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A BIAS IN THE PREDICTION OF TASTES*

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Recent research has documented an 'endowment effect' whereby people become more attached to objects they receive than would be predicted from their prior desire to possess the object. In two experiments, we test whether people are aware of the effect – whether they realise that they will become attached to an object once they receive it. In both experiments, subjects without an object underestimated how much they would value the object when they received it.

Although the standard economic theory of consumer preference assumes fixed tastes, the idea that tastes change over time is not controversial. Numerous 'habit formation' models have been proposed which assume that current consumption influences future tastes (Duesenberry, 1952; Pollak, 1970; Stigler and Becker, 1977). These models have been applied to such diverse phenomena as the development of tastes for music and food, substance addiction (Becker and Murphy, 1990), and the surprisingly high rate of return on equities relative to fixed-income securities (e.g. Constantinedes, 1990).

Although it is more complicated to model than fixed tastes, there is nothing intrinsically irrational about habit formation as long as economic agents can predict without bias the effect of their current behaviour on their own future tastes. If people are aware of the effect of their actions on their own future tastes, they can adjust their consumption in a rational manner – e.g. by desisting from crack based on anticipation of future disutility from addiction.

There is some evidence, however, pointing to situations in which people systematically mispredict their own tastes. For example Ausubel (1991) noted that large numbers of credit card users expect to maintain a zero credit balance but fail to do so – apparently underestimating their own future desire for spending. This self-forecasting error can explain the downward stickiness of credit card interest rates since consumers who expect to maintain zero card balances will not care about credit card interest rates. A similar pattern occurs in connection with consumer rebate programmes; consumer purchase decisions are quite sensitive to rebate offers, but very few consumers ultimately send in the forms required to obtain the rebate (Tat *et al.* 1988).

Our specific focus is on whether people are able to predict changes in their own tastes caused by the 'endowment effect' (Thaler, 1980). The endowment effect refers to the tendency for people to value an object more highly if they possess it than they would value the same object if they did not. In the typical demonstration of the endowment effect (see, e.g. Kahneman *et al.* 1990), one group of subjects (sellers) are endowed with an object and are given the option of trading it for various amounts of cash; another group (choosers) are not given the object but are given a series of choices between getting the object or

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getting various amounts of cash. Although the objective wealth position of the two groups is identical, as are the choices they face, endowed subjects hold out for significantly more money than those who are not endowed. As Tversky and Kahneman (1991) have shown, the endowment effect implies that indifference curves shift in a systematic manner when individuals acquire goods – increasing the valuation of the endowed good relative to all other goods. Thus, the endowment effect can be viewed as a type of endogenous taste-change.

Tversky and Kahneman analyse the effect of endowments on preferences with a 'reference-dependent preference structure' that indexes the standard preference relations ($\succ$, $\sim$, etc.) according to the individual's point of reference (typically the current asset position). For example, $x \sim_r y$ indicates that an individual with reference position r is indifferent between alternatives x and y. The selling price (s) and choice value (c) estimated in the experimental setup just described are represented in equations 1 and 2 respectively, where the first argument of each pair indicates the individual's level of wealth, the second designates possession (1) or nonpossession (0) of the object, and the preference relation is subscripted according to whether the decision maker is in possession of the object.

$$(w, 1) \sim_1 (w+s, 0) \tag{1}$$

$$(w, 1) \sim_0 (w+c, 0) \tag{2}$$

The endowment effect implies $s \gg c$.

To accommodate predictions of preferences within this framework, we generalise the notation by subscripting the preference relation by the asset position which the individual is attempting to predict, and superscripting it by the individual's current reference level. Thus, for an individual with asset position s, $\sim_r^s$ represents the indifference relations she would expect to prevail if her asset position were r instead of s.[1]

In the experiments presented below, we asked subjects to predict their own selling price for an object they did not have – i.e. to predict a selling price, s', as defined by,

$$(w, 1) \sim_1^0 (w+s', 0) \tag{3}$$

If subjects predict their own selling prices without bias, then, on average, $s' = s$. Our prediction is that subjects will underestimate s – i.e. $s' \ll s$.

The endowment effect has several advantages as the focus of a study of taste-change prediction. First, the effect operates very rapidly so that, unlike, for example, changes in the taste for classical music, it can be studied in a single experimental session. Second, discovery of a bias in predicting the impact of the endowment effect would have far-reaching implications for economics. The endowment effect refers to the impact on tastes of merely acquiring a good. Since many economic decisions, including most decisions involving consumer choice, involve acquisitions, documentation of a bias in the prediction of the endowment effect would call into question the rationality of a wide range of economic behaviour. Finally, we believed that there was a high likelihood of observing a prediction bias in this particular domain. This intuition is based

[1] Under the generalised notation, the conventional endowment effect can be expressed as: $(w, 1) \sim_1^1 (w+s, 0)$, and $(w, 1) \sim_0^0 (w+c, 0)$, with $s > c$.

on, first, the surprisingly long time it has taken social scientists to discover the effect, given its magnitude and robustness; second, the fact that the endowment effect disappears when people make valuation decisions on behalf of another person, as if they are not aware that others will get attached to objects in their possession (Marshall *et al.* 1987); and third, the fact that other studies have found that people tend to underestimate how quickly they will adapt to changed circumstances such as winning a lottery or becoming paraplegic (Brickman *et al.* 1978) – i.e. that they underestimate the impact of reference point shifts.

I. EXPERIMENT I

The first experiment was designed to test whether subjects without an object could predict how attached they would become if they were endowed with it. We first elicited hypothetical selling prices for an object from unendowed subjects then endowed them with the object and elicited an actual selling price.

Subjects were 27 undergraduates enrolled in a core humanities class at Carnegie Mellon University and 42 adults enrolled in two evening classes in finance at the University of Pittsburgh. In each class, the experimenter held up a mug engraved with the school logo for the students to see. A different style of mug was used at Carnegie Mellon and at the University of Pittsburgh. A form was then randomly distributed to approximately half of the students in each class. The form asked the students to imagine that they possessed the mug on display and to predict whether they would be willing to exchange the mug for various amounts of money. It was worded as follows:

> We are interested in your opinion about the mug displayed at the front of the room. Imagine that we gave you a mug exactly like the one you can see, and that we gave you the opportunity to keep it or trade it for some money. Below are a series of lines marked 'Keep mug____ Trade it for $ amount____.' On each line check whether you think that you would prefer to keep the mug or to trade it in for the amount of money written on the line. *Check one or the other on every line.*

The remainder of the page consisted of 40 lines each containing a choice between keeping the mug or trading it for an amount of money that ranged from 25 cents to 10 dollars in $0.25 increments. The experimenter waited until all subjects with a form had completed it. Next, *all* subjects were presented with a mug and given a second form which actually provided the opportunity to exchange the mug for cash. The instructions for the second form were directly analogous to those used in the prediction form, but made it clear that one of their choices would count. Subjects were told that they would receive the option they had circled on one of the lines – which line had been determined in advance by the experimenter.

The experimental design creates two groups of subjects, one that completed the prediction form prior to receiving a mug, and the other that did not. It allows us to conduct both a between- and within-subject analysis of prediction accuracy. The within-subject analysis compares the preliminary valuation

predictions of the group that completed the first form with their subsequent actual valuations. The between-subject test compares those predictions with the actual valuations of the group that did *not* make initial predictions. The between-subject comparison was included in case making an initial prediction influenced subjects' subsequent choices, in which case any bias would have been attenuated in the within-subject comparison.

I.1 *Results*

Results for the two University of Pittsburgh classes were similar, so their data are aggregated. Three University of Pittsburgh subjects gave nonmonotonic responses to both valuation questions, rendering their data uncodable, and two provided useful predictions, but uncodable actual valuations. All five subjects are excluded from the analyses. The mean minimum selling values for the two institutions are shown in Table 1. For each university group, the first line shows the mean predicted and actual selling price of the prediction group. The second line shows the actual selling price for subjects who did not previously predict their own selling price.

Table 1

Predicted and Actual Valuation of the Mug

Group/condition	Number of subjects	Prediction of valuation	Actual valuation
Carnegie Mellon University			
Prediction	14	$3.73	$5.40
		(0.41)	(0.65)
No prediction	13	—	$6.46
			(0.54)
University of Pittsburgh			
Prediction	22	$3.27	$4.56
		(0.48)	(0.59)
No prediction	17	—	$4.98
			(0.53)

Std. errors in parentheses.

Actual selling prices differed between the two universities, probably because different mugs were used. More interestingly, there was substantial underestimation of selling prices in both university groups, both within and between subjects. Within subjects, those who completed the first form substantially underestimated their own subsequent selling prices. For the Carnegie Mellon group, mean actual valuations were $1.67 greater than predicted valuations ($t(13) = 2{\cdot}8, p < 0{\cdot}02$); for the University of Pittsburgh group they were greater by $1.17 ($t(16) = 3{\cdot}2, p < 0{\cdot}01$).

Underprediction of value is also evident in the between-subjects comparison of the first group's predicted selling price and the second group's actual selling price. The mean difference between the predictions of the first group and the valuations of the second was $2.73 ($t(25) = 4{\cdot}1, p < 0{\cdot}0005$) for the Carnegie

Mellon group, and \$1.59 ($t(35) = 2{\cdot}1$, $p < 0{\cdot}05$) for the University of Pittsburgh group. Mug valuations of the group which did not make a prediction were higher, but not significantly so, than those of the group which did make a prediction, suggestive of a weak anchoring effect.

II. EXPERIMENT 2

A limitation of the first study is that it was not 'incentive compatible' because subjects had no incentive to provide accurate predictions of their own selling prices (although, by the same token, there was no incentive for misrepresentation). The second experiment avoided this problem by informing subjects that they had a 50% chance of getting a mug and eliciting a selling price that would apply if they got a mug. Our prediction was that subjects who only had a 50% chance of getting a mug would not feel endowed and, like the prediction subjects in the previous experiment, would underestimate the selling price that they would want to prevail if they did get a mug.

A second limitation of the first study was that it did not elicit choice prices from subjects, so it was impossible to determine where the predicted selling price lay on the continuum between choice values and actual selling prices. If subjects predict their own selling prices perfectly, then we would observe $s' = s$ (as defined in equations (1)–(3)); if they are completely unable to predict the effect of possessing the object on their preferences, then we would anticipate $s' = c$ – i.e. that predicted selling prices will correspond to choice prices. To assess where their predictions lie on this continuum, we can construct an index of prediction bias, β, defined by:

$$\beta = \frac{(s - s')}{(s - c)}. \tag{4}$$

β will equal 0 for individuals who predict their own selling prices perfectly, and 1 for those who are completely unable to predict the effect of being endowed on their valuation of the object. Note that this index reflects only the degree of prediction bias, and not the magnitude of the endowment effect which some people view as a type of bias in its own right.

II.1 *Method*

Two executive education classes at Northwestern University with a total of 106 students were each randomly assigned to two experimental groups which were isolated in separate rooms. In the control condition, a coin was flipped for each subject and subjects who called it correctly were given a mug emblazoned with the school logo. Selling prices were elicited from those who obtained a mug, and choice prices from those who did not, using forms that were analogous to those used to elicit selling prices in the first experiment.

For the experimental group, the identical type of mug was displayed at the front of the room, and subjects were told that there was a 50% chance of receiving one, based on whether they correctly called a coin flip. Prior to the coin flip, selling prices were elicited, which subjects were told would apply if

they called the flip correctly and got a mug.[2] After providing selling prices, subjects individually called a coin toss and were given a mug if they called it correctly. Finally, those who received a mug were asked whether they would like to revise their selling price (although they were not actually allowed to do so).[3]

Table 2

Mean Valuation of Mugs

Group	Form	Description	Number of subjects	Prediction of valuation
Control	1	Selling price	24	$5.96 (0.460)
	2	Choice	29	$4.05 (0.329)
Experimental	3	Selling price contingent on getting a mug	53	$4.16 (0.293)
	4	Desired revision of selling price	34	$4.69 (0.329)

Std. errors in parentheses.

II.2 *Results*

The standard endowment effect is evident in the mean values presented in Table 2. Subjects given a mug (Form 1) valued it an average of $1.91 higher than those without the mug (Form 2) ($t(51) = 3{\cdot}4$, $p < 0{\cdot}002$). More importantly, the bias in prediction of selling price is again evident. Subjects with a 50% chance of receiving a mug stated a mean selling price that was $1.80 lower than that for subjects who actually possessed a mug; the mean valuation for subjects prior to flipping the coin was $4.16 compared to $5.96 for subjects already endowed with a mug ($t(75) = 3{\cdot}352$, $p < 0{\cdot}002$). Selling prices for those who had a 50% chance of receiving a mug were very close to the choosing prices of subjects who did not have a mug ($4.16 vs. $4.05). The prediction bias β is equal to 0·94 measured between-subjects (i.e. 94% of its plausible maximum value).

The desired price revisions of subjects who got a mug provide further evidence of a prediction bias. The mean valuation of subjects endowed with the mug after having already decided on a selling price was $4.69, which is $0.53 higher than their previous valuation, a significant difference ($t(34) = 3{\cdot}3$,

[2] The exact wording of the form was as follows: 'There is a 50% chance that you will obtain the mug displayed at the front of the room. In a moment we are going to flip a coin to determine if you receive a mug exactly like the one you can see. We are interested in how much you will value the mug if you get it. Below are a series of lines marked 'Keep mug____ Trade it for $amount____.' On each line check whether, if you do get a mug, you would prefer to keep the mug or to trade it in for the amount of money written on the line. Check one or the other on every line. Later we will announce a line number and you will get your choice on that line. Think carefully about each check mark because if you get a mug your choice on one of the lines will count.'

[3] The exact wording was as follows: 'The form you filled out earlier will determine whether you get a mug or some money. Nevertheless, we are interested in whether, if you had a chance, you would prefer to change your responses on that form. Suppose you could complete FORM 3 again; please check below how you would respond.' The subject then recompleted the form eliciting selling prices.

$p < 0{\cdot}01$). If we use \$4.69 as a conservative estimate of the correct selling price, then the prediction bias index, β, drops to 0·84, which is still extremely high. Three subjects indicated that they would have liked to revise their price downward, 14 did not want to revise their price, and 17 wanted to revise it upward. However, the remaining \$1.27 discrepancy between the revised selling price and the mean selling price for the control condition ($t(56) = 2{\cdot}3$, $p < 0{\cdot}03$) indicates that the hypothetical selling prices of the experimental group were lower than they would have been if they had not 'anchored' their final valuations of the mug on their initial decisions.

III. GENERAL DISCUSSION

Despite the importance of taste prediction for rational choice, the accuracy of such predictions has only recently become a topic of systematic research and inquiry. Perhaps, as Kahneman and Snell (1990) argue, the earlier absence of such research was limited by the circularity of the revealed preference approach, in which tastes are viewed as revealed by behaviour rather than as an independent construct exerting an influence on behaviour. With tastes defined by behaviour there is, as the economists say, 'no arguing with tastes', and no possibility for tastes to be accurate or inaccurate – they simply are what they are.

While there are some prior results that are suggestive of taste-change misestimation, the current study is, to our knowledge, the first to observe a systematic bias in the prediction of taste-change. Moreover, one could argue that it is a surprising domain in which to observe such a bias. Numerous theoretical articles have focused on the process of habit formation in which tastes change as a function of past consumption. With certain important exceptions, such as, reputedly, the drug crack, such processes operate relatively slowly. The endowment effect, in contrast, leads to a much more rapid change in tastes. Our subjects predicted how their tastes would change, not over a matter of months or years, but minutes. Given how quickly the endowment effect operates, it is remarkable that people are unable to anticipate it. The failure to anticipate the endowment effect is also surprising considering the vast experience most people have had acquiring, possessing, and losing objects – experience that should provide ample opportunities for learning how tastes change following the acquisition of goods. Judging from our experiments, such learning is severely limited.

An unpublished experiment conducted by Kahneman and Loewenstein (1991) provides a possible clue as to why such learning does not occur. They found that subjects who were endowed with an object did not change their ranking of the object's desirability relative to other objects. However, when it came to exchanging the endowed object for another item, they displayed a heightened attachment to the endowed object. It thus appears that a person must be threatened with the loss of an object to appreciate his or her heightened attachment to it. Since people are rarely endowed with an object then immediately deprived of it, they may not get feedback about how attached they become to objects in their possession.

Another factor interfering with feedback is that people may forget their initial valuation of the object. Several studies have shown that people tend to forget their past attitudes – to believe that their past views were similar to those held in the present (e.g. Marcus, 1986). If the same bias applies to tastes, then people will remember their past tastes as being similar to their current tastes and erroneously conclude that their tastes have not changed. Thus, feedback about taste-change may be less plentiful than one might expect based on the accumulation of experience with possession.

Nevertheless, people probably receive more feedback about the effect of endowments than they do about a wide range of other taste changes. Their inability to predict the effect of endowment, therefore, raises the possibility that a much wider range of changes in tastes are predicted with bias. Tastes change for a variety of reasons, typically due to processes that act more slowly than the endowment effect. When hungry, can we predict how our tastes will be different when we are satiated? When unafflicted by addiction, can we accurately anticipate the agonies of addiction and withdrawal? Most changes in tastes are also less predictable and systematic than the endowment effect. Whereas most people are affected similarly by the endowment effect, other endogenous taste changes are more variable. For example, one person may learn to love classical music after repeated exposure, whereas another might grow to detest it.

The failure to predict the endowment effect suggests that hypothetical selling prices elicited from subjects who are not in possession of the relevant goods are probably biased downward. To provide a selling price for a good one does not possess requires two stages of introspection: (1) imagining one possesses the object and has adapted to ownership, and (2) imagining how one would feel about parting with it. Buying prices and choice values, in contrast, both involve one stage of introspection, and we know of no compelling evidence that estimates of either value are biased; indeed, Starmer and Sugden (1991) failed to observe a significant difference between probabilistic as compared to deterministic choices.

As a general rule, it seems likely that people will mispredict their own preferences when the superscript and subscript in equation (3) are different – i.e. when people are asked to introspect about how they would feel or behave in a situation different from their own – but not when the subscript and superscript are identical. It would be interesting to test whether people with objects overpredict the buying prices or choice values of those without such objects, as this hypothesis suggests.

The observation that individuals are unaware of the endowment effect presents a novel view of choice. It suggests that people not only become attached to what they have (as implied by the endowment effect), but do so unknowingly. People seem to be unwittingly trapped by their choices; they make choices with an unrealistic sense of their reversibility.

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