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The Effect of Giving It All Up on Valuation: A New Look at the Endowment Effect

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In three experiments we show that the endowment effect—the tendency to demand more money for relinquishing owned goods than one is willing to pay for the same goods—fails to emerge when sellers are not fully depleted of their endowment. This finding is incompatible with prospect theory's account of the effect as stemming primarily from aversion to loss relative to the individual's current state. We suggest a new account of the endowment effect as reflecting the human aversion to ''giving it all up'' rather than simply an aversion to incurring any loss relative to the status quo. Experiments 1 and 2 show the effect employing a pricing paradigm. Experiment 3 examines what constitutes "all" in the giving-it-all-up effect.

Keywords: endowment effect; loss aversion; reference dependence; end state
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Introduction

There is a widely reported disparity between people's valuation of gains and their valuation of otherwise commensurate losses (Kahneman et al. 1990, Thaler 1980). This disparity—the *endowment effect* (EE)—is typically assessed by comparing people's *willingness to pay* (WTP) to obtain a good to their *willingness to accept* (WTA) to relinquish it. Another method for assessing the effect is by comparing people's willingness to trade one item for another (e.g., a pen for a chocolate bar) when the type of endowed item is randomly determined.

The prominent model (Kahneman and Tversky 1979) explains the effect by positing (1) that losses loom larger than gains and (2) that gains and losses are defined relative to a subjective reference point, often the status quo. This implies that the evaluative determinants are changes relative to the reference point rather than to end states. To illustrate, reference dependence suggests that although the value lost by giving up an endowment such as a bottle of wine is greater, in absolute terms, than the value gained by obtaining the same bottle, the relative valuation of obtaining a bottle of wine and of giving up the same bottle does not depend on whether the person owns a single bottle or a dozen bottles of the same wine. A simple thought experiment, however, suggests that the person giving up the single bottle would experience the loss more intensely than the person giving up one of a dozen bottles he or she owns. Acquiring a bottle of wine may also be more pleasurable for a person who has none than it would be for one who already owns a dozen bottles, but the relative valuation of acquiring and losing the bottle is likely to shift, too. Thus, going beyond the standard explanation of the endowment effect as stemming from changes relative to an initial state, we propose that changes relative to the end state affect the emergence of the EE. In other words, we propose that the impact of "giving it all up" is a main source of the EE. In the present research, we test this hypothesis by examining the relative valuation of gains and losses, comparing changes that result in relinquishing the whole endowment to equivalent changes that allow the owner to retain some of the endowment.

Earlier studies on the endowment effect have pointed to several psychological and economic moderators of the effect such as attachment (Kogut and Kogut 2011, Strahilevitz and Loewenstein 1998), affect and mood (Lerner et al. 2004, Peters et al. 2003), differences in perspectives between buyers and sellers (Carmon and Ariely 2000, Carmon et al. 2003), the way the transaction is perceived (Johnson et al. 2007), the amount of cognitive effort invested (Rosenboim et al. 2013), prior experience and intentions (List 2003, 2004; Novemsky and Kahneman 2005a, b), product type (Chapman 1998, Paolacci et al. 2011, van Dijk and van Knippenberg 1998), aversion to bad deals

(Weaver and Frederick 2012), and buyer and seller expectations (Mellers and Ritov 2010).

Three earlier studies specifically varied the number of (identical) goods endowed. First, Horowitz et al. (1999) endowed participants with varied numbers of identical objects (goods), finding that participants demanded significantly more when asked to part with their complete endowment than when asked to part with only some of their endowment. Second, Morewedge et al. (2009) examined and documented changes in willingness to pay and willingness to accept as a function of the traded amount and the target to which the endowment is meant (i.e., the person who owns the endowment as opposed to someone else). Third, a recent study by Burson et al. (2012) showed that the endowment effect is contingent upon the perception of the traded object as a single cohesive unit. Our investigation differs from the above-mentioned studies in that it offers a rigorous examination of the end state while controlling for other confounding factors and alternative explanations.

In what follows, we present three experiments that directly examine the effect of the end state—namely, the *giving-it-all-up* effect—on participants' valuations. In all three experiments, we employed a pricing paradigm eliciting selling and buying prices. In these experiments, participants were randomly endowed with a number of units of one type of commodity (pens or chocolate bars). Endowed owners were given the opportunity to sell, and the other participants were given the opportunity to buy the goods. We compared conditions in which the sellers had to give it all up to those in which the sellers sold only part of their endowment. Similarly, buyers started out either with no endowment at all or with some endowed goods and were given the opportunity to buy more. Finally, in Experiment 3, we examine how framing the transaction as giving it all up, instead of giving some up, generates an endowment effect, using the same pricing paradigm used in Experiments 1 and 2.[1]

Experiment 1

Method

Participants. One hundred ninety-three students at the Hebrew University of Jerusalem participated in Experiment 1. Participation was voluntary and individual. Participants did not receive any payment or credit for participation aside from the opportunity to buy the goods (if they were buyers) or to sell the goods back to the experimenter (if they were sellers).

Procedure. Participants were randomly assigned to be a buyer or a seller in one of the four experimental conditions described in the first two columns of Table 1. The experimenter had the participants read the instructions describing the buying or the selling procedures (see Appendix A) and answered any questions pertaining to these procedures. The experimenter then asked the participants to write down their offers or demands at the bottom of the instruction sheet.

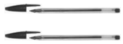
In Experiment 1, as in all other experiments reported in this paper, buying and selling prices were elicited using the BDM procedure (Becker et al. 1964), a well-established method of eliciting the true value of goods in experimental settings. The buyer gives his or her maximal bid, and the seller gives his or her minimal demand. The buyer's and seller's respective bid or demand is accepted if it is greater or smaller than a randomly generated price.

In two conditions, labeled 1_0 and 3_0, valuation was elicited for the entire endowment. Sellers in these conditions were initially endowed with one Milan® ballpoint pen (in the 1_0 condition) or with three Milan pens (in the 3_0 condition) and stated their demands for selling the whole endowment (in particular, selling all three pens in the 3_0 condition). Buyers in these conditions started out with no pens and bid for one pen (in the 1_0 condition) or for all three pens (in the 3_0 condition). Two other conditions elicited valuation of part of the endowment: sellers in the 2_1 condition were initially endowed with two pens, and sellers in the 3_2 condition were initially endowed with three pens. In these two conditions, sellers stated their price for selling a single pen. Buyers in these conditions started out with one or two pens (in the 2_1 and 3_2 conditions, respectively) and bid for a single additional pen. As mentioned above, all trades were brokered by the experimenter. That is, buyers bought the pens from the experimenter and sellers sold the pens to the experimenter.

Results. Table 1 summarizes the main results. As predicted, there was a pronounced EE only when ownership was fully depleted. Selling prices were significantly higher than buying prices in condition 1_0 ($M = 4.79$ versus 1.72, respectively; $t(46) = 5.104$, $p < 0.0001$) and in condition 3_0 ($M = 7.99$ versus 3.19, respectively; $t(46) = 2.88$, $p < 0.01$). In contrast, the gap between buying and selling prices was only marginally significant in condition 2_1 ($M = 2.92$ versus 1.85, respectively; $t(46) = 1.77$, $p = 0.08$) and not significant in condition 3_2 ($M = 3.20$ versus 2.33, respectively; $t(47) = 1.38$, $p = 0.173$).

[1] In all the experiments reported here, sample sizes were predetermined. None of the participants were excluded. Participation was voluntary and individual. Participants did not receive any payment or credit for participation aside from the opportunity to buy the goods (if they were buyers) or to sell the goods back to the experimenter (if they were sellers).

Table 1 Experimental Conditions and Main Results in Experiment 1

Condition	Sellers' initial state (= Buyers' end state)	Sellers' end state (= Buyers' initial state)	Mean sellers' WTA (SD)	Mean buyers' WTP (SD)	Mean selling to buying ratio	Median selling price	Median buying price	Median selling to buying ratio
1_0: Giving up 1 of 1 ($N = 48$)			4.79 (0.51)	1.72 (1.54)	2.78	4.35	1.00	4.35
			$t(46) = 5.10$, $p < 0.001$		$Z = 3.10$, $p < 0.001$			
3_0: Giving up 3 of 3 ($N = 48$)			7.99 (7.51)	3.19 (3.18)	2.50	7.00	2.25	3.11
			$t(46) = 2.88$, $p < 0.01$		$Z = 2.15$, $p = 0.03$			
2_1: Giving up 1 of 2 ($N = 48$)			2.92 (2.39)	1.85 (1.76)	1.58	2.50	1.00	2.50
			$t(46) = 1.77$, $p = 0.08$		$Z = 1.43$, $p = 0.15$			
3_2: Giving up 2 of 3 ($N = 49$)			3.20 (2.20)	2.33 (2.21)	1.37	3.00	1.70	1.76
			$t(46) = 1.10$, $p = 0.28$		$Z = 1.15$, $p = 0.25$			

Note. Z-scores for WTA/WTP ratios (testing the deviation from 1) were computed using the Delta method.

Next, we examined how buying and selling prices varied across conditions of complete and partial relinquishment. Because our main hypothesis concerns the comparison of ratios (of selling prices to buying prices) under the different conditions, we added \$0.1 to all valuations and log-transformed all price quotes. Analysis of variance (ANOVA) of the log-transformed quoted prices by role (buyers versus sellers) and partial versus complete relinquishment (conditions 1_0 and 3_0 versus 2_1 and 3_2) revealed a significant main effect of role ($F(1,192) = 31.58$, $p < 0.001$), qualified by a significant interaction between the role and complete/partial relinquishment ($F(1,192) = 6.64$, $p = 0.011$), suggesting that the endowment effect attenuates when participants are able to retain part of their endowment.

Although the ANOVA indicates that the endowment effect attenuates when participants can retain part of their endowment, it is not clear if the effect attenuates because sellers demand less when they can keep part of the endowment or because buyers who already own some are willing to offer more than those who start out with nothing. To better understand the source of the effect, we separately compared the quoted price of buyers and of sellers across conditions of complete and partial relinquishment (conditions 1_0 and 3_0 versus 2_1 and 3_2). The analysis revealed a nonsignificant change in sellers' quotes ($t(95) = 1.306$, $p = 0.195$) and a significant change in buyers' quotes ($t(94) = 2.008$, $p = 0.047$), suggesting that part of the endowment effect attenuation may be related to a greater willingness to pay on the buyers' side.

Another way to test our hypothesis is to directly examine the selling to buying ratios. Two tests can be done. The first test should examine whether the selling to buying ratio is significantly different from 1 in conditions of complete relinquishment but not significantly different from 1 in conditions of partial relinquishment. The second test should contrast the selling to buying price ratio in conditions of partial relinquishment with that of total relinquishment. The problem with conducting such tests is that the ratio function is too complex to derive its variance to construct the Z-statistic needed to compare the ratios. The Delta method provides a solution to this problem (see Appendix B for complete calculations). As shown in the sixth column of Table 1, the WTA/WTP ratio was significantly greater than 1 for conditions 1_0 and 3_0 (WTA/WTP = 2.78, $Z = 3.10$, $p < 0.001$ and WTA/WTP = 2.50, $Z = 2.15$, $p = 0.03$ for conditions 1_0, and 3_0, respectively) and was not significantly greater than 1 for conditions 2_1 and 3_2 (WTA/WTP = 1.58, $Z = 1.43$ $p = 0.15$ and WTA/WTP = 1.37, $Z = 1.15$, $p = 0.25$ for conditions 2_1 and 3_2, respectively). We used the Delta method further to directly compare the WTA/WTP ratio in the giving-it-all-up conditions (1_0 and 3_0) to the ratio in the other conditions (2_1 and 3_2). The Z-score for this comparison was 2.21 ($p = 0.03$). Thus, the WTA/WTP ratio was significantly greater when the whole endowment was sold or bought than when there were partial exchanges.

How is loss aversion related to the giving-it-all-up effect? If we assume that loss aversion—the overweighing of losses relative to gains of equal absolute value—does not depend on the magnitude of the change (as in the original model of Kahneman and Tversky 1979), then it cannot fully account for the giving-it-all-up effect because our findings indicate that the selling to buying ratio changes as a function of the number of items the seller possesses at the end of the transaction. In that sense, our findings are in line with recent research indicating that the extent of loss aversion depends on the magnitude of change. Harinck et al. (2007) showed, for instance, that loss

aversion does not hold for small outcomes: the joy of gaining a small amount of money is often greater than the pain of losing the same amount.

Experiment 2

Method

Experiment 2 employed the same pricing design and experimental procedures as in Experiment 1. The experiment was designed to test the generalizability of the giving-it-all-up effect with different goods and with a larger amount of traded goods. To test our hypothesis, participants in Experiment 2 received the opportunity to buy or sell small Toblerone chocolate bars.

One hundred and twenty students at the Hebrew University of Jerusalem participated in Experiment 2. Participation was voluntary and individual; none of the participants were excluded. As in Experiment 1, participants did not receive any payment or credit for participation aside from the opportunity to buy the goods (if they were buyers) or to sell the goods back to the experimenter (if they were sellers).

Procedure. Participants were randomly assigned to be buyers or sellers in one of the four experimental conditions described in the first two columns of Table 2. As in Experiment 1, we compared conditions in which sellers had to give it all up to conditions in which sellers had to only give some up. In two conditions, labeled 2_0 and 3_0, valuation was elicited for the whole endowment: sellers were initially endowed with two or three Toblerone Minis (in the 2_0 and 3_0 conditions, respectively) and stated their demands for selling the complete endowment. Buyers in these conditions started out with no Toblerone Minis and bid for two or three Toblerone Minis (in the 2_0 and 3_0 conditions, respectively). Two other conditions elicited valuation of part of the endowment: sellers in the 4_2 and 6_3 conditions were initially endowed with four or six Toblerone Minis and were asked to state their demand for selling two or three Toblerone Minis, respectively. Buyers in these conditions started out with two or three Toblerone Minis (in the 4_2 and 6_3 conditions, respectively) and could bid for two or for three additional Toblerone Minis, respectively.

As in Experiment 1, we hypothesized that an endowment effect would emerge only in conditions 2_0 and 3_0, where sellers had to give it all up and buyers started out with no endowment.

Results. Table 2 summarizes the main findings. It shows a similar pattern to that observed in Experiment 1. Sellers in the giving-it-all-up conditions (conditions 2_0 and 3_0) demanded significantly more than did buyers in these conditions ($M = 6.05$ versus $M = 2.35$, $t(28) = 2.32$, $p < 0.05$ and $M = 8.78$ versus $M = 3.59$, $t(28) = 3.79$, $p < 0.01$ for conditions 2_0 and 3_0, respectively). In contrast, sellers who could retain some of their endowment in conditions 4_2 and 6_3 did not demand significantly more than buyers in these conditions did ($M = 4.01$ versus $M = 4.00$, $t(28) = 0.12$, $p = 0.99$ and $M = 2.92$ versus $M = 2.41$, $t(28) = 0.635$, $p = 0.531$ for conditions 4_2 and 6_3, respectively).

Next, we examined how buying and selling prices varied across conditions of complete and partial relinquishment. Again, because our main hypothesis concerns the comparison of ratios (of selling prices to buying prices) under the different conditions, we log-transformed all price quotes. For the purpose of the analyses, zero values were set to 0.1. An ANOVA of the log-transformed quoted prices by role (buyers versus sellers) and partial versus complete relinquishment (conditions 2_0 and 3_0 versus 4_2 and 6_3)

Table 2 **Experimental Conditions and Main Results in Experiment 2**

Condition	Sellers' initial state (= Buyers' end state)	Sellers' end state (= Buyers' initial state)	Mean sellers' WTA (SD)	Mean buyers' WTP (SD)	Mean selling to buying ratio	Median selling price	Median buying price	Median selling to buying ratio
2_0: Giving up 2 of 2 ($N = 30$)		■	6.05 (5.89)	2.35 (1.82)	2.57	4.50	1.50	3.00
			$t(28) = 2.323$, $p = 0.028$		$Z = 1.90$ $p = 0.06$			
3_0: Giving up 3 of 3 ($N = 30$)		■	8.78 (4.66)	3.59 (2.50)	2.47	8.00	3.00	2.67
			$t(28) = 3.798$, $p = 0.001$		$Z = 2.61$ $p = 0.01$			
4_2: Giving up 2 of 4 ($N = 30$)			4.01 (2.42)	4.00 (2.42)	1.00	4.00	4.00	1.00
			$t(28) = 0.012$ $p = 0.991$		$Z = 0.01$ $p = 0.99$			
6_3: Giving up 3 of 6 ($N = 30$)			2.93 (2.45)	2.41 (2.32)	1.22	3.00	2.20	1.36
			$t(28) = 0.635$, $p = 0.531$		$Z = 0.55$ $p = 0.58$			

Note. Z-scores for WTA/WTP ratios (testing the deviation from 1) were computed using the Delta method.

revealed a significant main effect of role ($F(1, 116) = 7.968$, $p = 0.006$), qualified by significant interaction between role and complete/partial relinquishment ($F(1, 116) = 9.640$, $p = 0.002$), suggesting that the endowment effect attenuates when participants are able to retain part of their endowment. In contrast to Experiment 1, further examination of the source of the attenuation revealed a significant decrease in sellers' quotes ($t(58) = 3.642$, $p = 0.001$) but no significant difference in buyers' quotes between conditions of partial and complete relinquishment ($t(58) = 0.399$, $p = 0.691$). This finding suggests that the attenuation of the endowment effect in this experiment may be attributed mostly to the sellers.

As in Experiment 1, here too we used the Delta method to construct Z-statistics for the ratio of selling to buying price. The Z-scores are presented in the sixth column of Table 2. As shown, the WTA/WTP ratio was significantly greater than 1 for condition 2_0 (albeit marginally) and condition 3_0 (WTA/WTP = 2.57, $Z = 1.90$, $p = 0.06$ and WTA/WTP = 2.47, $Z = 2.61$, $p = 0.01$ for conditions 2_0 and 3_0, respectively) and was not significantly greater than 1 for conditions 4_2 and 6_3 (WTA/WTP = 1.00, $Z = 0.01$, $p = 0.99$ and WTA/WTP = 1.22, $Z = 0.55$, $p = 0.58$ for conditions 4_2 and 6_3, respectively). Again, using the Delta method to directly compare the WTA/WTP ratio in the giving-it-all-up conditions (2_0 and 3_0) to the ratio in the other conditions (4_2 and 6_3), we find that these ratios were significantly different (the Z-score for this comparison was 2.57, $p = 0.01$). Thus, we replicated Experiment 1's finding that when sellers have to give up all of their endowment, the obtained WTA/WTP ratio is greater than the ratio obtained when sellers retain part of the endowment.

Experiment 3

Interestingly, the endowment effect emerges even when people already possess goods identical to the ones employed in the experiment. Thus, a person who already owns a dozen coffee mugs would still demand a higher price for selling the single mug he or she was endowed with in the experiment than he or she would be willing to pay when buying the same mug. How then does the giving-it-all-up effect account for the endowment effect in those situations? We address this question in Experiment 3 by testing the effect of framing the transaction as giving it all up versus giving up only some of the endowment.

Procedure. Sixty students at the Hebrew University of Jerusalem participated in Experiment 3. None of the participants were excluded. Participation was voluntary and individual.

The experiment employed a between-subjects design under two conditions. The conditions differed in the way the transaction was framed at the end of the experiment. In the first condition, a giving-it-all-up framing was used. Participants in this condition were told they would participate in two unrelated experiments: the first experiment included filling out a questionnaire for which they would be rewarded with five Toblerone chocolate bars. The second experiment was the usual EE experiment, in which participants were randomly assigned as sellers or buyers. Sellers were endowed with a single additional Toblerone chocolate bar they could sell back to the experimenter, and buyers were given the opportunity to buy one Toblerone chocolate bar. In the second condition, a giving-some-up framing was used. The second condition was identical to the first condition with the exception that participants were told they would participate in one big two-stage experiment, for which sellers were rewarded with six Toblerone chocolate bars and buyers with five Toblerone chocolate bars. After completing the first stage of the experiment in which all the participants had filled out the questionnaire, the second stage began; in this stage, sellers were given the opportunity to sell back to the experimenter one of their Toblerone chocolate bars, and buyers were given the opportunity to buy one additional Toblerone chocolate bar. It is important to note that the two conditions are identical with respect to the total number of Toblerone chocolate bars participants receive as well as with respect to the number of Toblerone bars traded (a single bar). As in the previous experiments, participation in the experiment was individual. The buyers bought the chocolates from the experimenter, and the sellers sold the chocolates back to the experimenter. The complete instructions appear in Appendix A.

Results. Table 3 summarizes the main findings. As can be seen, sellers in the giving-it-all-up framing condition demanded significantly more than buyers did ($M = 3.54$ versus 0.57, $t(28) = 3.57$, $p < 0.01$ for sellers and buyers, respectively). In contrast, sellers in the giving-some-up framing condition did not demand significantly more than buyers ($M = 1.57$ versus 1.15, $t(28) = 1.34$, $p = 0.19$, respectively). Next, we directly compared how buying and selling prices varied across the two framing conditions. As in the previous experiments, we log-transformed all price quotes, setting zero values to 0.1. The analysis revealed a significant main effect of role ($F(1, 60) = 13.23$, $p = 0.0001$), qualified by a significant interaction between the role and framing condition ($F(1, 60) = 6.26$, $p = 0.0015$), suggesting that the endowment effect attenuates when participants perceive the trade as a partial rather than a complete relinquishment of the entire endowment. Further examination revealed that the attenuation of the endowment effect might also be attributed to buyers' tendency to offer higher amounts in the giving-some-up framing condition

Table 3 Experimental Conditions and Main Results in Experiment 3

Condition	Mean sellers' WTA (SD)	Mean buyers' WTP (SD)	Mean selling to buying ratio	Median selling price	Median buying price	Median selling to buying ratio
Giving-it- all-up framing	3.54 (3.77)	0.57 (0.66)	6.21	2.00	0.50	4.00
($N = 30$)	$t(28) = 3.00$, $p = 0.006$		$Z = 1.97$ $p = 0.05$			
Giving-some-up framing	1.57 (0.92)	1.15 (0.83)	1.36	1.00	2.00	2.00
($N = 30$)	$t(28) = 1.34$, $p = 0.192$		$Z = 1.13$ $p = 0.26$			

Note. Z-scores for WTA/WTP ratios (testing the deviation from 1) were computed using the Delta method.

than in the giving-it-all-up framing condition ($t(28) = 2.103$, $p = 0.045$) and a marginally significant change in sellers' demands ($t(28) = 1.963$, $p = 0.06$), suggesting that the effect's attenuation may stem from both buyers' greater willingness to buy additional goods and sellers' decreased demands.

Using the Delta method, we constructed Z-statistics for the ratio of selling to buying price in the two conditions. The Z-scores are presented in the fourth column of Table 3. As can be seen, the WTA/WTP ratio was significantly greater than 1 for the giving-it-all-up framing condition (WTA/WTP = 6.21, $p = 0.05$) but not for the giving-some-up framing (WTA/WTP = 1.36, $p = 0.26$). Direct comparison of the WTA/WTP ratio in the two conditions, using the Delta method, yielded a marginally significant difference (the Z-score for this comparison was 1.82, $p = 0.07$, two-tailed). Thus, even though in actuality all participants kept at least five chocolate bars, framing the trade of the extra single bar as giving-it-all-up increased the WTA/WTP ratio.

General Discussion

In the current research, we demonstrate that the giving-it-all-up effect is an important determinant of the endowment effect. In contrast to the traditional account of the EE as stemming solely from changes relative to the status quo, we demonstrated in three experiments that the EE is more salient when the endowment is totally relinquished. In Experiments 1 and 2, we examined selling and buying prices for, respectively, pens and Toblerone chocolate bars. The results of these experiments revealed that owners valued their endowed goods more so than non-owners—mostly when they had to relinquish the entire endowment. Finally, the results of Experiment 3 showed that simply framing the transaction as giving it all up is sufficient for the endowment effect to emerge.

Reference-dependent accounts such as prospect theory (Kahneman and Tversky 1979) explain the endowment effect by positing (1) that gains and losses are defined relative to a subjective reference point, which is often the status quo, and (2) that losses loom larger than gains. In the standard formulation of the loss aversion model, utility is specified as a two-part power function, $U(x) = x^{\alpha}$, for $x \geq 0$ and $U(x) = -\lambda * (-x^{\alpha})$ for $x \leq 0$, where x is the change in wealth. In this model, x is defined relative to a given reference state, and the coefficient of loss aversion is defined as the constant $\lambda = -U(-x)/U(x)$, with the assumption that $\lambda > 1$ (Tversky and Kahneman 1991). A growing body of research indicates that the assumption of a constant loss aversion does not hold (Erev et al. 2008, Ert and Erev 2008, Harinck et al. 2007). Our findings on the giving-it-all-up effect indicate that λ is not a single constant but depends on the end state of ownership. Thus, $-U(-x)/U(x) = \lambda_e$, where $\lambda_e > 1$ for the end state of complete depletion and possibly $\lambda_e \sim 1$ for other end states.

Second, our findings contribute to the literature on the role of reference points in shaping human choices. According to prospect theory, "The carriers of value or utility are changes of wealth, rather than final asset positions that include current wealth" (Kahneman and Tversky 1979, p. 273). Indeed, reference points and, in particular, the way they affect our perception of gains and losses have been found to affect negotiations (Moran and Ritov 2007, Ritov and Moran 2008, Shalvi et al. 2010), risk preferences (Barkan and Busemeyer 2003), regret (Mellers et al. 1997, 1999), and motivation to exert effort (Camerer 2000, Heath et al. 1999, Pope and Simonsohn 2011). The current research expands on these findings by showing that changes of final asset positions—in particular, whether the position is totally relinquished or not—may serve as an important reference point for determining value.

Finally, our findings clearly indicate that the emergence of an endowment effect depends on the existence of a qualitative difference between initial and final states. The effect occurs primarily when sellers go from having the endowed objects to not having any, and buyers go from not having any of the objects to having them. Our results are inconclusive regarding the question of whether the effect stems mostly from changes in the sellers' or in the buyers' evaluations. The results of Experiment 1 show that part of

the endowment effect's attenuation may be attributed to a greater willingness to pay on the buyers' side. What might cause buyers who already own a pen to pay more for additional pens? We believe one possible explanation is that ownership per se increases the perceived value of the endowment and, consequently, the willingness to pay for additional goods. Some support for this explanation comes from a study conducted by Morewedge et al. (2009), which examined the idea that the very ownership of the good is at the source of the EE, with cognitive dissonance leading one to inflate the value of the endowed object as it spontaneously becomes associated with the self. In one study they compare buyers who do not yet own a coffee mug and have the opportunity to buy one to buyers who already own one mug and bid for a second one. The former buyers bid, on average, lower amounts than the latter. However, this did not occur in Experiment 2, indicating that there are other intervening factors affecting buyers' and sellers' valuations. Furthermore, combining the results of Experiments 1 and 2 together indicates that there is no consistent evidence of diminishing marginal utility. If anything, we find some evidence for the opposite effect for buyers: they are willing to pay more for an extra unit than for the first unit, indicating that there are other factors interacting with buyers' valuations.

Returning to our focus on the sellers' side, we consider an alternative account for the decrease in demand when sellers get to keep part of the endowment. If sellers have a preference for diversification of their holdings over the endowed good and money, they may not require as much compensation in the conditions of partial relinquishment, which afford the possibility of diversification. Experiment 3 offers a good test of this account because participants in both conditions received the same number of goods and because in both conditions participants did not give it all up. Thus, if preference for diversification underlies the giving-it-all-up effect, a significant attenuation of the endowment effect should occur in both conditions. The results of Experiment 3 do not support this explanation because there was a substantial endowment effect in the giving-it-all-up condition.

Conclusions. Previous research on the endowment effect has mainly focused on the role of loss where gains and losses are defined relative to an initial reference point. In this research we found that the emergence of the endowment effect depends to a large extent on the end state and on the qualitative difference between having and not having the endowed goods. Clearly, further research is needed to understand the psychological mechanism behind this effect.

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Appendix A

Experiment 1 Instructions

Sellers' Conditions 1_0 [3_0]

Please look at the pen[s] you have just received. Consider the possibility of selling the pen[s]. What is the lowest price you are willing to accept to sell the pen[s]?

Before deciding on the price, we will explain the selling procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is higher than *X* (even in 0.01 shekels), you will have to sell the pen[s] and you will get in return the price drawn. If the price that will be drawn later is lower than the price you decide on (even in 0.01 shekels), you will not be able to sell the pen[s]. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the lowest price you are willing to sell the pen[s]? _____

Buyers' Conditions 1_0 [3_0]

Please look at the pen[s]. Consider the possibility of buying the pen[s]. What is the highest price you are willing to pay for the pen[s]?

Before deciding on the price, we will explain the buying procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is lower than *X* (even in 0.01 shekels), you will have to buy the pen[s] and you will pay the price drawn. If the price that will be drawn later is higher than the price you decide on (even in 0.01 shekels), you will not be able to buy the pen[s]. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the highest price you are willing to pay for the pen[s]? _____

Sellers' Conditions 2_1 *and* 3_2

Please look at the pens you have just received. Consider the possibility of selling one pen.

What is the lowest price you are willing to accept to sell the pen?

Before deciding on the price, we will explain the selling procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is higher than *X* (even in 0.01 shekels), you will have to sell the pen and you will get in return the price drawn. If the price that will be drawn later is lower than the price you decide on (even in 0.01 shekels), you will not be able to sell the pen. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the lowest price you are willing to sell the pen? _____

Buyers' Conditions 2_1 [3_2]

Please look at the pen[s]. Consider the possibility of buying one additional pen. What is the highest price you are willing to pay for the pen?

Before deciding on the price, we will explain the buying procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price that ranges between 0 shekels and up to *X* shekels, at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is lower than *X* (even in 0.01 shekels), you will have to buy the pen and you will pay the price drawn. If the price that will be drawn later is higher than the price you decide on (even in 0.01 shekels), you will not be able to buy the pen. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the highest price you are willing to pay for the pen? _____

Experiment 2 Instructions

Sellers' Conditions 4_2 *and* 6_3 [2_0 *and* 3_0]

Please look at the Toblerone chocolate bars you have just received. Consider the possibility of selling two (three) bars [in conditions 2_0 and 3_0: selling them all].

What is the lowest price you are willing to accept to sell the bars?

Before deciding on the price, we will explain the selling procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is higher than *X* (even in 0.01 shekels), you will have to sell the Toblerone chocolate bars and you will get in return the higher price. If the price that will be drawn later is lower than the price you decide on (even in 0.01 shekels), you will not be able to sell the Toblerone chocolate bars. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the lowest price you are willing to sell the Toblerone chocolate bars? _____

Buyers' Conditions 4_2 *and* 6_3 [2_0 *and* 3_0]

Please look at the Toblerone chocolate bars. Consider the possibility of buying two (three) additional bars. [2_0 and 3_0: consider the possibility of buying them].

What is the highest price you are willing to pay for the Toblerone chocolate bars?

Before deciding on the price, we will explain the buying procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is lower than *X* (even in 0.01 shekels), you will have to buy the Toblerone chocolate bars and you will pay the lower price. If the price that will be drawn later is higher than the price you decide on (even in 0.01 shekels), you will not be able to buy the bars. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the highest price you are willing to pay for the Toblerone chocolate bars? _____

Experiment 3 Instructions

Giving-Some-Up Condition (*Buyers*)

Thank you for participating in the experiment. The experiment includes two parts; in return for your participation in the experiment, you will receive five Toblerone chocolate bars.

In the first part of the experiment you will be asked to fill out the following questionnaire. Instructions for the second part will follow.

Instructions to the second part

Please look at the Toblerone chocolate bar [*the experimenter places the Toblerone on the participant's table next to the other Toblerones*]. Consider the possibility of buying this additional Toblerone chocolate bar. What is the highest price you are willing to pay for the bar?

Before deciding on the price, we will explain the buying procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is lower than *X* (even in 0.01 shekels), you will have to buy the Toblerone chocolate bar and you will pay the lower price. If the price that will be drawn later is higher than the price you decide on (even in 0.01 shekels), you will not be able to buy the Toblerone chocolate bar. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the highest price you are willing to pay for the Toblerone chocolate bar? _____

Giving-Some-Up Condition (Sellers)

Thank you for participating in the experiment. The experiment includes two parts; in return for your participation in the experiment, you will receive six Toblerone chocolate bars.

In the first part you will be asked to fill out the following questionnaire. Instructions for the second part will follow.

Instructions to the second part

Please look at the Toblerone chocolate bars you have just received. Consider the possibility of selling one chocolate bar.

What is the lowest price you are willing to accept to sell the bar?

Before deciding on the price, we will explain the selling procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price *X* and the price that will be drawn later is higher than *X* (even in 0.01 shekels), you will have to sell the Toblerone chocolate bar and you will get in return the higher price. If the price that will be drawn later is lower than the price you decide on (even in 0.01 shekels), you will not be able to sell the Toblerone chocolate bar. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the lowest price you are willing to sell the Toblerone chocolate bar? _____

Giving-It-All-Up Condition (*Buyers*)

Thank you for participating in the experiment. The experiment includes two subexperiments; in return for your

participation in the first experiment, you will receive five Toblerone chocolate bars.

In the first experiment, you will be asked to fill out the following questionnaire. Instructions for the second experiment will follow.

Instructions for the second experiment

Please look at the Toblerone chocolate bar. Consider the possibility of buying it. What is the highest price you are willing to pay for the bar?

Before deciding on the price, we will explain the buying procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price X and the price that will be drawn later is lower than X (even in 0.01 shekels), you will have to buy the Toblerone chocolate bar and you will pay the lower price. If the price that will be drawn later is higher than the price you decide on (even in 0.01 shekels), you will not be able to buy the Toblerone chocolate bar. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the highest price you are willing to pay for the Toblerone chocolate bar? _____

Giving-It-All-Up Condition (*Sellers*)

Thank you for participating in the experiment. The experiment includes two subexperiments; in return for your participation in the first experiment, you will receive five Toblerone chocolate bars.

In the first experiment, you will be asked to fill out the following questionnaire. Instructions for the second experiment will follow.

Instructions for the second experiment

Please look at the Toblerone chocolate bar you have just received. Consider the possibility of selling it. What is the lowest price you are willing to accept to sell the bar?

Before deciding on the price, we will explain the selling procedure: After you write down the price, a lottery will be held. You will pull one card out of a deck of cards. On each card there is a price. The prices start at 0 shekels and increase at intervals of 0.1 shekels.

Note: if you decide on price X and the price that will be drawn later is higher than X (even in 0.01 shekels), you will have to sell the Toblerone chocolate bar and you will get in return the higher price. If the price that will be drawn later is lower than the price you decide on (even in 0.01 shekels), you will not be able to sell the Toblerone chocolate bar. Therefore, the right thing to do is to write down the price that reflects your true preferences.

What is the lowest price you are willing to sell the Toblerone chocolate bar? _____

Appendix B

Delta Method

The Delta method is used to find an approximate expression for the variance of a function of random variables. The idea behind the method is to approximate the function by a linear approximation, usually the Taylor expansion. The simpler function can then be used to derive the variance.

We test two hypotheses. First, we test whether the selling to buying ratio in conditions of partial relinquishment is not significantly different from 1. That is, we test

$$H0: \left(\frac{WTA}{WTP}\right)_{\text{partial\_relinquishment}} - 1 = 0.$$

Second, we determine whether the selling to buying ratio in conditions of partial relinquishment is significantly different from that in conditions of total relinquishment. That is, we test

$$H0: \left(\frac{WTA}{WTP}\right)_{\text{partial\_relinquishment}} - \left(\frac{WTA}{WTP}\right)_{\text{total\_relinquishment}} = 0.$$

The estimate of the difference was found by plugging in the sample means of the values. These values appear in the first two columns of Table B.1.

We then computed the selling to buying ratio by dividing the sellers' mean with the buyers' mean. These values appear in the third column of Table B.1.

Next, we applied the Delta method to estimate the variance of the selling to buying ratio. For any two independent random variables X and Y with $SD(Y)/E(Y)$ small enough, $\text{var}(X/Y) \sim \text{var}(X)/E(Y)^2 + \text{var}(Y)(E(X)^2/E(Y)^4)$. Specifically, in our case, let $\overline{WTA}$ and $\overline{WTP}$ be two independent random variables taken from the sellers' and buyers' distributions; then $\text{var}(\overline{WTA}/\overline{WTP}) \sim \text{var}(\overline{WTA})/\overline{WTP}^2 + \text{var}(\overline{WTP})(\overline{WTA}^2/\overline{WTP}^4)$. The results of these estimates appear in the fourth column of Table B.1.

Finally, to get the Z-score and test our hypotheses, we plugged in the numbers from the first four columns to the following formulae.

For the first hypothesis,

$$Z = \frac{(\overline{WTA}_1/\overline{WTP}_1) - 1}{SD_1},$$

where

$$SD_i = \sqrt{\frac{\text{var}(\overline{WTA}_i)}{\overline{WTP}_i^2} + \text{var}(\overline{WTP}_i)\frac{\overline{WTA}_i^2}{\overline{WTP}_i^4}}, \quad i = 1, 2.$$

The fifth column summarizes the results of the first hypothesis.

For the second hypothesis, comparing the ratios in partial and complete relinquishment we compute the Z-score as follows:

$$Z = \frac{(\overline{WTA}_1/\overline{WTP}_1) - (\overline{WTA}_2/\overline{WTP}_2)}{\sqrt{SD_1^2 + SD_2^2}}.$$

Table B.1 **Summary Statistics for the Delta Method**

Condition	*S* mean (var)	*B* mean (var)	*S*/*B* ratio	*SD* estimate	*Z*-score
1_0	4.7919 (6.3104)	1.7208 (2.3774)	2.7845	0.5900	3.0244
2_1	2.9208 (5.7200)	1.8458 (3.1043)	1.5824	0.4062	1.4337
3_2	3.2040 (4.8421)	2.3333 (4.8675)	1.3731	0.3253	1.1471
3_0	7.9917 (56.3721)	3.1917 (10.1312)	2.5039	0.7003	2.1476

Note. *B*, buyer; *S*, seller.

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