EXPERIMENTAL TESTS OF THE ENDOWMENT EFFECT

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Abstract:

The discrepancy between WTA and WTP is supposed to be a manifestation of the endowment effect (KKT). The discrepancy between the average WTA-WTP disappears in the sense of statistical significance (Shogren et. al.) in settings with repeated interactions. In this paper we reexamine the KKT experimental procedures for identifying an endowment effect for consumer goods. No evidence of income or role effects is found. We show that even though the discrepancy between WTA-WTP diminishes undertrading can still persist in markets.

Key Words
Endowment Effect, Willingness to Accept, Willingness to Pay, Undertrading.

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Experimental Tests of The Endowment Effect*

Introduction: The Endowment Effect

Individual decision making studies have shown that human subjects reveal an

asymmetric response pattern toward losses (loss aversion) as contrasted with gains measured

relative to any individual's initial status quo position (Kahneman and Tversky, 1979).

Consequently, if one's initial wealth endowment is X_0, then the hypothesis is that the utility

function, $u(\cdot)$, has the property (among others) that $u'(X_0^-) > u'(X_0^+)$; i.e. marginal utility

from the left is above marginal utility from the right for any initial X_0. Although Kahneman

and Tversky (1979) were concerned with prospect theory as a modification of utility theory

for risky decision, in a fundamental extension Thaler (1980) argued that "many of the

elements of prospect theory can be used in developing descriptive choice models in

deterministic settings." (Thaler, 1980, p. 41). Thaler observed that the utility property, $u'(X_0^-)$

$> u'(X_0^+)$ implies that out-of-pocket costs are more heavily weighted in utility assessments

than opportunity costs[1]; i.e. a forgone gain has lower utility value than the actual loss of the

same amount. This cognitive underweighting of opportunity costs by the individual was

referred to as the "endowment effect," and was used to explain a number of questionnaire

survey examples.

Subsequently, Kahneman, Knetsch and Thaler (1991; hereafter KKT) suggested that

the discrepancy between willingness-to-pay (WTP) and willingness-to-accept (WTA), widely

observed in hypothetical surveys and in motivated exchange experiments, were all

manifestations of the endowment effect. (See KKT, Table 1 for a summary). However,

they argue (KKT, p. 1327) that the endowment effect does not apply when goods are purchased for resale rather than use. Thus there is no endowment effect for the retail firm, only for the consumer purchasing the firm's goods. Similarly, they note that it does not apply to the exchange of tokens (or rights) to which private redemption values, or induced values, have been assigned by the experimenter (Smith, 1976). Empirically, they show this to be the case in experiments establishing an endowment effect for Cornell and other coffee mugs but not for induced value tokens. Kahneman and Tversky (1991) subsequently showed how these empirical results could be used to provide a reference-dependent model of preferences.

The results of nine experiments are reported by KKT. Some of these were exchange experiments, others were choice experiments using the Becker, DeGroot and Marschak (1964) (hereafter BDM) procedure. In section I we discuss their choice experiments, introduce our modifications in their procedures, and present the new results. In section II we discuss their exchange experiments and present the results of ten new exchange experiments using the uniform price double auction mechanism which, because of its real time information feedback features, achieves high efficiency in single period exchange.

I. Choice Tests of the Endowment Effect

The KKT Experiments

In their typical choice experiment an undergraduate class is divided into two equal parts. Half the subjects are randomly designated sellers and the others become buyers. University coffee mugs (Cornell, Simon Fraser, or University of British Columbia), costing

about $6 in the local University bookstore, are then distributed to the sellers, and all buyers are given the opportunity to examine a mug. The following forms are then executed by all sellers [buyers] (See KKT, p. 178 for their instructions).

	I Will Sell [Buy]	I Will Keep [Not Buy] the Mug
If the price is $0	_____	_____
If the price is $0.50	_____	_____
......		
If the price is $9.50	_____	_____

As an example of a subject's response on the above form a seller might indicate a preference for keeping the mug for all prices at or below $5.00, selling it at all prices above $5.00. The subject's WTA would then be assessed at $5.25.

After the forms were executed a random (equally likely) price was drawn from the list between $0 and $9.50, and exchanges based on this price were conducted by the experimenter.[2] The results of their experiment 5 were typical of those reported by KKT: The median selling price, $5.75, is more than double the median buying price, which is consistent with an endowment effect. But, as recognized by KKT, this interpretation is clouded by the fact that the experiment did not control for the income effect in standard preference theory. Although sellers were given their mugs, buyers were required to use their own funds. Any income effect is thought to be 'small' relative to the WTP-WTA disparity shown by the KKT and other experiments. But standard theory tells us nothing quantitative about the magnitude of 'small.'

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To address this objection KKT (pp. 179-180) develop an ingenious variation on the above experimental design. Instead of two groups they use three: sellers, buyers and choosers. The sellers/buyers make the same sales/purchase decisions as before, while the choosers are asked to choose at each prospective price between the mug or cash. Thus sellers are given a mug, and choosers are given the right to either a mug or cash as they choose; any income effect on sellers as distinct from buyers, should also apply to choosers. The difference is that, according to the KKT implementation of the endowment effect, sellers own the mug, choosers do not.

KKT report median prices for the three groups for each of two experiments (KKT, experiments 6 and 7, p. 179-180). Mean prices for their data are shown in the first two rows of Table 1. The result is clear: choosers behave much more like buyers than like sellers, although choosers value mugs sixty percent more highly than buyers.

Choice Experiments Controlling for Differential Instruction Effects

Since it was these last two experiments that were critical to the hypothesized endowment effect (they controlled for any income effect), we conducted four experiments each with 24 subjects (8 in each group; N = 96 subjects, total) motivated by the three-group design. However, we made several instructional changes which, we conjectured, might be of substance.

Psychologically, 'buying', 'selling' and 'choosing' are distinct emotive terms. The first two are laden with strategic connotations -- buyers are motivated to buy low, sellers to sell high -- while 'choosing' appears to be not so laden. To control for effects due only to

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differences in the KKT wording of the tasks for each of the three groups of subjects we neutralized our instructions so that each group was presented with a choice task, not 'buying,' 'selling' and 'choice' tasks. Our instructions, common for all subjects, and the choice sheet for each of the three groups, now referred to with antiseptic evenness as Group 1, Group 2, and Group 3, are shown in the appendix. Each member of Group 1 is an owner of an Arizona Wildcat Mug, and their task is to choose, for each amount of money (not a "price"), between retaining their mug, or accepting the additional amount of money. Each member of Group 2 is designated as having the right to choose between accepting a mug or retaining an amount of money out of their earnings in a previous experiment in the same session. Finally, each person in Group 3 is designated as having the right to choose between accepting a mug or accepting an additional amount of money. Thus, all subjects are symmetrically described as choosers, but under different initial conditions, and no reference is made to 'buying,' 'selling,' or to 'prices.' This procedure should eliminate any instructional effect in applying different descriptions to the different subject groups.

All of our experiments were run at the end of two simultaneous posted offer market experiments (6 buyers, 6 sellers in each), reported in Franciosi et al (1994). The positions of Groups 1, 2 and 3 were assigned at random among the 24 subjects. All subjects were paid their earnings in cash at the end of the market experiments. Earnings ranged from $8.75 to $44.50, providing all Group 2 subjects with adequate funds to give up for a mug if they chose.

The mean monetary amounts ('prices') for each of Groups 1, 2 and 3 are shown in the second data row of Table 1. The mugs were priced at $9.95 (price tags removed) in the campus bookstore.

From Table 1 it will be seen that our subjects reported a substantially lower Group 1, WTA, a somewhat higher WTP, and a higher Group 3, WTA, than did the KKT subjects. Substituting a choice task for the buying and selling tasks appears to narrow the WTA/WTP discrepancy. But from Table 2 row 1, the t test shows that all pairwise comparisons of our three groups come from different distributions. Row 2 compares the KKT results with ours and shows that the reduction in selling prices and the increase in buying prices are significant using the Wilcoxon test. Since these comparisons did not control for differences due to subjects and experimenters, we cannot attribute them only to the treatment differences.

We also asked if being in the role of buyer or seller in the prior market experiments affected the value revealed for a mug. The effect was insignificant using the Epps-Singleton test ($\alpha = 0.37$).

Finally, we asked if the amount paid to subjects in the prior market experiments affected their revealed values in the mug experiment. A regression of the latter on the former yielded no significant relationship ($R^2 = 0.007$). This suggests that any 'house money' income effect on mug valuation is nil (Thaler and Johnson, 1990).

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Table 1

Mean WTA and WTP
for University Emblem Mugs

Experiment	WTA Sellers	WTP Buyers	WTA Choosers	WTA-S / WTP-B	WTA-S / WTA-C	Sample size, N
KKT 6[a] and 7[b]	$6.89	$1.91	$3.05	3.61	1.60	194
	WTA Group 1	WTP Group 2	WTA Group 3	WTA-1 / WTP-2	WTA-1 / WTA-3	
UofA[c]	$5.36	$2.19	$3.88	2.45	1.38	120

a. Mugs and subjects from Simon Fraser University.

b. Mugs and subjects from University of British Columbia. Price tags were left on the mugs.

c. Mugs and subjects from University of Arizona. All subjects make choices: In Group 1 each is endowed with a mug; Group 2, each is endowed only with the money earned in a pre-experiment; Group 3, each is endowed with the right to choose either a mug or additional money.

Table 2

Group Distribution Differences
and Comparisons with KKT Results
for Buyers, Sellers and Choosers
using t tests

Hypotheses			
	G1 = G2	G2 = G3	G3 = G1
Group 1-3	t = 7.33 α = 0.000	t = -4.01 α = 0.000	t = -2.98 α = 0.004
	G1 = S	G2 = B	G3 = C
KKT S, B and C Groups	t = -3.73 α = 0.00	t = 1.10 α = 0.27	t = 2.12 α = 0.04

II. Exchange Tests of the Endowment Effect

The KKT Exchange Experiments

In addition to their BDM choice experiments, KKT report the results of several exchange experiments. The typical experiment proceeds as follows. Of 2N subjects, N are randomly designated buyers, and N are randomly designated sellers. The latter are each endowed with a mug; the former use their own money. Buyers each submit a bid price to buy a mug, sellers each submit an offer price to sell their mug. Their 'bids' or 'offers' are solicited by asking each subject to choose between a price and a mug for a series of prices as in the BDM procedure except that the range starts at $0.25 and goes up in increments of $0.50. The bids (WTP's) of the subjects are then ordered from highest to lowest, while the offers (WTA's) are similarly ordered from lowest to highest. The intersection of these revealed supply and demand schedules determines the price and quantity exchanged. If there are no endowment or income effects, then due to the random allocation of subjects to the buy or sell category the supply schedule of those given the mugs should be the symmetrical mirror image of the demand schedule for those not given the cups; i.e. (demand) $\equiv D(P^*) = S(P^*) \equiv N - D(P^*) \equiv$ (supply) and $D(P^*) = N/2$. Consequently, the prediction is that N/2 mugs will trade. For example (KKT, pp. 170-173) with 44 subjects, and N = 22 buyers and 22 sellers, 11 mugs are predicted to trade. In fact between one and four trade at prices between $4.25 and $4.75. Although there are several bid/offer trials, only one is chosen at random to be binding. Table 3 summarizes their results for induced value tokens, mugs, and pens for all trials in four experiments.

Table 3

Experiment	Trial	Number Subjects	Object	Price	Observed Trades	Predicted Trades
1	1	44	Tokens	$3.75	12	11
1	2	44	Tokens	$4.75	11	11
1	3	44	Tokens	$4.25	10	11
1	4	44	Mugs	$4.25	4	11
1	5	44	Mugs	$4.75	1	11
1	6	44	Mugs	$4.50	2	11
1	7	44	Mugs	$4.25	2	11
1	8	44	Pens	$1.25	4	11
1	9	44	Pens	$1.25	5	11
1	10	44	Pens	$1.25	4	11
1	11	44	Pens	$1.25	5	11
2	1	38	Tokens	$3.75	10	10
2	2	38	Tokens	$4.75	9	10
2	3	38	Tokens	$4.25	7	8
2	4	38	Mugs	$1.75	3	9.5
2	5	38	Mugs	$2.25	3	9.5
2	6	38	Mugs	$2.25	2	9.5
2	7	38	Mugs	$2.25	2	9.5
2	8	38	Binoculars	$1.25	4	9.5

Experiment	Trial	Number Subjects	Object[1]	Observed Trades	Predicted Trades
3	1	26	Tokens	5	6.5
3	2	26	Pens	2	6.5
3	3	26	Pens	2	6.5
3	4	26	Pens	2	6.5
3	5	26	Pens	1	6.5
4	1	74	Tokens	15	18.5
4	2	74	Tokens	16	18.5
4	3	74	Mugs	6	18.5
4	4	74	Mugs	4	18.5
4	5	72	Mugs	4	18
4	6	73	Mugs	8	18
4	7	74	Mugs	8	18.5

1. Prices are not reported in experiments 3 and 4. In these experiments "the subjects were asked for minimum selling or maximum buying prices rather than answer the series of 'yes or no' questions used in Experiments 1 and 2" (KKT, p. 175).

According to the endowment hypothesis the predicted number of trades will be realized for induced value tokens, since one is simply trading dollars for identical dollar claims: in fact, on average there is undertrading (in experiments 2, 3 and 4 but not 1). This is consistent with other studies showing a tendency to underreveal (token) demand and/or supply by subjects in uniform price sealed bid institutions (Smith, et al, 1982). But with consumer goods (mugs, pens) there is substantial undertrading -- much less than half the predicted volume is observed to trade.[3] If there are income effects, then the demand by subjects not endowed with mugs, $d(P) < D(P)$, the demand by the endowed subjects. Hence $d(P^*) = N - D(P^*) < N - d(P^*)$ and $d(P^*) < N/2$. But our finding reported above, showing no income effect, suggests that this cannot account for the results in Table 3.[4]

We should add that the KKT procedure does produce an incentive to underreveal demand (supply). When subjects are asked to choose between an object and a price, they know that their crossover price is, in effect, a bid price for a buyer and an ask price for a seller. Then "the market price was the point at which the elicited supply and demand curves intersected." (KKT, footnote 2, p. 171). This procedure means that if the highest accepted ask, $A_H < B_L$, the lowest accepted bid, then there are many prices that clear the market. The typical (fair?) procedure is to set the clearing price at $P_C = (A_H + B_L)/2$. The mug price in trial 6 of experiment 1 is an example in which P_C is half way between the discrete values $4.25 and $4.75 on the subject's choice form. If subjects believe that $A_H < B_L$ is a possible outcome it pays any seller (who may turn out to be the marginal seller) to 'ask' more than her WTA (or marginal buyer to 'bid' below his WTP). Since the distribution of the consumer good object values is highly uncertain, and unknown to both the subjects and

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the experimenters, the incentive to misrepresent may be more pronounced than with tokens. This is noted by KKT (p. 177) and is the important reason why they invoke the BDM choice procedure discussed above.

The Uniform Price Double Auction Mechanism

There exists a trading institution which results in a single block trade at a uniform price but which has the real time information display, feedback, characteristics of the continuous double auction, called the Uniform Price Double Auction (UPDA); it has been extensively studied in the laboratory, (McCabe, Rassenti and Smith, 1993; Friedman, 1991). Bids and offers are displayed in real time, and continuously crossed to yield a provisional common price and corresponding quantity while the market is open. When the trading period ends, all trades become binding at the price and quantity standing at the close. This institution is particularly well suited for examining the exchange predictions of the endowment effect because it has been shown to have excellent revelation properties for marginal units, resulting in fully efficient exchange quantities.

Table 4 and Figure 1 illustrate the state of all bid and offer realizations at the market close for a typical trading period in an UPDA experiment (period 12, experiment 7302 below). The first column lists the ID of each buyer, followed by that buyer's bid (column 2). The rank order (high to low of bids, low to high of offers) is shown in column 3. Column 4 displays each seller's offer followed by the seller's ID in column 5. The horizontal line below the 6th ranked bid and offer separates the accepted bids and offers above from the rejected bids and offers below the line. The accepted bids and offers form contracts at

Table 4

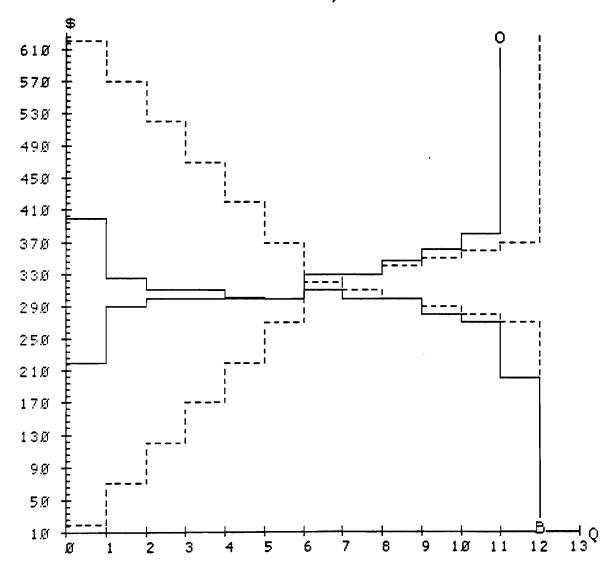### Bid, Offers and Trades
UPDA Experiment 7302, Period 12

ID No.	Bid	Rank	Offer	ID No.
2	400	1	220	19
6	325	2	290	24
9	310	3	300	22
4	310	4	300	21
11	301	5	300	17
12	300	6	300	27
10	311	7	329	25
7	300	8	330	26
1	300	9	347	18
8	280	10	362	23
5	270	11	380	20
3	200	12		

Figure 1

Graph of Induced Supply and Demand,
and of Bid/Offer Realizations

UPDA Experiment 7302, Period 12

C.E. Price = $320,   C.E. Volume = 7
Mrkt Price = $300,   Mrkt Volume = 6

a uniform price (300 cents in Table 4). Several alternative information feedback and price algorithm procedures for UPDA have been studied. We use the procedure in which subjects see displayed in real time only the best rejected bid and offer (311 and 329 in Table 4) not the accepted set of bids and offers. This puts maximum pressure on the outside traders to reach agreement, and has been found to yield the highest exchange volume and market efficiency (McCabe, Rassenti and Smith, 1993, p. 320).

In Figure 1 the demand bids (supply offers) are plotted as solid line steps. Also plotted, as broken line steps, are the induced value or cost of each trader. Note the substantial value/cost underrevelation, which does not thereby impede the efficient exchange of six units.

Mug Exchange Using the Uniform Price Mechanism

We report the results of two series of experiments. In each experiment 24 different subjects were randomly assigned to groups of 12 buyers and 12 sellers. Each series was divided into Parts 1 and 2 (See Table 5). In Part 1 of Series 1 each buyer was assigned a value and each seller a cost by a random draw with replacement from the uniform distribution on [0, $9.99] at the beginning of each of 10 (or 12) trading periods. This baseline served as a training session in UPDA. All periods lasted 4 minutes. In Part 2, Series 1 and 2, each buyer was endowed with a $9.99 cash balance which was theirs to keep if no mug was purchased; each seller was endowed with a University of Arizona emblem mug priced at $9.95 in the University bookstore and was theirs to keep if not sold. Each subject was paid in cash all of his/her earnings from the induced value UPDA training

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Table 5

Description of Treatments in
UPDA Exchange Experiments

	Series 1	Series 2
Part 1	Induced Values [0, $9.99]; random equilibrium; 4 minute periods	Induced Values [0, $9.99]; constant equilibrium; 4 minutes periods
Part 2	Buyers: $9.99 each. Sellers: one mug each; 4 minute periods	Buyers: $9.99 each. Sellers: one mug each; 4 and 6 minute periods $9.95 tag left on mug
Number of Experiments (subjects)	4 (96)	6 (144)

experiments in Part 1 of each of the sessions. In series 2, Part 1 used the constant volume equilibrium environment shown in Figure 1; in each period a random constant was added to each value, and the values randomly assigned to individuals. Part 2 of series 2 was like that of series 1 except that the price tag ($9.95) was left on each mug, and this was pointed out to the subjects. This was intended as a treatment to reduce uncertainty concerning the cash or market value of the mug in each group. Also in series 2 we increased the trading time for the mug exchange from 4 to 6 minutes in four of the six experiments. This is because it appeared that the subjects were still adjusting their bids and offers when the period ended after four minutes. Table 5 summarizes the experimental design.

Results of Exchange Experiments

Table 6 lists the predicted competitive equilibrium volume, and corresponding observed trading volume in periods 1-10 for the random equilibrium induced value environment. The induced value results are those recorded for periods 1-10 in four experiments. The mug exchange volume is recorded in period 11 for each experiment, with the corresponding UPDA price shown in parenthesis.

Table 7 lists the volume data for the experiments using a constant equilibrium volume environment for periods 1-12 in the UPDA training baseline. Period 13 records the volume in the subsequent mug exchange experiments, with the UPDA mug price shown in parenthesis.

In both Tables 6 and 7 it can be seen that as we move from the induced value exchange to mug exchange, volume relative to the prediction is decreased. But comparing

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Table 6

Volume Traded in UPDA Experiments
Series 1, Random Equilibrium[2]

UPDA Experiment[1]	5282		6012		7162		7232	
Trading Period	Volume Predicted	Observed	Volume Predicted	Observed	Volume Predicted	Observed	Volume Predicted	Observed
1	8	8	7	6	6	5	5	5
2	7	8	6	5	5	5	6	7
3	6	6	4	4	6	6	6	5
4	8	7	5	5	7	6	7	6
5	4	5	7	6	7	6	7	7
6	6	6	7	6	6	6	5	4
7	7	6	6	5	6	5	5	4
8	6	5	8	7	6	5	6	5
9	5	5	7	7	5	5	5	5
10	7	6	5	4	6	5	6	6
11[3]	6	6(189¢)	6	3(300¢)	6	3(100¢)	6	4(101¢)

1. Experiment numbers refer to date experiment was conducted, e.g. 5282: May 28, 1992.
2. In each period, 1-10, values were drawn with replacement from the uniform distribution on [0, $9.99].

Table 7

Volume Traded in UPDA Experiments
Series 2, Constant Equilibrium[1]
Four and Six Minute Mug Trading Periods

UPDA Experiment[1]	7302[2]		10152[2]		01263[3]		01283[3]		02193[3]		02243[3]	
Trading Period	Volume Predicted	Observed	Volume Predicted	Observed	Volume Predicted	Observed	Volume Predicted	Observed	Volume Predicted	Observed	Volume Predicted	Observed
1	6-7	6	6-7	8	6-7	6	6-7	7	6-7	7	6-7	6
2	6-7	6	6-7	7	6-7	6	6-7	6	6-7	6	6-7	6
3	6-7	6	6-7	6	6-7	7	6-7	7	6-7	6	6-7	6
4	6-7	7	6-7	6	6-7	6	6-7	7	6-7	5	6-7	6
5	6-7	6	6-7	7	6-7	6	6-7	7	6-7	7	6-7	6
6	6-7	6	6-7	6	6-7	6	6-7	6	6-7	6	6-7	6
7	6-7	6	6-7	6	6-7	7	6-7	7	6-7	6	6-7	6
8	6-7	6	6-7	5	6-7	6	6-7	7	6-7	6	6-7	6
9	6-7	6	6-7	7	6-7	7	6-7	6	6-7	6	6-7	6
10	6-7	6	6-7	7	6-7	7	6-7	6	6-7	6	6-7	7
11	6-7	7	6-7	6	6-7	6	6-7	6	6-7	6	6-7	6
12	6-7	6	6-7	6	6-7	6	6-7	6	6-7	6	6-7	6
13[4]	6	2(223¢)	6	3(250¢)	6	6(350¢)	6	5(85¢)	6	3(452¢)	6	3(215¢)

1. One set of values are drawn with replacement from the uniform distribution on [0, $9.99]. A random constant was added to all values in each period 1-12, and the individual assignments randomized.
2. Each period was 4 minutes duration.
3. Periods 1-12 were 4 minutes duration, period 13 was 6 minutes duration to allow more time for mug trading.
4. Volume for number of mugs traded in period 13. Price in cents is shown in parenthesis. The price tag, showing $9.95 was left on each mug, and this was pointed out to the subjects.

the mug exchange volume in Tables 6 and 7 with the various objects exchanged in Table 3 it is clear that our UPDA mechanism results in much less undertrading than was observed by KKT. In two of our ten experiments half the mugs (6) trade as predicted by standard theory.

Since earnings in the induced value experiments vary from zero to $34, we can ask if there are any income effect on the submitted bids or offers of subjects in the mug experiments. Separate regressions of such bids (offers) on earnings for buyers and for sellers yield no significant effect of earnings on subject WTP or WTA for a mug (the regression coefficients yield t-values of -0.28 for sellers and -0.20 for buyers).

Each UPDA mug exchange experiment provides a sample of bid and offer prices standing at the close of each experiment. Since the exchange mechanism provides full opportunity for each subject to adjust his or her bid or offer price to the level needed to produce a trade, if a trade is truly desired, the resulting distributions of bids and offers provide market incentive-based measures of WTA and WTP that are distinct from the BDM measures elicited in Groups 1 and 2 in section I. It is therefore of interest to compare the distribution of the Group I WTA prices with the distribution of closing exchange offers, and the Group II WTP prices with closing exchange bids. We report these t test comparisons in Table 8. In these comparisons we use only the bid/offer data for the UPDA experiments in which the mug prices were unknown, since this was the treatment condition in the BDM data for Groups 1 and 2. Both the offer and the bid distributions are significantly below the

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Table 8

Comparison of UPDA Bids, Offers and Exchange
Prices with Choice Valuations

		Bids	Offers	Prices
Group 1 WTAs	t statistic		-8.68	-4.14
	prob. level		(0.00)	(0.00)
Group 2 WTPs	t statistic	-9.043		0.14
	prob. level	(0.00)		(0.89)

corresponding Group 1 WTA and Group 2 WTP distributions. The BDM procedure does not yield valuations that are good predictors of the actual bids and offers submitted in the iterative UPDA market setting.

Also in Table 8 we report comparisons of the Group 1 and 2 valuations with the sample of all mug prices from the UPDA experiments. These comparisons show that prices are significantly below the Group 1 WTAs, but not the Group 2 WTPs. Thus the WTPs based on choice data are a better indicator of the level of exchange prices than are the WTAs. Coursey, Hovis and Schutze (1987) report similar findings in their study of the disparity between WTA and WTP.

In a new study using repeated second price auctions to measure WTP and WTA for goods with close substitutes (candy bars and mugs), Shogren, et al (1994) find no significant difference between the <u>average</u> of WTA and WTP (or price) for these goods. These carefully conducted new experiments cast doubt upon the WTA/WTP discrepancy for goods with close substitutes, and they reject the KKT hypothesis of an endowment effect. Thus, for mugs Shogren et al (1994, p. 265) report WTA/WTP ratios of only 1.08 and 1.05 in two treatments on the final three trials 8-10.

We have no disagreement with their results or conclusions. Their results are not inconsistent with our market results because we directly examine trading volume <u>not</u> the WTA/WTP discrepancy. It is very important to realize that mean differences between WTA and WTP in two situations can be indistinguishable statistically, yet trading volume can differ substantially. To see this look at Figure 1. A slight decrease (increase) in the last four accepted bids (offers) would have no discernible effect on the difference between WTA

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and WTP, on average, but volume would decrease from 6 to 2 units. Similarly, variation in the WTA/WTP ratio of 1.08 to 1.05 could in our setting (and that of KKT), yield considerable differences in trading volume. The ratio of mean WTA to mean WTP in Table 4 is only 1.05, but the market trades fully, (except for the marginal indifferent units that add nothing to efficiency).

III. Conclusions and Discussion

This paper has reexamined the KKT experimental procedures for identifying an endowment effect for consumer goods; it is based on a series of individual choice experiments, and an independent series of market exchange experiments.

In our choice experiments we removed all reference to buying, selling and prices and reformulated the task uniformly across KKT's three treatment groups as a choice problem. Since each experiment in the choice series was an addendum to a prior unrelated market experiment in which the subjects earned substantial, but highly variable amounts of money, we were able to obtain a measure of any effect on choices due to differential incomes earned or to the buyer/seller role in the previous experiment. We found no income or role effects.

Comparing the KKT results with those of our pure choice experiments we find that the KKT use of different instructional descriptions -- buyers, sellers, choosers -- may have exaggerated seller's WTA, but their hypothesis of an endowment (possession) effect is

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supported by our choice data. Consequently, although we observe smaller WTA/WTP discrepancies, their qualitative choice results are robust under the replication procedures used in this paper.

The results of our mug exchange experiments parallel those of the choice experiments although the methodology is quite different. The training experiments for UPDA, using induced valuation, generated a wide disparity in the earnings of both buyers and sellers. Since the buyers (sellers) subsequently submit bids (offers) for a mug we could ask whether the reported WTP (WTA) was affected by prior income earnings: for neither buyers or sellers was there a significant income or 'house money' effect. The theory predicts that, in the absence of an income effect, half of the 12 seller's mugs should trade. We observed this in two of ten experiments. In seven experiments 2-4 mugs traded, and in one 5, mugs traded. This discrepancy is larger (relative to prediction) than observed in the token (induced value) UPDA experiments, but not nearly as large as reported by KKT. Our UPDA exchange procedures narrow the discrepancy reported by KKT, but do not eliminate it. We concur with KKT that there does, indeed, appear to be an undertrading endowment effect, although we find the effect to be considerably smaller under our procedures than under those of KKT.

A comparison of the bid (offer) distribution in the UPDA mug exchange experiments with the WTP (WTA) distribution in the choice experiments shows that both the bid and the offer distributions in exchange are below those in the choice experiments: buyers bid less and sellers offer less in actual exchange than is revealed by the BDM procedure. A

similar comparison with the UPDA mug prices reveals that the WTP distribution in the choice experiment is a better indicator of market value than the WTA distribution.

We accept the Shogren et al (1994) finding of no _statistically_ significant difference between WTA and WTP (for mugs, candy bars) using second price auction measures. They show that the difference does indeed become trivial _relative_ to sampling variability over time. But we observe undertrading relative to predictions, which is entirely consistent with persistent small statistical differences between WTA and WTP. Consequently, we are unable to reject the KKT undertrading hypothesis. Statistical insignificance in the WTA--WTP space is associated with economically significant reductions in trade.

As we interpret the evidence, the key hypothesis in KKT that withstands market scrutiny is not the disparity between WTA and WTP, but undertrading.

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1.   Actually Thaler expresses the utility property as $v(X) < -v(-X)$ for deviation, X, from current wealth, or income. In this form the condition captures the well-known Kahneman/Tversky hypothesis that the loss function is steeper than the gain function, which is consistent with a smooth concave utility function for finite changes in wealth (income). It does not capture the apparent WTP/WTA discontinuity at $X = 0$, for otherwise continuous Hicksian inverse demand functions.

2.   In some experiments the ordered individual WTPs and WTAs are crossed and the exchange is directly between buyers and sellers at a common clearing price. But in these cases it is no longer true "that your decision can have no effect on the price ...," as stated in the KKT instructions (p. 178).

3.   Sometimes it has been suggested that subjects trade in market experiments because they think the experimenter expects it and brought them to the lab for this purpose. The KKT results are quite contrary to this interpretation.

4.   One could also use our WTP and WTA data from the BDM experiments to determine a hypothetical exchange quantity based upon the BDM elicitation procedures. We performed this exercise by crossing the Group 1 WTA with the

Group 2 WTP and found that of 20 predicted trades only 8 would occur. This undertrading is consistent with the findings of KKT. If we use the Group 3 data as a better estimate of 'true WTA' and cross these with the Group 2 WTP, we still get only 12 of a 20 predicted trades.

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Appendix

General Instructions

This experiment is being financed by research funds. Any money or objects that are in your possession at the end of the experiment are yours to take home. As is our strict policy with all experiments, there are no deceptions of any kind in this experiment.

You have been divided into three distinct groups, 1, 2, and 3, as indicated at the top of your instruction sheet.

Group 1 consists of _____ people. Each of you has been designated as an owner of the Arizona Wildcat Mug that you see on your desk. Please feel free to examine the mug carefully, since you will be asked to choose between retaining your mug, or, instead, accepting an additional amount of money to be determined.

Group 2 consists of _____ people. Each of you has been designated as having the right to choose between accepting a mug or retaining an amount of money, to be determined, that you have earned in the previous experiment. Please feel free to examine the mug that we pass among you to determine if you wish to acquire one. It is identical to the mugs owned by those in Group 1.

Group 3 consists of _____ people. Each of you has been designated as having the right to choose between accepting a mug or accepting an additional amount of money to be determined. Please feel free to examine the mug that we pass among you to determine if you wish to acquire one. It is identical to the mugs owned by those in Group 1.

Special Instructions for Each Group

Group 1. For each of the possible amounts of money listed on your choice sheet please indicate whether you wish to

(1) accept that amount of additional money to replace your mug, or

(2) retain your mug.

Group 2. For each of the possible amounts of money listed on your choice sheet please indicate whether you wish to

(1) retain that amount of money, or

(2) accept one of the mugs to replace this amount of money.

Group 3. For each of the possible amounts of money listed on your choice sheet please indicate whether you wish to

(1) accept that amount of additional money, or

(2) accept one of the mugs.

Instructions for Determining Final Allocation of Money and Mugs

After all three groups have marked their choice sheets, a single common amount of money will be selected at random to determine (according to your choice sheet for that amount of money) whether those in group 1 receive that common amount of money or retain their mug; whether those in group 2 retain that common amount of money or receive a mug; and whether those in group 3 receive that common amount of money or receive a mug. The random selection will be made by one of you by drawing a ball from a bingo cage containing 23 balls, each marked with a number corresponding to one of the amounts on your choice sheet.

Notice, that each person takes home an outcome -- money or mug -- which corresponds to the preferred choice that you expressed. It is, therefore, in your best interest to make your choices carefully and accurately according to your true value for the mug.

Group __1__   Person number _____

Choice Sheet

		I will accept this additional amount of money to replace my mug.	I will retain the mug.
1.	If the amount of money is 0.00	_____	_____
2.	If the amount of money is 0.50	_____	_____
3.	If the amount of money is 1.00	_____	_____
4.	If the amount of money is 1.50	_____	_____
5.	If the amount of money is 2.00	_____	_____
6.	If the amount of money is 2.50	_____	_____
7.	If the amount of money is 3.00	_____	_____
8.	If the amount of money is 3.50	_____	_____
9.	If the amount of money is 4.00	_____	_____
10.	If the amount of money is 4.50	_____	_____
11.	If the amount of money is 5.00	_____	_____
12.	If the amount of money is 5.50	_____	_____
13.	If the amount of money is 6.00	_____	_____
14.	If the amount of money is 6.50	_____	_____
15.	If the amount of money is 7.00	_____	_____
16.	If the amount of money is 7.50	_____	_____
17.	If the amount of money is 8.00	_____	_____
18.	If the amount of money is 8.50	_____	_____
19.	If the amount of money is 9.00	_____	_____
20.	If the amount of money is 9.50	_____	_____
21.	If the amount of money is 10.00	_____	_____
22.	If the amount of money is 10.50	_____	_____
23.	If the amount of money is 11.00	_____	_____

Group _2_   Person number _____

Choice Sheet

		I will retain the money.	I will accept the mug to replace this amount of money.
1.	If the amount of money is 0.00	_____	_____
2.	If the amount of money is 0.50	_____	_____
3.	If the amount of money is 1.00	_____	_____
4.	If the amount of money is 1.50	_____	_____
5.	If the amount of money is 2.00	_____	_____
6.	If the amount of money is 2.50	_____	_____
7.	If the amount of money is 3.00	_____	_____
8.	If the amount of money is 3.50	_____	_____
9.	If the amount of money is 4.00	_____	_____
10.	If the amount of money is 4.50	_____	_____
11.	If the amount of money is 5.00	_____	_____
12.	If the amount of money is 5.50	_____	_____
13.	If the amount of money is 6.00	_____	_____
14.	If the amount of money is 6.50	_____	_____
15.	If the amount of money is 7.00	_____	_____
16.	If the amount of money is 7.50	_____	_____
17.	If the amount of money is 8.00	_____	_____
18.	If the amount of money is 8.50	_____	_____
19.	If the amount of money is 9.00	_____	_____
20.	If the amount of money is 9.50	_____	_____
21.	If the amount of money is 10.00	_____	_____
22.	If the amount of money is 10.50	_____	_____
23.	If the amount of money is 11.00	_____	_____

Choice Sheet

	I will accept this additional amount of money.	I will accept the mug.
1. If the amount of money is 0.00	____	____
2. If the amount of money is 0.50	____	____
3. If the amount of money is 1.00	____	____
4. If the amount of money is 1.50	____	____
5. If the amount of money is 2.00	____	____
6. If the amount of money is 2.50	____	____
7. If the amount of money is 3.00	____	____
8. If the amount of money is 3.50	____	____
9. If the amount of money is 4.00	____	____
10. If the amount of money is 4.50	____	____
11. If the amount of money is 5.00	____	____
12. If the amount of money is 5.50	____	____
13. If the amount of money is 6.00	____	____
14. If the amount of money is 6.50	____	____
15. If the amount of money is 7.00	____	____
16. If the amount of money is 7.50	____	____
17. If the amount of money is 8.00	____	____
18. If the amount of money is 8.50	____	____
19. If the amount of money is 9.00	____	____
20. If the amount of money is 9.50	____	____
21. If the amount of money is 10.00	____	____
22. If the amount of money is 10.50	____	____
23. If the amount of money is 11.00	____	____