is that the pattern of median and mean WTA in trial five to eight, when looking only at the subjects who remained buyers or sellers for both sessions, closely resembles the pattern in trial one to four, only at a lower level of WTA (for a visual, see graph 4). That is, the decline in median WTA from trial one to two (\$1.50) is far greater than the decline

from trial two to three (\$0.62) and three to four (\$0.23). The same pattern is apparent in trial five to eight: the decline in median WTA from trial five to six (\$1.05) is far greater than the decline from trial six to seven (\$0.33) and seven to eight (\$0.50). If the decline was a continuing trend, there is no reason to expect WTA to decline more rapidly from trial four to five than from trial three to four.

One has to acknowledge, however, that the rival hypothesis that the apparent difference between WTA in trial four and eight is caused by additional market exposure and the resulting experience, rather than the seven week interval between trial four and five, cannot be rejected confidently with the given data. As apparent from both graphs 3 and 4, the median WTA shows a declining trend over all eight trials. The main weakness of the data is that WTA did not stabilize in the first session. It continued to decline from trial three to four. Had it stabilized, i.e. remained the same in at least two consecutive trials, and then declined again in the second session, one could have concluded with confidence that the seven week interval between trial four and five caused the decline. As the data stands, however, the further decline may simply be the continuation of a falling trend, and one might even conjecture that, had yet more trials been conducted, WTP and WTA would have converged entirely (as in Shogren et al.'s experiment).

It also has to be admitted that while the decline in WTP was small in absolute terms (only \$0.13), this still amounts to a further decline of 34% from the value in trial four in February. Median WTP decreased from \$0.38 in trial four in February to \$0.25 in trial four in the April session for the subset of subjects that were buyers in both sessions. While the influence of term of possession on WTP is not statistically significant, this is most probably due to the relatively small numbers. Since WTP was very small even after the first four trials, any further decline was necessarily small in absolute terms. A larger sample would be needed to achieve statistically significant results with such small effects.

It does seem that the potential sellers valued the pigs less in the second session. One probable explanation is that they regarded the pig as used, and although rationally the porcelain pig did not depreciate (and none of the pigs was damaged), this seemed to have lowered WTP. The larger drop from median WTP of \$1.50 in February to \$0.25 in April when including all subjects (see graph 3) is explained by the five successful sellers of the February session, who valued the pig very little, and depressed the median WTP when they became potential buyers in the April session.

Another weakness of the experiment which has to be admitted is that the experimental good proved to be rather undesirable, as becomes evident from the high number of buyers who placed a value of zero on it (seven, or 33%, of the buyers valued the pig at zero in the last trial). The suspicion that women might value a pink porcelain giggling pig more than men is unfounded. The influence of gender on both WTP and WTA was highly insignificant.

Many sellers tried to “aim for” the market price announced in the previous round. This is quite obvious for trials two to four. In trial four, 13 sellers stated a WTA that was within +/- \$0.25 of the previously announced market price, a result that is hardly coincidental, as the expected number of bids within +/- \$0.25 of any given point is only 2.5.¹⁰⁴ No such affiliation of stated WTA with the market price is evident in trials five to eight.

WTP does not seem to be affiliated with the announced market price at all. I attribute this to the fact that buyers seem more confident of their WTP than sellers are of their WTA, which is evident from the fact that WTP remained fairly stable, while WTA declined greatly over the course of the eight trials. The buyers are less likely to be influenced by the posted market price than the sellers because they are more confident of their private valuation. In trial five to eight, when the sellers have had both possession of the good for seven weeks – and hence should be more confident about where it fits within their set of preferences – and more experience with the market setting, they are not influenced by the posted market price as much as in trials one to four. In trial eight, only 3 sellers are within +/- \$0.25 of the market price announced in trial seven, a number fairly close to the expected number of 1.66. This supports the hypothesis that subjects are less likely to be lead by a posted market price the more confident they are of their private valuation.¹⁰⁵

¹⁰⁴ Sorry, I have not run any significance tests for this.

¹⁰⁵ See John A. List and Jason F. Shogren, Price information and bidding behaviour in repeated second-price auctions, 81 Am. J. of Agri. Econ. 942 (1999): posted prices influence the behavior of the median naïve bidder, but posted prices do not influence the behavior of the median experienced bidder or the bidder for familiar goods.

4.5.2 Summary of Discussion and Conclusion

In sum, the results of the experiment lend tentative support to the hypothesis that length of time of possession will decrease willingness to accept to give up possession of the good.

To be more conclusive, the experimental design should be improved in the following ways:

- (1) Use an experimental good that is more desirable. This is not easy – I knew that the subjects would probably not place a high value on a “useless” good, on the other hand, I wanted to exclude any possible influence of depreciation, and therefore did not want to use a good that had a practical use.
- (2) The market trials during the first session, before the extended time period, should be repeated until WTA and WTP remain the same for at least two consecutive trials. This would allow to be more confident that the time of possession, rather than the additional experience with more market trials, causes the decline in WTA. Another, even better, way to control for this rival hypothesis would be to conduct eight trials on the same day with a control group (four trials in the morning, then four trials in the afternoon), and four trials on one morning and the other four trials two months later on an afternoon with the treatment group. A comparison of the results from the two groups allows to isolate the influence of the additional experience from the influence of the time of possession.