Journal of Experimental Psychology:
Learning, Memory, and Cognition
2007, Vol. 33, No. 3, 461–474

0278-7393/07/$12.00 DOI: 10.1037/0278-7393.33.3.461

Aspects of Endowment: A Query Theory of Value Construction

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How do people judge the monetary value of objects? One clue is provided by the typical endowment study (D. Kahneman, J. L. Knetsch, & R. H. Thaler, 1991), in which participants are randomly given either a good, such as a coffee mug, that they may later sell ("sellers") or a choice between the good and amounts of cash ("choosers"). Sellers typically demand at least twice as much as choosers, inconsistent with economic theory. This result is usually explained by an increased weighting of losses, or loss aversion. The authors provide a memory-based account of endowment, suggesting that people construct values by posing a series of queries whose order differs for sellers and choosers. Because of output interference, these queries retrieve different aspects of the object and the medium of exchange, producing different valuations. The authors show that the content and structure of the recalled aspects differ for selling and choosing and that these aspects predict valuations. Merely altering the order in which queries are posed can eliminate the endowment effect, and changing the order of queries can produce endowment-like effects without ownership.

Keywords: decision making, preference construction, loss aversion, endowment effect

The *endowment effect* (Kahneman & Tversky, 2000) represents a severe challenge to views of the "rational" decision maker—assumed by economics—and to psychology's ability to explain deviations from that standard. In the typical endowment study (Kahneman, Knetsch, & Thaler, 1990, 1991), half of all participants are randomly given a good such as a coffee mug. All participants then partake in a market in which the experimenter offers to buy the mug from those who got one and to sell a mug to those who did not. The typical result is that those who have received a mug value it 2 to 3 times more than those who did not. Thus, the value of an object depends on ownership, even when that ownership is assigned randomly.

The most common psychological characterization of the endowment effect is *loss aversion*, which describes and summarizes two phenomena: First, valuations depend on a reference point; second, decreases in the objective value of an attribute have more influence on valuation and choice than equivalent increases in objective value. In the endowment effect, the reference point is the current state of affairs, and the good represents either a gain or a loss. Loss aversion is a major premise of prospect theory and is used as a basis for explanations of many decision phenomena. These include why the framing of options influences choices (Tversky & Kahneman, 1981), how the addition of irrelevant options affects choice (Simonson & Tversky, 1992), why there are differences in organ donation rates across countries (Johnson & Goldstein, 2003) and differences in retirement savings with different defaults (Madrian & Shea, 2001), and why people do not sell stocks that have gone down in value (Shefrin & Statman, 1985; see Kahneman & Tversky, 2000, for a review).

The endowment effect illustrates how the strategies used in evaluating simple objects have significant economic consequences. For example, this result challenges the Coase theorem, an important assumption in the economic analysis of social welfare and political economy, which suggests that the value of an object is independent of initial ownership (Kahneman et al., 1990). Despite its importance, empirical robustness, and explanatory power, there is only a limited amount of research on, and little agreement about, the psychological mechanisms underlying the endowment effect, particularly as compared with the number of empirical demonstrations of the effect.

Two other candidate accounts, often suggested by skeptical economists, are *strategic misrepresentation* and *wealth effects*. The strategic misrepresentation account suggests that participants think they are making opening offers much like starting positions in a negotiation rather than stating their true valuation of the good. To control for this possibility, experimenters use a standard method in experimental economics (see Becker, DeGroot, & Mar-

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This research was supported by National Science Foundation Grant SES-0352062 to Eric J. Johnson and a Canada Research Chair in Behavioral Science awarded to Gerald Häubl.

We thank Dan Ariely, Daniel Kahneman, George Loewenstein, Bobbie Spellman, Elke Weber, and seminar participants at the University of Alberta, Columbia University, Cornell University, Duke University, Harvard University, the Massachusetts Institute of Technology, the University of Toronto, and the Second Asian Conference on Experimental Business Research for many helpful comments. We also thank Praful Mangalath for running the latent semantic analysis.

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schak, 1964, or "BDM"), which provides respondents with an incentive for truthful revelation of their value for a good. Participants must indicate, for each of a number of amounts of money (i.e., possible market prices), whether they would prefer the mug or the money. The experimenter then announces the market price, which was determined a priori, and completes transactions with participants according to what they stated to be their preference at that price. Reporting anything other than their true value costs participants money. To control for wealth effects, experimenters have contrasted two equivalent decisions with different frames: Selling prices (for those who are given a mug) and choices between money and the object (for those who are not). These controls have become standard in research on the endowment effect (Kahneman et al., 1991), but Plott and Zeiler (2005) have recently argued that it is a misunderstanding of the incentive procedure, and not loss aversion, that accounts for the endowment effect. The experiments we report in this article include controls for both wealth effects and strategic misrepresentation, and they allow tests for understanding of the task.

A more psychological class of explanations suggest that buying and selling shift the decision maker's focus of attention, consistent with the notion that most evaluations are sensitive to implicit goals (Fischer, Carmon, Ariely, & Zauberman, 1999), or that the relative weights attached to different features of an object differ for buyers and sellers (Birnbaum & Stegner, 1979; Birnbaum, Yeary, Luce, & Zhao, 2002). Consistent with this explanation, Carmon and Ariely (2000) suggested that the endowment effect is caused by a "focus on the forgone" (pp. 360). In their account, buying and selling generate increased attention to the object that is about to be lost. In the typical endowment study, they argued, buyers focus on the money that they are about to give up, and sellers focus on the good that they are about to surrender. This account is supported by studies that manipulate aspects of the good or money, with independent effects on buying and selling prices. For example, the list price of a ticket to a basketball game affects buying prices more than selling prices, whereas the anticipated climate in the arena influences selling prices more than buying prices.

However, these ideas may be only a start in understanding what underlies the endowment effect. In this article, we develop and test a process account of endowment effects that is based on the notion that valuations depend on memory retrieval processes. This approach has several advantages: First, it connects the valuation of simple objects with the literature on memory and leverages our understanding of retrieval. Second, it may help identify boundary conditions, delineating when endowment effects may and may not occur. Third, a process explanation may help identify whether loss aversion actually reflects experienced preferences or, instead, is an artifact that should be minimized in measuring values. Finally, a mechanism-based explanation might suggest interventions that would reduce or eliminate endowment effects.

A Query Theory of the Endowment Effect

Our starting point is that preferences, like all knowledge, are subject to the processes and dynamics associated with retrieval from memory, and that these principles can largely explain the endowment effect and other phenomena in evaluation (see Weber & Johnson, 2006). Indeed, if one takes the view that preferences are sometimes constructed, it seems highly plausible that memory in general, and in particular the retrieval of information about the objects in question, will play a central role. In this spirit, Kahneman and colleagues (Kahneman, Ritov, & Schkade, 1999) have observed that reported preferences are often predictions about future enjoyment and that these predictions depend on what is retrieved.

Premises of Query Theory

Our explanation of the endowment effect is based on four premises. The first is that decision makers naturally decompose valuation questions such as "What should be my selling (or buying) price?" into a series of queries, such as "Why should I make the trade?" or "Why should I not make the trade?" The second premise is that these queries are executed serially, one after the other, and that query order differs across response modes. Note that this decomposition and execution may well be automatic, without the awareness of the decision maker. The third premise of our account is that because of output interference, query order matters: The first query results in a richer and more heavily weighted representation than the second. To produce differences in valuation, our fourth premise suggests, different response modes produce different query orders: Choosers tend to first consider why they might not enter into the transaction and then consider why they might enter into the transaction. Sellers, we argue, tend to execute the same two queries in the reverse order.

The first premise, that valuation is based on a series of queries, suggests that people respond to a question like "How much would you pay for this mug?" by decomposing it into a series of standard queries (Collins & Michalski, 1989). To be more precise, we argue that the decision maker first considers the advantages of current state or status quo and then considers the opposite state of affairs. For example, a seller will tend to first evaluate the advantages of owning the mug. To illustrate, in Table 1 we provide a possible taxonomy of the aspects considered in a pricing judgment, along with typical aspects listed by participants in our experiments. These four types of aspects fall into two categories. Positive aspects focused on the object (e.g., a mug) and negative aspects focused on the currency are termed *value increasing*, because they tend to enhance the value of the object. These are shown in the top left and bottom right panels of the table. Aspects that focus on negative properties of the object or on positive properties of the currency are termed *value decreasing*, because they tend to reduce the value of the object. Our analysis is novel in that we argue that queries are about the ad hoc goal-derived categories asking about why the trade should or should not be made (Barsalou, 1983), whereas Carmon and Ariely (2000) suggested that focus is driven by the natural categories of objects and currency. We argue that this focus on the advantages and disadvantages of the trade is based on the need to evaluate the current potential action, but we will test this claim empirically.

Our second premise is based, in the decision literature, on the idea that different weights are revealed by different response modes and, consistent with Fischer et al. (1999), that this shift in weights is caused by a shift in the goals that are used to construct values for different response modes. For example, Fischer et al. suggested such differences in goals as an explanation of the *prominence effect*—the finding that decision makers are more likely to prefer the alternative that is superior on the most impor-

Table 1
Classification of Aspects Based on Focus and Valence (With Examples for Mugs)

Aspect focus	Aspect valence: Positive	Aspect valence: Negative
Mug	A nice memento of this experiment. It says U of. . .on it and can be sort of a memory for me. It can be used as a Christmas present for my sister. You can never have too many mugs. [2.59]	The mug is ugly. I don't really need a coffee mug. The mug looks dusty and a little dirty. [0.99]
Money	I am a starving student and a couple of dollars is still a couple of dollars. [1.67]	I could not buy that much with the money. [0.04]

Note. Numbers in brackets indicate the frequency of these aspect types in a typical aspect listing. The top left and bottom right cells have value-increasing aspects; the top right and bottom left cells have value-decreasing aspects.

tant attribute in choice rather than in matching (Tversky, Sattath, & Slovic, 1988).

Our third premise, that the results of queries depend on query order, is based on the idea of *output interference* in memory research, suggesting that directed recall of some members of a list can result in a decrease in memory for the unrecalled part of the list (Dempster, 1995). This observation closely parallels the phenomenon of *retrieval-induced forgetting* (Anderson, Bjork, & Bjork, 1994; Anderson & Spellman, 1995; Perfect, Moulin, Conway, & Perry, 2002) and is related to a number of memory phenomena. Similar interference effects have been demonstrated in many different experimental paradigms, including the closely related part-list cuing paradigm (Mueller & Watkins, 1977). The effects seem robust, occurring for both semantic and episodic memory and for verbal as well as nonverbal materials, such as visual stimuli and motor skills (see Anderson & Neely, 1996, for a review). Recent studies have identified conditions under which implicit memory also demonstrates interference effects (Lustig & Hasher, 2001; Perfect et al., 2002). Although there is a current debate on the relationship between inhibition and interference (Anderson & Spellman, 1995; MacLeod, Dodd, Sherad, Wilson, & Bibi, 2003), we simply require that queries show order dependence, such that the first query leads to suppression of answers to the second, generating a different set of query results, which the decision maker then uses to construct the value of an object. Because we are agnostic about the mechanism generating the effect, we distinguish the empirical observation of interference from putative mechanisms such as inhibition (Friedman & Miyake, 2004; MacLeod et al., 2003). Our specific idea is that retrieving one type of information about the potential trade, such as the positive features of the mug, will interfere with retrieval of the other aspects of the trade, such as what else one could do with the money.

Our final premise, that the order of queries depends on the endowment state, will of course be subject to empirical verification, but it also reflects the intuition that people consider the advantages of the current state of affairs along with the disadvantages of an alternative reality before they think about the disadvantages of their current state and the advantages of an alternative reality. Put another way, decision makers tend to first assess the advantages of the status quo, then assess the advantages of the alternative state (Kahneman & Miller, 1986).

Aspect Listing

To obtain some indication of the aspects considered during a pricing decision, we used a variant of a verbal report methodology called an *aspect listing*. We asked respondents to type into a computer interface the things they were considering as they made their pricing judgment, recording the content, order, and latency of these entries. Of course, this is only an approximate measure of the cognitions that occur as respondents make this judgment. Although the queries themselves may be automatic processes and thus difficult to observe, the aspect-listing method is designed to capture their effect by showing what is produced by the queries. Compared with more sophisticated measures, however, this approach has the advantage of being easily scalable to the kinds of large samples and market settings that are used to demonstrate the endowment effect.

Predictions

This perspective produces several clear predictions that we test in the course of this research, specifically, the following:

1. Listed aspects should differ, in content and number, depending on an individual's endowment state.

2. The sequence of aspects should correspond to our hypothesized order of queries, which depends on endowment state. Although we cannot observe the queries used per se, we should be able to see their effects in what is produced. Specifically, when participants are endowed with the good, value-increasing aspects should be more numerous and appear earlier in the aspect protocol, and the opposite should occur when participants are not endowed.

3. Aspect listings should predict prices. If the retrieval of aspects is used to determine value, then the quantity and valence of aspects should predict prices. This finding would demonstrate that these concurrent reports (Ericsson & Simon, 1993) are not epiphenomenal and, if we observe the standard pattern of prices, not reactive (Russo, Johnson, & Stephens, 1989).

4. Changing the order of queries might eliminate the endowment effect. Because endowment changes query order, which in turn changes the kinds of aspects considered, we might, by manipulating the order of queries, change prices. By reversing the natural order of queries, we should be able to diminish or eliminate the endowment effect.

5. Finally, we should be able to produce changes in value without endowment. If the construction of value depends on query order, changing query order alone should change people's valuation of a good, even when ownership is held constant.

General Method

With the current work we sought to explain a phenomenon widely replicated using the methods of experimental economics with concepts from the study of memory. In our experiments, we attempted to meet the requirements of experimental economics (Hertwig & Ortmann, 2001), while facing the challenge of collecting individual-level measures appropriate for testing our hypotheses. We implemented a number of practices that are common in experimental economics. All transactions were real—mugs were actually bought, sold, or chosen in a market. Experimental sessions consisted of small groups of participants who actually paid or received money as a result of their pricing decisions. There was no deception. Finally, we used comprehension tests to ensure that participants understood all critical task instructions, and we eliminated participants who did not.

Experiment 1: Does Endowment Change the Aspects Considered?

This experiment was based on a standard endowment paradigm, with the exception that participants were also asked to list aspects of what they considered prior to indicating their valuations.[1] After setting their price and executing any ensuing market transactions, respondents saw these aspects again and indicated both the focus (thoughts about the object or the money) and the valence of each. If these aspect listings reflect the information retrieved from memory and used by respondents to determine their valuation, they should differ in content, number, and order for choosers and sellers. In addition, we expected these aspects to predict prices.

Method

Participants

Eighty-seven participants were recruited on a university campus. They were each paid $5 for their participation and, depending on their choices, received either a mug or a cash amount determined by their choices and the incentive-compatible mechanism.

Materials and Procedure

Practice task. Prior to the main task, respondents completed a practice task during which they were required to use the computer interfaces for both aspect listing and pricing in a domain unrelated to that used in the main task. To practice the pricing task, participants had to indicate an experimenter-induced valuation of a good. They were allowed to proceed only if they entered this valuation correctly.

Test of understanding. Some have argued that the endowment effect may involve respondents' misconceptions of task instructions (Plott & Zeiler, 2005). The BDM approach to value elicitation (described above) is fairly complex. Participants were told both in the general introduction at the beginning of the experiment and in the instructions to the endowment task that the transaction was actually going to be carried out in accordance with their responses and that once they had indicated their valuations they would not be able to change their mind. To ensure that participants fully understood the pricing task and market mechanism, we asked them to identify which outcomes would occur under certain hypothetical conditions (i.e., different market prices) given the valuation they had entered during the practice task. All respondents were given two multiple-choice questions repeatedly until they answered both correctly. Random responding to these test questions (without repetition) would require an average of five attempts to pass. Seven participants (out of 87) did no better than chance and were eliminated.

Revelation of endowment state. Participants were given the opportunity to examine a mug placed in front of them, after which they proceeded to a computer screen that revealed their endowment state—they were randomly assigned to either a "selling" condition (i.e., endowed) or a "choosing" condition (i.e., not endowed). More specifically, respondents were informed either (a) that the mug was theirs to keep but that they would later have an opportunity to sell it to the experimenter for some amount of money (selling condition) or (b) that they would later be able to choose between receiving the mug and receiving some amount of money (choosing condition).

Aspect listing. Before indicating their valuation of the mug, participants listed the aspects they were considering in making their decisions. Specifically, they were asked to type all reasons why they personally would want to either have the mug or have the money, one reason at a time (see Appendix A for details).

Pricing. To eliminate the potential confound of wealth states with endowment, we contrasted selling prices to a choice condition, in which participants chose between receiving the mug and receiving various amounts of money. This contrast controls for the wealth position of those endowed and those not endowed, with the only difference between conditions being the description of the transaction (see Lerner, Small, & Loewenstein, 2004, p. 338, for further discussion of why choice is a superior control to selling). Participants revealed their valuation of the mug on a scale ranging from $.50 to $12, with increments of 50 cents. In the selling condition, participants were asked to indicate whether, at each of these 24 prices, they would prefer to sell the mug or not (see Appendix B for details). The corresponding question in the choos-

[1] The thought-listing procedure used here differs from other methods for assessing reasons, such as cognitive responses (Cacioppo, von Hippel, & Ernst, 1997), in that it is concurrent with rather than retrospective to the task and serves as a manipulation as well as a measure.

ing condition was whether, for each of the amounts, participants would prefer to get the mug or the money.[2]

Market transaction. Once participants had completed the pricing task, the experimenter announced the market price, which had been determined a priori. Transactions were then completed according to the preference that each participant had expressed in connection with that amount during the pricing task. That is, in the selling condition, participants either kept the mug or sold it to the experimenter for the market price (in cash), depending on their earlier response. In the choosing condition, participants either received a mug or the market price (in cash), according to their preference as revealed in the pricing task.

Self-coding of aspects. Participants were presented with the aspects they had listed earlier, one at a time, and asked to indicate both the focus (whether the statement referred to the mug or the money) and the valence (positive or negative, in reference to the focus) of each aspect. Of note, in several other studies we have had aspects coded by naive raters, and these codings produce very similar results.

Finally, participants responded to a series of general questions, including the Positive and Negative Affect Scale (PANAS; Watson, Clarke, & Tellegen, 1988) for measuring mood and some demographic questions, and completed a funnel debriefing for detecting evidence of suspicion as to the purpose of the study.

Results

Prices

As can be seen in the top line of Figure 1, this study replicated the standard endowment effect. Sellers, who had been endowed with a mug, demanded an average of $5.71 to surrender it. Choosers, who faced the same economic decision but had not been endowed with anything, were indifferent between getting a mug and receiving $3.42, on average. This difference was significant, $F(1, 79) = 228.9$, $p < .0001$, and similar results are provided by a median test ($p < .01$).

Content of Aspects

Participants generated different aspects depending on whether they were endowed, as shown in Figure 1. As suggested by our query account, choosers produced more value-decreasing aspects (positive thoughts about the money and negative thoughts about the mug) than sellers (2.38 vs. 1.77), whereas sellers produced more value-increasing aspects (positive thoughts about the mug and negative thoughts about the money) than choosers (1.81 vs. 1.43). A repeated measures analysis of variance (ANOVA) confirmed this interaction between endowment and aspect type, $F(1, 75) = 3.82$, $p < .06$.

Order of Aspects

The sequential nature of our query account predicts that the kind of aspects generated will change during the aspect listing. For participants endowed with a mug, we expected that aspect listings would initially consist of mostly value-increasing aspects and that value-decreasing aspects would be produced more frequently toward the end. We expected the reverse would be true for participants not endowed with a mug.

Because participants listed different numbers of aspects, we tested this prediction by calculating, for each participant, a score that reflects his or her tendency to produce value-increasing aspects before value-decreasing ones. This score, the standardized median rank difference of aspect types (SMRD), is defined as $2(MR_i - MR_d)/n$, where MR_d = median rank of value-decreasing aspects in a participant's sequence, MR_i = median rank of value-increasing aspects in a participant's sequence, and n = total number of aspects in a participant's sequence.[3] The SMRD score can take on values from 1 (all value-increasing aspects were listed before any value-decreasing aspects) to –1 (all value-decreasing aspects were listed before any value-increasing aspects).

As predicted, the mean SMRD score was significantly higher for sellers (.62) than for choosers (.26), $F(1, 79) = 4.14$, $p < .05$. This result provides support for our hypothesis that ownership of an object leads to a difference in queries, as reflected by differences in the order in which aspects are produced.

Predicting Prices From Aspects

The aspects generated by respondents are not epiphenomenal, or what economists term "cheap talk," because they help predict participants' valuations of the mug. Using price as a dependent variable and the number of value-increasing aspects and value-decreasing aspects produced by each respondent as independent variables in a multiple regression reveals that this crude encoding of aspects explains 21% of the variance in valuations, $F(4, 75) = 4.81$, $p < .001$. Both regression coefficients are in the expected direction—that is, the effects of the number of value-increasing and value-decreasing aspects on price are positive and negative, respectively. As a comparison, endowment state (i.e., whether a participant was a seller or a chooser) explains only 16% of the variance in valuations.

Discussion

Experiment 1 provides initial support for the first three of the five predictions of our query-based account of the endowment effect: First, respondents generate different kinds of aspects if they are setting selling prices than if they are choosing between the object and a set of cash amounts. This experiment also provides strong support for the hypothesized change in recall order: Consistent with our prediction that endowment state influences query order, value-increasing statements are generated earlier by sellers and value-decreasing statements are generated earlier by choosers. Finally, consistent with the third prediction of our theoretical account, the number and valence of these aspects predict valuations, and they do so at least as well as the endowment manipulation itself.

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[2] Exact instructions for the experiment are available from the authors upon request.

[3] Note that for any sequence (of length s) in which only one of the two response categories of interest (i.e., value-increasing or value-decreasing aspects) appears, the median rank of the unobserved response category is set to $s + 1$, which is a conservative way of representing the low level of accessibility of thoughts of that type. In addition, for the purpose of calculating the SMRD score, $n = s + 1$ for such single-category sequences. For sequences that include responses from both categories, $n = s$.

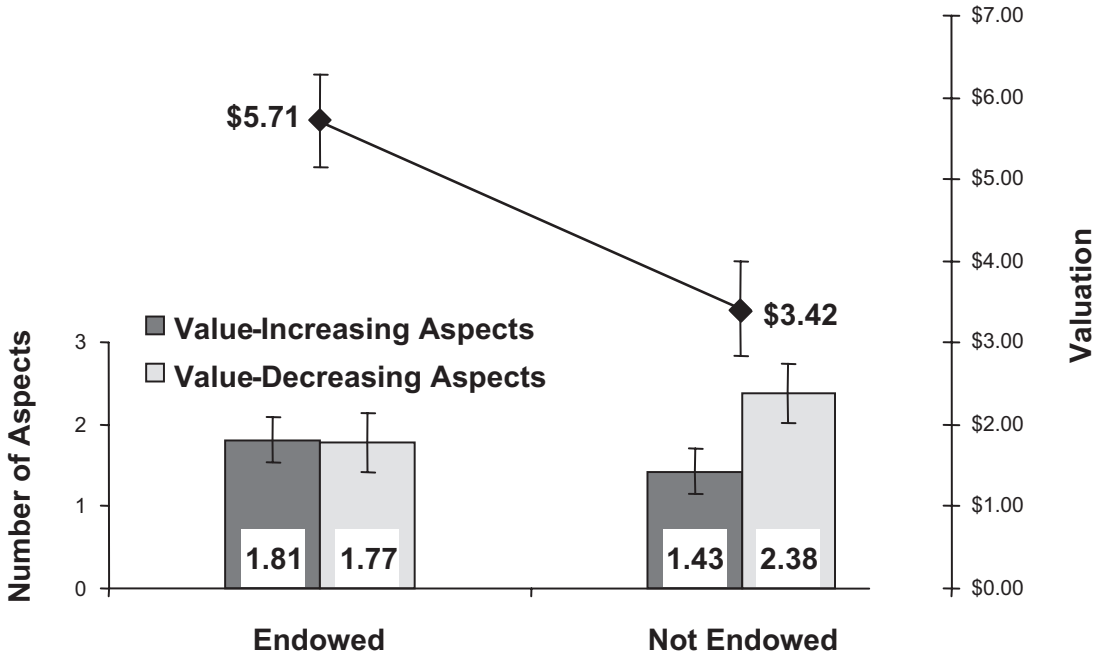

Figure 1. Effects of endowment on valuations (line graph) and generated aspects (bar graph).

Experiment 2: Eliminating Endowment Effects

Although the results of Experiment 1 support our query theory account of the endowment effect, much of this evidence is correlational and could also be consistent with other accounts. Stronger evidence for our query-based explanation would be provided by a test of our fourth prediction, that by manipulating the order of queries, we might actually influence the aspects considered by respondents and the magnitude of the endowment effect. In Experiment 2, we did this by manipulating, for some participants, the order in which they generated value-increasing versus value-decreasing aspects. In particular, we included a condition that reversed the natural order of queries to memory for a given endowment state suggested by our query theory and confirmed by Experiment 1. We expected that this reversal of the natural query order would result in a smaller endowment effect, as well as a difference in the nature of the aspects produced by participants.

Method

Participants

Eighty-three participants were recruited on a university campus. They were paid $5 each for their participation and, depending on their choices during the experiment, also received either a mug or a cash amount, as determined by the incentive-compatible BDM mechanism.

Materials and Procedure

The procedure was similar to Experiment 1, starting with a practice task. Again, participants who did no better than chance in the practice task were eliminated (10 participants). In addition, 1 participant was eliminated for evidently having misunderstood the aspect-listing task. This left us with 72 usable participants.

As in Experiment 1, participants were assigned to either a selling condition (i.e., endowed) or a choosing condition (i.e., not endowed). After learning their endowment state and before indicating their valuation of the mug, participants listed the aspects they were considering in making their decisions. We used two aspect-listing conditions. One was an unguided condition where, as in Experiment 1, participants simply listed all of the aspects they were considering without any externally imposed query order. In the other condition, the natural order of queries to memory for a given endowment state suggested by our theory was reversed, such that sellers (endowed) were asked to first produce value-decreasing aspects and then produce value-increasing aspects, whereas choosers (not endowed) were asked to list value-increasing before value-decreasing aspects. Thus, participants in Experiment 2 were randomly assigned to one of four conditions in a 2 (endowment state: selling vs. choosing) $\times$ 2 (order of aspect generation: unguided vs. reverse of natural order) between-subjects design.

Results

Prices

As can be seen from the line graph in Figure 2, we observed a strong endowment effect in the unguided aspect-listing condition but not in the conditions in which the aspect-listing task reversed what we believe to be the natural query order. Indeed, in the latter condition, the endowment effect was eliminated entirely. An ANOVA on prices confirmed these observations, with a significant Endowment State $\times$ Order of Aspect Generation interaction, $F(1,$

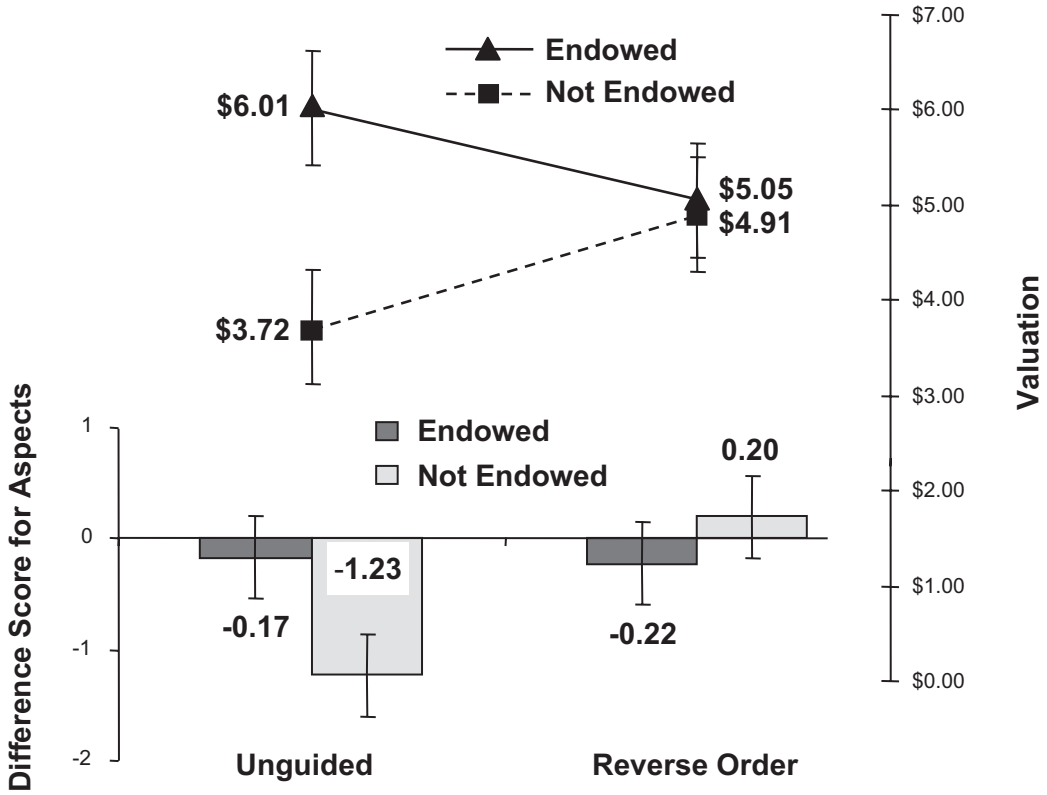

Figure 2. Effects of endowment and query format on valuations (line graph) and generated aspects (bar graph).

68) = 5.04, $p < .05$. This is best described by an analysis of simple effects within the two aspect-listing conditions, which revealed a large endowment effect for unguided aspect listing, $F(1, 68) = 7.55$, $p < .01$, as shown on the left side of Figure 2, but no endowment effect in the reverse-order condition, $F(1, 68) = 0.24$, $p > .50$, as can be seen on the right side of the graph. Thus, our manipulation—simply altering the order in which participants reported the aspects they were considering—was successful in completely eliminating the endowment effect.

Content of Aspects

Again, we expected the aspects considered by participants to vary as a function of their endowment state and the nature of the aspect production task. In particular, we anticipated a significant effect of endowment on the aspects considered, but only for the unguided query format and not for the reverse of the natural order. Here, we computed the difference between the number of value-increasing and value-decreasing aspects that each participant produced. The means of these difference scores for the four conditions are depicted in the bar graph in Figure 2.

Consistent with the results of Experiment 1, respondents in the unguided condition produced substantially fewer value-increasing than value-decreasing aspects (indicated by a negative difference score) when they were not endowed with the mug and produced a roughly equal number of the two types of aspects (indicated by a difference score close to zero) when they were endowed. By contrast, when the natural query order was reversed, participants produced a roughly equal number of value-increasing and value-decreasing aspects, independent of endowment state.

We tested these impressions with a repeated measures ANOVA that included aspect type as a within-subject factor and endowment state and aspect query format as between-subjects factors. Our primary interest was the Endowment × Query Format interaction, which was statistically significant, $F(1, 67) = 4.14$, $p < .05$. An analysis of simple effects revealed that only the unguided condition, and not the reverse-order condition, showed the interaction between aspect type and endowment.

The crossover interaction in difference scores for aspects in Figure 1 mirrors the pattern of prices and suggests that, as hypothesized, the differences in considered aspects are responsible for the differences in the endowment effect. To further test this theory, we regressed the prices of the mug on both the number of value-increasing and the number of value-decreasing aspects. As predicted, the coefficient for value-increasing aspects was positive ($\beta = .47$, $p < .05$) and that for value-decreasing aspects was negative ($\beta = -.34$, $p < .06$, one-tailed).

Order of Aspects

The unguided query condition allowed an analysis of the sequence of aspects generated by participants. Recall that although we expected both value-increasing and value-decreasing aspects to be produced by all participants, we predicted that ownership of the object would affect the order of queries. This, in turn, should lead to different sequential patterns in the list of aspects generated.

As in Experiment 1, we calculated an SMRD score for each respondent, a metric ranging from 1 to –1 and reflecting the tendency to produce value-increasing aspects before value-decreasing ones. The results strongly support our hypothesis. The mean SMRD score was much higher for sellers (.77) than for choosers (.12). This difference is statistically significant, $F(1, 37) = 6.40$, $p < .05$, further corroborating the query theory prediction that ownership renders value-increasing aspects more easily accessible in memory relative to value-decreasing aspects.

Discussion

Experiment 2 succeeded in eliminating the endowment effect, the fourth prediction of our query-based account. It also replicated several other key predictions of a query account: first, the difference in the types of aspects produced by respondents depending on their endowment state; second, the difference in the sequential pattern of listed aspects between endowed and unendowed participants in the unguided condition; and third, the ability of aspects to predict prices.

Experiment 3: Endowment Effects Without Ownership

Although the results of Experiment 2 demonstrate that the differences in query order are necessary for the endowment effect to occur, they do not answer the question of whether these differences might be sufficient. We examined this in the next study, in which we attempted to induce changes in valuations due to differences in query order alone.

Method

Participants

Fifty-two participants were recruited from a university population. Payment and warm-up procedures were identical to those used in Experiment 2. Eight participants failed to understand the practice task, and 1 was dropped because of technical problems.

Materials and Procedure

After a warm-up aspect-listing task, instruction, testing on the incentive-compatible mechanism, and inspection of the mug, participants were informed that they were going to be choosing between various amounts of money and the mug—that is, nobody was endowed with a mug. All participants then completed two aspect-listing tasks, the order of which was manipulated. Participants were randomly assigned either to first generate value-increasing aspects followed by value-decreasing aspects or to produce the two types of aspects in the reverse order.

Results

Prices

Could simply reversing the order of the queries produce a difference in the price paid for the mugs? Recall that when the production of value-increasing aspects precedes that of value-decreasing aspects, we expected prices to be higher than when the order is reversed. The results support this hypothesis. Although all participants were in the same endowment state (i.e., not endowed with a mug) and responded to the same set of aspect questions, merely manipulating the order in which the two types of aspects were generated resulted in a mean price difference in the predicted direction of \$1.67—a 41% increase in valuations (see the line in Figure 3). The difference between these mean prices is statistically significant, $F(1, 41) = 6.10$, $p < .05$.

Aspects

We expected the order of the aspect listing to influence the number of aspects of each type generated. To test this predic-

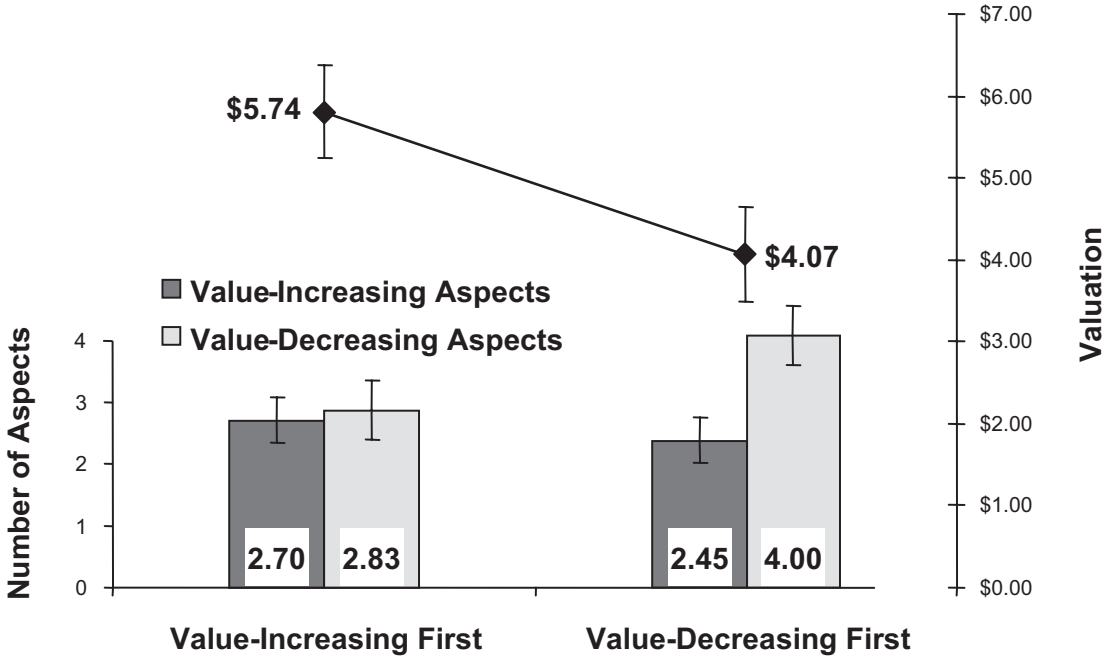

Figure 3. Prices and number of aspects as a function of order of aspect generation.

tion, we tallied the number of value-increasing and value-decreasing aspects for each of the two aspect-listing orders (see the bars in Figure 3). Our hypothesis focuses on whether the order of the aspect listing changes this tally. Specifically, we predicted an interaction between type of aspects and order of listing. Consistent with our prediction, the interaction between order of aspect listing and type of aspect is significant, $F(1, 41) = 3.49$, $p < .05$ (one-tailed). However, there is also a main effect of aspect type, with value-decreasing aspects being more common.

Finally, we used the number of value-increasing and value-decreasing aspects produced by each participant to predict prices and found a significant overall relationship, $F(2, 40) = 4.33$, $p < .05$ ($r^2 = .18$). Both coefficients were in the correct direction and were significantly different from each other, but only the one for value-increasing aspects was significantly different from zero ($\beta = .64$), $t(1, 40) = 2.9$, $p < .05$. This coefficient indicates that for each additional value-increasing aspect that was generated, a respondent's valuation of the mug increased by 64 cents, on average.

General Discussion

We have introduced a query theory of loss aversion, from which we have derived five predictions about the endowment effect as a memory-based phenomenon. In three experiments, we have demonstrated (1) that endowment influences the aspects that individuals consider (Experiments 1 and 2), (2) that endowment changes the order in which aspects are recalled (Experiments 1 and 2), (3) that these aspects are related to decision makers' valuations of objects (Experiments 1, 2, and 3), and that by changing the order of aspect queries, we can (4) eliminate the endowment effect (Experiment 2) as well as (5) produce an endowment effect in the absence of actual ownership (Experiment 3).

One possible concern with the evidence presented here is that although the aspect-listing results of Experiment 1 are consistent with our theory, the manipulation of query order in Experiments 2 and 3 may have induced mental processes that would not occur naturally. However, the fact that the valuation results in the "natural" order conditions of Experiment 2 are very similar to those produced by other researchers without aspect listings (see, e.g., Kahneman et al., 1991, Experiments 6 and 7) seems to indicate that imposing a query order might not lead to any significant departures from what people would do spontaneously.

Moreover, work by Nayakankuppam and Mishra (2005) provides an indirect measure of the accessibility of aspects of an object for buyers and sellers. In that study, respondents were first asked to learn positively and negatively valenced items about a mug. Respondents then set either a buying or a selling price for the mug and, after a delay, were asked to recall the features of the mug. As predicted by our theory, sellers had more accurate recall for the positive features of the mug and worse recall for its negative features. Buyers showed the reverse pattern, consistent with the idea that the first query causes interference and reduced accessibility for the second. Finally, in a related test in the domain of intertemporal choice, Weber et al. (2006) used a verification task that showed that participants were faster to identify the items that query theory suggests should be more accessible after a decision.

Aspects Versus Objects: Prediction and Mediation

We have shown that the aspects considered differ for choosers and sellers and that by merely manipulating the order in which they are generated, we can both create and destroy endowment effects. In this section, we would like to do two things: clarify one interpretation of the "focus on the foregone" perspective of Carmon and Ariely (2000) and examine the predictive ability and possible mediation of both that account and the one introduced here. As Carmon and Ariely stated, theirs is an attention-based account, and a simple version of their story is that more attention is paid to either the object or the currency, depending on the response mode. In the case of the typical endowment effect experiment, this is either the mug or money (i.e., the rows in Table 1). Forgoing the mug, for example, involves giving up the negative aspects of the mug as well. A more nuanced approach is to suggest, as we do in Table 1, that it is the positive and the negative aspects of the *exchange* that produce the differences in valuation (i.e., the diagonals in Table 1).

To contrast these object-based and exchange-based accounts, we conducted tests of mediation using all of the data from Experiments 1 and 2 that were collected without any externally imposed query order, for a total of 115 participants. We first examined whether endowment changed the focus (mug vs. money, corresponding to an object-based account) of the generated aspects or rather the number of value-increasing versus value-decreasing thoughts (corresponding to an exchange-based account). We did this by calculating, for the object-based account, a difference score between the number of aspects focused on the money and the mug and, for our exchange-based account, a difference score between the number of value-increasing and value-decreasing aspects. Both showed significant differences ($p < .05$, based on an ANOVA) in the predicted directions: For the object account, the mean difference score was 1.27 for the endowed respondents and 0.57 for those not endowed. For the exchanged-based account, the equivalent difference scores were −0.06 and −1.07. Next, we tried to predict prices from these difference scores using a regression model. Here, the difference in focus (mug vs. money) had no effect, $t(113) = 0.62$, whereas the difference in value-increasing versus value-decreasing aspects had a significant effect, $t(113) = 3.27$, $p = .001$. As an illustration, each additional positive aspect (or deleted negative aspect) increased the value of the mug by 37 cents.

We also examined whether either measure mediated the endowment effect by conducting a Sobel test on these coefficients. Although the object-based account was far from significant ($t = 0.6$, $p > .50$), the difference between the number of value-increasing and value-decreasing aspects, corresponding to our exchange-based account, showed significant mediation, $t(113) = 2.07$, $p < .04$. Given that the aspect listings are a noisy measure of cognition, we expected at best partial mediation, and that is what we achieved, with an estimated P_M of .22. Such partial mediation (Shrout & Bolger, 2002) suggests that other processes play into the endowment effect and/or that there is significant attenuation due to

error in the observed mediators, both of which are important questions for future research.[4]

A Latent Semantic Analysis

Our query theory account suggests that choosers and sellers use very different aspects of their knowledge to evaluate the possible exchange. Although we have had both participants themselves and naive raters code the generated aspects, these procedures assume that the taxonomy in Table 1 adequately captures these differences. To examine in a more inductive way what choosers and sellers consider in setting a price, we submitted all of the aspects listed by participants in Experiment 1 to latent semantic analysis (LSA; Landauer & Dumais, 1997), specifically examining the single word identified by the LSA algorithm to be the nearest neighbor (i.e., most closely related) to each aspect listed by participants. Thus, we used the LSA as a "blind coder," asking it to identify the single word most similar to each aspect. Differences in the semantic meaning of the aspects, whether or not they are consistent with our coding scheme, would be revealed by these nearest neighbors. If respondents consider different things when selling and choosing, we would expect differences in the nearest neighbors across response modes. The LSA algorithm analyzes a large corpus of text, in our case the tasaALL semantic space, based on a body of texts, novels, newspaper articles, and other materials thought to be approximately representative of the reading done by a college-age student. It uses singular value decomposition to identify relations in the semantics of input documents using their co-occurrence in that corpus.

In Table 2, we list eight common nearest neighbors (words returned by LSA as most closely associated with an aspect) that differ in frequency for choosers and sellers. Words with very low frequencies in the corpus (i.e., fewer than 50 occurrences) were excised from the list, and alternative forms of single or similar words (e.g., *drinks*, *drink*, and *drinking*, or *my* and *mine*) are combined. Although some words, such as *money*, are frequent for both choosers and sellers, there are also some marked differences. The top half of Table 2 shows four nearest neighbors that are more frequent for sellers. *Drink*, emphasizing uses of the mug, is the second most common neighbor for sellers. Similarly, *want* and *need* appear more frequently as neighbors for sellers. In contrast, the bottom half of Table 2 contains words such as *spend* and *earn*, which are more frequent neighbors for choosers. These words show up almost twice as frequently for choosers, emphasizing the giving up of money. Of interest, consistent with speculation in social psychology, personal pronouns occur more frequently for sellers, suggesting that identification with the self is tapped more by sellers than by choosers (Beggan, 1992). Although this is clearly an exploratory effort, the use of such data-driven analysis suggests that different types of knowledge are being tapped by choosers and sellers.

Table 2
Nearest Neighbors Derived by a Latent Semantic Analysis

Subject and nearest neighbor	Choosers' frequency	Sellers' frequency	Difference (sellers minus choosers)
Sellers			
I, me, myself	90	146	−56
Drink, drinks, drinking	31	61	−30
Beer, Vodka, Whiskey, beverage	44	78	−34
Want, need	8	20	−12
Choosers			
Might	20	3	17
Spend	62	34	28
Earn, earns	85	46	39
Money, coins, dollars, nickels	183	123	60

Other Related Phenomena

One facet of this research is that it suggests that counterbalancing the order of positive and negative aspects is more than merely a control for a nuisance variable. It is indeed, because of inhibition, a theoretically important manipulation. Although not motivated by an interference perspective, several studies have manipulated the natural order of queries, often in an attempt to debias judgments.

Hoch (1984) examined interference in the prediction of preferences and thus future purchase intentions. Participants were asked to provide reasons why they would or would not buy a consumer product in the future. He counterbalanced the order of the two tasks, arguing that the first task caused interference with the second. Consistent with this notion, he found that participants generated more reasons in the first task than in the second and that the first task thus had greater influence on the prediction of purchase intentions—a primacy effect. Participants were more likely to predict that they would purchase the item when they generated reasons for buying it first. Note that all participants answered both types of questions; only the order changed. To demonstrate that the effect was due to memory interference, Hoch conducted another study, separating the two reason-generation tasks in time. Consistent with the fact that interference is a transient phenomenon, he found no evidence of interference in that study and instead observed a recency effect, in which the output of the second task received more weight in people's prediction of purchase intentions.

Other studies that varied the kind or order of information reported by respondents found similar effects. Koriat, Lichtenstein, and Fischhoff (1980) argued that overconfidence results from asking first why one might be right and then why one might be wrong. The interference account suggests that overconfidence occurs because people naturally generate pro reasons first, not necessarily because they have a motivational stake in generating more pro than con reasons. Consistent with this explanation, Koriat et al. showed that asking explicitly for reasons why an answer might be wrong diminishes overconfidence. Similarly, asking for reasons why an anchor might be irrelevant has been shown to reduce the anchoring effect (Chapman & Johnson, 1999; Mussweiler, Strack, & Pfeiffer, 2000).

Query theory clearly owes a debt to the idea of reason-based choice (Shafir, Simonson, & Tversky, 1993), which shares the idea

[4] To illustrate the possible role of measurement error in attenuating P_M, let us assume that mediation is perfect in the absence of error—that is, the standardized coefficients of endowment on aspects and of aspects on prices are both 1. If both the aspect listing and the stated price have test–retest reliabilities of .71, we will observe a P_M of 1 * .5 * .5 * 1 = .25, which is very close to the value of .22 that we observed.

that choice is based on the recall and construction made to justify the decision. This stands in contrast to views that suggest that loss aversion originates in the way gains and losses are perceived (Coombs & Avrunin, 1977). We extend that notion here by suggesting a specific mechanism for differences between reasons, observing them in aspect listings, and applying that notion to loss aversion.

Affect, Aspects, and Endowment

Given recent research reporting differences in the endowment effect when strong affect is induced (Lerner et al., 2004), it is natural to ask about the relationship between our memory-based account and one that posits affect as a driving force behind endowment. We did attempt to measure any affect that was induced by using the PANAS immediately after the prices were generated in Experiments 1 and 2. The results were inconsistent: In Experiment 1, we found that endowment led to an increase in positive affect but had no effect on negative affect. When we performed a mediation analysis, by including positive affect as a predictor, it proved to be a significant predictor of prices but was not a significant mediator. In Experiment 2, we found at best marginal results. However, this finding does not eliminate a role for affect. An overt measure like the PANAS may well not measure subtle and fleeting changes in affect. Furthermore, we know that induced affect can have a major role in changing the nature of endowment.

Our current results suggest an interesting speculation: that recall of affective states might be part of the changed information used in making a pricing judgment and that changes in affect might influence what is recalled. Perhaps affect operates by changing the aspects people consider when they construct their valuations. The relationship between memory-based and affect-based explanations of the endowment effect is one that is likely to be interesting and complementary.

Status of the Endowment Effect and Loss Aversion

The results reported here stand in stark contrast to many studies that have also tried to diminish the effect of endowment on valuation. Because loss aversion and the endowment effect represent challenges to much extant economic theory, this phenomenon has attracted significant attention from skeptical economists. For example, some economists have proposed that intense experience with the goods used (List, 2003, 2004) or extensive instruction in trading may diminish or eliminate the endowment effect.

Our approach illustrates that economists have tried too hard, perhaps, with the wrong model of human behavior. Although significant incentives alone are not enough to diminish the endowment effect, a subtle manipulation—simply reversing the order of two questions about the possible exchange—does. This finding, along with recent results concerning affect, suggests the value of a psychological theory of the endowment effect.

Our findings also speak to those who argue that the endowment effect might be due to a misunderstanding of the task. The use of tests measuring how well respondents understand task instructions has been a welcome addition by experimental economists (Hertwig & Ortmann, 2001). We should note that in the studies reported here, eliminating participants who did not understand the task actually increased the magnitude of the endowment effect, suggesting that such a lack of understanding adds random noise to the observed responses.

A key issue raised by this research is the relationship of our findings to the more general phenomenon of loss aversion. For example, can an approach based on differing query orders and inhibition help explain framing and status quo effects? Consistent with our model but motivated by a different framework are findings by McKenzie and Nelson (2003) that suggest that people use different language when illustrating and communicating different frames. Clearly, a more complete model is needed (see Reyna, Lloyd, & Brainerd, 2003, for similar ideas), but the notion that loss aversion is based, in part, on memory-based processes seems to warrant further examination.

Finally, we hope that the current work represents a step in bridging the gap between two fruitful research traditions to provide insight into the origins of valuation. Further work should clearly explore the basis of the memory phenomena we have explored. Other studies have explored the applicability of retrieval-induced forgetting to domains such as stereotyping (Dunn & Spellman, 2003) and eyewitness testimony (MacLeod, 2002). By elucidating the processes underlying the construction of value and by developing methods that span the gaps between paradigms, we believe that a richer dialogue will ensue.

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Appendix A

Aspect Listing Task (Experiment 1)

First aspect:

Reasons Why You Would Want to Either Have the Mug Or Have the Money

Now, please think of all the **reasons** why you personally would want to **have the mug** rather than the money and all the reasons why you personally would want to **have the money** rather than the mug.

We will ask you to enter your reasons one at a time. Type your first complete reason in the box below and, as soon as you are done, hit the "**Enter**" key to submit it.

Reason 1: _____

(Maximum of 200 characters per reason.)

Each subsequent aspect:

Reasons Why You Would Want to Either Have the Mug Or Have the Money

Please continue to list your **reasons** why you personally would want to either **have the mug or have the money.** We would like you to list all reasons that you might have. Please keep going until you cannot think of any more. If you need to pause to consider more reactions, feel free to do so.

Type your next reason why you would want to either have the mug or have the money in the box below and, as soon as you are done, hit the "**Enter**" key to submit it.

Reason 3: _____

(Maximum of 200 characters per reason.)

If you have entered all of your reasons and are sure that you cannot think of anything else to enter in the field above, click *here.*

So far, you have entered the following reasons:

Reason 2: xxx xxx xxx

Reason 1: xxx xxx xxx

(*Appendixes continue*)

Appendix B

Pricing Task (Selling Condition)

How much are you willing to sell your mug for?

For **each of the amounts of money** listed below, please indicate whether you would **prefer to sell your mug or not** by checking the button corresponding to your preference. You **must** select one of the two options on **each** line.

Once you click the button at the bottom of this page, your responses will be **final and binding.**

At a price of $12.00:	○ I will **sell the mug.**	○ I will **not sell the mug.**
At a price of $11.50:	○ I will **sell the mug.**	○ I will **not sell the mug.**
At a price of $11.00:	○ I will **sell the mug.**	○ I will **not sell the mug.**
	. . .	
	. . .	
At a price of $1.00:	○ I will **sell the mug.**	○ I will **not sell the mug.**
At a price of $0.50:	○ I will **sell the mug.**	○ I will **not sell the mug.**

Note that, in order to continue, you must have clicked a button for **each** of the prices listed above.

Click here to continue

Received May 22, 2006
Revision received December 18, 2006
Accepted January 17, 2007 ■