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Salience in Experimental Tests of the Endowment Effect[†]

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Starting with Knetsch (1989), experiments on the "endowment effect" (Thaler 1980) typically rely on a two-stage procedure. In the first stage, subjects are endowed with a good, such as a mug. In the second stage, the same subjects are given the opportunity to trade this good for another good of similar value, such as a pen. The endowment effect holds that very few subjects chose to trade, sometimes as few as ten percent. In related experiments, subjects state selling prices for their endowment that are much higher than their buying prices for the same good. These patterns are hard to reconcile with standard choice theory, which predicts that about half the subjects would trade and that selling prices and buying prices are similar.

The common explanation of this evidence relies on prospect theory's loss aversion (Tversky and Kahneman 1979). Because the pain of parting with the endowment looms larger in the decision maker's mind than the pleasure of acquiring a good of similar value (Kahneman, Knetsch, and Thaler 1990), a decision maker endowed with a mug is unwilling to trade it for a pen (or states a high selling price).[1]

Recent experimental evidence, however, suggests that loss aversion relative to expectations may not be the whole story. Perhaps the most revealing fact is that the endowment effect is sensitive to the type of goods involved and to the information available about them. Novemsky and Kahneman (2005) argue that the endowment effect should not arise in exchanges of identical goods. Brenner et al. (2007) show that the pattern reverses in experiments concerning bads rather than goods, as decision makers become systematically eager to trade away their bad endowment. In experiments investigating the gap between selling and buying prices, the gap is sensitive to information about the market price of the endowment (Weaver and Frederick 2011).

A common thread of these works is that contextual factors such as the nature of the goods involved or the information provided about market prices systematically affect the manifestation of the endowment effect in ways difficult to reconcile with standard accounts based on reference points and loss aversion. In this paper, we try to account for these findings by modeling the endowment effect as a form of context dependence, arising through the salience mechanism described in Bordalo, Gennaioli, and Shleifer (hereafter, BGS) (2011, forthcoming). As reviewed next, when a decision maker contemplates the options available to him, he focuses on—and gives disproportionate weight to—those features along which each option "stands out," or is salient, relative to the other options. In this way, a good's salient features, and thus its evaluation, depend on what it is compared to. The gist of our salience-based explanation of the endowment effect is that the two-stage procedure implemented in experiments (but perhaps also the experience of ownership in the real world) implies that the endowment and the other goods are evaluated in different contexts.

Specifically, after the decision maker is given the endowment good e, he values it in comparison with his status quo of having nothing. In this context, what stands out are good e's best attributes. The decision maker overweights these attributes, which leads to an overvaluation of good e. This captures a perceptual "warm glow" induced by receiving a gift or getting ownership

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[1] By modeling the reference point as expectations, Kőszegi and Rabin (2006) reconciled the endowment effect with the fact that people trade in large amounts if they expect to do so. See also List (2003), Ericson and Fuster (2011), and Heffetz and List (2011).

of an object (Tversky and Griffin 1991), driven by the decision maker's focus on that object's upside. In the second (trade) stage, the decision maker is given the option to trade the endowment e for a new good n. Now the evaluation of n is shaped not only by the backdrop of having nothing but also by the contrast between n and e. When this contrast makes salient the new good's disadvantage relative to the endowment, the decision maker undervalues the new good and displays the endowment effect.

The critical asymmetry between the endowment and the new good comes from the warm glow of ownership: when the decision maker receives a mug, he focuses on its most valuable uses. These uses are still present in his mind when he considers exchanging the mug for a pen, so that the mug's valuation persists in the second stage. This logic yields the new predictions that the endowment effect should be reversed in the case of bads, should not arise when identical goods are exchanged, and that its manifestation should be sensitive to information about market prices.

I. Salience

Following BGS (2011), we consider the simplest case of two-attribute goods, where a generic good k is a two-dimensional vector of qualities $(q_{1k}, q_{2k}) \in R^2$, and the decision maker's intrinsic utility is linear in the attributes, $v(q_{1k}, q_{2k}) = w_1 q_{1k} + w_2 q_{2k}$, where the weights w_i sum up to 1. The *perceived* value of the good, however, differs from its intrinsic value because the decision maker overweights the good's salient attribute at the expense of its nonsalient attribute: if attribute i is salient and attribute j is not, then the decision maker evaluates good k with weights given by

$$\frac{w_i^{LT}}{w_j^{LT}} = \frac{1}{\delta} \cdot \frac{w_i}{w_j}, \qquad w_i^{LT} + w_j^{LT} = 1,$$

where $\delta \in (0, 1]$ captures the degree to which the decision maker neglects nonsalient features. Referring to such neglect, we call our decision maker a "local thinker" (when $\delta = 1$ the local thinker is a standard, rational decision maker).

Which attribute is salient for good k depends on two factors: the decision maker's consideration set C and a salience function $\sigma: R^2 \to R_+$. The set C includes the goods considered by the decision maker when evaluating good k, and provides our measure of context. The salience of attribute $i = 1, 2$ for good k is a function $\sigma(q_{i,k}, \overline{q}_i)$ that measures the extent to which the good's attribute i "stands out" relative to its average value $\overline{q}_i$ in C. This intuition is in line with well-established features of human perception: our visual apparatus automatically allocates scarce attentional resources to aspects of the environment that are most surprising or different from what is expected. To capture these features of perception, we assume that the salience function satisfies three properties: (i) *ordering*: whenever an interval $[x, y]$ is contained in a larger interval $[x', y']$, we have $\sigma(x, y) < \sigma(x', y')$; (ii) *diminishing sensitivity*: for all $x, y > 0$ and any $\epsilon > 0$, we have $\sigma(x + \epsilon, y + \epsilon) < \sigma(x, y)$; and (iii) *reflection*: if $x, y, x', y' > 0$ then $\sigma(x, y) < \sigma(x', y')$ if and only if $\sigma(-x, -y) < \sigma(-x', -y')$.

Following BGS (2011), we use a salience function symmetric and homogenous of degree zero $(\sigma(\alpha x, \alpha y) = \sigma(x, y) = \sigma(y, x)$ for all $\alpha > 0$, with $\sigma(0, 0) = 0)$, which is sufficient to ensure diminishing sensitivity. A typical example is $\sigma(x, y) = |x - y|/(|x| + |y|)$. Due to ordering, salience $\sigma(q_{ik}, \overline{q}_i)$ increases with the distance $|q_{ik} - \overline{q}_i|$. Due to diminishing sensitivity and reflection, $\sigma(q_{ik}, \overline{q}_i)$ decreases as q_{ik} and $\overline{q}_i$ rise in absolute value.

II. Of Mugs and Pens

To formalize trade of mugs for pens, suppose that q_1 captures a good's "quality for drinking" while q_2 is its "quality for writing" (both measured in utils), and that the decision maker puts equal weight on both attributes, $w_1 = w_2 = 1/2$. A mug M is a good $(q_M, 0)$, a pen P is a good $(0, q_P)$, where the zeros capture the fact that experiments involve no writing mugs or drinking pens.[2] Suppose further that M and P have the same quality level $q_M = q_P = q$. Then, absent salience distortions, the decision maker values both objects at $q/2$.

As the decision maker is given the mug in the endowment stage, he evaluates M against the status quo $(0, 0)$ of not having it. The consideration set is $C^e = \{(q, 0), (0, 0)\}$ and the average good is $(q/2, 0)$. By ordering, the quality of the

[2] The main results go through for complex goods having nonzero attribute values.

mug is salient: $\sigma(q, q/2) > \sigma(0,0) = 0$. The local thinker weighs by $1/(1+\delta)$ the mug's quality for drinking and by $\delta/(1+\delta)$ its (zero) quality for writing, so that the weights add up to one. The mug's perceived value is

$$(1) \quad v^{LT}(M \mid C^e) = q \cdot \frac{1}{1+\delta} > q \cdot \frac{1}{2}.$$

The mug is overvalued because its quality is salient against the backdrop of not having it. Since in the endowment stage the local thinker's focus is on the mug's quality, this focus should also play a role when he subsequently considers whether to trade the mug. To capture this idea in a simple way, we assume that the mug's salience ranking in the endowment stage carries through to the trading stage with probability γ: when $\gamma > 0$ there is a warm glow of ownership in the trading stage.

In the trading stage, the decision maker must decide whether to trade his mug for a pen. The consideration set thus becomes $C^t = \{(q,0),(0,0),(0,q)\}$, and the average good is $(q/3, q/3)$.[3] As a result, the pen's quality for writing is not salient because

$$\sigma(0, q/3) > \sigma(q, q/3) \Leftrightarrow \sigma(0, 1/3) > \sigma(1, 1/3),$$

which follows from homogeneity of degree zero. Due to diminishing sensitivity, the pen's complete lack of quality for drinking is more salient than its higher-than-average quality for writing, implying that at the trading stage the value of the pen is

$$(2) \quad v^{LT}(P \mid C^t) = q \cdot \frac{\delta}{1+\delta} < q \cdot \frac{1}{2}.$$

Because the mug and the pen are perfectly symmetric goods, in the trading stage C they both have a salient downside. Accounting for the warm glow of ownership, however, the mug's average valuation in the second stage is

$$(3) \quad v^{LT}(M \mid C^t, C^e) = q \cdot \frac{\delta(1-\gamma)+\gamma}{1+\delta}.$$

The mug may also be undervalued relative to the rational case. As long as $\gamma > 0$, however, it is valued more than the pen. As a consequence, the local thinker keeps it, exhibiting the endowment effect.[4] If $\gamma = 0$, the endowment effect disappears.

This mechanism can provide a context-based foundation for loss aversion based on the idea that the valuation of the goods we own is at least partly formed against the backdrop of not having them, while trades are valued by comparing exchange options.[5] The first comparison induces us to focus on the best attributes of the goods we own, while the second comparison induces us to focus on either good's relative disadvantages. The combination of the two stages boosts the relative valuation of the goods we own. This perspective on the endowment effect makes several testable predictions:

(i) If the good available for trade is an identical mug, $(q,0)$, then $C^t = \{(q,0),(0,0),(q,0)\}$, and the average good is $(2q/3, 0)$. Because $\sigma(q, 2q/3) > \sigma(0,0)$, the upside is salient both for the new mug and for the original one, so both are valued at (1). There is *no endowment effect for identical objects*. Similarly, if the new good is a better mug, $(2q,0)$, the decision maker likewise focuses on its upside and overvalues it. There is *no endowment effect in upgrading*. The endowment effect requires a trade-off between the endowed good and the new good.

(ii) If the endowment is a bad $(-q,0)$, then in the endowment stage the decision maker focuses on the bad's downside because $\sigma(-q, -q/2) > \sigma(0,0)$. Given the option to trade the endowment with a different bad $(0, -q)$, he focuses on the upside 0 of the latter: by diminishing sensitivity and reflection

[3] Removing decision maker's status quo $(0,0)$ from C^t does not substantially affect our analysis.

[4] Expression (3) can also be interpreted as the evaluation of a subject who averages between the salience rankings of the two stages.

[5] If the pen is sufficiently better than the mug, e.g., $q_P > q_M \cdot \left[1 + \gamma \frac{1-\delta}{\delta}\right]$, the local thinker will trade the pen for the mug (even though the pen's downside is still salient). The coefficient in square brackets can be viewed as the loss aversion parameter.

$\sigma(0, -q/3) > \sigma(-q, -q/3)$. In the case of bads, there is then a "cold glow" of ownership and people are overly willing to trade their lot. There is a *reverse endowment effect for bads*.

(iii) If the endowment is a pen and a mug, the warm glow of ownership would apply to all goods. As a result, keeping the assumption of linear utility, the decision maker is no longer reluctant to exchange a mug for a pen (or vice versa) in the trading stage. Thus, there is *no endowment effect for comprehensive endowments*.

III. Of Mugs and Bucks

We now turn to the experimental evidence of a gap between decision makers' willingness to pay (WTP) and willingness to accept (WTA). Consider again the case of a mug of quality q. Here q_1 is the quality q of the mug while $q_2 = -p$ is its price disutility. The utility from the mug $(q, -p)$ is $q/2 - p/2$.

In the endowment stage the consideration set is $C^e = \{(q,0),(0,0)\}$ and the mug's upside is salient. In the trading stage the decision maker includes in the consideration set the option $(0, WTA)$ of obtaining his *WTA*, so $C^{WTA} = \{(q,0),(0,0),(0,WTA)\}$. As before, by diminishing sensitivity the downside of all options in C^{WTA} is salient. The decision maker's utility from $(0, WTA)$ is

$$(4)\quad v^{LT}((0,WTA)\,|\,C^{WTA}) = WTA \cdot \frac{\delta}{1+\delta} < \frac{WTA}{2}.$$

The monetary gain is undervalued because the decision maker focuses on the loss of the mug. The value of the mug is equal to (3) as before. The decision maker's WTA equates (4) and (3) and is thus equal to

$$(5)\qquad WTA = q\cdot\left(1 + \gamma \cdot \frac{1-\delta}{\delta}\right).$$

Consider now the decision maker's WTP for the mug. Because he is not endowed with the mug, he has no warm glow of ownership. He then determines his *WTP* in $C^{WTP} = \{(q, -WTP),(0,0)\}$. Now the price and the quality of the mug are equally salient, so the decision maker states his correct valuation:

$$(6)\qquad WTP = q.$$

Compare (5) to (6): in line with the endowment effect, there is a positive *WTA*-*WTP* gap, equal to $q \cdot \gamma \cdot (1-\delta)/\delta$. This gap is shaped by the warm glow of ownership γ, as well as by the extent of local thinking δ.

Additional evidence for this mechanism is provided by Kahneman et al. (1991). Consider a decision maker who is not endowed with a mug, but is asked for his mug cash-equivalent at the trading stage. He faces a problem identical to that of the endowed subject; namely, finding the price at which he is indifferent between receiving that price or the mug. Yet, due to the absence of warm glow ($\gamma = 0$), we predict that this subject's *WTA* is given by (6) and not by (5). This is consistent with the findings of Kahneman et al. (1991).

Weaver and Frederick (2011) show that the *WTA*-*WTP* gap changes when subjects are provided with information about the mug's market price. The dependence of *WTA* and *WTP* on market prices is not in itself surprising. With a high market price $p_M > q$, a rational decision maker expecting to sell the mug in the market with probability α (and to keep it with probability $1-\alpha$) values the mug at $\alpha p_M + (1-\alpha)q$. The value of the mug clearly increases in p_M, but of course there is no endowment effect.[6] What needs to be explained is the persistence of the *WTA*-*WTP* gap, and its amplification with high market prices.

From the local thinker's perspective, information about market prices simply brings to his attention an alternative valuation of the mug besides consumption; namely, the possibility of trading at the market price. Relative to the case of no reference prices, the local thinker's consideration set in the trading stage now includes the option $(0, p_M)$ of selling the mug in the market, $C^t = \{(q,0),(0,0),(0,WTA),(0,p_M)\}$. To determine *WTA*, note that also in this context the downside of each option is salient. Moreover, the mug's quality is boosted by $1/\delta$ due to the

[6] The probability α of trade is taken to be rational and exogenous, and may depend on the cost/ease of finding trading partners.

warm glow of endowment, as in (5) (where for simplicity we set $\gamma = 1$). The decision maker's selling price is thus

$$(7) \qquad WTA = \alpha p_M + (1 - \alpha)q \cdot \frac{1}{\delta}.$$

When stating his WTP for a mug, however, the local thinker's consideration set is $C^{WTP} = \{(q, -WTP),(0, 0),(0, p_M - WTP)\}$, which also takes into account the possibility of trading the mug at market price, namely $(0, p_M - WTP)$. Then, provided the market price is sufficiently high relative to q,[7] the downside of each option is salient. In particular, the price *WTP* paid when buying the mug is very salient to the buyer. Thus, given an expectation α of reselling the mug, the local thinker's buying price is

$$(8) \quad WTP = \big(\alpha p_M + (1 - \alpha)q\big) \cdot \frac{1}{\alpha + \frac{1 - \alpha}{\delta}}.$$

Equations (7) and (8) capture the *WTA*-*WTP* gap in the presence of reference prices. Two points can be noted. First, the gap arises whenever the local thinker is not certain about trading: for any $\alpha < 1$ (and $\delta < 1$) we have $WTA > WTP$.[8] When $\alpha = 1$ the gap disappears as $WTA = WTP = p_M$, just as in the rational case. Second, consistent with Weaver and Frederick (2011), the selling price is more sensitive than the buying price to p_M when p_M is high. In this regime the *WTA*-*WTP* gap increases with the good's market (or reference) price. A similar calculation shows that when p_M is low relative to q, the selling price is less sensitive than the buying price to p_M. In this case, as p_M becomes smaller the *WTA*-*WTP* gap increases, resulting in a *U*-shaped relation between *WTA*-*WTP* gap and p_M.[9]

[7] Formally, this is true when $p_M > 2 \cdot WTP$, where *WTP* is given by (8). This follows from $p_M > q$ if trade is unlikely and δ is small.

[8] This is the case even if $\gamma = 0$. The asymmetry between buying and selling arises at the trade stage: since downsides are salient, the buying price is relatively more salient for the buyer.

[9] This feature is also predicted by Weaver and Frederick (2011), who provide suggestive evidence for it. To see how it arises in our model, note that when $p_M < q$, the owner of the mug never sells it in the market, and sets $WTA = q/(1 + \delta)$. The subject without a mug can try to buy it in the market. His consideration set is then $C' = \{(q, -WTP),(0, 0),(q, -p_M)\}$ and so his buying price *WTP* decreases as p_M goes to zero.

IV. Conclusion

Unlike prospect theory, our model does not feature loss aversion, either in the utility or in the salience functions, which can both be symmetric in gains and losses (e.g., the salience function may satisfy $\sigma(-q, 0) = \sigma(q, 0)$). We have shut down any mechanism involving loss aversion relative to expectations. The mechanism we propose is based on the novel ingredients of salience and context dependence.

Our approach highlights a fundamental difference between the context of absolute evaluation, in the endowment stage, and the context of comparative evaluation, in the trading stage. In the former, the decision maker focuses on the endowment's most extreme attribute (due to the ordering property of salience), whereas in the latter his attention is drawn to the alternative's downside (due to diminishing sensitivity), generating an endowment effect. In our view, what makes ownership special is the focus on the most attractive attributes of the goods one owns; there is no warm glow of ownership when these attributes are surpassed.

This intuition highlights a deep connection between the endowment effect and attitudes towards risk. BGS (forthcoming) show how the same mechanism of salience can shed light on risk attitudes, whereby the decision maker is risk-averse if he focuses on a risky lottery's downside, and risk-seeking if he focuses on its upside. Similarly, here the endowment effect is due to an aversion to the alternative good generated by focusing on its downside.[10] Moreover, just as BGS (forthcoming) show that salience generates a shift from risk seeking to risk aversion as lottery gains are reflected into losses, here we predict a reverse endowment effect for bads. Salience therefore provides a unified account of disparate puzzles such as the endowment effect, preference reversals, and the public health dilemma (the finding that experimental subjects switch from risk averse to risk seeking behavior as lottery gains are reflected into losses, see Tversky and Kahneman 1981) as the

[10] This intuition can be formalized to account for recent evidence on an endowment effect for risk, as documented by Sprenger (2010).

consequence of the same perceptual forces of diminishing sensitivity and ordering applied to different contexts of absolute and comparative evaluation.

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