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Consumption Experience, Choice Experience and the Endowment Effect

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Consumption experience, choice experience and the endowment effect

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Abstract: This paper reports an experiment investigating how different kinds of experience influence the endowment effect. Previous studies have investigated how the endowment effect is influenced by experience gained through repetition of decision problems and trading in natural and experimental markets. In this study we explore how it is influenced by experience of consuming elements of a potential endowment and by experience of choosing prior to acquiring an endowment. We find evidence of an endowment effect and that measured loss aversion predicts the reluctance to trade. We find no effect of consumption experience. Choice experience increases trading. Finally, we find evidence of a new species of 'splitting effect', whereby acquiring an endowment in two instalments significantly reduces trading.

JEL classification: C91, D12

Keywords: endowment effect, experience, splitting effects

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1. Introduction

This paper presents a new experimental study probing the determinants of the 'endowment effect' (Thaler, 1980). We use the term here to refer to behavioural tendencies consistent with people valuing goods more highly when they own them, relative to when they do not. The simplest experiments demonstrating the endowment effect involve a 'swapping task', introduced by Jack Knetsch (1989), in which subjects are randomly endowed with one of two items and then given the opportunity to swap their endowment for the other item. The common finding in such settings is that the majority choose not to swap. This is an anomaly relative to the standard economic theory of preferences, which would predict a trading rate of 50%.[1] Evidence from a wide range of studies, which show that willingness-to-accept valuations for goods are often significantly higher than willingness-to-pay valuations, has also been interpreted as evidence of an endowment effect (Horowitz and McConnell (2002) review many of these studies; see also Plott and Zeiler (2005) and Isoni et al. (2011) for further discussion of the interpretation of endowment effects). Across these two genres of experiment, endowment effects have been found for both a wide range of goods (e.g. money, lotteries, mugs, candy, toys, memorabilia, stationary, food and drink) and subjects (children, undergraduates, and non-student adults).

Although the endowment effect has been widely observed, there is growing evidence that it may be eroded or even eliminated by certain kinds of experience. Much of the existing evidence relates to the influence of various forms of *market* experience. For example, when valuations are elicited repeatedly in experimental markets, the gap between willingness-to-accept and willingness-to-pay usually decays (e.g. Shogren et al. (2001), Loomes, Starmer, and Sugden (2003)). Similarly, research using variants of the classic swapping task shows that resistance to trade is reduced among those with prior trading experience. For example, List (2003, 2004) reports that experienced traders in a naturally occurring market show no endowment effect, and Engelmann and Hollard (2010) find that subjects who have previously been 'forced' to trade exhibit no endowment effect in subsequent swapping tasks.

In this research, we take a new direction in the study of how experience impacts the endowment effect by focussing on the role of experiences that are separable (but not necessarily separate) from market participation. Our primary motivation was to explore two dimensions of experience that arise commonly in daily life and which, based on pre-existing

theory and evidence, we conjectured might influence the extent of an endowment effect: these are experiences arising, respectively, from *consuming* and *choosing* goods. In the next section we discuss background theory and evidence. Section 3 sets out our experimental design, Section 4 presents results and Section 5 concludes.

2. Background theory and evidence

We draw on a recent theory proposed by Loomes, Orr, and Sugden (2009) (henceforth LOS) to motivate our interest in how different types of experience influence the endowment effect. LOS introduce a new model of consumer choice which predicts the endowment effect as a consequence of two key factors: individuals are uncertain about the level of utility an alternative will deliver and they are loss averse. The theory is essentially an application of Sugden's (2003) reference dependent subjective expected utility theory (RDSEUT) to choices over consumption bundles. In LOS, preferences are defined over consumption bundles (x,y,z) which are interpreted as sets of consumption characteristics. RDSEUT is a theory of *choice under uncertainty*, but it is applied to the consumption choice problem by interpreting each bundle, x, as an act (in the sense of Savage 1954) associating a specific utility $U_s(x)$ with each element, s, of a state space S. The state space is then interpreted as representing 'taste uncertainty' which can arise from two sources. Consider an individual ordering a meal from a restaurant menu. In this case, uncertainty about how well a dish will be prepared could be a source of *extrinsic* uncertainty about the satisfaction that it will deliver (I think I would enjoy fish tonight, but only if it's cooked well). Added to this, LOS postulate the possibility of *intrinsic* uncertainty, arising from 'variable states of mind', which may also influence the enjoyment that will actually arise from a given material consumption experience (as a metaphor for variable states of mind, imagine the restaurant goer trying to decide whether they are *in the mood* for fish or meat and, at least temporarily, vacillating).

Formally, in LOS, preferences over any pair of acts (x,y) are evaluated from a reference act (which we label z) which might be (but does not have to be) the status quo position. Following LOS, for any three acts x,y,z, expression (1) states the condition for x being (weakly) preferred to y, viewed from reference act z:

$$(x \succcurlyeq y|z) \leftrightarrow \sum_s p_s\, \varphi\big(U_s(x) - U_s(z)\big) \geq \sum_s p_s\, \varphi(U_s(y) - U_s(z)) \qquad (1)$$

In this expression, p_s is the probability of state s and the function $\varphi(.)$ is a 'gain/loss evaluation function' which is assumed to be continuous, increasing and weakly concave with $\varphi(0) = 0$. This has the effect of inducing loss aversion (i.e. losses of utility loom larger than corresponding magnitude gains).

The theory predicts an endowment effect. To illustrate this, consider a very simple choice between two acts (x, y) each of which gives a unit of utility in just one of two states of the world (s_1, s_2) as described in Figure 1.

Figure 1: A choice between acts x and y

	s_1	s_2
x	1	0
y	0	1

For simplicity, assume that $p_1 = p_2 = 0.5$ so that x and y are stochastically equivalent acts. Then assume that one of these two acts, say y, is the current endowment or reference act and apply the preference condition in expression (1) above. Setting y as the reference act makes the right-hand-side of the inequality in expression (1) equal to zero. The ranking of x and y is then determined purely by the sign of $\{\varphi(1) + \varphi(-1)\}$ which is negative due to loss aversion. Hence, an individual endowed with y (or, equivalently, endowed with x) will not swap for the stochastically equivalent act: *there is an endowment effect*.

2.1. The taste uncertainty hypothesis

A distinctive property of the LOS model is that "the strength of status quo effects is positively related to the extent of taste uncertainty" (LOS, p.132). While we leave interested readers to pursue the detail in LOS, an intuition can be provided again from the example of Figure 1. In the complete absence of taste uncertainty either s_1 or s_2 is known to occur for sure. In this case, the individual will have a strict preference ranking of the two acts which will be independent of their endowment. An important corollary of this second property of the LOS model is that any experiences which reduce taste uncertainty should also weaken the endowment effect. We call this the *taste uncertainty hypothesis*. We test this hypothesis with a treatment which involves the experience of tasting edible goods before being endowed with

a bundle of these goods and facing a swap decision. We expect this to reduce subjects' uncertainty about the utility they will derive from the consumption goods that are available as outcomes in our experiment. We test whether this reduces the endowment effect by comparison against a baseline treatment without a tasting opportunity.

2.2. The choice experience hypothesis

One interpretation of the endowment effect observed in classic swapping task is that prior endowments create *biases* (relative to a straight choice) causing at least some individuals' stated preferences to deviate from their underlying (unbiased) preferences. For example, the endowment effect is sometimes interpreted as evidence of a bias towards the status quo (e.g. Samuelson and Zeckhauser, 1988). This leads us to pose the following thought experiment. Suppose one could find a way of allowing a subject to make a straight choice between a pair of goods before confronting them with the classic swapping task (involving the same pair of goods). On the assumption that the endowment effect is a bias relative to underlying preferences, it is plausible that the prior experience of choosing between the goods, pre-endowment, could diminish the impact of a subsequent endowment effect. We call this conjecture, the *choice experience hypothesis.*

We can think of several mechanisms that might work in this direction. The first is 'preference discovery' of the type discussed by (Plott, 1996): the individual has an underlying preference which the straight choice task helps them to identify and, having done so, they will be more likely to implement that preference in sufficiently proximate future tasks. An alternative hypothesis, which does not necessarily require that the endowment effect is a bias, is that accumulating experiences of ranking a pair of alternatives from different initial endowment positions weakens the influence that any particular endowment has on subsequent choice. For example, an individual who has chosen between two goods without owning either of them may be less susceptible to an endowment effect in a swapping task than an individual who has no prior experience of forming an endowment-free ranking. A third possible mechanism is suggested by the model of LOS. As explained above, in that model, the strength of the endowment effect may be positively related to the degree of intrinsic uncertainty an agent has associated with a choice. So, if reaching a decision in a choice between two goods reduces vacillation in subsequent decisions over the same pair of goods, that would provide another conduit for operation of the choice experience hypothesis.

So how could the choice experience hypothesis be tested? One possibility would be to ask subjects to make a choice between some pair of goods {x, y} believing that this was their only task and that it was for real. After completing the task, the experimenter then 'confiscates' the chosen option, randomly allocates either x or y and then invites swaps. This setup has the attractive feature that it introduces experience in a first step but subsequently allows us to observe the x versus y choice from a randomly determined endowment (hence the standard theoretic assumption of 50% swaps applies). On the other hand, it also has an obvious, and arguably fatal, flaw: it involves actively misleading the subjects about the consequences of their initial decisions. Since we endorse the standard experimental economist's prohibition of deceptive methods we must pursue another route. To this end, our study introduces a new variant of the swapping task that involves *sequences* of choices among *bundles* of goods. Using this technique we are able to create a deception-free procedure for testing the choice experience hypothesis. The details of this procedure are explained in the next section where we set out our full design.

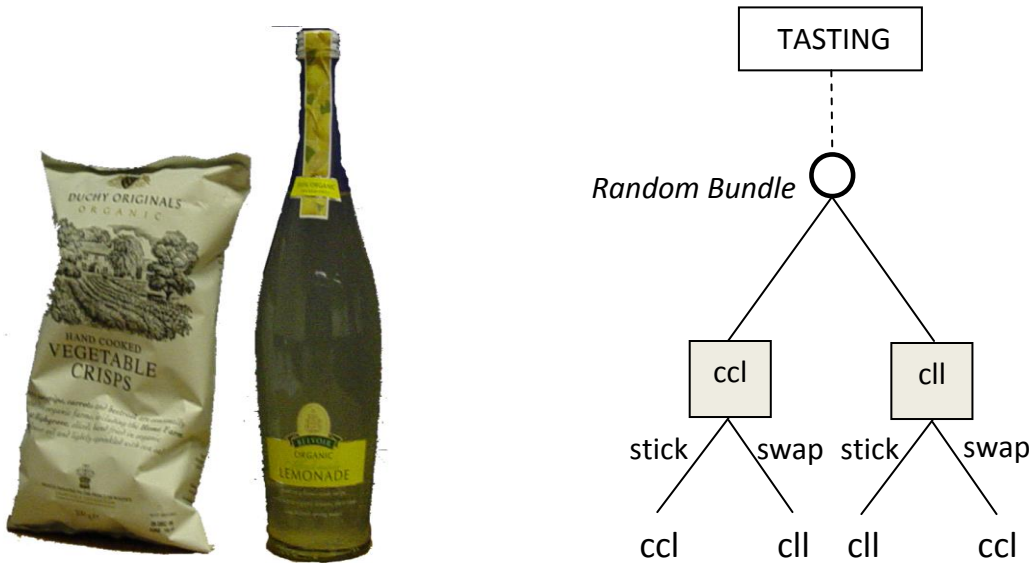
3. The experiment

We test the *taste uncertainty hypothesis* by investigating whether consumption experience, in an environment where subjects are uncertain about how much they will enjoy available alternatives, reduces the endowment effect. To which end we compare behaviour in two treatments which we label BASELINE and TASTING.

Our BASELINE treatment was a variant of the classic swapping task due to Knetsch (1989), where subjects were randomly allocated one of two possible endowments and then given the opportunity to either stick or swap. Relative to the classic task, our BASELINE treatment has two distinguishing features. The first is that the goods which comprised the endowments were consumption goods selected in the expectation that subjects would be unsure how much they might like them. The two goods were premium organic vegetable crisps (100g packets) and handmade organic lemonade (75cl bottles) and they are pictured below in the left hand panel of Figure 2. The goods were supplied by specialist wholesalers and had similar retail prices of approximately £2. The limited availability and premium nature of the goods meant that subjects were unlikely to have tasted them before. The second distinctive feature of our BASELINE treatment was that each endowment was a *bundle* of goods rather than a single object: each subject was randomly endowed with either a 'crisps-

rich' bundle consisting of two packets of crisps and a single bottle of lemonade (which we denote ccl) or a 'lemonade-rich' bundle consisting of a single packet of crisps and two bottles of lemonade (denoted cll). The rationale for using bundles is explained below.[2]

Figure 2: The BASELINE and TASTING treatments



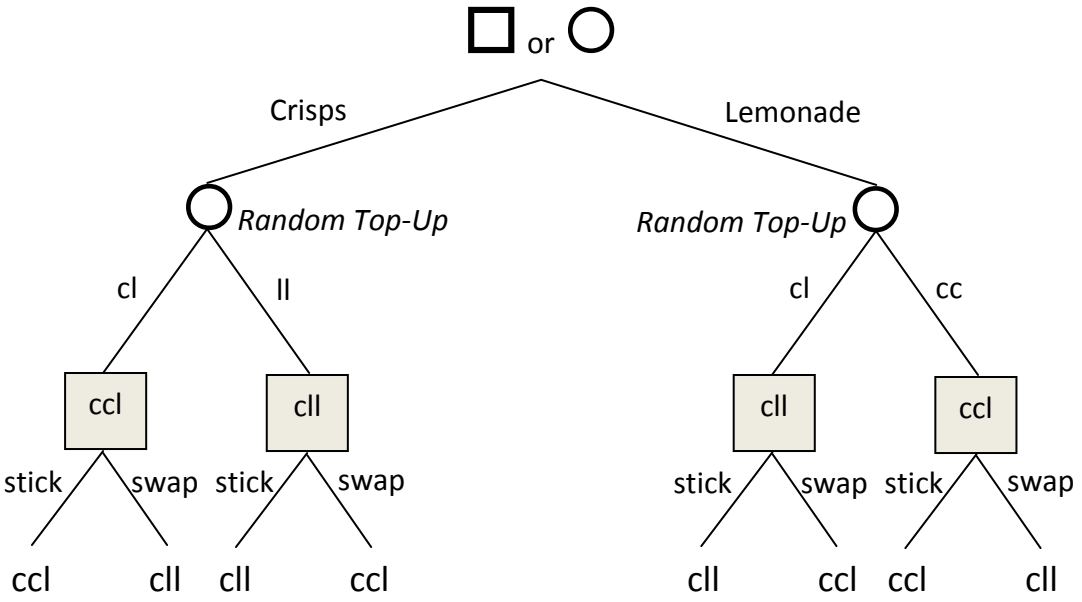
The TASTING treatment was identical to the BASELINE treatment except that each subject consumed a small amount of the two goods before being endowed with their bundle. The TASTING treatment is represented in the right hand panel of Figure 2. Starting from the top of that panel, the treatment began with a subject tasting samples of each of the two goods. The experimenter then allocated one of the two possible endowments at random. This randomisation placed each subject at one of the shaded choice nodes where they were faced with a choice between sticking with their allocated endowment or swapping for the other one. This decision determined a final allocation which was theirs to keep and take from the experiment. The structure of the BASELINE treatment was identical except that there was no TASTING phase preceding the random allocation.

Given the assumptions that (i) the goods used in our experiment are ones for which individuals would have taste uncertainty and (ii) that consuming small quantities of these goods would reduce taste uncertainty, the comparison of behaviour in the BASELINE and TASTING treatments provides a simple test of the hypothesis that taste uncertainty

contributes to the endowment effect. On that hypothesis, we should expect the endowment effect to be relatively weaker in the TASTING treatment.

Our second main objective (explained in Section 2.2) was to test the *choice experience hypothesis*. Our test of this hypothesis involves a comparison of two treatments which we label CHOOSING and PASSIVE. These two treatments are described by the tree in Figure 3. The only difference between them is what happened at the first node at the top of the figure.

Figure 3: The CHOOSING and PASSIVE treatments



In the CHOOSING treatment, the first node was a *choice node* at which the subject had to choose either one packet of crisps or one bottle of lemonade. Once the subject had selected a good they were physically given it by the experimenter. They then completed a filler task. Following this, a random device determined a 'top-up' to their endowment, so that with equal probability they would find themselves with either a crisps-rich or a lemonade-rich bundle. This placed the subject at one of the four shaded choice nodes in the lower part of Figure 3. They then had to choose whether to stick with their endowment, or swap it for the endowment rich in the other good. The PASSIVE treatment worked in exactly the same way except that the initial component of the endowment (at the first node) was determined by chance rather than by the subject's own choice.

Therefore, in both the CHOOSING and PASSIVE treatments, a subject with the crisps-rich (resp. lemonade-rich) bundle has an opportunity to stick with their three item bundle, or

swap one packet of crisps (resp. one bottle of lemonade) for one bottle of lemonade (resp. one packet of crisps). The only difference between the treatments is whether the first unit of the endowment is acquired by choice or at random. But since our "top-up" method ensures that the final endowed bundle is randomly determined in both treatments, and that it is independent of the initial choice in the CHOOSING treatment, the standard prediction of a 50% swap rate applies to both. Consequently, our comparison of behaviour in the CHOOSING and PASSIVE treatments provides a test of the choice experience hypothesis. On that hypothesis we should expect more swaps in the CHOOSING treatment than in the PASSIVE treatment.

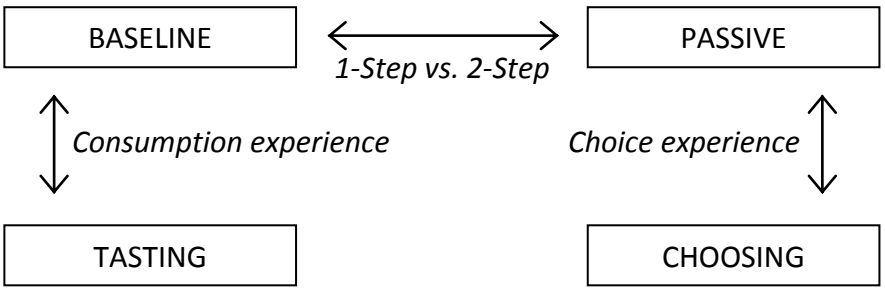
Another feature common to the PASSIVE and CHOOSING treatments also distinguishes them from other work on the endowment effect. This is that the acquisition of a subject's endowment is split into two distinct steps: the initial step determining the first item in the endowment (by either choice or chance), followed by a random top-up of two further items to either a crisps-rich or a lemonade-rich bundle. Whilst splitting the acquisition of endowments into two distinct steps arises as a consequence of our method for testing the choice experience hypothesis, it has potentially important implications beyond this test.

A number of experiments have revealed evidence of "splitting effects". These effects, observed in a variety of decision-making tasks, all involve objects, or attributes of objects, being split into smaller component parts. For example, Starmer and Sugden (1993) and Humphrey (1995) report evidence of *event-splitting* effects, whereby individuals prefer lotteries which offer two (split) chances of an outcome to a single (combined) chance of the same outcome, despite the total probability of the outcome being identical in each case. Bateman et al. (1997) report evidence of a *part-whole bias* in contingent valuation which shows, in an incentive compatible design, that when a restaurant meal is split into its constituent parts (main course, coffee and dessert) the sum of the valuations of the parts exceeds the valuation of the whole meal. Weber et al. (1988) report similar effects in multi-attribute utility measurement.

The existence of splitting effects across multiple domains raises the possibility that measured endowment effects may be different in the two-step treatments in our design (PASSIVE and CHOOSING) relative to the treatments where endowments are acquired all at once (BASELINE and TASTING). Specifically, splitting effects provide a reason to expect

that a bundle acquired in two steps could be more highly valued than the same bundle acquired in a single step. Consequently, if subjects view a decision at any one of the (lower) choice nodes of Figure 3 as a choice between an endowment acquired in two steps and an alternative that can be acquired in one step, the splitting effect would work in the direction of *strengthening* the observed endowment effect.[3] Given that this two-step structure of the PASSIVE and CHOOSING treatments is distinctive relative to tasks used in other investigations of the endowment effect, it is important that we can assess the influence of split versus single acquisitions of endowments. By using bundles of goods as endowments in the single step treatments (as opposed to the single good endowments of more conventional swapping tasks) we are able to conduct a controlled test of this influence by comparing behaviour between the BASELINE and PASSIVE treatments.

Figure 4: Summary of treatments



The full set of treatments and the comparisons we conduct is summarized in Figure 4. The common feature across all treatments is that every subject ultimately received a random allocation of either the crisps-rich or lemonade-rich endowment (i.e. arrived at one of the shaded choice nodes in either Figure 2 or Figure 3). Every subject then faced a choice of whether to keep their endowment or to swap. From the point of view of conventional preference theory in which endowments, or the experiences involved en route to their acquisition, play no role, the task faced at any of these nodes is an equivalent choice: that is, the subject is required to select the most preferred item from the pair (ccl, cll). Given that any subject in our experiment was equally likely to have been endowed with either bundle, the standard theoretic prediction in each treatment is that 50% of subjects will swap.

Our BASELINE treatment is a quasi-replication of the standard swapping task, but with the added dimension that the endowments are bundles. Comparison of BASELINE and TASTING treatments provides a test of the hypothesis that consumption will reduce taste

uncertainty and hence the endowment effect. The comparison of PASSIVE and CHOOSING provides a test of the choice experience hypothesis. The comparison of BASELINE and PASSIVE provides a test of whether splitting the acquisition of endowments into two distinct steps strengthens the endowment effect.

A total of 210 subjects were recruited by email from a database of pre-registered volunteers at the CeDEx Research Centre (University of Nottingham). Each subject was randomly assigned to one of the four treatments. The implementation of our design involved some filler tasks (these and some other details of the implementation are set out in an Appendix). As part of the filler tasks we gathered some individual level data which we explain and utilise in econometric analysis reported in the next section.

4. Results

Table 1 cross-tabulates endowments against final allocations resulting from the swap task with data pooled from all treatments. The majority of subjects endowed with lemonade (73/110 or 66%) stuck with lemonade and the majority endowed with crisps (60/100) stuck with crisps. Based on a one-sided Fisher's exact test we can confidently reject the null hypothesis ($p<0.001$) that final allocations are independent of endowments. So, in our aggregate data, there is clear evidence of an endowment effect.

Table 1: Endowment against final allocation for pooled data

	Final Allocation		
	Lemonade rich	Crisps rich	Total
Endowment			
Lemonade rich	73	37	110
Crisps rich	40	60	100
Total	113	97	210

Table 2 reports swap rates broken down by treatment. The *Endowments* column shows the number of subjects initially endowed with each of the two bundles. The S*waps* column reports the total number of swaps and shows the number of swaps in each possible direction: swapping crisps for lemonade (c→l) and swapping lemonade for crisps (c←l). The *Swap Rate* is the proportion of subjects who swapped in each treatment. The final column reports *p*-values for tests of the null hypothesis (based on standard preference theory) that final

allocation is independent of endowment against the alternative hypothesis that there is an endowment effect.

Table 2: Endowments and trading by treatment

Treatment		N	Endowments (ccl, cll)	Swaps total (c→l, c←l)	Swap rate	P-Value
One-step acquisition	**BASELINE**	50	(25, 25)	21 (10, 11)	0.42	0.198
	TASTING	56	(27, 29)	26 (16, 10)	0.46	0.418
	Total	106	(52, 54)	47 (26, 21)	0.44	0.170
Two-step acquisition	**PASSIVE**	52	(26, 26)	12 (6, 6)	0.23	0.000
	CHOOSING	52	(22, 30)	18 (8, 10)	0.35	0.029
	Total	104	(48, 56)	30 (14, 16)	0.29	0.000
All		210	(100, 110)	77 (40, 37)	0.37	0.000

We first comment on the results for the BASELINE and TASTING treatments where endowments were acquired in a single step. While the trading rates for these two treatments have the pattern we expected with BASELINE < TASTING < 0.5, neither has a statistically significant endowment effect. The absence of an endowment effect in the BASELINE treatment is noteworthy, and we discuss this in the next section. In the absence of an endowment effect in this treatment, we are unable to conduct a meaningful test of whether tasting experience reduces it. Turning to the treatments where endowments were acquired in two steps, a comparison of the trading rates for PASSIVE and CHOOSING (0.23 vs. 0.35) provides some evidence that the experience of choosing en route to an endowment reduced the endowment effect. Subjects in the CHOOSING treatment are approximately 50% more likely to trade though this difference is not statistically significant (p=0.1395, one-sided Fisher's exact test).[4]

Perhaps the most striking feature of the results in Table 2 is the difference between the treatments in which the acquisition of endowments was split into two steps and the treatments where the endowment was acquired in one step. Subjects who acquired their endowment in two distinct instalments swapped considerably less often than those who acquired it all at once. While 44% of subjects swapped in the one-step treatments, only 29% of subjects did so in two-step treatments. This means that acquiring the endowment in one instalment made subjects over 50% more likely to swap. This difference is statistically significant (p=0.014, one-sided Fisher's exact test). Comparing the BASELINE and PASSIVE treatments, which

control for the experiences of choosing between and tasting the goods, respectively 42% and 23% of subjects swapped their endowments. This difference is also statistically significant (p=0.033 one-sided Fisher's exact test). These results establish new evidence of a splitting effect in the acquisition of goods which comprise a bundle.

We now supplement this treatment level analysis with regression analysis of the decision to swap which allows us to take account of information on individual characteristics. To this end, we estimate a logit model of the form:[5]

$$Pr(Swap_{\mathrm{i}} = 1|X_i) = \Lambda(X_i\beta).$$

The variable Swap_i indicates whether subject i swapped and Λ is the standard logit function. The vector X_i contains individual level characteristics and dummy variables representing the treatment subject i faced. As part of the set of filler tasks, subjects completed a survey which recorded their age and gender. It also contained a set of questions, responses to which enabled us to rank individuals according to their degree of loss aversion. Subjects were shown a series of hypothetical 50/50 lose X/win Y bets with the win figure, Y, left blank.[6] They were asked to specify the minimum value for Y such that they would still be willing to play the bet. The resulting data allow us to rank individuals according to their degree of loss aversion.[7]

The results of estimating several variants of the logit model are reported in Table 3. We restrict our discussion to the most interesting results of this analysis. Model 1, which includes only a constant, provides a simple econometric test for the presence of an endowment effect. When y = Λ(x), y is always between zero and one. In Model 1, the constant is negative which indicates a swap rate of less than 50%. This effect is highly significant and confirms the presence of an endowment effect in our data.

In all three models that include individual level characteristics (2, 4 and 5), the coefficient for measured loss aversion is negative. Tests of the null hypothesis that the swap rate is independent of loss aversion are rejected at the 5% level in favour of the alternative hypothesis that the coefficient for loss aversion is negative (model 2, p=0.0436; model 4, p=0.0424; model 5, p=0.0369). In our data, measured loss aversion predicts the propensity to swap: more loss averse individuals were less likely to trade. This provides further support for

theories, including LOS, which explain the endowment effect as, in part, a consequence of loss aversion. Neither age nor gender plays a significant explanatory role.

Table 3: Logit analysis of swap decisions

	(1)	(2)	(3)	(4)	(5)
Constant	-0.55***	-1.09	-0.47	-1.49	-1.55
	(0.14)	(1.82)	(0.32)	(1.86)	(1.91)
Female		-0.33		-0.37	-0.37
		(0.29)		(0.30)	(0.30)
Age		0.05		0.09	0.09
		(0.09)		(0.09)	(0.09)
Loss aversion		-0.88*		-0.90*	-0.93*
		(0.51)		(0.52)	(0.52)
Endowed crisps		0.36	0.29	0.34	0.37
		(0.29)	(0.29)	(0.30)	(0.30)
TASTING			0.19		0.24
			(0.39)		(0.40)
PASSIVE			-0.89**		-0.94**
			(0.44)		(0.44)
CHOOSING			-0.29		-0.34
			(0.41)		(0.42)
Two-step				-0.75**	
				(0.30)	

The dependent variable is 1 if the subject traded, 0 otherwise. Female is 1 if the subject was female, 0 otherwise. *Age* is measured in years. *Loss aversion* ranges from 0 (least averse) to 1 (most averse). *Endowed crisps* is 1 if the subject received a crisps-rich endowment, 0 otherwise. The remaining variables are 1 or 0 according to which treatment the subject was assigned. Parameter estimates are logit coefficients with standard errors in parentheses. *Denotes significance at the p < .1 level; ** at the p<.05 level; *** at the p<.001 level.

Models 3 and 5 provide evidence that the experience of choosing part of the endowment increases the trading rate (and reduces the endowment effect). Tests of the null hypothesis that the trading rates in the PASSIVE and CHOOING treatments are equal are rejected at the 10% level in favour of the alternative hypothesis that the trading rate is *higher* in the CHOOSING treatment (model 3, p= 0.0898; model 5, p= 0.0894).

Finally, the logit analysis confirms the observation that splitting the acquisition of endowments into two steps decreases the trading rate (and increases the endowment effect).

This is evidenced by the significant negative coefficients on PASSIVE in Models 3 and 5 and by the significant effect for the dummy 'Two-Step' in Model 4, which takes a value of 1 if the treatment is either PASSIVE or CHOOSING (it is zero otherwise).

5. Discussion and conclusion

Our study has revealed a number of new results relating to the existence – or absence - of the endowment effect and, where it is present, the factors which determine its size. Whilst an endowment effect is present in our aggregate data, the treatment-level analysis reveals this effect to be highly sensitive to the factors which we varied between treatments. It is this aspect of our data, in particular, which warrants discussion.

The first issue to consider is why our BASELINE treatment, which is closest to the classic swapping task of Knetsch (1989), did not generate a significant endowment effect. The most obvious difference between this study and others which have used simple swapping tasks and found an endowment effect, is that we endowed subjects with bundles of goods and not single items[8]. For instance, in Knetsch's study, subjects who swapped their endowment were giving up their only mug or only chocolate bar; in this study, subjects were giving up one of two packets of crisps or one of two bottles of lemonade. It is plausible to think that loss aversion may be more acute when one is faced with giving up the last unit of a good than when faced with giving up one of several units. Indeed, this idea gains support from a recent experiment by Burson, Faro, and Rottenstreich (2012) demonstrating just such an effect. The implication of this emerging picture may be that the significance of the endowment effect for the efficient operation of markets can depend upon whether the goods traded in those markets are normally held in single or multiple units.

Our study has produced particularly interesting findings in the treatments where endowments were acquired in two-steps. We find some evidence that the experience of having made a straight choice between a pair of goods may *reduce* the endowment effect observed in a later swap task involving those same goods. While we have found only modest support for such an effect, we think there is a case of further investigation because the operation of such an effect appears to cohere with both emerging theory and evidence. From a theoretical point of view, we have argued that the choice experience hypothesis can be interpreted as an implication of the LOS model and we view this theory as an attractive model because it models mechanisms which may explain not only why the endowment effect

occurs, but also why it changes (as it does) as a consequence of particular forms of experience. From an empirical point of view, we see a possible parallel with the work of Engelmann and Hollard (2010). They conjectured that endowment effects may be partly caused by individuals having biased assessments of the costs associated with trading (where costs can include mental costs associated with bargaining or even deciding what to do). To test this hypothesis, their experiment involved some subjects being obliged to undertake trades before taking part in a classic swaps experiment. They found that subjects who had traded as a consequence of this 'therapy' exhibited no endowment effect. One possible interpretation of the reduced endowment effect in our CHOOSING treatment is that the opportunity to exercise choice en route to an endowment plays a comparable 'therapeutic' role: learning to exercise choice, even outside of any trading institution, may be a lubricant for later market participation.

Finally, our most striking finding is that even though there was no endowment effect for bundles which were acquired in a single step, the endowment effect re-emerged for bundles that were acquired in two steps. We have suggested that this finding may constitute evidence of a new species of splitting effect, related to those observed in research across a broad range of decision-making contexts (e.g. Starmer and Sugden, 1993; Humphrey, 1995; Bateman et al. 1997; Weber, et al. 1998). Future research might fruitfully seek to investigate whether these apparently similar behaviours can be traced to the same underlying mechanisms. To the extent that splitting effects do promote endowment effects there is reason to expect the latter to be particularly pronounced in markets where endowments tend to be built up over time. These may range from markets for, economically, relatively insignificant items, such as collections of stamps and memorabilia accumulated over time, to important investments such as building a business or a home (where, for example, the initially acquired endowment has been supplemented over time with new kitchens, bathrooms etc. to form the endowment that will be traded). In markets for goods with these characteristics, it is possible that previous experimental evidence has under-estimated the extent to which exchange efficiency may be disrupted by the endowment effect.

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Appendix: Experimental protocol

The experiment was run by two people, referred to as experimenter A and experimenter B. Subjects completed the experiment one at a time. The room used was divided into three areas so that subjects in one area could not see what those in other areas were doing. Subjects arrived at five minute intervals. Upon arrival, they read through a set of paper instructions. The stages completed by subjects in each of the treatments were as follows:

Stage	Treatments			
	1-Step		2-Step	
	BASELINE	TASTING	PASSIVE	CHOOSING
1.a	Taste items		Allocated item	Choose item
1.b	Complete survey (filler task)			
2.a	Allocated items		Allocation topped-up	
2.b	Complete survey (filler task)			
3.a	Given option to trade			
3.b	Debrief survey			
3.c	Complete receipt			

Experimenter A called subjects individually into Area 2 and assigned the subject at random to one of the four treatments and then ran through stages 1.a to 2.b of the experiment. Then the subject carried their goods to area 3. Here, experimenter B ran through stages 3.a to 3.c of the experiment with the subject. The option to trade was framed as follows. The experimenter read one of the statements depending on which combination of goods the subject possessed.

(i) You have two packets of crisps and one bottle of lemonade. If you want, you can swap one of your packets of crisps for a bottle of lemonade.

(ii) You have two bottles of lemonade and one packet of crisps. If you want, you can swap one of your bottles of lemonade for a packet of crisps.

The experimenter swapped the item if the subject wished to trade. The experimenter recorded the trade decision, then asked the subject to complete a debrief survey and receipt form. Finally the experimenter gave the subject an opaque plastic bag to carry their items. The plastic bags reduced the risk of other subjects seeing what the subject leaving the experiment had been given.

Notes

[1] Suppose that, in a choice between two goods, a and b, in the relevant population a fixed proportion p strictly prefer a over b while the rest have a strict preference for b. For the half endowed with a, the fraction 1-p is expected to swap while for those endowed with b, a proportion p is expected to swap. Hence the predicted swap rate is 0.5*p + 0.5*(1-p) = 0.5.

[2] Recent research has examined the effects of bundles versus individual goods and we comment on this related research below in Section 5.

[3] In principle, splitting effects might also have implications for the strength of the endowment effect in one-step treatments. Specifically, suppose that subjects at either of the decision nodes in Figure 2 viewed their options as choosing between sticking with their initial endowment (acquired in one step) or switching to a new bundle consisting of two parts: the part they retain from their original endowment, plus the new component acquired from the swap. Such mental accounting, combined with a splitting effect, would tend to *reduce* the endowment effect. On this interpretation, the swapping is itself creating a relevant split. While this is a logical possibility, it is one that arises in common across all four of our treatments. The one step and two step treatments are then distinguished from each other in that the net effects of splitting should be to favour the endowment effect in the two step treatments.

[4] The comparison between PASSIVE and CHOOSING is based on 104 observations while the comparison (above) between the one and two-step treatments is based on all 210 observations. If the trading rates of the choosers and owners were observed in a sample of 210 observations the difference would be statistically significant.

[5] This model is comparable to that used in List (2003); see tables IV, VI and VIII therein.

[6] While we should be wary about relying too heavily on data generated via responses to hypothetical tasks, our statistic for loss aversion is a significant predictor of incentivised decision behaviour (see below).

[7] A single measure of loss aversion was constructed using the seven responses each subject gave to the attitude to risk survey. This was done by ranking the answers for each of the seven 50/50 lose X/win Y bets according to the figure specified for Y. Answers indicating the bet would be rejected however large Y were assigned the highest rank. An overall rank was produced by summing the rank values for the seven answers. The higher the rank value of a subject, the greater their recorded aversion to losses.

[8] Another distinctive feature of our setup, which may be relevant here, is that there were two experimenters. The first experimenter endowed the subjects with the goods, then the subject carried the goods to the second experimenter, who was separated from the first experimenter by a screen. It seems possible that reluctance to exchange is in part driven by a reluctance of subjects to return what they have been given, but this reluctance is reduced by moving to a different location and dealing with a different person.