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RESEARCH REPORT

Constructing Preference From Experience: The Endowment Effect Reflected in External Information Search

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People often attach a higher value to an object when they own it (i.e., as seller) compared with when they do not own it (i.e., as buyer)—a phenomenon known as the *endowment effect*. According to recent cognitive process accounts of the endowment effect, the effect is due to differences between sellers and buyers in information search. Whereas previous investigations have focused on search order and internal search processes (i.e., in memory), we used a sampling paradigm to examine differences in search termination in external search. We asked participants to indicate selling and buying prices for monetary lotteries in a within-subject design. In an experience condition, participants had to learn about the possible outcomes and probabilities of the lotteries by experiential sampling. As hypothesized, sellers tended to terminate search after sampling high outcomes, whereas buyers tended to terminate search after sampling low outcomes. These differences in stopping behavior translated into samples of the lotteries that were differentially distorted for sellers and buyers; the amount of the distortion was predictive of the resulting size of the endowment effect. In addition, for sellers search was more extended when high outcomes were rare compared with when low outcomes were rare. Our results add to the increasing evidence that the endowment effect is due, in part, to differences in predecisional information search.

Keywords: decisions from experience, endowment effect, risky decision making, sampling, search

According to economic theory, a person's valuation of an object should be independent of whether she or he owns the object or not (Kahneman, Knetsch, & Thaler, 1991). People's actual behavior, however, often violates this assumption. In one experiment, for instance, Kahneman et al. (1991) gave one group of participants a free coffee mug, whereas a second group did not get a mug. When the first group was asked to indicate the minimum amount of money for which they would sell the mug and the second group was asked to indicate the maximum amount for which they would buy the mug, the former's willingness-to-accept (WTA) was, on average, about twice as high as the latter's willingness-to-pay (WTP). This *endowment effect* (Thaler, 1980) has been established as a robust phenomenon (Horowitz & McConnell, 2002; but see Plott & Zeiler, 2005). The dominant psychological explanation for the endowment effect is loss aversion (Kahneman et al., 1991): In subjective valuations, decreases in objective value (relative to a reference point) are weighted more heavily than equivalent increases in objective value. Therefore, the owner of an object (seller) attaches a higher value to it than someone not owning the object (buyer). That subjective evaluations depend on a (variable) reference value suggests that preferences are often constructed (by the decision maker) rather than merely revealed (by the experimenter) during elicitation.

Although the endowment effect is consistent with loss aversion, loss aversion says relatively little about the underlying cognitive processes (cf. Willemsen, Böckenholt, & Johnson, 2011). Understanding the cognitive processes, however, is key for predicting and improving behavior (e.g., Payne & Venkatraman, 2011; see also Glöckner & Pachur, 2012; Pachur, Hanoch, & Gummerum, 2010). Toward the goal of developing a more process-oriented account of the endowment effect, it has been speculated that buyers and sellers focus their attention on different aspects of the target object (e.g., Carmon & Ariely, 2000). More recently, it has been proposed that these differences in attention between buyers and sellers lead to differences in information search (e.g., J. G. Johnson & Busemeyer, 2005; E. J. Johnson, Häubl, & Keinan, 2007). For instance, in their query theory, E. J. Johnson et al. (2007) proposed what might be called a *search order thesis*. They argued that the endowment effect arises because, when retrieving positive and negative aspects of an object from memory, the search order depends on one's status quo, which is different for sellers and buyers. As a consequence, sellers start by querying for reasons to keep the object (i.e., its positive aspects), whereas buyers start by querying for reasons not to buy (i.e., its negative aspects). Due to interference effects during search in memory (Anderson &

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Spellman, 1995), the initial query yields a larger set of reasons than subsequent queries, and sellers thus end up generating a larger proportion of positive aspects than buyers. This then translates into a higher valuation by the former. In line with the search order thesis, E. J. Johnson et al. (2007) showed that sellers retrieve positive aspects earlier than buyers and generate fewer negative aspects than buyers.

Whereas query theory is concerned with internal information search (i.e., in memory), in this article we examine external search processes associated with the endowment effect. Specifically, we use the sampling paradigm, which is often employed in research on decisions from experience (Hertwig, Barron, Weber, & Erev, 2004), to examine search when sellers and buyers are asked to evaluate lotteries. In decisions from description, all possible outcomes and probabilities of a lottery are presented as a summary (e.g., 20% chance of winning \$100, 80% chance of winning \$0). In decisions from experience, by contrast, people have to glean this information by sampling from an initially unknown payoff distribution. The typical set-up of the sampling paradigm is that people can click on a button, which is followed by an outcome drawn from the distribution. Because in the sampling paradigm people can draw as many (or few) samples as they wish before making a decision, the paradigm allows an examination of predecisional search behavior (Hills & Hertwig, 2010).

How might sellers and buyers differ in external search when, for instance, evaluating a lottery? Note that compared with search in memory, in the sampling paradigm the type of outcome sampled is determined randomly by the underlying payoff distribution. Buyers and sellers thus cannot differ in the order in which information is searched. Nevertheless, we argue that buyers and sellers may still differ in terms of when search is *terminated*. In line with previous proposals, we assume that because sellers and buyers have different goals (Carmon & Ariely, 2000), they differ in their attention to the positive and negative aspects of an object (Birnbaum, Yeary, Luce, & Zhao, 2002): Sellers focus on reasons for demanding a high price, whereas buyers focus on reasons for offering a low price. In their sequential value matching (SVM) model, J. G. Johnson and Busemeyer (2005) proposed that due to these different perspectives, sellers and buyers draw initial candidate responses for their evaluation of an object (e.g., a lottery) from differently shaped distributions. For sellers, the distribution is skewed toward high values, whereas for buyers the distribution is skewed toward low values. According to the SVM model, the candidate responses are then compared with information sampled about an object and sequentially adjusted until indifference between a candidate response and the sampled outcomes is reached, which leads to a termination of the search process. Importantly, this process of information sampling is likely to be terminated differently for sellers and buyers: Because sellers are more likely to start by considering high prices as candidate responses, indifference between an (internal) candidate value and the externally sampled information is more likely to occur after sampling a high outcome—leading to sampling being stopped after high outcomes. Conversely, as buyers are more likely to start by considering low prices, indifference is more likely to occur after sampling low outcomes—leading to sampling being stopped after low outcomes.

Based on the SVM model, we thus propose a *search termination thesis*. We hypothesize that in the sampling paradigm sellers are more likely to stop sampling after encountering (relatively) high outcomes, whereas buyers are more likely to stop after encountering (relatively) low outcomes. One direct corollary of this hypothesis is that sellers and buyers end up being exposed to different samples about the objects. Moreover, the resulting differences in the samples should be correlated with the size of the endowment effect. We do not claim that differences in stopping behavior between sellers and buyers are the only factor responsible for the endowment effect. For instance, it is possible that search in memory and retrieval order still play a role because people recall previously sampled outcomes. Nevertheless, differences in search termination in external search may represent an additional and previously neglected factor in search contributing to the effect. The main goal of this article is to test whether differences in search termination indeed exist and whether these differences are predictive of the endowment effect. In addition, we test the prediction of the SVM model that sampling should be more extensive the higher the variance of a lottery (for details, see J. G. Johnson & Busemeyer, 2005).

To test these hypotheses, we conducted an experiment in which participants were presented with lotteries. All previous research on the endowment effect with lotteries has used a description-based paradigm, where the payoff distribution is conveniently summarized to participants (i.e., as a table listing all outcomes and probabilities). Therefore, we presented the lotteries both in an experience condition and in a description condition, to see whether the endowment effect is critically affected by how the lotteries are presented. For each lottery, participants were asked to indicate both their WTA (i.e., a selling price) and their WTP (i.e., a buying price) in a within-subject design. In the experience condition (where people had to learn the payoff distribution by sequential sampling), we recorded for each lottery (separately for the WTA and WTP tasks) how many samples each participant had drawn before giving a response as well as which outcomes had been sampled.

In addition to shedding light on how differences in search between buyers and sellers contribute to the endowment effect, our study extends previous research on decisions from experience. So far, the sampling paradigm has been mainly applied to study binary choice and relatively little is known about people's sampling behavior in other types of decisions (but see Fantino & Navarro, 2011). Further, search in decisions from experience has so far been primarily discussed from the perspective of cognitive limits—such as constrained working memory capacity (Hertwig et al., 2004; Hills & Hertwig, 2010; Rakow, Demes, & Newell, 2008). To what extent task characteristics (e.g., seller vs. buyer perspective) might affect stopping behavior in search has, to the best of our knowledge, not previously been examined.

Method

Participants

One hundred and fifty-two students from the University of Basel (109 female; M = 23.6 years, SD = 5.3) participated in the experiment in exchange for 10 Swiss francs or course credit. Half of the participants were randomly assigned to the experience condition (n = 76; 55 female) and the other half to the description condition (n = 76; 54 female).

Material

We used lotteries from previous studies on lottery pricing by Slovic, Griffin, and Tversky (1990) and Ganzach (1996; cf. J. G. Johnson & Busemeyer, 2005). In some tasks of these studies, the lotteries were presented as pairs, with each pair containing a high-variance and a low-variance lottery. We picked six lottery pairs from Slovic et al. (the "small bet lotteries," where most outcomes were lower than $10) and nine randomly selected pairs from Ganzach (with most outcomes ranging between $10 and $90). In total we thus used 30 individual lotteries (for a complete list, see Appendix A).

Design and Procedure

For each lottery, participants indicated both a selling price (WTA) and a buying price (WTP) in a within-subject design. In the WTA valuation task, participants were asked to imagine that they owned the right to play a lottery and to indicate the minimum amount of money they would accept to sell that right. In the WTP valuation task, participants were asked to imagine that they had the possibility to buy the right to play a lottery and to indicate the maximum amount of money they would be willing to pay. The lotteries were hypothetical (below we discuss to what degree this might affect our findings). The two valuation tasks were presented as separate blocks, each including all 30 lotteries. The order of both blocks was counterbalanced across participants and, within the blocks, the 30 lotteries were presented in random order. Participants were not told in advance that the two blocks contained the same lotteries.

All tasks were presented on a computer screen. The presentation format (experience vs. description) was manipulated as a between-subjects factor. As illustrated in Figure 1A, in the experience condition participants were instructed to learn about the payoff distribution of the lottery by clicking on a button on the computer screen, which resulted in a random draw from the respective lottery's payoff distribution. Participants were encouraged to sample until they felt confident enough to evaluate the lottery. In the description condition (Figure 1B), the outcome and probability information was presented in a summary description. In both the experience and the description conditions, participants were asked

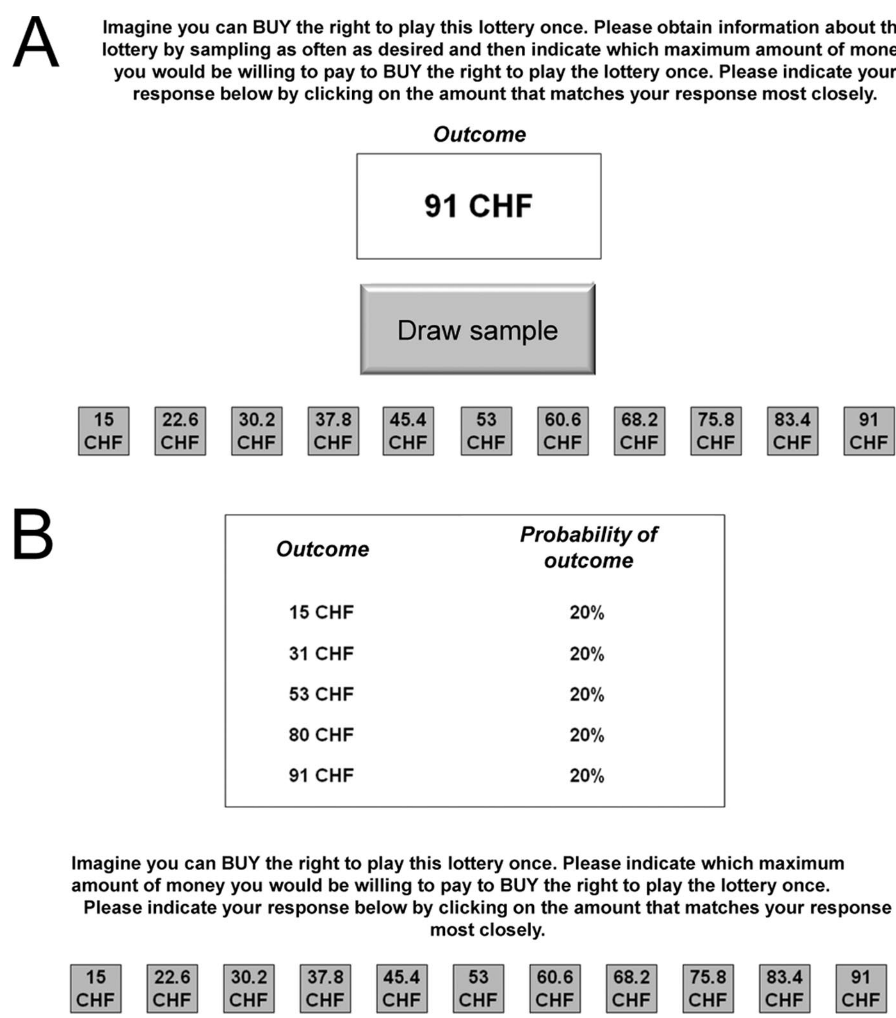

Figure 1. Presentation format of the lotteries in the experience condition (A) and in the description condition (B). Both examples are shown for the WTP task (with the instructions translated from German into English).

to price each lottery (i.e., either WTA or WTP) on an 11-point scale. At each trial, this scale ranged from the lowest to the highest possible outcome of the respective lottery in 10 equally spaced intervals. Participants took between 20 and 35 min (experience condition) and between 10 and 20 min (description condition) to complete the experiment.

Results

The Endowment Effect in Experience-Based Versus Description-Based Decisions

Because the lotteries differed considerably in terms of their possible outcomes, we analyzed people's selling and buying prices expressed in category units on the 11-point response scale (the absolute valuations in the experience and description conditions are reported in Appendix A).[1] To examine possible differences between people's selling and buying prices, we conducted a mixed-design analysis of variance (ANOVA) with the type of valuation task (WTA vs. WTP) as a within factor and the type of presentation format (experience vs. description) as a between factor. As indicated by a main effect of the type of valuation task, there was an endowment effect, with the WTA task leading to higher valuations than the WTP task, *M*s = 6.66 (*SD* = 1.66) vs. 3.85 (*SD* = 1.51), $F(1, 150) = 318.3$, $p = .001$, $\eta_p^2 = .68$. Moreover, there was a trend for a slightly larger endowment effect in the experience than in the description condition, 3.06 (*SD* = 1.89) and 2.56 (*SD* = 1.99), but the interaction between the type of valuation task and the type of presentation format was not significant, $F(1, 150) = 2.55$, $p = .11$, $\eta_p^2 = .02$.[2] (In Appendix B we report additional analyses showing that the order in which the tasks were presented did not affect the size of the endowment effect.)

Information Search in Experience-Based Decisions

In the experience condition, participants drew, on average, 23.1 (*SD* = 13.5) samples per lottery before making a valuation. The number of draws did not differ between the WTA and the WTP tasks, *M*s = 22.2 (*SD* = 14.0) versus 24.1 (*SD* = 15.7), $t(75) = -1.36$, $p = .18$. As illustrated in Figure 2, participants who sampled less showed a larger endowment effect, $r = -0.29$, $p = .01$. One possible reason for this correlation is that limited sampling led to a greater uncertainty about a lottery's actual value and that under greater uncertainty, sellers' and buyers' attention to the lotteries' aspects are to a greater extent led by their implicit goals ("selling high and buying low"; cf. Carmon & Ariely, 2000). A mixed-design ANOVA with the position of the valuation task (first vs. second half of the experiment) as a within-subject factor and order condition (WTA vs. WTP presented as first task) as a between-subjects factor indicated a main effect such that participants sampled less in the second half than in the first half of the experiment, *M*s = 21.45 versus 24.84, $F(1, 74) = 6.09$, $p = .016$, $\eta_p^2 = .076$. This was the case irrespective of whether the WTA or the WTP task was presented first, as indicated by a nonsignificant interaction between task position and order condition, $F(1, 74) = 1.96$, $p = .17$, $\eta_p^2 = .026$.

Next we tested our hypothesis that sellers tend to stop sampling after encountering relatively high outcomes of a lottery, whereas buyers tend to stop sampling after encountering relatively low outcomes. For that purpose, we determined, for each participant and separately for the WTA and the WTP tasks, the probability that search was stopped depending on the value of the previously drawn outcomes. For simplicity, "low" and "high" outcomes were defined relative to the midpoint of the 11-point response scale for a given lottery. For instance, if the response scale ranged from 15 to 91 Swiss francs, the midpoint was 54 Swiss francs (cf. Figure 1). Outcomes below the midpoint counted as low, whereas outcomes that were larger or equally large counted as high.[3] Our stopping index, *S*, was based on the log-transformed ratio of the probability to stop sampling after encountering high outcomes and the probability to stop after encountering low outcomes:

$$S = \log\left(\frac{p(stop|o_w \geq rv)}{p(stop|o_w < rv)}\right), \tag{1}$$

where o_w is the average outcome in the current sampling window of size w and rv is the reference value (i.e., the midpoint of the

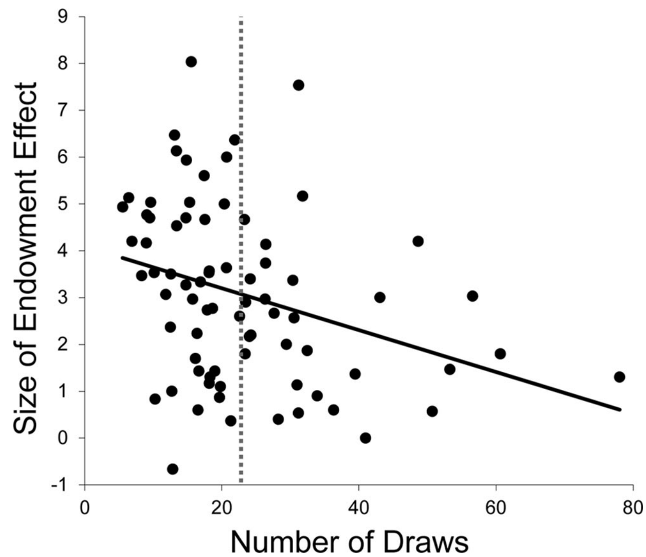

Figure 2. Relationship between the size of the endowment effect (expressed as the mean difference in category units on an 11-point scale across all 30 lotteries) and the mean number of draws in the experience condition. Each point represents one participant. The dotted line indicates the average amount of sampling. The solid line indicates the fitted regression line.

[1] Otherwise, the results would mainly reflect the valuations for the lottery problems in Ganzach (1996), which had considerably higher outcomes than those in Slovic et al. (1990; see Appendix A).

[2] A similar result was obtained when we compared the WTA and WTP valuations in a between-subjects analysis, focusing on those participants who received the tasks in the first block (i.e., thus comparing WTA and WTP between participants). In this analysis, the difference between the WTA and WTP valuations were *M*s = 4.12 versus 3.30 in the experience and description conditions, respectively, and the interaction between type of presentation format and type of task was not significant, $F(1, 148) = 2.97$, $p = .09$, $\eta_p^2 = .02$.

[3] On average (across participants), only 5.45% (WTA) and 5.04% (WTP) of the sampled outcomes coincided with the midpoint of the scale. Therefore, a very similar pattern obtained when these cases were considered in the denominator (rather than the nominator) of Equation 1.

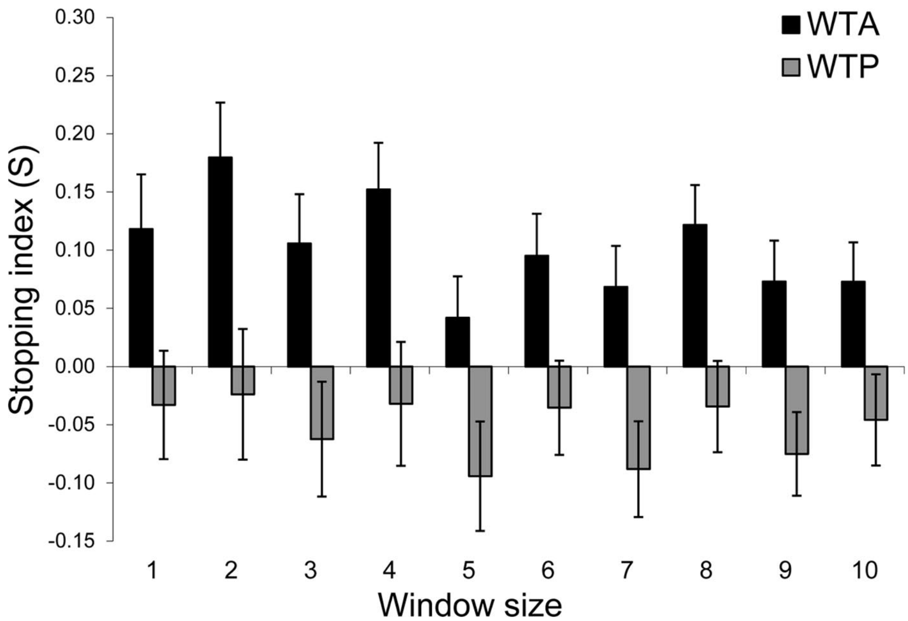

Figure 3. Stopping index *S* for different sizes of the final sample window in the experience condition, separately for the WTA and the WTP tasks. Error bars indicate ±1 standard error of the mean.

respective response scale). (Expressing the stopping index on the normally-distributed log-odds scale rather than on the bounded probability scale is advantageous because it allows aggregating and analyzing the data across all participants.) A value of *S* larger than zero indicates that search tends to be terminated after encountering relatively high outcomes, whereas a value of *S* below zero indicates that search tends to be terminated after encountering relatively low outcomes. Figure 3 shows *S* separately for the WTA task and the WTP task for different sizes of the sample window (i.e., how many draws prior to the decision are considered to calculate o_w). As can be seen, *S* differed systematically between sellers and buyers: *S* exceeded zero for selling prices (WTA) but was smaller than zero for buying prices (WTP), and this pattern was relatively independent of the size of the sample window. *S* was larger for selling prices than for buying prices for all sizes of the sample window (all ps $< .03$).[4] This supports the key prediction of our search termination thesis that sellers and buyers differ in terms of when they stop drawing samples from the lotteries.

But do the differences in stopping behavior of buyers and sellers indeed lead to distorted representations of the lotteries (and eventually to the endowment effect)? If so, the average outcome in the sample window immediately prior to making a valuation should be higher for sellers (WTA task) than for buyers (WTP task). Figure 4 shows the differences between the average outcomes in the WTA and the WTP tasks (determined for each lottery) for window sizes ranging from 1 to 10 draws. The figure shows that the average outcomes in the final sample window were higher in the WTA task than in the WTP task (indicated by the difference being positive), in particular when considering samples drawn immediately before sampling was stopped. Thus, in line with the search termination thesis of the endowment effect, buyers and sellers ended up with different samples of the lotteries.

If differences in search termination are linked to the endowment effect, the size of the effect should be higher when the difference in the average sampled outcomes between the WTP and the WTA tasks (i.e., the sample gap) is high. To test this prediction, we correlated the sample gap (calculated across all samples drawn at a trial) for a given lottery with the size of the endowment effect, separately for each participant. The average (Fisher transformed) correlation across all participants was $r = .33$, $t(75) = 12.08$, $p = .001$ (one-sample *t* test using the *z*-transformed individual *r*s). The individual correlations were positive for 71 of the 76 participants (93%) in the experience condition and ranged between −.23 and .76. (Additional analyses showed that neither the size of the sample gap nor the correlation between the sample gap and the endowment effect was affected by the order in which the WTA and WTP tasks were presented in the experiment.) In addition, the sample gap was negatively correlated with the number of samples drawn, average (Fisher transformed) correlation $r = -.08$, $t(75) = 3.14$, $p = .002$ (one-sample *t* test using the *z*-transformed individual *r*s). The bias in the sampled outcomes due to the differences in stopping behavior between sellers and buyers was thus larger in small than in large samples.

Taken together, the analyses support the hypothesis that asking for a selling or a buying price triggers different stopping behavior in the sampling paradigm. Due to these differences buyers and sellers experience different samples of the lotteries before making a valuation and the resulting differences systematically influence the size of the endowment effect. To the best of our knowledge, the results represent the first demonstration that the endowment effect

[4] A comparison of the stopping behavior in the WTA and the WTP tasks in a between-subjects analysis, focusing on those participants who received the tasks in the first block (i.e., thus comparing WTA and WTP between participants), showed essentially the same picture.

is preceded by different stopping behaviors by sellers and buyers during information search.[5]

Biased Search Termination and Rare Events

The hypothesis, supported in the analyses above, that asking for selling and buying prices triggers differences in stopping behavior has an interesting corollary. If sellers focus on the high outcomes of a lottery but buyers focus on the low outcomes, the amount of sampling should differ depending on whether high or low outcomes are rare. Sampling should be more extensive for sellers when in a lottery high outcomes are rare compared with when low outcomes are rare and vice versa for buyers. To test this, we calculated an ANOVA with the type of lottery (high outcomes rare vs. low outcomes rare) and the type of the valuation task (WTA vs. WTP) as within factors and the number of samples drawn as dependent variable. We expected an interaction between the type of lottery and the type of valuation task. Lotteries were classified as "high outcomes rare" if the majority of the possible outcomes was higher than the expected value of the lottery (16 of the 30 lotteries); lotteries were classified as "low outcomes rare" if the majority of the possible outcomes was lower than the expected value of the lottery (12 of the 30 lotteries). (Two lotteries were excluded from the analysis because higher and lower values occurred equally frequently.) As expected, there was a significant interaction between the type of valuation task and lottery type, $F(1, 75) = 5.09$, $p = .03$, $\eta^2_p = .06$. Figure 5 shows that in the WTA task participants sampled more when low outcomes were rare; in the WTP task, by contrast, there was no such difference in the number of draws. There was no main effect for the type of lottery, $F(1, 75) = 2.30$, $p = .13$, $\eta^2_p = .03$, or for the type of the valuation task, $F(1, 75) = 1.54$, $p = .22$, $\eta^2_p = .02$, on the number of draws (additional analyses showed no effect of task order).

Variance of a Lottery and Information Search

As mentioned above, the SVM model predicts that sampling should be more extensive for lotteries with a high variance, with variance defined as a function of lottery i's N outcomes x and their associated probabilities p (cf. J. G. Johnson & Busemeyer, 2005, Equation 8):

$$\delta_i^2 = \sum_{i=1}^{N} x_i^{\,2} \times p_i - \left(\sum_{i=1}^{N} x_i^{\,2} \times p_i \right)^2. \tag{2}$$

This prediction was supported by our data, which showed a positive correlation between the variance of a lottery and the number of draws (averaged across the WTA and WTP tasks), $r = .17$ (average Fisher transformed correlation), $t(75) = 5.70$, $p = .001$ (one-sample t test based on z-transformed individual rs).

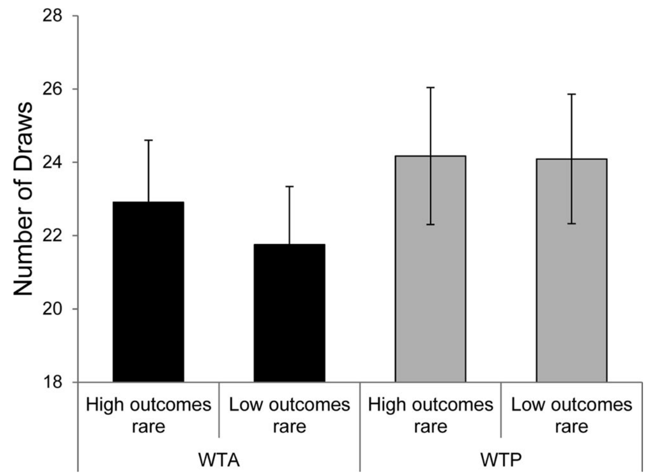

Figure 5. Mean number of draws (across all participants) for lotteries in which high outcomes were rare and for lotteries in which low outcomes were rare, separately for the WTA and the WTP tasks. Error bars indicate ±1 standard error of the mean.

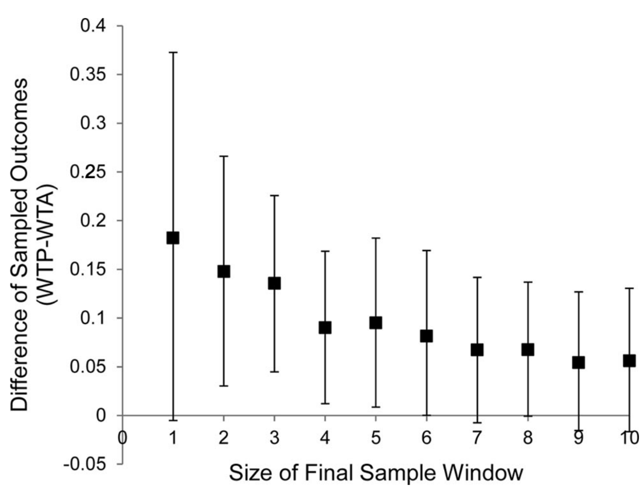

Figure 4. Difference in the average outcome in the final sample window between the WTP and the WTA tasks for different sizes of the sample window in the experience condition. Differences are expressed in category units on the 11-point response scale. Error bars indicate bootstrapped 95% confidence intervals (based on 10,000 draws).

Discussion

Consistent with recent process accounts of the endowment effect (E. J. Johnson et al., 2007), we argued that buyers and sellers differ in their information search. Based on a computational model of preference construction (J. G. Johnson & Busemeyer, 2005), we proposed and tested a search termination thesis of the endowment effect in a situation that involves external information search.

[5] Note that the link between outcome-contingent stopping behavior and the endowment effect implies a recency effect. To test for a recency effect, we fitted the value-updating model (for details see Hertwig, Barron, Weber, & Erev, 2006), which allows to quantify recency effects. According to the model, the valuation of lottery i after the tth draw is $A_i(t) = (1 - \omega_t)A_i(t - 1) + \omega_t x_t$, where x_t is the outcomes sampled at draw t, and ω_t is the weight accorded to the outcome sampled at that draw. $\omega_t = (1/t)\varphi$, where φ is a recency parameter; a recency effect is indicated if $\varphi < 1$ (meaning that more recent outcomes receive more weight). When we fitted the value-updating model to each participant's WTA and WTP responses (based on the individual sample sequences), the best fitting value of φ was, on average, 0.957 ($SD = 0.249$), one-sample t test against 1, $t(75) = 1.50$, $p = .068$, one-tailed. For the majority of participants (57.9% vs. 42.1%, $z = 2.79$, $p = .005$) the individually fitted value of φ was smaller than 1, indicating, overall, a recency effect.

According to this thesis, sellers and buyers differ in when they stop search, leading to systematically different samples about the respective options. As hypothesized, our experimental results indicate that (a) sellers tend to terminate search after encountering high outcomes, whereas buyers tend to stop sampling after encountering low outcomes. We further found that (b) due to these differences in stopping behavior sellers and buyers experience different aspects of the lotteries and that (c) the resulting distortion in experience predicts the size of the endowment effect. Our findings extend previous process analyses of the endowment effect—such as E. J. Johnson et al.'s (2007) query theory approach—to external search and highlight differences in sellers' and buyers' stopping behavior as one additional factor contributing to the effect. Moreover, our results demonstrate the usefulness of the sampling paradigm as a process-tracing tool and the importance of examining predecisional search in general (see also Khader et al., 2011).

In contrast to some other studies on the endowment effect (e.g., E. J. Johnson et al., 2007), we did not use a sophisticated incentive scheme that explicitly encouraged people to reveal their true valuations of the lotteries. As a consequence, some participants might have thought that they were in a negotiation situation and their valuations could thus reflect strategic first offers rather than their actual subjective values (e.g., Plott & Zeiler, 2005). Although we cannot rule out this possibility, we do not think this compromises our main conclusions concerning observed differences in information search. Specifically, it is unclear why and how strategic considerations in a negotiation should be reflected in information search. Therefore, we deem it unlikely that our main finding—the systematic difference between sellers and buyers in stopping behavior—is due to an insufficient incentive scheme. Moreover, in a meta-analysis of the endowment effect, Horowitz and McConnell (2002) concluded that the endowment effect is not an artifact of hypothetical lotteries but is even amplified in incentive-compatible designs.

The observed difference in stopping behavior between buyers and sellers is certainly not the only reason for the endowment effect. Clearly, the sample gap arising from differences in stopping (.1–.2 category units; cf. Figure 4) is considerably smaller than the observed endowment effect (3.06 category units). Therefore, there must be additional factors at play that are not reflected in how people search for information in the sampling paradigm, such as the order in which previously sampled outcomes are retrieved, or how well high and low outcomes are recalled (E. J. Johnson et al., 2007; Nayakankuppam & Mishra, 2005). Although these additional factors are beyond the scope of this article, due to the multiply determined nature of the endowment effect it seems unlikely that the effect would disappear if in the sampling paradigm the sampling sequence was manipulated experimentally.

Sampling in Decisions From Experience

Our investigation is one of the first that uses the sampling paradigm to examine valuations of individual (rather than pairs of) lotteries. Interestingly, with a mean of 23.1 draws per lottery our participants searched considerably more extensively than in previous studies on decisions from experience involving binary options. For instance, Hertwig et al. (2004) reported a median value of seven draws per lottery (in our study, participants made seven or fewer draws in only 4.8% of the trials). There are two possible reasons for these differences. First, the lotteries in Hertwig et al.'s studies had only two possible outcomes, whereas half of the lotteries used in our experiment had five outcomes—which require considerably more search to learn. Second, in binary choice it is only necessary to make a relative evaluation of a lottery ("Which lottery is better?"), whereas the determination of a WTA or a WTP requires a more fine-grained absolute evaluation ("What is the value of the lottery?").

Conclusion

Research on the endowment effect has for a long time focused on methodological issues (e.g., hypothetical vs. real lotteries, incentive-compatible elicitation; Horowitz & McConnell, 2002) and on the identification of moderating factors (e.g., ownership source, ownership history; Loewenstein & Issacharoff, 1994; Strahilevitz & Loewenstein, 1998). In contrast, the underlying cognitive processes, such as information search and integration, are only beginning to be understood. Our results highlight the importance of studying information search behavior during preference construction. Toward that goal, the sampling paradigm is a valuable tool to obtain insights into specific search patterns underlying the endowment effect. We extend previous work on the endowment effect by showing that sellers and buyers have biased samples of the to-be-valued object not only because of memory interference (as highlighted by query theory) but also because decision makers actively shape their samples of the world by the way in which they stop information search.

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(*Appendices follow*)

Appendix A

Lotteries Used in the Experiment, Their Expected Values (EV), and the Average Willingness-to-Accept (WTA) and Willingness-to-Pay (WTP) Valuations

								Experience		Description	
Lottery	*p*	o1	o2	o3	o4	o5	EV	WTA	WTP	WTA	WTP
1^{SL}	35/36	4	0	—	—	—	3.89	3.45	2.39	3.34	2.38
2^{SH}	11/36	16	0	—	—	—	4.89	7.6	3.37	7.52	3.35
3^{SL}	29/36	2	0	—	—	—	1.61	1.44	0.84	1.45	0.96
4^{SH}	7/36	9	0	—	—	—	1.75	3.99	1.36	3.38	1.47
5^{SL}	34/36	3	0	—	—	—	2.83	2.5	1.58	2.4	1.71
6^{SH}	18/36	6.5	0	—	—	—	3.25	3.92	1.6	3.76	2.15
7^{SL}	32/36	4	0	—	—	—	3.56	3.17	2.06	3.09	2.06
8^{SH}	4/36	40	0	—	—	—	4.44	11.89	3.37	12.95	4.16
9^{SL}	34/36	2.5	0	—	—	—	2.36	2.17	1.33	1.88	1.32
10^{SH}	14/36	8.5	0	—	—	—	3.31	4.59	2.08	4.15	2.17
11^{SL}	33/36	2	0	—	—	—	1.83	1.56	1.02	1.57	1.13
12^{SH}	16/36	5	0	—	—	—	2.22	2.99	1.2	2.93	1.56
13^{GH}	0.2	5	9	27	40	45	25.2	28.63	17.11	25.95	14.16
14^{GL}	0.2	14	22	26	28	36	25.2	26.04	18.72	24.74	19.59
15^{GH}	0.2	8	13	23	44	55	28.6	31.5	19.32	29.34	17.59
16^{GL}	0.2	18	25	29	31	40	28.6	29.61	22.54	28.19	22.89
17^{GH}	0.2	13	19	26	57	66	36.2	40.83	23.46	36.78	21.51
18^{GL}	0.2	25	29	37	41	49	36.2	37.09	30.15	35.04	30.02
19^{GH}	0.2	6	17	33	64	89	41.8	47.06	24.89	45.86	22.16
20^{GL}	0.2	18	27	37	50	63	39	40.74	29.96	39.02	27.3
21^{GH}	0.2	8	25	29	77	89	45.6	50.84	25.8	44.24	23.56
22^{GL}	0.2	18	33	45	54	71	44.2	49.17	31.18	44.01	30.27
23^{GH}	0.2	10	25	47	73	81	47.2	54.19	25.98	46.15	26.54
24^{GL}	0.2	27	33	45	54	71	46	49.12	36.09	46.97	35.74
25^{GH}	0.2	15	31	53	80	91	54	59.3	35.7	53.9	32.3
26^{GL}	0.2	27	33	50	61	79	50	54.51	39.11	51.49	37.33
27^{GH}	0.2	23	37	74	81	91	61.2	68.9	43.49	62.91	39.46
28^{GL}	0.2	39	51	60	67	82	59.8	62.42	48.68	59.37	48.11
29^{GH}	0.2	31	59	71	89	97	69.4	71.12	48.72	66.69	49.15
30^{GL}	0.2	55	60	72	81	88	71.2	73.76	62.82	70.68	61.9

Note. Lotteries taken from Slovic et al. (1990) and Ganzach (1996) are indicated by the superscripts $^{\text{S}}$ and $^{\text{G}}$, respectively. The second superscript indicates whether the lottery was a high-variance lottery (i.e., $^{\text{H}}$) or a low-variance lottery (i.e., $^{\text{L}}$). For the lotteries from Slovic et al., the probability *p* refers to the probability of outcome 1 (o1); in the lotteries from Ganzach all five outcomes (o1–o5) were equally probable (i.e., $p = .2$).

Appendix B

Analysis of Task Order Effects on WTA and WTP Valuations

Given that one group of participants started with the WTA task and the other with the WTP task, we also examined effects of task order. Analyzing participants' valuations using a mixed-design ANOVA with task position (first vs. second) as a within-subject factor and presentation format (i.e., experience vs. description) as a between-subjects factor, there was no indication that participants provided different valuations of the lotteries in the first and the second half of the experiment, *M*s = 5.31 versus 5.19, $F(1, 148) = .584$, $p = .446$, $\eta_p^2 = .004$. A mixed-design ANOVA with type of valuation task (WTA vs. WTP) as a within-subject factor and presentation format (i.e., experience vs. description) and order condition (WTA as first task vs. WTP as first task) as between-subjects factors revealed a main effect of order, $F(1, 148) = 22.66$, $p = .001$, $\eta_p^2 = .133$. Specifically, the valuations were higher when participants were first asked for a selling price than when they were first asked for a buying price, *M*s = 5.70 versus 4.80. This order effect may be due to anchoring: Because selling prices tended to be higher than buying prices, asking participants first to provide selling prices could have anchored them on higher values. Crucially, however, the difference between selling and buying prices—that is, the size of the endowment effect—was not affected by whether the WTA or the WTP task was the first task, as indicated by a nonsignificant interaction between type of valuation task and order, $F(1, 148) = 0.58$, $p = .45$, $\eta_p^2 = .004$.

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