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THE ENDOWMENT EFFECT

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ABSTRACT

The endowment effect is among the best known findings in behavioral economics, and has been used as evidence for theories of reference-dependent preferences and loss aversion. However, a recent literature has questioned the robustness of the effect in the laboratory, as well as its relevance in the field. In this review, we provide a summary of the evidence, and describe recent theoretical developments that can potentially reconcile the different findings, with a focus on expectation-based reference points. We also survey recent work from psychology that provides either alternatives to or refinements of the usual loss aversion explanation. We argue that loss aversion is still the leading paradigm for understanding the endowment effect, but that given the rich psychology behind the effect, a version of the theory that encompasses multiple reference points may be required.

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Introduction

The observation that people seem to attach additional value to things they own simply because they belong to them—the "endowment effect"—has had a substantial influence on economics. Endowment effect experiments are used as evidence for theories of reference-dependent preferences, such as Kahneman and Tversky's (1979) prospect theory, which are applied in many areas of economics, including investment behavior and labor supply.[1] The endowment effect is relevant for the design of incentives and institutions, and has had an influence beyond economics— particularly on the legal literature that deals with the allocation and valuation of property rights.

Thaler (1980) first identified the "endowment effect" as an example of how the concept of loss aversion in prospect theory might affect choice in settings without risk.[2] From the very beginning then, the empirical phenomenon of the endowment effect has been linked to a loss-aversion explanation: the loss in utility associated with giving up a good is greater than the gain in utility associated with getting that good. Or, more simply: losses loom larger than gains.

Despite being identified over 30 years ago and being termed "one of the most robust findings in the psychology of decision making" (Knetsch, Tang, and Thaler 2001), the endowment effect remains a fertile field of research. Recent work in the lab has found that the endowment effect disappears under certain changes to experimental procedures, leading researchers to question whether the effect indeed results from reference-dependent preferences (Plott and Zeiler 2005, 2007); furthermore, experiments conducted outside the lab have given mixed results. Meanwhile, a number of theories have been proposed as refinements of— or alternatives to— the loss-aversion account. This article provides an overview of these recent developments.

There are two classic paradigms used to show the endowment effect, with many subsequent variants. In the exchange paradigm (e.g., Knetsch 1989), individuals are randomly given one of two items and allowed to trade for the other. The endowment effect is manifested when individuals are more likely to keep the item they were randomly given. In the valuation paradigm (e.g., Kahneman, Knetsch, and

[1] See Camerer (2000), DellaVigna (2009) and Barberis (2013) for field applications of reference-dependent preferences.

[2] Plott and Zeiler (2007) argue against using the term "endowment effect" on the ground that doing so assumes a particular theory explains the empirical phenomenon. However, following other literature, we will use the term "endowment effect" to refer to a range of related findings, including valuation gaps and exchange asymmetries. That said, "reference effect" might be a more appropriate term, because it is not necessarily ownership per se that drives the effect.

Thaler 1990), individuals are randomly assigned either to be buyers or sellers: willingness-to-pay (WTP) for an item is elicited from buyers, while sellers are given that item and their willingness-to-accept (WTA) for it is elicited. The endowment effect is manifested when WTA is higher than WTP (by more than any plausible income effect could explain). Though the phenomenon of the endowment effect has been replicated many times in these paradigms, the interpretation of this phenomenon is disputed: does it result from loss aversion, from non-preference explanations (e.g. subject misconceptions), other sources, or some combination of the above? Furthermore, how relevant is the effect outside the lab, in settings we ultimately care about?

The endowment effect was originally seen as evidence for loss aversion around a reference point determined by current ownership. However, new theories of the reference point have been developed (in particular, Kőszegi and Rabin 2006), and recent evidence suggests that the reference point is not solely determined by ownership. Furthermore, while leading models of reference-dependent preferences generally contain a single source of the reference point, the empirical literature has found many factors that affect behavior in a way that indicates they shift the reference point: ownership, expectations, history, proximity, etc. We discuss a loss-aversion framework that allows for multiple influences to affect reference points. We also present a variety of competing or complementary theories, mostly developed by psychologists, that are not based on loss aversion. While these theories are also relevant, they do not entirely supplant loss aversion in our view.

For this review, we divide the literature into three waves. Wave 1 includes the classic demonstrations of the endowment effect, which we use to introduce the loss aversion theory of the endowment effect, and a discussion of the endowment effect's early influence. Wave 2 examines challenges to the loss-aversion explanation for the endowment effect, and questions regarding its generalizability outside the lab. Wave 3 examines the most recent literature, distinguished by testing theories of the reference point. We then discuss alternative, non-loss aversion theories of the endowment effect, and some evidence on the neurological and evolutionary roots of the effect. Finally, we point to future directions for research.

Our focus on the endowment effect means that we only selectively engage the extensive literature on reference-dependent preferences. In particular, we do not cover applications of prospect theory to risky choice; see Barberis (2013) for a recent overview of that domain. Moreover, Kahneman et al. (1991) and Hoffman and Spitzer (1993) provide more extensive overviews of the early literature on the endowment effect. Finally, given the vast literature on the topic, we are forced to omit some relevant papers.

Wave 1: The Early Experiments and Theory

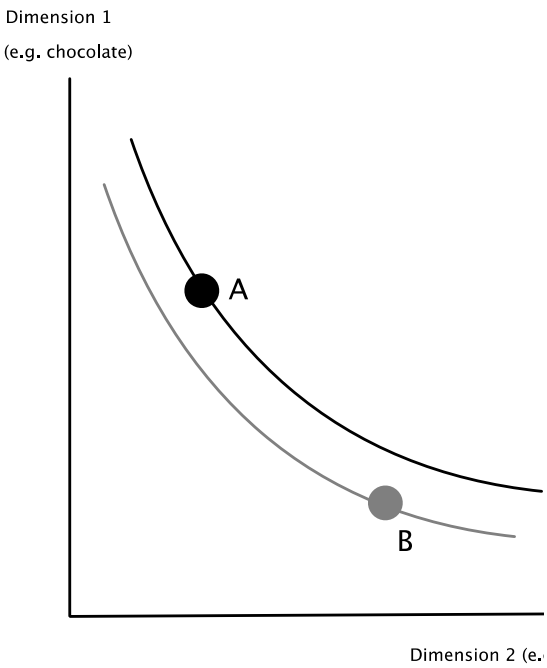
There are two classic paradigms that show the endowment effect: *the exchange paradigm* and *the valuation paradigm*. Both paradigms focus on the instant endowment effect in the laboratory, arising within minutes of the initial entitlement. This was considered a powerful demonstration of the endowment effect, with the design taking steps to rule out many alternative non-preference explanations for the result.

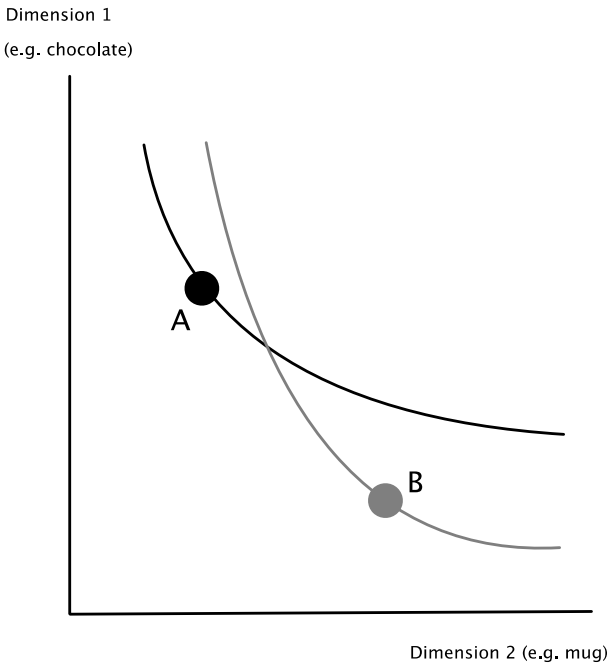
Exchange Paradigm

The exchange paradigm, developed by Knetsch (1989), shows the endowment effect in an extremely simple environment: subjects simply choose which of two items they prefer. In Knetsch's experiment, some participants were given a coffee mug, while others were given a chocolate bar. After a few minutes, participants were told that they could keep their items, or have the alternative item (by "trading" with the experimenter). Initial endowment mattered: 90% of those endowed with the candy chose the candy, while only 11% of those endowed with the mug chose the candy. (A third group, endowed with neither item, was given the choice between the mug and candy; 44% chose the candy.)

Standard (non-reference dependent) theory makes clear predictions: subjects should simply choose the item they prefer, initial assignment to an item should be irrelevant, and the fraction choosing the mug should be the same in both groups. This can be seen in the left panel of Figure 1: if a person with an endowment at point A prefers A to B, then they should also prefer A to B if they start at point B. Knetsch argued that the endowment effect was evidence for non-reversible indifference curves, shown in the right panel—individuals might use one indifference curve to compare A to B starting at point A (the black one), but another (the grey one) when starting at point B.

Another way of phrasing the prediction of standard theory is that half of participants should trade their item for the other item (assuming half the subjects begin with each item). This prediction holds regardless of the distribution of the valuation of the items, and is equivalent to endowment not predicting choice. For instance, if 80% of subjects preferred the mug to the chocolate, 80% of subjects endowed with the chocolate would trade and 20% with the mug would trade, for a total of 50%. Knetsch's results strongly reject this prediction; following Plott and Zeiler (2007), we will refer to his finding as an "exchange asymmetry."





indifference curves: A is preferred to B when starting from A, but B is preferred to A when starting from B.

Valuation Paradigm

The second paradigm is the *valuation paradigm*, often referred to by its result: the WTP-WTA gap. Again, non-reference dependent theory predicts that the WTA and WTP for an item (or other entitlement) should be approximately equal, apart from any income effect from getting the item. However, a substantial literature had noted that WTA and WTP were typically far apart for both hypothetical surveys about avoiding risks (Thaler 1980; Knetsch 1989), or in the contingent valuation of public goods and non-market resources (e.g. Heberlein and Bishop 1986). The hypothetical and unfamiliar nature of such questions was thought to drive this gap; furthermore, income effects for such entitlements could be large.

In lab experiments, the income effect is presumed to be small, since the value of the items used is small relative to individuals' wealth.[3] Also, unlike in hypothetical surveys, participants can be properly incentivized to reveal their "true valuation." Yet, the WTP-WTA gap continued to appear in a number of initial experiments (Knetsch and Sinden 1984, Heberlein and Bishop 1986).

The experiments by Kahneman, Knetsch, and Thaler (1990) were particularly convincing because they took steps to rule out alternative explanations for the gap. In Kahneman et al.'s series of experiments, participants were randomly assigned to be given an item ("sellers") or not given an item ("buyers"). Kahneman et al. then elicited sellers' WTA for the item, and buyers' WTP for that same item. The results were again striking: the median selling prices for the items were more than twice the buying prices. In contrast, no WTP-WTA gap was observed in rounds with induced value tokens (in these, subjects bought or sold tokens redeemable for a fixed amount of cash), suggesting that the gap was not due to confusion about the trading rules or transaction costs. Other treatments showed that the WTP-WTA gap was robust to multiple methods of eliciting valuation (the Becker-DeGroot-Marschak procedure, henceforth BDM, and multiple-price lists).

The exchange and valuation paradigms teach us complementary things about the endowment effect. The exchange paradigm is simple and rules out income effects, but doesn't tell us much about the quantitative importance of the endowment effect, since small changes in individual preferences are consistent with large changes in choices, if subjects were otherwise near-indifferent between the two items. The valuation paradigm permits a quantitative measure of the endowment effect. However, buying and selling are different for many reasons, so it is possible that WTP-WTA gaps can have sources other than loss aversion.

Other contemporaneous work also informed and broadened the endowment effect. For instance, Samuelson and Zeckhauser (1988) showed that status quo bias—a tendency to stick with the current state of affairs—is present in a variety of decision-making environments. Some of those contexts touch

[3] It might be possible to generate WTA-WTP gaps from income effects in the presence of mental accounting; see Shapiro and Hastings (2013) on field evidence for large income effects resulting from small changes in gasoline prices.

directly on the endowment effect and have a natural loss aversion explanation, while others are more naturally interpreted though other theories (e.g. cognitive dissonance, rational switching costs).[4]

Why did the endowment effect become so influential?

These demonstrations of the endowment effect attracted enormous attention among scholars in economics, psychology, law, and other disciplines. The finding represented a rejection of one of the fundamental assumptions in standard economics, namely the assumption that preferences are independent from endowments and consequentially, that indifference curves are reversible.

The endowment effect also seemed important in various applications, in particular the "Coase Theorem." Roughly, the Coase Theorem states that in the absence of wealth effects and transaction costs, initial allocations of property rights should not matter for the efficiency of final allocations, as affected parties will bargain to maximize total surplus.[5] The key assumption that WTP and WTA are independent of the initial property rights was contradicted by the experimental findings, implying final allocations of property rights would depend on their initial allocation. As a consequence, the endowment effect has been highly cited in legal scholarship over the past 20 years. Jolls, Sunstein, Thaler (1998), for instance, discuss that one may not see as much bargaining around court orders as expected based on the Coase Theorem. Similarly, mandated contract terms (e.g. employment benefits) may be "sticky" even after the mandate is no longer binding, as consumers/employees may value their entitlements more highly after incorporating them into their reference point. Klass and Zeiler (2013) note numerous other examples in which legal scholars invoke the endowment effect to provide an explanation for observed behavior, or to draw normative conclusions that differ from those of the standard model.[6]

[4] The valuation paradigm has also been applied to intertemporal choice. Loewenstein (1988) showed that WTP to speed up receipt of an item is typically below that WTA to delay receipt of that item—a phenomenon referred to as the "delay-speed up asymmetry".

[5] For instance, consider a homeowner who is protected by law against the fumes coming from a nearby factory. If his value of clean air is below the factory manager's value of being able to pollute, the manager can offer the homeowner a transfer for the right to pollute; the homeowner accepts, and the result is efficient. Most importantly, if the homeowner had not originally been entitled to clean air, the outcome would have been the same apart from the transfer (and any income effect). While transaction costs are often important, this idea nevertheless created an important benchmark for the economic analysis of law.

[6] The endowment effect's normative implications are messy: for instance, if stated WTAs and WTPs for a non-market good differ, it is unclear which one policy-makers should rely on. See Knetsch, Riyanto and Zong (2012) for a discussion.

A Loss Aversion Framework for Understanding the Endowment Effect

Gain-Loss Utility

Loss aversion—the idea that losses loom larger than equally-sized gains— has been the primary framework for explaining the endowment effect. Loss aversion is one of the key elements of Kahneman and Tversky's (1979) Prospect Theory and subsequent derivations.[7] In order to interpret the literature, we present an adaptable loss-aversion framework, based on Kőszegi and Rabin (2006), with three components:

1) Reference dependence: outcomes are evaluated with respect to a reference point or points, and individuals experience "gain-loss utility" in addition to standard "consumption utility."

2) Loss aversion: a loss of x relative to the reference point has a larger effect on gain-loss utility than a gain of x.

3) Consumption dimensions: for loss aversion to predict an endowment effect for riskless decisions,[8] individuals must disaggregate consumption into *consumption dimensions*. If gain-loss utility is merely aggregated into a consumption index *c,* as is standard in many economic applications, there would be no "loss" involved in trading one equally-valued item for another. Moreover, no endowment effect is predicted for goods that lie on the same consumption dimension, consistent with evidence that the endowment effect is smaller for similar items (e.g., Chapman 1998).

This model can accommodate multiple reference points, which may be important in explaining empirical data (see discussion below).[9]

Let $\mathbf{c}$ be a vector of an individual's consumption level on *K* dimensions. We do not place much structure on $\mathbf{c}$, but it can be helpful to think of the "mug" dimension and the "pen" dimension of consumption. Let $u_k = u_k(c_k)$ be the standard consumption utility from $\mathbf{c}$ in dimension *k*.

[7] The other aspects of prospect theory—diminishing sensitivity and probability weighting—are not necessary to interpret the endowment effect paradigms presented here, as these paradigms deal with binary outcomes and (typically) choice under certainty.

[8] Prospect theory for decision under risk does not rely on consumption dimensions.

[9] An alternative class of models would contain a single reference point that was affected by multiple factors. For example, in the "disappointment aversion" class of models (e.g. Bell 1985), agents take the mean of their outcome distribution as their reference point. There is little evidence available to distinguish between these two versions, though Sprenger (2011) suggests the multiple reference points version better explains choices under risk.

The reference point is a reference level of utility on each consumption dimension. Let there be *J* reference points—e.g. a reference point given by current endowments, a reference point given by expectations, etc. Each reference point $\boldsymbol{r_j}$ is a vector that specifies a reference utility level on each of the *k* dimensions.

Then, utility of a particular outcome $\mathbf{c}$ is given by:

$$U\left(\mathbf{c}\middle|\{\boldsymbol{r_j}\}_{j\in J}\right) = \sum_{\text{dimensions } k}\left\{u_k + \sum_{\text{references } j}\eta_j \mu(u_k - r_{jk})\right\}$$

The gain-loss function μ is the reference-dependent component of the utility function, and its main feature is that it has a kink at zero: we assume that it is a piecewise linear function with $\mu(x) = x$ for gains (when $x \geq 0$) and $\mu(x) = \lambda x$ for losses (when $x < 0$). Then $\lambda \geq 1$ measures the degree of loss aversion, with larger values indicating a higher degree of loss aversion. The weight on reference point *j's* gain-loss utility is given by η_j.

The Role of the Reference Point

A theory of the reference point is necessary for loss aversion to have predictive power. For instance, consider someone who currently owns a mug but could trade it for a pen. If the reference point is current ownership ($\boldsymbol{r_j} = \{1\ mug, 0\ pens\}$), an individual will display the endowment effect, as they will only prefer to trade if: $u_{pen} + \eta(u_{pen} - \lambda u_{mug}) \geq u_{mug}$, or $u_{pen} \geq \frac{1+\eta\lambda}{1+\eta} u_{mug}$. Thus, some individuals who would prefer the pen over the mug if they currently owned nothing now choose the mug instead, to avoid the loss. This is the typical interpretation given to the experimental findings described above.[10]

Choice would be different under an alternative reference point. Suppose that though the person currently owns the mug, the reference point were $\{0\ mugs, 1\ pen\}$. This reference point could have resulted from expectations of future outcomes, ownership history, etc. In this case, there would be no "endowment effect" in the sense of wanting to keep the mug: the individual would trade away the mug for the pen whenever $u_{pen} \geq u_{mug} + \eta(u_{mug} - \lambda u_{pen})$, or $u_{pen} \geq \frac{1+\eta}{1+\eta\lambda} u_{mug}$. In fact, the individual would display an "anti- endowment effect", in some cases trading away the mug even if $u_{pen} < u_{mug}$.

[10] This model also predicts a WTP-WTA gap, if the two dimensions considered are the mug dimension and the money dimension. In fact, this prediction goes through even if the decision-maker was only loss averse in the mug dimension but not the money dimension. See Novemsky and Kahneman (2005) for a discussion of studies that have investigated loss aversion over money, with mixed results.

The reference point was left imprecise in Tversky and Kahneman's (1991) theory of loss aversion in riskless choice; they suggested it is often an individual's current position, but could also be their aspirations, expectations, norms, or social comparisons. In applications, the reference point has often been assumed to be what individuals "already have" (in an amorphous way) or the "status quo" (Samuelson and Zeckhauser 1988), which are usually taken to be current legal entitlements. Kőszegi and Rabin (2006) made a major innovation by formalizing the reference point as recent expectations about future outcomes; these may be different from the status quo. We will return to the details of their theory later.

As the following sections will discuss, a number of different reference points have been found to affect choice in experiments, including: current ownership/the status quo, expectations of future ownership or consumption, historical ownership, and physical proximity. Other reference points— norms, social comparisons, arbitrary anchors, goals, reference prices, or contracts — likely also matter at least in some situations. These various concepts could provide the different $\boldsymbol{r_j}$ in the formulation above. To see how multiple reference points might matter, consider an employee who gets a year-end bonus of $9,800. They may have mixed feelings because i) it is more than they expected; ii) more than they got last year; but iii) less than their colleague receives, and iv) less than $10,000 (an arbitrary anchor).[11]

Wave 2: Challenges to existence and interpretation of endowment effects

Plott and Zeiler Experiments

By the early 2000s, the exchange and valuation paradigms' results had been replicated by various researchers in lab experiments; see Horowitz and McConnell (2002) for an overview. However, two influential papers by Plott and Zeiler (2005, 2007; henceforth PZ) re-examined the methodology used to demonstrate the endowment effect, and argued that the effect found in earlier studies was not evidence of reference-dependent preferences.

PZ (2005) revisit the valuation paradigm to test whether subject misconceptions could explain the WTP-WTA gap. For instance, subjects may not understand the BDM mechanism[12] used to elicit valuations, and thus might inappropriately use "buy low, sell high" heuristics. Moreover, if decisions are not

[11] See, for instance, the discussion in Kahneman (1992).
[12] Some papers use the BDM mechanism, while others use a multiple-price list design. Cason and Plott (2012) provide direct evidence that subjects misunderstand the BDM mechanism.

anonymous, subjects might be concerned with how they are viewed by others (for instance, as a good bargainer).

PZ find that with paid practice rounds (in which subjects can buy/sell lottery tickets under a BDM mechanism and repeatedly get feedback) and anonymity, the WTA-WTP gap for a mug indeed disappears -- in their pooled data from three experiments (*n*=74 in total), the mean and median WTP in fact exceed the WTA (though not significantly), which is the opposite of the "usual" result.[13] They conclude that "observed WTP-WTA gaps do not reflect a fundamental feature of human preferences," but instead "are symptomatic of subjects' misconceptions about the nature of the experimental task."

Recall, a major innovation of Kahneman, Knetsch, and Thaler (1990) was to show that while the WTP-WTA gap appeared for goods, it did not appear for induced value rounds. PZ replicate the finding of no gap in the induced value rounds in both their version of the Kahneman et al. procedures and in their preferred procedures. However, since they find a WTP-WTA gap for goods with the former procedures but not the latter, Plott and Zeiler argue that the absence of gaps in induced value rounds does not prove that subjects have no misconceptions.

In a subsequent paper, PZ (2007) reexamine the exchange paradigm. Here, the potential for misconceptions is much smaller, as subjects simply decide whether to exchange. However, PZ point to reasons unrelated to loss aversion that could have generated an exchange asymmetry in earlier studies. They hypothesize that subjects may not realize the good they are given is randomly selected, and may then (mistakenly) infer that the item they were given is better than the one they could trade for. Furthermore, PZ argue the language used in the experiment might signal information about the item: language suggesting the item is a gift may make subjects reluctant to exchange to avoid seeming ungrateful, and repeatedly emphasizing ownership may signal the 'correct' choice. They also note that an endowment effect might result if decisions are not private, or from (perceived) transaction costs (if the subject does not physically possess the non-endowed item and might have to wait for it if they choose to exchange).

PZ then alter various combinations of these design features and find that they matter strongly for behavior: while in a baseline treatment they find a pronounced exchange asymmetry, this asymmetry disappears (either completely or mostly) in their "full set of control" and "loss emphasis" treatments,

[13] In one of PZ's experiments, subjects were provided with extensive explanation and unincentivized practice of the BDM mechanism, but no paid practice rounds. The same result obtains (WTP>WTA, but not statistically significant), suggesting that paid practice rounds are not necessary for subjects to comprehend the mechanism.

where it is made clear to subjects that which good they received is random, where ownership is not repeatedly emphasized, and where subjects make their choice on a form (not by show of hands).[14] PZ again conclude that exchange asymmetries are unlikely to have resulted from loss aversion, but rather result from classical preferences interacting with experimental procedures.

Interpretation and Related Work in the Lab

Naturally, these influential studies generated follow-up work. Isoni et al. (2011) run experiments directly comparing PZ's procedures to Kahneman, Knetsch, and Thaler's (1990; henceforth KKT) procedures. Isoni et al. make two changes: first, they randomize assignment to procedure conditions, allowing them to identify a treatment effect of the procedures themselves; other studies compare results from different procedures without actually using randomization to prevent contamination from confounding factors. Second, Isoni et al. hold show-up fees constant, paying them to subjects assigned to the KKT procedures as well as the PZ procedures. Isoni et al. have two main findings regarding the WTP-WTA gap for goods: *no significant gaps* in their version of the KKT and PZ procedures, and *no difference in gaps* between the two procedures. They conclude that PZ's procedures did not remove misconceptions, but that some other factor drove the absence of the gap. Isoni et al. conjecture that "house money" effects may have been what removed the WTP-WTA gaps in PZ's procedures: in the original KKT experiment and in the PZ replication of it, subjects did not receive a show-up fee and buyers had to spend money from their pre-experiment endowment to purchase the item. See also the skeptical reply of PZ (2011).

Moving beyond goods, Isoni et al. (2011) show that a significant WTA-WTP gap exists in paid practice rounds for risky lotteries both in PZ's (2005) data, as well as in their own experiment. This gap did not decrease with repetition of the valuation task. In their reply, PZ (2011) argue that the lottery data are contaminated by irrational choices, distorted beliefs about the probabilities of lottery outcomes, and inconsistent risk preferences across rounds.[15]

[14] The two treatments differ by how strongly ownership is emphasized, and by the location of the endowed item at the time of choice. Based on these two treatments and an additional treatment, PZ conclude that the location of the item does not seem to matter much for whether an exchange asymmetry materializes. As discussed later, this contrasts with other work that finds physical proximity matters for valuation. Also, note that under PZ's "full set of controls," where subjects have physical possession of the alternative item (not the owned item) when they make their choice, PZ observe a reverse asymmetry (significant at p=0.06).

[15] Koh and Wong (2011) point out that the WTA-WTP gap for lotteries could also be driven by anticipatory regret.

Koh and Wong (2011) implement a number of changes to the PZ (2005) procedures, with the goal of "strengthening the reference state". In one experiment, buyers were not given possession of the mug when stating their WTP, and for sellers, giving up the mug was framed more as a loss than in the PZ procedure. Koh and Wong also eliminate the lottery practice rounds, which one of PZ's treatments suggested were unnecessary for the WTP-WTA gap to disappear. In this experiment, Koh and Wong find large and significant WTP-WTA gaps, suggesting that physical proximity to the item and the framing of the decision are important. In another experiment, they run their experiment under very similar procedures to PZ, except that they eliminate the practice round. In this experiment, they also find statistically significant (though smaller) gaps, suggesting that the paid practice rounds in PZ (2005) may have contributed to the elimination of the gap after all.

In related work, Knetsch and Wong (2009) revisit the PZ (2007) exchange procedures. They run three treatments: the first one is close to PZ's "full set of controls" and replicates the finding of no exchange asymmetry. The second one changes the wording on the decision form, such that giving up the item is framed more strongly as a loss, and endows subjects based on their student ID number. An exchange asymmetry appears (statistically significant, but of moderate size). In the third treatment, subjects are initially given physical possession of one of the items but are explicitly told that they do not own it yet (and, unlike in the other two treatments, they are not initially informed that they may have the possibility to exchange their item later). The decision is again framed as keeping versus giving up their item. In this treatment, despite the lack of formal ownership, a very large and significant exchange asymmetry obtains.[16]

Overall, this work suggests that while PZ's procedures affected behavior, it is unclear whether they removed misconceptions, or had an effect through another channel. While formal ownership alone may not always produce an endowment effect, other factors may be important in affecting the reference point, and indeed the body of results seems consistent with loss aversion around multiple reference points.

[16] In this treatment, unlike the other two, subjects are not told that the initial assignment of items was random, and so the observed endowment effect might be due to subjects believing that the alternative item is less valuable. Knetsch and Wong counter that a more likely belief is that the experimenter initially gives the less valuable item, in order to minimize the cost of the experiment.

Independently of the interpretation, however, an important lesson is that experimental procedures matter substantially. In particular, the early, stark findings were likely produced not by ownership alone, but by other factors as well.

What do we make of practical applications of the endowment effect, if one were to conclude based on this work that the "instant endowment effect" (caused by current formal ownership) is not a robust finding? First, note that for most applications discussed, for instance, in the legal literature, an *instant* effect is not required, as individuals generally own things for longer periods of time. And indeed, Strahilevitz and Loewenstein (1998) document that the endowment effect in an experimental setting appears to become stronger the longer subjects have owned an object, consistent with historical ownership providing a reference point around which people are loss averse.[17]

Perhaps more importantly, even if we discard preference-based explanations outside the standard framework, there are reasons why past or current endowment with an object or some other right may lower one's willingness to trade it. For instance, individuals may develop habits or sentimental attachments, invest in learning, make investments complementary with continued ownership (e.g. choosing a job near one's house), and so on. These explanations can fit within a standard framework yet also produce endowment effects that often (though not always) will have similar implications to those of instant endowment effects.

Relevance of the Endowment Effect Outside the Lab

While PZ's experiments indicated that findings from earlier lab experiments may not be as robust as previously thought, an equally influential study by List (2003) instead tested whether the endowment effect generalizes beyond the typical lab environment. List ran an exchange experiment with participants at sports card and pin shows, using sports memorabilia or pins of non-trivial value. Inexperienced traders displayed a strong reluctance to trade, in line with earlier lab findings. However, this reluctance declines with participants' trading experience and is absent for the most experienced traders and dealers.

In a closely related study, List (2004) again conducted an exchange experiment at a sports card show, but this time with mugs and chocolate bars. He found very similar results: a significant exchange

[17] The longest ownership duration in the Strahilevitz and Loewenstein study is one hour; it is an interesting question for future study whether the effect would further strengthen beyond that, or weaken instead (as the salience of the reference point may decrease).

asymmetry (consistent in magnitude with Knetsch's) for inexperienced consumers, a smaller asymmetry for more experienced consumers, and no asymmetry for the most experienced consumers and professional dealers. List's interpretation of the evidence in the two studies is that market experience can help people overcome the endowment effect, and it can do so even in domains different from the one where the experience got acquired.

An important question for the interpretation of these results is whether market experience *causally* eliminates the endowment effect, or whether the correlation between market experience and willingness to trade is simply due to selection into trading (as individuals who are less loss averse may be more likely to engage in trading activities). List (2003) repeated the exchange experiments a year later on a subset of the original participants. Individuals who increased their trading activity also decreased the extent of their endowment effect. This finding is consistent with a causal effect, but still may result from self-selection into increased trading activity.

Cleaner evidence would randomly allocate market experience, and List (2011) returns to the sports card market to do just that. He recruits 60 subjects and incents half of them to gain increased experience in the market over a six-month period by giving rewards for executed trades. The control group is given no such incentives. Then, all subjects participate in three exchange experiments with sports memorabilia. List finds that in the treatment group, the percentage of subjects that trade increases from 10 to over 50 percent from the first to the third round, while in the control group the trading propensity remains below one quarter. This is again consistent with market experience eroding the reluctance to trade that generates the endowment effect, although as List acknowledges, the design of the experiment could also give rise to an experimenter demand effect.

> **Box: Do people anticipate the endowment effect?** Loewenstein and Adler (1995) show that subjects without an object underestimate how much they would value that object once they receive it, evidence that is more consistent with the endowment effect resulting from tastes that are mispredicted than from a buy-low, sell-high heuristic. By neglecting the endowment effect, people will tend to accumulate more belongings than optimal if storing things is costly—a prediction that casual observation (of ourselves, others, and the self-storage industry) appears to confirm.

Engelmann and Hollard (2010) follow up on List's findings of experience reducing the reluctance to trade. They conjecture that an important driver of the endowment effect is "uncertainty regarding the trading procedure itself," coming for instance from possible perceived transaction costs or the risk of offending the experimenter they trade with. They design an experiment where half the subjects are "forced" to trade their items (otherwise they lose it) in three preliminary rounds, and find that those subjects then do not display an exchange asymmetry in the main (separate) trading decision of interest. Subjects in the other treatment, who have the possibility (but not obligation) to trade in the preliminary rounds still display an exchange asymmetry in the final trading decision. Engelmann and Hollard's interpretation of this evidence is that forced trade teaches subjects that trading is not as risky as they might have thought. Also, the learning here appears to happen much more quickly than in List's experiments, perhaps because without forced trade, subjects only make trades that are so advantageous to them that they don't focus on the potential trade risk and thus also don't learn about it.

Interpretation and Related Field Evidence

List's findings raised questions about how general the endowment effect is, as they suggest that the endowment effect will not be present with experienced market participants. However, most people do not acquire much experience trading (and especially selling) goods they own in a marketplace. Relatedly, while the most experienced traders in his setting do not display an endowment effect, equally interesting is the finding that there is an endowment effect for individuals that do participate in sports card trading, even if they are not very active.

Trade uncertainty, as proposed by Engelmann and Hollard, could well contribute to the endowment effect in- or outside the lab. However, it seems to provide only an incomplete account of some lab results: in particular, it would not directly predict the smaller observed endowment effect when the available items are similar (Chapman, 1998) or the absence of an endowment effect in PZ and other studies.

A recent field literature has examined the implications of the endowment effect and loss aversion for the design of incentives and "nudges." Hossain and List (2012) show in a field experiment that a simple framing manipulation can have nontrivial effects on factory workers' effort. They compare two treatments: one in which workers receive a provisional bonus which is revoked if they perform below a threshold, and an alternative in which workers earn a bonus if they perform above the threshold. The

thresholds and monetary consequences across the treatments are identical. However, in the first treatment, the provisional bonus plausibly becomes the reference point, meaning that earning less would be a loss, while in the second treatment the lower original salary is likely to remain the reference point. Hossain and List document that productivity is higher in the first treatment, consistent with an endowment effect. (The result is more robust for group reward treatments than individual reward treatments).

Turning to teachers, Fryer et al. (2012) examine whether the endowment effect can be leveraged to raise student achievement. They compare incentives framed as losses (teachers get money and have to give it back if their students don't meet performance targets), to standard incentives that are paid only if the target is met. They find that incentives framed as losses raise math test scores significantly (0.2 to 0.4 standard deviations), but find no impact of incentives framed as gains.[18]

These findings suggest that loss aversion is relevant in settings outside the lab and that it can be "used" by policymakers to implement more effective incentive schemes or "nudge" people towards desirable behaviors (Thaler and Sunstein, 2008). Of course this means it can also be used by firms to increase the surplus they can extract from consumers (see, for instance, Novemsky and Kahneman 2005 for some implications of loss aversion for marketing).

Wave 3: Expectation-based Reference Points

Theory[19]

The findings of PZ and List, along with the lack of a formal theory of reference points, paved the way for Kőszegi and Rabin's (2006) theory of expectations-based reference points. While previously, the reference point was somewhat of a free parameter, Kőszegi and Rabin formalized the reference point as an individual's recent expectations about future outcomes. As expectations are endogenous to an individual's planned action, and an individual's optimal action depends on their expectations-based reference point, an equilibrium concept is required. Kőszegi and Rabin impose rational expectations: when acting, individuals will maximize their expected utility given their reference point (itself

[18] In contrast, for incentives for students, Levitt, et al. (2012) find no difference between losses and gains.
[19] This exposition draws from Ericson and Fuster's (2011) account.

determined by their plan), and when planning, individuals correctly anticipate the action they will take once they have made a plan and developed the associated reference point.[20]

In the Kőszegi-Rabin model, the reference points in each consumption dimension, r_k, are now given by an individual's recent expectation of his utility in that dimension. For example, if a subject in an exchange experiment is endowed with a mug but no pen and expects (during the course of the experiment) to leave with the mug and no pen, Kőszegi and Rabin assume the individual's reference point is given by $\boldsymbol{r} = \{1\ mug, 0\ pens\}$. If, on the other hand, they expect to have the chance to trade the mug for the pen with probability p, and plan on doing so if this possibility arises, then their reference points (or "reference lottery") $\boldsymbol{r}$ would be $\{1\ mug, 0\ pens\}$ with associated weight $1-p$, and $\{0\ mugs, 1\ pen\}$ with weight p.

A crucial implication of the Kőszegi and Rabin theory is that changing the probability of getting to trade should change the willingness to trade. Consider the individual expecting the opportunity to trade their mug for the pen with probability *p*. If they planned to trade, would they actually follow through if given the possibility to do so (i.e. is trading a personal equilibrium)? Only if the utility of getting the pen, given their reference point, exceeds that of getting the mug: $U(pen|\boldsymbol{r}) \geq U(mug|\boldsymbol{r})$. Note that $U(pen|\boldsymbol{r}) = u_{pen} + \eta[(1-p)u_{pen} - \lambda(1-p)u_{mug}]$, with the loss of not getting the mug weighted by the loss-aversion parameter λ, and decreasing in *p.* A similar expression holds for $U(mug|\boldsymbol{r})$. The personal equilibrium condition then holds if

$$u_{pen} \geq u_{mug}\ \frac{[1+\eta(\lambda - p(\lambda-1))],}{[1+\eta(1+p(\lambda-1))]}$$

and it is easy to see that the right-hand side decreases in *p*.

This brings out the first important prediction of the theory for the endowment effect: an individual is less likely to be willing to trade something he currently owns for an alternative if the ex-ante probability that a trading possibility arises is lower. Notice that if *p*=0, the PE condition boils down to $u_{pen} \geq \frac{1+\eta\lambda}{1+\eta} u_{mug}$, the same as if the reference point were given by current endowments. The Kőszegi-Rabin

[20] Kőszegi and Rabin (2006, 2007, 2009) give multiple equilibrium concepts. Kőszegi and Rabin (2006) features "personal equilibrium" (plans must be consistent with optimal actions), and "preferred personal equilibrium" (you must pick the best personal equilibrium). They later (2007) refer to these as "unacclimating" personal equilibria, and introduce a new concept: "choice-acclimating personal equilibrium." Predictions of the different concepts can diverge, but all make roughly the same predictions in typical endowment effect settings (see Ericson and Fuster 2011).

theory is thus consistent with there being an endowment effect when there is little or no ex-ante chance that a trade will be possible, as is arguably the case, for instance, in the original Knetsch (1989) experiment. However, to really test this prediction, expectations need to be explicitly controlled for.

The second important prediction of the theory comes when $p = 1$, a situation where the individual is certain that the possibility of trade will arise. In this case (subject to the "preferred personal equilibrium" refinement) the individual should trade whenever $u_{pen} \geq u_{mug}$ and gain-loss utility does not enter the decision. As a result, if reference points are given by expectations alone, there should be no endowment effect if individuals know they can trade.[21]

Evidence from Endowment Effect Experiments

Ericson and Fuster (2011) test the first prediction, that the likelihood of trading should be higher if the possibility of trade is more likely to arise ex-ante. In their exchange design, Ericson and Fuster endow all subjects with a mug, and then tell subjects that they might have the option to exchange that mug for a pen. Subjects were then randomly assigned a probability *p* of having the option to exchange (*p*=90% or 10%, with the outcome based on the roll of a 10-sided die). Subjects completed filler tasks to give time for expectations to sink in, and then made a conditional decision: if given the option, would they prefer to keep the mug or trade the mug for the pen? Consistent with the Kőszegi-Rabin prediction, the fraction of subjects choosing to trade the mug for the pen rose from 23% in the low probability condition to 57% in the high probability condition.

Ericson and Fuster conduct a second experiment showing the effect of expectations in the valuation paradigm, modifying a set up used in Smith (2012).[22] In this set up, subjects were told that they had a high (80%) or low (10%) probability *p* of getting a mug for free. After letting expectations sink in, they then made conditional choices between money amounts and the mug to measure WTA for the mug. In this setting, the Kőszegi-Rabin theory predicts that WTA for the mug is increasing in *p* and loss aversion, with the effect proportional to the consumption utility of the mug: WTA $=\left(1+\frac{\eta(\lambda-1)}{1+\eta}p\right)u_{mug}$.

Again, as predicted by the theory, subjects who expected to get the mug for free with high probability had a 20% higher WTA for the mug. However, because variance of WTA for the mug is large, Ericson and

[21] Relatedly, Novemsky and Kahneman (2005) argue that goods exchanged as intended are not evaluated as losses.
[22] Smith's original draft was from 2008. Smith does not find significant effects of *p* on valuation, though his confidence intervals are rather wide. A potentially important difference between Smith and Ericson and Fuster is that Smith elicits valuations *after* subjects learn whether they receive the item; reference points may have adapted by the time the valuation is elicited.

Fuster also elicit WTA for a second item, a pen, to control for idiosyncratic factors that affect WTA for university merchandise. Controlling for the WTA for the pen raised the point estimate to 30% and improved precision.

Heffetz and List (2013) contemporaneously run a design similar to Ericson and Fuster's exchange paradigm; in a 2 x 2 design, they vary both the probability of getting to trade, as well as the default/endowed item. They provide evidence for an endowment effect that is based on "assignment": subjects who are assigned to get the mug with 1% probability (and get to choose with 99% probability) are more likely to choose to keep the mug than those who get assigned the pen with 1% probability. This assignment or default item effect seems very similar to an ownership-based endowment effect.

On the other hand, Heffetz and List find little evidence that expectation manipulation affects exchange behavior in their design, in contrast with the findings of Ericson and Fuster (2011). Their confidence intervals rule out even moderately sized effects of expectation manipulation on exchange behavior.[23] The design of Heffetz and List differs in some ways from Ericson and Fuster's exchange design. For instance, as also discussed by Heffetz and List, the manipulation of expectations may have been differentially salient (Ericson and Fuster used graphical, written, and verbal instructions, Heffetz and List used written instructions only).

Interpreting Previous Literature via Expectations

The Kőszegi-Rabin theory can explain why the endowment effect is absent in some experiments: when subjects expect to get to trade— based on instructions and procedures that explicitly or implicitly point out this possibility—their endowed item does not become differentially incorporated into the reference point. Thus, procedures intended to remove misconceptions may reduce the endowment effect by changing expectations about trading probability. For instance, PZ (2005) and Isoni et al. (2011) feature extensive instructions and training about the trading procedure before the endowment occurred. Thus, subjects were likely aware when they were given the mug that they would subsequently be able to sell it. Similarly, PZ (2007) began their sessions "by informing the subjects that mugs and pens would be used during the experiment. Subjects were then told that a coin was flipped before the start of the experiment to determine which good, the mug or the pen, would be distributed first." This again makes

[23] Additional experiments show that similar effects obtain when the probability of trade is 10%, or when the assignment of expectations is transparently random. Pooling across experiments, Heffetz and List can rule out (with 95% confidence) a 14 percentage point effect of expectations for subjects with the pen, and a 3 percentage point effect for subjects with the mug.

it plausible that subjects either anticipated the possibility of trade, or expected to receive the other item as well. Likewise, in Engelmann and Hollard (2010) having subjects trade repeatedly can induce expectations of trade and eliminate the endowment effect. Finally, Knetsch and Wong (2009, experiment 1) explicitly tell the subjects from the beginning that they will be able to trade, and as in the other studies cited in this paragraph, no endowment effect is found.

Yet, not all studies in which the possibility of trade is anticipated find that the initial assignment is unimportant. Knetsch and Wong (2009)'s experiment 2 also makes it clear to subjects that they will be able to trade their item for the alternative at the end, yet an exchange asymmetry is observed; the main difference to their experiment 1 being that the original endowment is now based on student ID number. Heffetz and List find a significant exchange asymmetry in their treatments with high likelihood ($p=0.9$ or 0.99) of trade being possible, after their subjects had been endowed with their item based on a coin flip. This suggests that the method of endowment may affect behavior independently of valuations. And in the Kahneman, Knetsch and Thaler (1990) repeated-market trials, subjects likely anticipated the possibility of trade (at least after the first round), yet the WTP-WTA gap persisted, suggesting (as discussed earlier) that factors other than (expected) ownership may have contributed to the gap.

This area is ripe for future research. On the one hand, the Kőszegi-Rabin theory nicely explains why the endowment effect is often absent when the forthcoming possibility of trade is (implicitly or explicitly) communicated to subjects. On the other hand, the effect of directly manipulating expectations in this context is mixed. One conjecture is that the effect is not necessarily driven just by "probabilistic expectations" (the way an economist would think about them) that matter, but also by probabilities of different outcomes affecting how much or how intensely subjects think about one versus the other item.[24] This is related to research by psychologists, as discussed below.

Related Evidence and Implications

Moving outside the lab, expectation-based reference points could potentially explain List's (2003) finding that experienced traders do not display an endowment effect for sports memorabilia (they may simply anticipate that they will trade them again soon) but that inexperienced traders do (they may be more likely to anticipate keeping the item). However, the Kőszegi-Rabin theory would not necessarily

[24] Consistent with this, Ericson and Fuster find in their exchange experiment that subjects in the low probability condition tend to agree more strongly with the statement that they thought more about the mug than the pen (see the working paper version of the article). Heffetz and List do not find a difference in this across treatments in their experiment.

explain why these experienced traders also don't seem to exhibit an endowment effect for mugs and pens (List 2004), unless one believes that they also anticipate trading those in the future, which seems unlikely.

Other work has examined whether expectations affect reference points outside of the classic endowment effect paradigms. Ariely and Simonson (2003) and Heyman, Orhun and Ariely (2004) argue that bidders that hold the winning bid in an online auction for longer are subsequently more likely to increase their bid past their original WTP, in order to avoid losing their "quasi endowment," which can be interpreted as an expectation-based reference point. Abeler et al. (2011) manipulate expectations in a real-effort experiment, where subjects know that they will receive either a fixed payment or be paid according to their effort. When the amount of the fixed payment is higher, subjects work more, as predicted if subjects wanted to avoid being disappointed. Similarly, Gill and Prowse (2011) find evidence of disappointment aversion in a real-effort competition. Two recent studies test particular predictions of the Kőszegi-Rabin framework in a purchase decision situation: Karle, Kirchsteiger, and Peitz (2013) find support for the Kőszegi-Rabin prediction, while Wenner (2013) does not. In the field, Crawford and Meng (2011), and Pope and Schweitzer (2011) find evidence consistent with expectations-based reference points for cab driver labor supply and professional golfer effort.

If people are loss averse relative to reference points based (at least in part) on expectations rather than ownership, some implications of loss aversion are unchanged — this is the case whenever the status quo is expected to persist (e.g. you own something and expect to keep owning it). However, in other settings, the implications can be quite different. For instance, loss aversion may not inhibit trade in situations where individuals expect to trade, as discussed above. This could lead to multiple equilibria in settings that are ex-ante identical: in one equilibrium, no one expects to trade, and it would be difficult to get people to trade; in another, many people expect to trade, which leads them to not be loss averse relative to their endowment, and results in many transactions. Expectation-based reference points can thus be another source of "thick-market externalities." The consequences of expectation-based reference points have also been explored theoretically in industrial organization (Heidhues and Kőszegi 2008), contract theory (Herweg, Müller, and Weinschenk 2010), consumption-savings analysis (Kőszegi and Rabin 2009) and other settings.

Alternative Theories of the Endowment Effect

Loss aversion has been the leading theory to explain the endowment effect. Under one view, loss aversion tracks some sort of experienced utility flows—people not only behave loss averse, but "feel" losses. Under another view, loss aversion is a reduced-form model that captures complicated mental processes to lead objects in the reference point to be valued more.

Here, we examine alternative valuation-based theories (endowment affects the utility of an item) that have been proposed to explain the endowment effect. Our discussion in Wave 2 already considered process-based theories (e.g. subject misconceptions and trade uncertainty).

Motivated Taste Change

In the theory of "motivated taste change", owning an item increases the utility of that item: like judgments about oneself, judgments about an item one owns are also subject to self-enhancing biases (Beggan 1992). Motivated taste change produces an endowment effect, as owners will value an item more than non-owners. However, in this account, there is no special role of "loss" in giving up an endowed item; rather, the endowment effect would result from ownership changing the perceived utility of an item. The endowment effect should not be used as evidence for reference-dependent preferences more broadly if it were fully explained by motivated taste change.

Motivated taste change and loss aversion can be distinguished in two ways: motivated taste change should raise the perceived usefulness or attractiveness of an owned item (since owned items are evaluated more favorably), while loss aversion makes no such prediction (instead, merely giving up the item is painful). Similarly, under motivated taste change, owning one item should raise an individual's value of a second identical item (since both should be perceived as more valuable).

Early evidence for motivated taste change (Beggan 1992) found that owners of an item rated it more highly than non-owners. However, these results were challenged by Barone, Shimp, and Sprott (1997a, 1997b), who argue that Beggan's findings were due to experimenter demand effects. Strahilevitz and Loewenstein (1998) find no evidence for taste change when ownership had only lasted for a few minutes, as in typical experiments, but find some taste change for goods owned over a long period of time (about an hour).

Morewedge et al. (2009) find that people who already received a mug for free have a significantly higher WTP for a second mug than non-owners do for a first mug (or per mug if given the opportunity to buy

two). Their finding is consistent with the motivated taste change story, since owning one mug could enhance its perceived value, but is not predicted by loss aversion, since the second mug is a gain for both groups. However, Plott and Zeiler's concern about subject misconceptions from experimental procedures (i.e. perceiving the mug as a gift, etc.) may apply here, and may have contributed to the observed difference in valuation. Moreover, Ericson and Fuster (2011) find no difference in the valuation of a second mug between subjects with higher versus lower expectations of getting one mug, suggesting motivated taste change was not driving the effect they observed from expectations.

Cognitive Perspective and Query Theory

Carmon and Ariely (2000) propose that the endowment effect arises because buyers and sellers pay attention to different aspects of the transaction: sellers focus on the item they might give up, while buyers focus on the potential expenditure. Supporting this view, Carmon and Ariely show, in experiments using NCAA basketball tickets, that selling prices are more sensitive to changes in the salience of certain attributes of the event than buying prices, while the latter are more sensitive to changes in the salience of the face value of the tickets.

Related to this, Johnson, Haubl, and Keinan (2007) offer a "query theory" account of the endowment effect. They begin from the premise that preferences are constructed (e.g. through memory retrieval), and argue that endowment changes the order of 'queries' we ask ourselves. Owners may first look for reasons not to sell/trade, while buyers may look for reasons not to spend money on an item. Indeed, Johnson et al. find that buyers (as compared to sellers) have more positive thoughts about money and more negative thoughts about the mug. They then show that the endowment effect disappears when participants are told to follow a query process opposite to that predicted by the endowment effect.[25]

Bordalo, Gennaioli and Shleifer (2012) provide a model of the endowment effect based on salience, but very much related to the ideas above. In their model, the value of endowed goods is formed against the backdrop of not having them, leading individuals to focus on the endowed good's most valuable attributes; these attributes become salient and are relatively overweighed. When considering whether to trade, the increased salience of these attributes persists in part—leading to higher relative value for the owned good—even as the new comparison focuses on the goods' relative advantages.

[25] See also Burson, Faro, and Rottenstreich (2012), who argue that query theory may explain their intriguing finding that the endowment effect is attenuated when individuals are deciding whether to trade bundles of goods (e.g., seven chocolates against five pens).

The relationship between these focus- and salience-based accounts and loss aversion can be interpreted in different ways: they can either be seen as providing a more detailed mechanism for why losses loom larger than gains, or as supplanting loss aversion altogether. An open question is whether loss aversion has additional predictive power conditional on the attention paid to different aspects of the transaction or the queries used to construct value.

Attachment

Carmon, Wertenbroch and Zeelenberg (2003) argue that close consideration of options can induce attachment to them, a "sense of prefactual ownership." In their account, attachment is generated by psychological proximity (which increases in how long or intensely one thinks about an option), and people dislike breaking attachments.

Physical proximity is one factor that seems to affect attachment (Bushong et al. 2010), along with the act of physically touching an object (Peck and Shu 2009). Reb and Connolly (2007) find that physical possession, not factual ownership, appears to explain the WTP-WTA gap in a valuation experiment. As pointed out earlier, Koh and Wong (2011) also document evidence along those lines.

The source of an object also seems to matter for valuation: Loewenstein and Issacharoff (1994) find that subjects value an object more if they obtained it as a result of good performance on a task rather than if they got it by chance. Similarly, creating an object oneself seems to enhance its value (e.g. self-assembled Ikea furniture or self-built sets of legos; Norton, Mochon, and Ariely 2012). Both of these results could be interpreted in the lens of attachment theory—the process by which you get an object affects your attachment to it.[26]

Attachment looks like loss aversion—especially expectation-based loss aversion. Attachment may be a mechanism by which reference-points are formed: things you become attached to form a reference point, and losses relative to that reference point are painful. In this view, attachment theory is a categorization of ways items become incorporated into your reference point.

Aversion to Bad Deals: Reference Price as a Reference Point

Weaver and Frederick (2012) provide evidence for a "reference price theory" of the endowment effect (see also Isoni 2011). In this theory individuals are adverse to "bad deals" and they experience disutility

[26] Loewenstein and Issacharoff (1994) argue source dependence in valuation rises from "associationism", in which the value of objects is enhanced because they become associated with positive memories.

from selling at a price below a reference price, or buying at a price above a reference price. Along these lines, Brown (2005) finds that "seeking a good deal" is a more frequently referenced justification for constructing WTP and WTA for items than loss associated with giving up endowments. Because individuals experience no disutility from trading at the reference price, this theory predicts no endowment effect when the reference price is near individuals' valuation. Consistent with this prediction, the WTP-WTA gap in Weaver and Frederick (2012) is u-shaped, lowest at moderate prices. Although Weaver and Frederick (2012) contrast their account to a "pain-of-losing" account, their theory may be accommodated with a loss aversion theory, setting the reference point as the reference price.

Other Perspectives

Neuroeconomics

In addition to behavior, researchers can directly examine the mental processes underlying behavior using neuroscientific methods. Neuroeconomic research typically proceeds by engaging subjects in a task while using functional magnetic resonance imaging (fMRI) to measure activation patterns in the brain. Features of the task are then correlated with activation patterns. Rick (2011) reviews the neuroeconomic literature on loss aversion; here we focus on endowment effect related paradigms.

The literature is mixed, but suggests that the endowment effect is associated with regions of the brain implicated in negative emotions. Weber et al. (2007) compared subjects buying and selling digital songs, and found significantly higher amygdala activation when selling. The amygdala is associated with negative emotions, such as fear, supporting the interpretation of the endowment effect being associated with a "pain-of-losing" account.

Knutson et al. (2008) compared subjects buying, selling, and choosing consumer items, and found activation in the medial prefrontal cortex (an area associated with receipt of money) correlated negatively with price when buying and positively with price when selling, suggesting that the net gain of the transaction was incorporated in this area. They also found some evidence that increased insula activation (a region associated with distress) correlated with a larger endowment effect, supporting the idea that gains and losses are processed by distinct neural circuits. De Martino et al. (2009) examined subjects buying and selling lottery tickets and also found that insula activation correlated with the size of the endowment effect.

However, there are still unresolved questions: in contrast to Weber et al., Knutson et al. (2008) do not find increased amygdala activation in the selling conditions. Moreover, Tom et al. (2007) do not find any brain areas that correlate with the size of losses in risky gambles.

How Basic is the Endowment Effect?

Examining whether the endowment effect is present in our evolutionary ancestors and in children can provide additional information on the source of the endowment effect.

Lakshminarayanan, Chen, and Santos (2008) show that capuchin monkeys demonstrate the endowment effect in a token trading task (for fruit discs versus cereal chunks).[27] They build on previous work (Brosnan et al. 2007) showing the endowment effect in chimpanzees, but in this case took steps to eliminate potential confounds due to transaction costs and timing delays. Lakshminarayanan, Chen, and Santos argue that their results provide evidence for the loss aversion account of the endowment effect, since it is unlikely that non-human primates have a sophisticated notion of ownership or are subject to the self-enhancement biases underlying the motivated taste change account.

Evidence on the origins of the endowment effect in humans is more mixed. Harbaugh et al. (2001) show that children (5 to 10 years of age) display the endowment effect in trading for toys, suggesting that the endowment effect is hard-wired and appears before we are exposed to markets or bargaining. In contrast, Apicella et al. (2013) test for the endowment effect in the Hadza, a group of hunter-gatherers living in an environment approximating that in which humans evolved. Hadza with exposure to markets and modern society display the endowment effect, while those living in isolated regions do not. This suggests that culture does influence the extent of the endowment effect.[28]

Looking Back and Forward

We look back on waves 1 through 3 of research on the endowment effect and see a robust finding that becoming 'attached' to an item leads to a reluctance to give up that item, and that attachment can come from a variety of factors —ownership, expectations, history, physical proximity, and others. Loss aversion parsimoniously accounts for many observed facts about the endowment effect, and is— in our

[27] The finding has been extended to other species as well (e.g. Kanngiesser et al. 2011, Flemming et al. 2012).
[28] One interpretation is that conditions needed for loss aversion to produce the endowment effect did not apply to the isolated group. For instance, the isolated group may have been more likely to expect to give away the items (the Hadza are highly egalitarian), leading them not to incorporate the item into their reference point.

view—still the leading paradigm for understanding the endowment effect.[29] This conclusion is controversial (see e.g. Klass and Zeiler 2013). The endowment effect has a rich psychology, and seemingly small procedural details matter substantially. Under one view, this means the effect is fragile; under another, this means it results from many influences.

An important question to consider is what the use of further laboratory experiments in this area is. We believe that experiments are most useful to test particular theories of the endowment effect or, more broadly, theories of reference-dependent preferences, such as the Kőszegi-Rabin theory. However, they may be less useful to assess the importance of the endowment effect outside the lab. First, it is not clear how important the "instant" endowment effect in the lab is relative to an endowment effect that grows with the amount of time one has owned (or expected to own) an item. This is related to the broader issue of how quickly reference points adapt, which to us is among the main challenges for further research. Second, the items considered in lab experiments are of trivial value relative to the goods for which we would care about the endowment effect in applications outside the lab (for instance, a house). While this is difficult to do, it would be very desirable to get more evidence from field settings with goods or entitlements of substantial value. Relatedly, more research is needed in the field that examines how decisions in important domains such as education, health, labor supply, or savings/investment are affected by changes in ownership, expectations about the future, and framing.

We point out a few additional challenges for further research:

Challenge 1: Estimating Quantitative Theoretical Parameters. Multiple different reference points can affect behavior, but existing research has focused on identifying whether a particular factor affects behavior. Thus, we do not yet have evidence on the relative importance of the various reference points. In particular, the theory framework presented earlier (based on Kőszegi-Rabin) contains two important sets of parameters: the weights η_j on each of the *j* reference points, and the loss aversion coefficient λ. We do not have any estimates of the various η_j parameters, nor of loss aversion parameters taken from riskless choice.

Challenge 2: The loss aversion account of the endowment effect crucially relies on consumption dimensions. However, we have limited evidence on this aspect of mental accounting, and do not have a sharp theory of consumption dimensions.

[29] Another advantage of the loss aversion framework is that it can also explain observed patterns in decision making about risky monetary gambles.

Challenge 3: A theory of ownership. While ownership is probably the most frequently considered reference point, we do not have a sharp theory of ownership-based reference points. Ownership/endowment of things is not binary, neither from a legal standpoint nor from individuals' perspectives (see the discussion in Klass and Zeiler 2013). For instance, a lease grants an individual certain rights to the car or apartment, though the individual does not own the thing itself. In other cases, an individual may have what in law is called a "future interest" in property (i.e. ownership will be transferred if a condition is met). Economists could draw on psychological research that has distinguished between a "feeling of ownership" (psychological ownership) and legal ownership (see Pierce, Kostova and Dirks 2003). Engaging theories of ownership seems crucial given the dispute over whether ownership alone leads to an endowment effect.

The literature on the endowment effect is large, but still has room to grow. It is surprising that the interpretation of such a simple paradigm is still disputed; this is a consequence of the rich psychology underlying it. The endowment effect has direct implications in a variety of economic applications, and both policy-makers and firms can potentially leverage it to their advantage. The endowment effect has also been considered a major piece of evidence for reference-dependent preferences. We believe loss aversion around multiple reference points is supported by the current evidence, but more research testing— and quantifying— models is necessary.

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