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THE ENDOWMENT EFFECT *

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Abstract

The divergence between the willingness-to-pay (WTP) and willingness-to-accept (WTA) has resulted in two explanations. First, that this may be due to the manifestation of the endowment effect (Kahneman, Knetsch and Thaler, 1991). Second, the difference between WTA and WTP is directly related with the substitutability of the goods (Haneman, 1991). In this paper we show that one can observe undertrading in markets even if the WTA-WTP discrepancy is negligible. Due to underrevelation of intramarginal units very flat reported inverse supply and demand curves are obtained. As a result very small deviations in reported WTA and WTP can lead to undertrading.

Keywords: Endowment effect, WTA, WTP, Uniform Price Double Auction.

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The Endowment Effect

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The Background

The emergence of empirical evidence suggesting divergence between the willingness-to-accept (WTA), for the sale of an object, and the willingness-to-pay (WTP), for the purchase of an object, has resulted in two explanations. One of the explanations was proposed by Kahneman, Knetsch and Thaler (1991) (hereafter KKT), that the discrepancy between the WTP and the WTA may be a manifestation of the endowment effect. Thus, "... endowment effects will almost certainly occur when owners are faced with an opportunity to sell an item purchased for use that is not easily replaceable" (p. 1344). Further they argue that the endowment effect will not apply when the goods are purchased for resale and not for use; there is no endowment effect for the retail firm, only for the consumer purchasing the firm's good. Similarly, they argue that the endowment effect 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).

The second explanation came from Hanemann (1991) who showed that when close substitutes exist for the good in question (and given positive income elasticity) WTA and WTP can be shown to be very close, and vice-versa.

Given the explanations for the divergence between the average WTA and WTP the experimental literature focused on direct choice tests of these (theoretical) explanations, and their examination in market contexts.

The first choice, and exchange, experiments were run by KKT establishing the endowment effect for Cornell and other (emblem) coffee mugs but not for induced value tokens.

These were followed by experiments from Shogren et al. (1994) and Franciosi et al. (1996). Shogren et al. establish that the Hanneman hypothesis under repeat play is robust and that the divergence between the WTA and WTP disappears with repeat interaction for close substitutes but not for imperfect substitutes. Further, in their experimental setting (distinct from that of KKT) they show that under repeat interaction the endowment effect disappears. Franciosi et al. show that we can observe undertrading in markets even if the WTA-WTP discrepancy is negligible. This is the result of underrevelation of intramarginal units leading to very flat reported inverse supply and demand so that very small deviations in reported WTA and WTP can lead to undertrading.

The Experiments

Kahneman-Knetsch-Thaler Choice Experiments:

In the typical experiment of KKT an undergraduate class is divided into equal parts. Half the subjects were randomly assigned to the role of buyers and the other half sellers. University emblem coffee mugs (Cornell, Simon Fraser, or University of British Columbia), costing around \$6 in the local University bookstore, were then distributed to the sellers, and all the buyers were given the opportunity to examine the mug. The following forms were then executed.

	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	_____	_____

Next, a random price (KKT used the BDM procedure, in Becker et al., 1964) was drawn from the list between \$0 and \$9.50, and exchanges were conducted by the experimenter on the

basis of this price. The typical result was a median selling price that was double the median buying price, an observation that is consistent with the endowment effect. KKT, however, recognized that this procedure did not control for any income effect. This problem was exacerbated by the fact that buyers in their experiments were required to use their own funds while the sellers were given the coffee mugs.

To address the need to control for income effects KKT (pp. 179-80) developed an ingenious variation on the above experiments. Instead of two groups they used three: sellers, buyers and choosers. The sellers/buyers made the same choices as before, while the choosers were asked to choose at each prospective price between the mug, or cash. Thus, sellers were given a mug, and choosers were given the right to either a mug or cash as they chose; any income effect on sellers as distinct from buyers, should then also apply to the choosers. The difference according to the KKT implementation of the endowment effect is that sellers own the mug, choosers do not.

Their results were clear: choosers behave more like buyers than like sellers, although choosers value mugs sixty percent more highly than buyers. (See KKT, p. 178-80).

Franciosi et al. Choice Experiments

Franciosi et al. conducted four experiments each with 24 subjects (8 in each group; $N=96$ subjects in total) motivated by the three-group design which controlled for any income effect. However, they made several instructional changes which might be important in the context of the choice experiments due to their framing effects. Because the use of emotive terms such as “buying,” and “selling” may alter the strategic behavior of market participants, Franciosi et al. (1996) neutralized their instructions and removed all mention of “buying” or “selling.” Instead they use expressions that did not suggest any specific role behavior on the part of market

participants. First, the three groups were simply called Group 1, Group 2 and Group 3. The subjects were told that each member of Group 1 is an owner of an Arizona Wildcat Mug, and their task is to choose, for each amount of money (no mention of “price”), between retaining their mug or, accepting the additional amount of money. Each member of Group 2 was designated as having the right to choose between accepting a mug, or retaining an amount of money out of their earnings in a previous unrelated experiment in the same session. Finally, each person in Group 3 is designated as having the right to choose between a mug or accepting an additional amount of money. Thus, all subjects were symmetrically described as choosers, but under different initial conditions.

All their choice experiments were run at the end of two simultaneous posted offer market experiments (6 buyers, 6 sellers in each), reported in Franciosi et al. (1995). Subjects were assigned to the three groups randomly, and were paid their earnings in cash at the end of the market experiments. Earnings ranged from \$8.75-\$62.50 providing all Group 2 subjects with sufficient funds to obtain a mug based on the experimental prices. The mugs were priced at \$9.95 (price tags removed) in the campus bookstore.

From Table 1 it can be seen that the subjects report 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. Pairwise statistical tests, however, show that the data from all three groups come from different distributions (Franciosi, et a., 1996). Hence, the qualitative differences among the three groups, as postulated by KKT, were supported as is evident in the last row of Table 1.

KKT (1991) Exchange experiments:

In addition to their BDM choice experiments KKT report the results of several exchange experiments. Half the subjects were randomly assigned the role of buyers, the others sellers. Sellers were each endowed with a mug, while the former used money they had been asked to bring to class. Buyers each submitted a bid price to buy a mug, sellers each submitted an offer price to sell the mug. Their 'bids' and 'offers' were 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 intersection of the descending bids and ascending offers 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 condition, the supply schedule of those given the mugs should be a mirror image of the demand schedule for those not given the mugs. This leads to the prediction that one-half of the mugs should trade. Consequently, in their experiments with 22 buyers and 22 sellers, 11 mugs were predicted to trade. They observe that between 1 and 4 trade at prices between \$4.25 and \$4.75. As before only one bid/offer trial is chosen at random.

Mug Exchange Experiments using Uniform Price Double Auction

Franciosi et al. (1996) used the uniform price double auction (UPDA) mechanism to study mug exchange due to its strong equilibrating properties. (See McCabe, Rassenti and Smith, 1993). The authors felt that using an efficient auction market mechanism may be crucial to testing the undertrading hypothesis.

Two series of experiments were run. 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. In Part 1 of series 1 each buyer was assigned a value and each seller a cost 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. 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 which was theirs to keep if not sold. Each subject was paid in cash all of their earnings from the induced value training experiments in Part 1 of each of the sessions. In series 2, Part 1 used the constant volume equilibrium environment, but in each period a random constant was added to each value, and the values randomly assigned to each individual. 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 a treatment to reduce uncertainty concerning the cash or market value of the mug in each group. Also in series 2 the trading time for mug exchange was increased from 4 to 6 minutes in four of the six experiments. This was done because it seemed that subjects were still adjusting their bids and offers when the period ended after 4 minutes. The experimental designs are summarized in Table 2.

The trading volume in the two series of experiments is plotted in Figure 1. Comparing the results with the KKT experiments it is clear that in these experiments there was much less undertrading. In three of the eleven experiments half of the mugs trade as predicted by standard theory. In the KKT exchanges no more than one-third of the mugs ever trade. But undertrading still occurs. How can undertrading be reconciled with the Shogren, et al. (1994) finding that the WTP-WTA discrepancy converges to miniscule levels? The answer is as follows: Francioso, et al. observe that the reported supply and demand schedules using UPDA are very flat, with many bids to buy and offers to sell very near the market clearing price. Hence, undertrading can result from very slight underrevelation, although there is little discrepancy between WTA and WTP.

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Experiment	WTA sellers	WTP Buyers	WTA choosers	WTA-S/ WTP-B	WTA-S/ WTA-C	Sample size, <i>N</i>
KKT 6 and 7	\$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	
U of A	\$5.36	\$2.19	\$3.88	2.45	1.38	120

Table 1. Row 2 lists the mean WTA and WTP prices obtained from experiments 6 and 7 reported by KKT for mugs and other objects at Simon Fraser and UBC. Row 4 lists the corresponding means from the University of Arizona experiments. In the latter all subjects make choices: Group 1 endowed with a mug; Group 2 endowed with money earned in a pre experiment in the same session; Group 3 endowed with the right to choose either a mug or additional money. The U of A procedures yield lower seller WTA, higher buyer WTP and higher chooser WTA than the KKT procedures. But the qualitative relationship among the treatment measures of value are preserved as in KKT.

	Series 1	Series 2
Part 1	Induced Values [0,\$9.99]; random equilibrium; 4 min periods	Induced Values [0,\$9.99]; constant equilibrium; 4 min periods
Part 2	Buyers: \$9.99 Sellers: one mug each 4 min periods	Buyers: \$9.99 Sellers: one mug each 4 and 6 min periods \$9.95 price tag left on mug
Number of Experiments (subjects)	4(96)	7(144)

Table 2. Part 1 in each of two series of experiments used induced value supply and demand schedules to train subjects in the Uniform Price Double Auction (McCabe, Rassenti and Smith, 1993). The environment was one in which the random equilibrium prices and volumes were comparable to what would be expected, theoretically, in the subsequent mug trading experiments. In Part 2 buyers were endowed with \$9.99 as in Part 1, but sellers were endowed with University of Arizona emblem mugs and cash was traded for mugs. A total of 4 experiments were run in Series 1, and 7 in Series 2.

Figure 1. See Table 2 for a description of the series 1 and series 2 experiments. The mugs traded in Part 2 of each of the two series of experiments are shown plotted in red in the figure. Plotted in blue are the predicted volumes of trade (6). Note that in three of the eleven total experiments six or more of the mugs trade; in eight less than 6 mugs trade. Generally we observed much more trading volume than obtained by KKT, but still substantially below the prediction, tending to confirm the undertrading hypothesis.

Figure-1:

UPDA Exchange experiments: Volume of mugs traded in constant and random equilibrium experiments

Two series of experiments, constant and random equilibrium, were run. In each experiment 24 different subjects were randomly assigned to groups of 12 buyers and 12 sellers. Each series was divided into two parts.

The first part was a market experiment while the second part was the mug exchange experiment. In the first part each buyer was assigned a value and each seller a cost from the distribution [\$0, \$9.99] at the beginning of each experiment.

In Part 1 of series 1 each period lasted for 4 minutes. In Part 2 of series 1 and 2 each buyer was endowed with a \$9.99 cash balance which was theirs to keep if the mug was not purchased; each seller was endowed with a University of Arizona emblem mug which was theirs to keep if not sold. In series 2, Part 1 used the constant equilibrium environment, but in each period a random constant was added to each value, and the values randomly assigned to individuals. Part of series 2 was like that of series 1 except that the price tag was left on the mug, and this was pointed out to all the subjects. This was done to reduce the uncertainty regarding the market or cash value of the mug. The trading time for the mug exchange experiment in series 2 was increased from 4 to 6 minutes in four of the six experiments. This was done as it appeared that the subjects were still expecting their bids when the period ended after 4 minutes.

Figure 2: Two series of experiments were run. Each series was divided into Part 1 and 2. In each experiments 24 different subjects were assigned randomly to groups of 12 buyers and 12 sellers.

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 [$\$0$, $\$9.99$] at the beginning of each of the 10 (12) trading periods. This baseline served as a training session. 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 their earnings in cash from the induced value training experiments in Part 1 of each of the sessions.

In Series 2, Part 1 used the constant volume environment shown in Figure 2, but 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 done to reduce uncertainty concerning the cash or market value of the mug in each group. Also in Series 2 the trading time was increased from 4 to 6 minutes in four of the six experiments. This was done because it appeared that the subjects were still adjusting their bids and offers when the period ended (see Figure 2: several subjects are within 10-30 cents of a trade). Most mug experiments in Series 1 and 2 were characterized by under revelation on the part of both Buyers and Sellers. Conclusion: The WTA/WTP discrepancy can be negligible, but one can still get undertrading from under revelation.

Figure-1

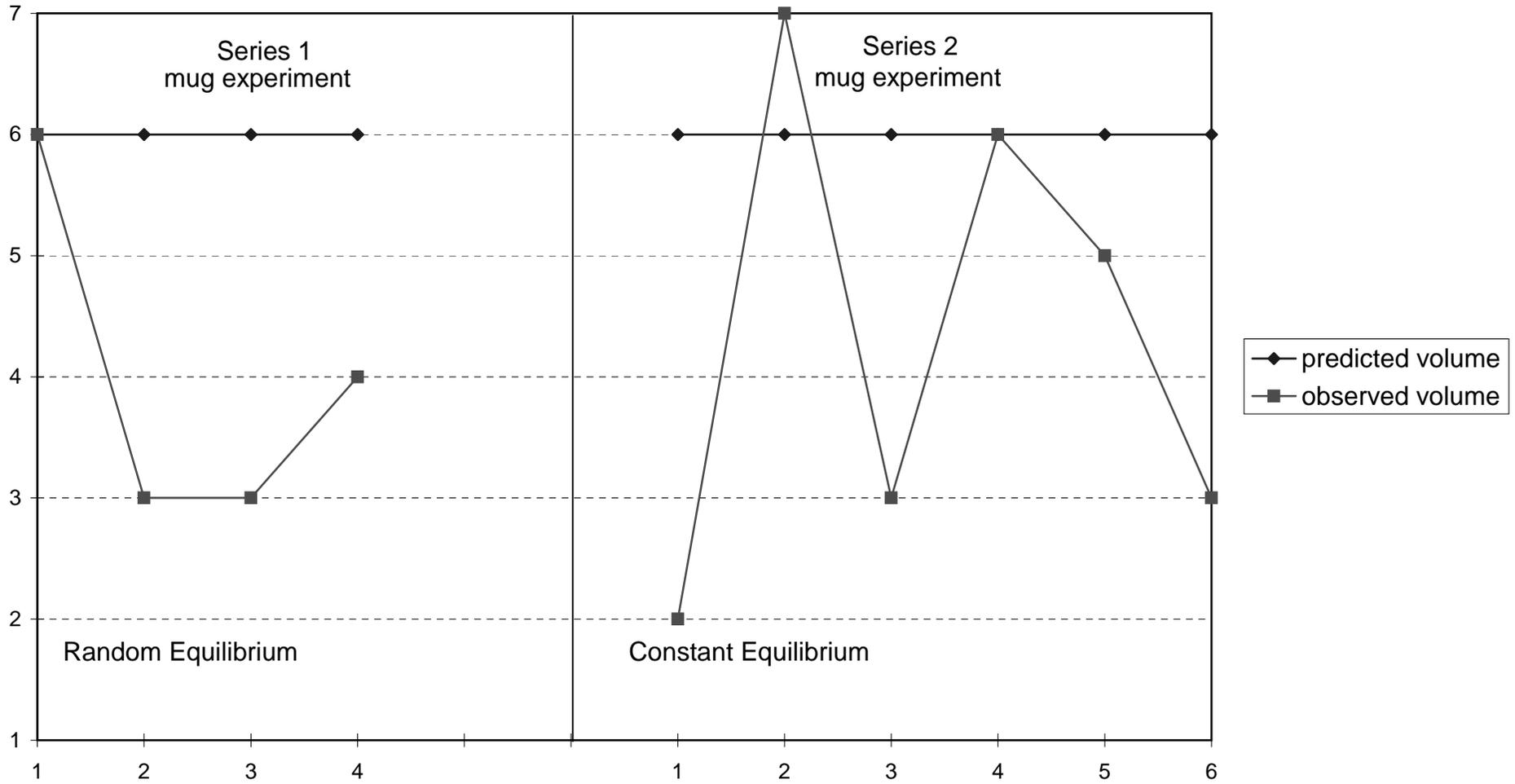


Figure 2

