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 13%. In related experiments, subjects state selling prices for their endowment, which 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 (Kahneman and Tversky 1979). Because the pain of parting with the endowment (or with its expected consumption, Koszegi and Rabin 2006) looms larger in the agent's mind than the pleasure of acquiring a good of similar value (Kahneman, Knetsch, and Thaler 1991), an agent endowed with a mug is unwilling to trade it for a pen (or states a high selling price).[2]

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 agents become systematically eager to trade

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[2]By modeling the reference point as expectations (Koszegi and Rabin, 2006), the literature has reconciled the endowment effect with the fact that people trade in large amounts if they expect to do so. List (2003) documents that experienced traders of sportscards have a more stable valuations of cards than do novice traders (and exhibit a weaker endowment effect for other goods as well).

away their bad endowment. In experiments investigating the gap between selling and buying prices, further evidence has emerged. The gap is: i) stronger when the goods involved are non standard, whereas standard everyday goods generate a limited endowment effect (Horowitz and McConnell, 2002), and ii) sensitive to the provision of information about the market price of the endowment (Weaver and Frederick 2011). Finally, the endowment effect is very sensitive to details of experimental procedure, particularly in experiments that test the loss aversion account by manipulating reference points.[3]

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 (BGS 2011 a,b). As reviewed in the next section, 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 endowed good and the other goods are evaluaded in different contexts.

Specifically, after the agent 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 psychological "warm glow" induced by receiving a gift or getting ownership of an object (Tversky and Griffin, 1991), driven by the agent's focus on that object's upside. In the second (trade) stage, the decision maker is given the option to trade

[3]Plott and Zeiler argue that the gap between selling and buying prices (2005) and the lack of trade (2007) can be eliminated using appropriate experimental procedures (including trading experience and neutral language). Ericson and Fuster (2011) and Heffetz and List (2011) provide the first direct tests of the role of expectations in the endowment effect, by manipulating the probability with which subjects are given the opportunity to trade. By treating mugs and pens in entirely symmetric ways, Heffetz and List find that expectations do not affect willingness to trade. Ericson and Fuster find, in contrast, significant endowment effects driven by loss aversion toward expected consumption.

the endowment e for a new good n. Now the evaluation of n is shaped not only by the warm glow of ownership but also by the contrast between n and the current endowment 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 (or of receiving a gift), which determines the endowment's valuation in the first stage, without reference to the new good. We view this warm glow as arising from a form of hedonic imprinting: when the decision maker receives a mug, he focuses on its most valuable uses. The mug's benefits will still be present in his mind when he considers exchanging the mug for a pen, so that the mug's value is relatively unaffected by the shift in context in the second stage.

Besides explaining the endowment effect as a form of context dependence, we explore a number of new predictions: the endowment effect should not arise when identical goods are involved, and should be reversed in the case of bads (due to a "cold glow" from owning bads). The model also provides insight into the role of market prices (Weaver and Frederick, 2011).

1 Salience

Following BGS (2011b), we consider the simplest case of two-attribute goods, where a generic good k is a two dimensional vector of qualities $(q_{1,k}, q_{2,k}) \in R^2$, and the agent's intrinsic utility is linear in the attributes, $v(q_{1,k}, q_{2,k}) = w_1 q_{1,k} + w_2 q_{2,k}$, 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 non-salient attribute: if attribute i is salient and attribute j is not, then the decision maker evaluates good k with weights given by

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

where $\delta \in (0, 1]$ captures the degree to which the decision maker neglects non salient features.

Referring to such neglect, we call our decision maker a "local thinker" (when $\delta = 1$ the local thinker is a standard rational agent).

Which attribute is salient for good k depends on two factors: the agent's consideration set C and a salience function $\sigma : R^2 \to R_+$. The set C includes the goods considered by the agent 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. To capture basic features of human perception such as Weber's Law (see BGS 2011a,b), we assume that this 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 b), we use a salience function homogenous of degree zero ($\sigma(\alpha x, \alpha y) = \sigma(x, y)$ for all $\alpha > 0$, with $\sigma(0, 0) = 0$), which is sufficient to ensure diminishing sensitivity. A typical example is $\sigma(x, y) = |x - y| / (|x| + |y|)$. In short, ordering says that salience $\sigma(q_{i,k}, \overline{q}_i)$ increases with the distance $|q_{i,k} - \overline{q}_i|$. Diminishing sensitivity says that $\sigma(q_{i,k}, \overline{q}_i)$ decreases as $q_{i,k}$ and $\overline{q}_i$ rise in absolute value. Finally, the reflection property implies that salience depends on the magnitude of attributes, and not on their signs.

2 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 zeroes capture the fact that experiments involve no writing mugs or drinking pens.[4] Suppose further that M and P have the same quality level $q_M = q_P = q$. Then, in the absence of salience distortions, the agent values both objects at $q/2$.

As the decision maker is given the mug in the endowment stage, he evaluates M against

[4]This restriction is for used expository purposes. The main results go through for more complex goods, with non-zero values of all attributes.

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 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:

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

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 agent 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 $(q/3,q/3)$.[5] As a result, the pen's quality for writing is not salient because:

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

where the equivalence between the two conditions 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 pen is valued at

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

Because the mug and the pen are perfectly symmetric goods, in the trading stage C^t they both tend to have a salient downside and thus to be undervalued. However, since with probability γ the mug inherits the first stage ranking where its upside is salient, the mug's

[5]The decision maker's status quo $(0,0)$ is included in C^t. This status-quo captures the assumption that the decision maker does not entirely adapt to the first stage's endowment, and still considers getting either good as a gain. Removing $(0,0)$ from C^t does not substantially affect our analysis.

average valuation in the second stage is:

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

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

This mechanism can be viewed as providing 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.[6] 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. In combination, this mechanism boosts the relative valuation of the goods we own in the trading stage. This perspective on the endowment effect has the following interesting 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 the new mug is also valued at (1). There is *no endowment effect for identical objects*.

ii) If the new good is a better mug, $(2q, 0)$, the decision maker would likewise focus on its upside and overvalue it, both in absolute terms and relative to the endowment. There is *no endowment effect in upgrading*.

iii) 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 of the latter: by diminishing sensitivity and reflection $\sigma(0, -q/3) > \sigma(-q, -q/3)$. 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*.

iv) If the endowment is both a pen and a mug, the warm glow of ownership would apply

[6] 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.

to both 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*.

3 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 agent includes in the consideration set the option $(0, p_{\text{WTA}})$ of obtaining his WTA, namely $C^{t_{\text{WTA}}} = \{(q, 0), (0, 0), (0, p_{\text{WTA}})\}$, and determines the lowest p_{WTA} at which he is willing to sell the good. As before, by diminishing sensitivity the downside of all options in C^t is salient. The utility obtained by the agent from $(0, p_{\text{WTA}})$ is then:

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

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

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

Consider now the agent's WTP for the mug. Crucially, in this case the agent is not endowed with the mug, so he has no warm glow of ownership. As a consequence, he determines his WTP in $C^{t_{\text{WTP}}} = \{(q, -p_{\text{WTP}}), (0, 0)\}$. Now the price and the quality of the mug are equally salient, so the agent states his correct valuation:

$$p_{\text{WTP}} = q. \tag{6}$$

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 by Kahneman, Knetsch and Thaler's (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 Kahneman et al's (1991) findings.

Weaver and Frederick (2011) provide subjects with information about the mug's market price and find that the WTA-WTP gap increases with that price. The dependence of WTA and WTP on market prices is not in itself surprising. With a 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.[7] 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. Just like the rational agent, the local thinker's valuation takes this possibility into account, with the difference that his perceptions of the different uses of the mug are affected by salience. 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, $C^t = \{(q,0),(0,0),(0,p_{WTA}),(0,p_M)\}$. To determine p_{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 warm glow of endowment, as in (5) (where for simplicity we set

[7] We focus on the case where $p_M > q$, which coincides with Weaver and Frederick's "high" market price treatments, where the gap is observed. Moreover, the probability of trade is taken to be rational and exogenous. It might for instance be related to search costs, where α is the probability of finding a trading partner.

$\gamma = 1$). The decision maker's selling price is thus

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

When stating his WTP for a mug, the local thinker's consideration set is $C^t = \{(q, -p_{WTP}), (0,0), (0, p_M - p_{WTP})\}$, which also takes into account the possibility of trading the mug at market price, namely $(0, p_M - p_{WTP})$ (recall that $p_M > q$). Then, as before, the downside of each option is salient. In particular, the price p_{WTP} paid when buying the mug is very salient to the buyer. Thus, given an expectation α of re-selling the mug, the local thinker's buying price is

$$p_{WTP} = (\alpha p_M + (1-\alpha)q) \cdot \frac{1}{\alpha + \frac{1-\alpha}{\delta}} \tag{8}$$

Equations (7) and (8) capture the WTA-WTP gap in the presence of reference prices. Two aspects are noteworthy. First, the gap arises whenever the local thinker is not certain about trading: for any $\alpha < 1$ (and $\delta < 1$) we have $p_{WTA} > p_{WTP}$.[8] When $\alpha = 1$ the gap disappears as $p_{WTA} = p_{WTP} = p_M$, just like in the rational case. Second, consistently with Weaver and Frederick, the selling price is more sensitive than the buying price to p_M. As a consequence, the WTA-WTP gap increases with the good's market (or reference) price.

4 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. We do not view loss aversion as being inconsistent with our model (instead, we view it as a complement). The mechanism we propose is based on the novel ingredients of salience and context dependence.

In a nutshell, our approach highlights a fundamental difference between the context of absolute evaluation, in the endowment stage, and the context of comparative evaluation,

[8] This is the case even in the absence of warm glow, $\gamma = 0$. 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.

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.

This intuition highlights a deep connection between the endowment effect and attitudes towards risk. In BGS (2011a) we showed 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. Moreover, just as BGS (2011a) show that salience generates a shift from risk seeking to risk aversion as lottery gains are reflected into losses, here predict a reverse endowment effect for bads. The theory of salience therefore provides a unified account of disparate puzzles such as the endowment effect, preference reversals, and the public health dilemma as the consequence of the same perceptual forces of diminishing sensitivity and ordering applied to different contexts of absolute and comparative evaluation.

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