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A Shock Therapy Against the “Endowment Effect”*

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Abstract

Simple exchange experiments have identified the fact that participants trade their endowment less frequently than standard demand theory predicts. List (2003) finds, however, that the most experienced dealers acting on a well functioning market are not subject to this “endowment effect”. Thus, it seems that a lot of market experience is needed to overcome the “endowment effect”. In order to understand the effect of market experience, we introduce a distinction between two types of uncertainty, choice uncertainty and trade uncertainty, which could both lead to an “endowment effect”. While List’s own explanation is related to choice uncertainty, we conjecture that trade uncertainty is important for the “endowment effect”. To test this conjecture, we design a simple experiment where the two treatments impact differently on trade uncertainty, while controlling for choice uncertainty. Supporting our conjecture, we find that “forcing” subjects to give away their endowment in a series of exchanges, eliminates the “endowment effect” in a subsequent test. We discuss why markets might not succeed in providing sufficient incentives for learning to overcome the “endowment effect”.

JEL Classification: C91, D12

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1 Introduction

Simple exchange experiments, starting with Knetsch (1989) have identified that participants trade their endowment less frequently than standard demand theory predicts. This could suggest that individuals value objects differently when they are in their possession than when they are not. Further experiments and replication have confirmed the robustness of this phenomenon. Taken at face value, this “endowment effect”¹ implies that subjects are likely to miss beneficial trades. To evaluate the impact of such anomalies on actual markets, it is natural to wonder whether the “endowment effect” disappears with market experience. List (2003) ran an experiment where subjects were dealers acting on a well functioning market. He shows that the most experienced dealers are indeed not subject to the “endowment effect”. List’s experiment has played a prominent part in the debate to address the robustness of results from the laboratory in the field.

This raises the question of what it is the market does that makes people rational. The answer is generally twofold: the market selects rational individuals – the market acts as a filter for irrational behavior – and provides incentives to correct possible mistakes – the market acts as a teacher (see List and Millimet (2008) and the numerous references therein). The functioning of the selection on markets is rather easy to understand. Those who make too many mistakes perform poorly on the market and either choose to withdraw

¹We agree with Plott and Zeiler (2007) that the term “endowment effect” is problematic because this already entails an interpretation for the observed phenomenon, namely that too little trade in simple exchange experiments is driven by the fact that players are endowed with one of the goods and experience loss aversion with respect to their endowment. They refer to “endowment effect theory” as the theory that attributes this phenomenon to an endowment effect. The results of Plott and Zeiler (2007) suggest that the interpretation of endowment effect theory is not warranted. Plott and Zeiler (2007) hence refer to “exchange asymmetry” instead of “endowment effect” for the phenomenon of too little trade in exchange experiments. To keep a clear link to the literature, but to signal at the same time that the term is problematic, we call the phenomenon the “endowment effect”, keeping it in quotation marks throughout.

or go bankrupt. But little is known about *how* market experience succeeds in teaching participants to avoid anomalies, such as the “endowment effect”. Note that if the underlying mechanism was known we should be able to implement it in the lab so that subjects would learn to overcome the “endowment effect” using mechanisms similar to those they encounter on the market. We make the following four observations that need to be taken into account to understand this learning process.

First, in List’s experiments, only traders with intense market experience do overcome the “endowment effect”. Specifically, the experienced traders for whom no significant “endowment effect” is detected are those with six or more trades a month in List (2003), and typically they have had this experience over several years. Thus, learning is at best very slow. Alternatively, it could be that no learning occurs at all, but just selection (those who are not subject to the “endowment effect” simply trade more both on the market and in the lab). Given the slow speed at which participants overcome the “endowment effect” (if they learn at all), we wonder whether the market is a rather poor teacher in this subject² or whether what has to be learned to overcome the “endowment effect” is just very difficult.

Second, the experiments used to test for the existence of an “endowment effect” are very simple and do not necessitate any computational skills, nor inference about others’ behavior as in auctions. Subjects are just asked whether they want to exchange an object they hold for another one. It is thus rather surprising that a lot of experience is required to perform such a simple task adequately.

Third, while List (2003) uses unique sports collectors’ items, List (2004) replicates a classical experiment in which the choices to be made involve mugs and chocolate bars,

²We stress that learning in the marketplace regarding other issues might be substantially faster, for example, market participants might quickly learn how prices are formed on markets. Our focus here is on the apparent lack of trading.

again using participants who have experience on a sports-card market. As in List (2003) only the participants with intensive market experience in the sports-card market, here even eleven or more trades a month, show less of an “endowment effect” in the simple choice experiment with mugs and chocolate bars. That substantial experience is required to eliminate an “endowment effect” for such common items is even more surprising than the intense experience required in List (2003).

Finally, List (2003) also reports experiments where subjects take part in four trading sessions, each separated by a week. He notes a decline, though not elimination, of the “endowment effect”, concluding that these results “reinforce the notion that useful cognitive capital builds up slowly, over days or years, rather than in the short run of an experiment.” (p. 67), as noted previously by Camerer and Hogarth (1999).

Taken together, these four observations imply that the market does not eliminate the “endowment effect” easily and that learning is slow. To understand why, we take a step back and consider what can be learned in the marketplace. List suggests that his results “may indicate that experienced subjects are more certain of their preferences (or the goods’ values) and therefore trade more often than lesser-experienced agents.” (List, 2004, p. 617).³ According to this interpretation, what is learned in the marketplace is a better ability to rank goods according to their relative value. Market experience may thus reduce preference uncertainty. This is a plausible explanation for the results in List (2003), although it is still surprising that such a large number of trades is required to learn this skill. Moreover, as noted above, in List (2004) participants with higher market experience in the sports-card market show less of an “endowment effect” in the simple choice experiment with mugs

³This argument is essentially an application of Plott’s (1996) “discovered preference hypothesis”. It is interesting to note that List’s argument, which refers to experience the subjects have gained in the field, is captured by Plott’s hypothesis, which was developed to explain results in the laboratory.

and chocolate bars. But it is hard to see why intense experience dealing with sports-cards should help develop expertise in ranking common items such as mugs and chocolate bars. Therefore, the results in List (2004) are difficult to explain only with the idea that experienced dealers are more certain about their preferences. We thus conjecture that in addition to uncertainty about preferences and the relative values of goods, market participants face a different type of uncertainty, which can be only slowly overcome with market experience, if at all.⁴

We stress that in typical exchange experiments, the objects are carefully chosen to have about equal market value. It is then reasonable to assume that the utility difference is rather small for most subjects. In other words, a typical trade experiment is about choosing on the edge, i.e. in the neighborhood of the indifference curve. Any small amount of uncertainty might thus affect subjects' behavior, even if it seems negligible in other experiments. Consequently, there are a myriad theories that could account for the "endowment effect". Each of these then suggests a potential mechanism that could eliminate the "endowment effect". Rather than going through a very long list, we argue that the various sources of uncertainty that subjects might perceive when they face a trade opportunity fall into one of the following two distinct categories: choice uncertainty or trade uncertainty.

Choice uncertainty includes all the potential sources of uncertainty that matter when an individual has to choose between two or more objects. The relative value of the objects at stake could be uncertain, individuals might have incomplete or fuzzy preferences, etc. Choice uncertainty thus subsumes what we might want to call object or product uncertainty as well as preference uncertainty.

⁴A natural question is to wonder how individuals can lack market experience since most of us are active on the market on a daily basis. This is true as long as buying is considered. However, most individuals, including usual lab subjects, have almost no experience as sellers. As pointed out already, e.g., by Kahneman et al. (1990), the pathologies are most likely to occur on the selling side of the market.

The other type of uncertainty concerns the market procedures. Individuals sometimes overestimate the costs or the risks associated with market transactions. Thus, they might be reluctant to trade if the benefits are too small, judging that the benefits will not cover the transaction costs or the risk premium. This is what we call *trade uncertainty*. In general, trade uncertainty concerns any uncertainty that might affect the trading procedure itself. At the most basic level, trading, in contrast to choosing, involves a (human) partner. This implies that issues like fairness, altruism or other-regarding preferences might matter. For example, as Plott and Zeiler (2007) argue, typical designs in exchange experiments entail a potential risk of offending the experimenter by rejecting an initial endowment perceived as a gift. Anything that could be interpreted as an (uncertain) transaction cost falls into the category of trade uncertainty. Alternatively, and somewhat more generally, one could refer to process uncertainty instead of trade uncertainty. For the present context, however, trade uncertainty captures the aspects we focus on.

This distinction helps us in making sense of the four observations listed above. If subjects perceive trade uncertainty, then in order to realize that trading is not as risky as they might believe, they need to experience trade precisely in those situations where they are reluctant to trade. If they are free to choose when to trade, however, they will only very rarely make such trades, for example only if the good to be obtained promises a substantial gain. Put differently, in order to overcome a reluctance to trade, market participants need to learn new trading strategies, namely to trade also when the perceived trade uncertainty is high. But this is difficult to learn because these are the trades they avoid. The market would thus be a poor teacher because traders will avoid those trades that would teach them the crucial lessons. Hence, if trade uncertainty is largely responsible for the “endowment effect”, this is consistent with learning to overcome it being slow, if it occurs at all. On the

other hand, if people learn new trading strategies, they can also apply these to different types of good, so that the spill-over effects observed in List (2004) are plausible.

The next step of our reasoning consists of finding a way to test our hypothesis that trade uncertainty is a major factor underlying the “endowment effect”. This boils down to finding an experimental design that (1) controls for choice uncertainty and (2) impacts on trade uncertainty, i.e. provides incentives to consider new trading strategies.

To do so, we create an experimental design composed of two distinct stages. The first stage, called the market stage, consists of a simple (experimental) market in which subjects are free to trade with each other, interact, bargain, move, and so on. Subjects can thus gain market experience in a setting that resembles a real market. After this training stage, we test for the existence of an “endowment effect” in the second stage of the experiment. This second stage is performed in isolation and subjects can only trade with the experimenter. The second stage is identical in all treatments.

The only difference between our two treatments is that in one treatment subjects are free to trade at the market stage, while in the other treatment they are forced to trade, i.e. if they do not exchange their initial endowment, they lose their object. This “forced” trade encourages participants to trade even in situations where they perceive trade uncertainty to be high and hence would normally avoid trade. As a result, relatively little experience can be sufficient to learn new trading strategies. In that sense, our forced-trade treatment serves as a “shock therapy” against the “endowment effect”. The effects of such learning should also spill over to markets for different goods (as is the case in our experiment) as long as these are organized in a similar way so that the possible causes for trade uncertainty are similar.

We find that when forced to overcome their reluctance to trade during the market stage, subjects are no longer prone to the “endowment effect” afterwards. In contrast, if trade in

the market stage is voluntary, we detect a clear “endowment effect” in the second stage.

The key result is that in the forced-trade treatment subjects learned something that they would not have learned if they had been free to trade. And as a consequence of what they learned, subjects overcame the “endowment effect”. By not providing sufficiently strong trading incentives, in a market where they were free to trade subjects did not consider the trades that would have provided the crucial lessons.

That the endowment effect can be eliminated in the lab is not a new result, as shown by Plott and Zeiler (2007). These authors vary the endowment procedure and the way subjects trade with the experimenter. Our approach is to use a trading mechanism that sheds light on the way market experience can eliminate the “endowment effect”, rather than experimental procedures that are not related to market experience.

Having in mind that the difference between the forced-trade and free-trade treatments is about trade uncertainty, we can safely assert that the “endowment effect” is driven to a large part by trade uncertainty and possibly more than by choice uncertainty. Furthermore, our experiments show that learning the crucial lessons is not necessarily difficult if the proper learning incentives are provided. Learning on the market might thus be slow because it provides only limited incentives to learn new trading strategies to overcome trade uncertainty. This then makes sense of the observation that market experience removes under-trading only if it is very intense.⁵ Hence a free market is indeed a rather poor teacher.

The rest of the paper is organized as follows. In Section 2 we explain our experimental design and procedures in detail. This is followed by the results in Section 3, a discussion of possible explanations and links to related literature in Section 4 and concluding remarks in Section 5.

⁵For the same reason, repetition in trading experiments in the lab typically does not succeed in eliminating the “endowment effect”.

2 Experimental Design and Procedures

Our experiment was designed to test for the impact of trade uncertainty, and hence is designed to keep the impact of choice uncertainty and the opportunities to reduce it through learning constant across treatments.⁶ In contrast, the treatments differ in the incentives to learn new trading strategies that can overcome trade uncertainty.

The experiments were run in April 2007 at the University of Antille-Guyane in Martinique. Participants were primarily students of economics at undergraduate and master's level. The total number of participants was 74. The laboratory consisted of a circle of small tables. On entering the room, participants drew cards assigning them to one of the tables.

The experiment consisted of two parts. The first part consisted of three interactive trading rounds that gave subjects the opportunity to gain trade experience. The second part was performed in isolation and is a standard test of the “endowment effect”.

In each trading round, the participants were randomly endowed with one of two different goods. After being given the opportunity to freely inspect the goods, they were assigned one of the goods by drawing a card that was then exchanged for the respective good. All the goods had non-trivial value for the participants: a package of coffee and a package of rice (round 1), a package of crisps and a can of cola (round 2) and a notepad and a ball-pen (round 3).

We conducted four sessions, two with “free trade” and two with “forced trade” in the first part. In the free-trade sessions, participants were free to trade with any of the participants endowed with the other good. Interaction, movement and communication was not restricted in any way. Participants could keep the good they possessed at the end of

⁶We also limit the possible impact of choice uncertainty, by reducing what is suggested by the results of Plott and Zeiler (2007) to resolve choice uncertainty in a biased way by sending misleading signals about the value of the objects. For example, there is no opportunity of herding.

each round, whether it was the one they were endowed with at the beginning of the round or the other type of good. Each trading round was restricted to a total of 5 minutes.

The forced-trade sessions differed from the free-trade sessions only in one respect. Participants were only allowed to keep the good in their possession at the end of the round if it was *not* the type of good they were endowed with at the beginning of the round. If at the end of the round they were still in possession of the type of good they were endowed with, they had to return it to the experimenter. In this respect they were “forced” to trade, because they had to trade with a participant who was endowed with a different good in order to take home any good from that round. This procedure was aimed as a shock-therapy for participants who are generally reluctant to trade. It demonstrates in a simple and tough way that trading can sometimes be beneficial.

In all sessions, we introduced an imbalance in the endowments over the three rounds. In the first round, exactly half of the participants received one of the goods and the other half the second good, but in round 2 two more than half received one good and in round 3 four more than half. This increases the number of players who are unable to trade. The purpose was to create pressure for the participants with the good in excess supply to trade fast, in particular in the forced-trade sessions.

The effect of the forced-trade treatment on the existence of an “endowment effect” was assessed in a simple manner that closely follows the procedures used by List (2003, 2004). This part was identical in both the forced-trade and the free-trade sessions. After the last trading round, participants were given an additional good as compensation while filling out a survey. They were informed that they could do whatever they wanted with this good. They were then asked one by one to proceed to an adjacent room with their endowed good. There a short exit interview was conducted (which did not reveal any subject misconceptions regarding the experimental procedures). While still in isolation,

	Endowment D	Endowment P	Total
Free Trade	free-D (18)	free-P (20)	38
Forced Trade	forced-D (16)	forced-P (20)	36
Total	34	40	

Table 1: Summary of experimental treatments. Endowment is the type of good given as compensation for participation after the end of the first stage. The number of participants in each treatment is given in parentheses. Total numbers are given across categories.

they were offered an exchange of the additional endowed good for another good. The rate of exchange at this stage serves to measure the “endowment effect”. In any one session all participants were given the same good, but this differed between sessions. Specifically, in one of the free-trade and one of the forced-trade sessions, they were given a re-writable DVD (D) and could exchange this for a package of copy paper (P). In the other two sessions, it was the other way around. Pre-tests with other students revealed that both these goods were of substantial value for the participants and were valued more than the goods from the market trading rounds.

Hence we have a 2x2 design, with one dimension being the type of trade (free vs. forced) in the first part of the experiment and the other the type of good subjects were endowed with in the second part of the experiment (D vs. P). Table 1 summarizes the treatments. The number of participants in each treatment is given in parentheses.

If participants do not suffer from an “endowment effect”, that is their preferences for either D or P are independent of which of the goods they are endowed with, the share of participants leaving with good D should be the same for both endowment conditions. This implies that the average trade rate at the last stage would be 50%.⁷ An “endowment effect”

⁷For example, if a share p of all participants prefer D over P, then in treatments free-D and forced-D, a share $1 - p$ should exchange D for P, while in treatments free-P and forced-P, a share p should exchange P for D, yielding an average trade rate of $\frac{p+1-p}{2} = \frac{1}{2}$. Note that if the treatments have different numbers of

implies a smaller average trade rate.

Our main hypotheses are, first, that three rounds of free trade are not enough to eliminate the “endowment effect” because participants will in general not trade in situations where they are reluctant to trade and will hence not learn anything new, whereas, second, forced trade is expected to significantly reduce the “endowment effect” because all participants will experience beneficial trade (or learn that missing out on a deal can be harmful) and, in particular, some subjects will be “forced” to trade in situations where they perceive high trade uncertainty and will thus learn something about these situations. Put differently, forced trade, but not free trade, encourages subjects to learn new trading strategies and this should carry over at least to some degree to the final exchange stage with the experimenter, since the trading mechanism is not fundamentally different between the training rounds and the exchange with the experimenter that we use to assess the “endowment effect”. Therefore if, as we hypothesize, trade uncertainty is largely responsible for the “endowment effect”, the latter should be substantially reduced after forced trade compared to the treatment with free trade. If, however, choice uncertainty alone drives the “endowment effect” we should see little if any difference between the two treatments, because the amount of experience with the various goods is the same in both treatments. Furthermore, experience with three rounds is very limited and refers to different types of goods so that even if subjects make more trades in the forced-trade training rounds, the scope for reducing choice uncertainty is very small.

It is also reasonable to expect that participants in the free-trade sessions who trade more frequently would show a smaller “endowment effect” than participants who trade less

participants, it is important to consider the average of the trade rates of both treatments and not the total trade rate. Otherwise, the results could be biased. For example, if the number of participants is larger in the treatment endowed with the generally more popular good, the total trade rate would be smaller than $\frac{1}{2}$ even if in both treatments the same share of subjects chose this good.

	Rev. Prefer P	Rev. Prefer D	Total
free-P	15 (75%)	5 (25%)	20
free-D	7 (38.9%)	11 (61.1%)	18
Total	22	16	

Table 2: Results for the test of the “endowment effect” in the free-trade treatments. Participants in treatment free-P are endowed with good P, those in free-D with good D. Rev. Prefer P and Rev. Prefer D denote the numbers of those who revealed prefer P and D, respectively, i.e. they leave with this good. In the absence of an “endowment effect” the revealed preference would have to be independent of the endowment.

frequently. This would, however, not allow us to infer that the former participants learn to trade, as it could just be a selection effect since those generally more willing to trade will trade more, both in the three rounds of free trade and in the second stage of the experiment. The comparison between free and forced trade does not suffer from any selection problems, because participants were exogenously sorted into the different treatments.

3 Experimental Results

We find clear support for our main hypotheses. Table 2 shows the distribution of goods in possession at the end, that is the revealed preferred good, for the free-trade treatments. We see that in both free-P and free-D, the majority of participants leave with the goods they were endowed with. The average trade rate is just 31.9%. Indeed, Fisher’s exact test rejects the H_0 that the revealed preference is independent of the endowment at conventional levels of significance ($p = 0.047$, two-sided).⁸ Thus we replicate the “endowment effect” for the

⁸A caveat regarding our tests is that they treat the data as independent even though the participants interacted before we employed our measure of the “endowment effect”. It is, for example, conceivable that a trade advocate in one of the treatments might have been very successful in the three rounds of trading in convincing the others that trading is a good thing and that this might have carried over to the last stage. We note, however, that there were no substantial differences in general trading activity (except for

	Rev. Prefer P	Rev. Prefer D	Total
forced-P	9 (45%)	11 (55%)	20
forced-D	6 (37.5%)	10 (62.5%)	16
Total	15	21	

Table 3: Results for the test of the “endowment effect” in the forced-trade treatments. Participants in treatment forced-P are endowed with good P, those in forced-D with good D. Rev. Prefer P and Rev. Prefer D denote the numbers of those who revealed prefer P and D, respectively, i.e. they leave with this good. In the absence of an “endowment effect” the revealed preference would have to be independent of the endowment.

free-trade treatments.

In the forced-trade treatments the results are remarkably different. Table 3 shows the revealed preferences for the forced-trade treatments. We see that the revealed preference is essentially independent of the endowment. Indeed, Fisher’s exact test cannot reject the H_0 that the revealed preference is independent of the endowment at any conventional level of significance ($p = 0.741$, two-sided)⁹ and the average trade rate is 46.3%, substantially closer to the “rational” level of 50% than in the free-trade treatments. Thus the shock-therapy applied in the forced-trade treatment is successful in almost completely eliminating the “endowment effect”.¹⁰

the expected effect of more pressure in the forced-trade treatments). More importantly, the last stage was conducted independently for each participant and involved trade with the experimenter with a one-shot option in contrast to open haggling in a large group. Thus while one should keep this caveat in mind, we strongly believe that it does not invalidate our main claim.

⁹A Pearson χ^2 - test is also far from any conventional level of significance, $\chi^2 = 0.206, p = 0.65$)

¹⁰Alternatively, if we run a probit regression with the dependent variable whether the participant leaves with good P, and independent variable a dummy whether she was endowed with good P, $EndowP$, we find that the endowment matters in the free-trade treatments (coefficient for $EndowP = 0.957, p = 0.025$) but not in the forced-trade treatments (coefficient for $EndowP = 0.1930, p = 0.65$). Moreover, if we run the regression for all data and include an interaction effect $EndowPXForced$, we find the latter to be marginally significant (coefficient: $-0.8001, p = 0.054$). This supports the conclusion that the “endowment

		Rev. Prefer P	Rev. Prefer D	Total
non-traders	free-P	3 (75%)	1 (25%)	4
	free-D	2 (33.3%)	4 (66.7%)	6
infrequent traders	free-P	9 (81.8%)	2 (18.2%)	11
	free-D	4 (57.1%)	3 (42.9%)	7
frequent traders	free-P	3 (60%)	2 (40%)	5
	free-D	1 (20%)	4 (80%)	5

Table 4: Results for the test of the “endowment effect” in the free-trade treatments, separately for those who never trade (“non-traders”), those who trade exactly once (“infrequent traders”) and those who trade at least twice (“frequent traders”) in the three rounds of free trade.

To address the additional question whether the “endowment effect” is stronger for those participants in the free-trade treatments who trade only little in the three rounds of market trade, we split the sample into those who never trade (“non-traders”), those who trade only once (“infrequent traders”) and those who trade two or three times (“frequent traders”). The results are given in Table 4. We observe relatively few non-traders or frequent traders (10 for each category) and in both cases three subjects trade and seven do not. The category of infrequent traders is most frequent (18 subjects) and the average trade rate (37.6%) is just slightly larger than that for the other categories. In none of the categories by itself is there a significant “endowment effect” ($p > 0.3$ in all cases according to Fisher’s exact test, two-sided).¹¹ Thus, we find no evidence that the amount of trading experience gathered in the free-trade sessions has an effect on the likelihood of trading in the second stage.

One might wonder why those subjects who trade two or three times in the market stage still look like showing an “endowment effect” afterwards. There are a number of effect” is indeed (significantly) weaker with forced trade.

¹¹If we aggregate either the non-traders and the infrequent traders, or the infrequent and frequent traders, we do not get a significant “endowment effect” ($p = 0.114$ and $p = 0.121$, respectively, Fisher’s exact test, two-sided). According to Pearson χ^2 - tests, the effect is marginally significant in both cases, $\chi^2 = 3.475, p = 0.062$ and $\chi^2 = 3.193, p = 0.074$, respectively.

possible explanations. First, given that these are only 10 observations, we cannot really conclude anything from the fact that only three among them trade. Second, we do not claim that individual subjects perceive the same degree of trade uncertainty in all possible trades. The degree of uncertainty they perceive may depend on various factors and these particular subjects may have perceived low or no uncertainty in the market stage and high uncertainty in the exchange with the experimenter. Trading in the face of low uncertainty should not provide insights into trades with high perceived uncertainty. Third, these subjects may have perceived a non-trivial degree of trade uncertainty, but at the same time they may have had sufficiently strong preferences regarding the goods in the market stage that they overcame that uncertainty. A possible reason why they might not learn anything from these trades could be that if they have a strong preference for the object they can obtain through trade, they do not pay much attention to the perceived risk and hence do not learn anything about it. In contrast, if the preference is weak, uncertainty comes into focus and something can be learned about it (but only if it is overcome, which is not the case in the free-trade treatment if their preference between goods is weak).

4 Discussion

We argue that existing results on the robustness of the “endowment effect” can be better understood thanks to the distinction between choice and trade uncertainty. We thus review existing interpretations of the “endowment effect” through the lenses of our two dimensional approach.

Taken together the results in List (2003) and List (2004) already suggest that no simple and unified explanation can account for all his results simultaneously. In the first experiment, the goods belong to the same category that are usually exchanged by his subjects.

However, subjects are not familiar with the objects used in the experiment, as the specific items are unique pieces. The uncertainty with respect to the relative value of these objects is relatively high, but can well be substantially lower for subjects with a lot of experience with related goods. This supports the view that these results may be driven by what we called choice uncertainty.

This explanation is no longer valid to explain the fact that market experience also has an impact when the goods at stake are familiar objects (such as mugs and chocolate bars in List, 2004). Such familiar objects should cause little choice uncertainty and moreover, it is unclear why this should be lower for those subjects with substantial experience in sports-card markets. Thus two issues need explanation, as choice uncertainty seems unable to capture them. First, why is there an “endowment effect” for such familiar objects, and second, how can we explain the apparent spill-over of experience to completely different goods? Trade uncertainty is a very plausible candidate to explain both the “endowment effect” for familiar goods as well as the rationality spill-overs: the trading mechanism remains constant, while the nature of the goods at stake changed. According to this view experienced traders are those who realized that trading close to their indifference curve is safe (whether the underlying reason is selection or learning through occasional experimentation is another matter), not necessarily those who are experts in the type of goods exchanged in a sports-card market.

Our two dimensional view and the result that trade uncertainty is an important aspect is very much in line with the existing results obtained in the lab.¹² Plott and Zeiler (2007)

¹²Several papers, including Plott and Zeiler (2007), suggest a distinction similar to what we interpret as trade and choice uncertainty. See also Section 5 in Braga and Starmer (2005), who distinguish between “institutional learning” and “value learning”. This distinction to some degree parallels ours between trade uncertainty and choice uncertainty, but Braga and Starmer’s institutional learning is more concerned with subjects’ understanding of the mechanism (similar to Plott and Zeiler, 2005), whereas trade uncertainty captures the risk related to the mechanism.

demonstrate that the “endowment effect” is very sensitive to various experimental features such as (1) method and language used to endow subjects, (2) suggestions of relative values, (3) location of the endowed good at the time of choice and (4) public revelation of choices. The variables that Plott and Zeiler identify as crucial are those closely related to trade uncertainty (such as the method of endowing subjects with a good), whereas those addressing only aspects of choice uncertainty (such as public revelation of choice) are not sufficient to eliminate the “endowment effect”. However, it is not always straightforward to assign each of their experimental features to one of our two categories. For example, they identify as a crucial aspect whether the experimenter chooses the object that subjects are endowed with. This entails both aspects: fear of offending the experimenter by rejecting a gift (which is an element of trade uncertainty as it refers to the process) and signaling the experimenter’s preference for one object, thus sending a signal about the relative value of the object (which impacts on choice uncertainty). The important point is that the two dimensions – trade and choice uncertainty – are both affected and that taken together they account for all the experimental features used in Plott and Zeiler’s experiment (while existing theory, operating along one dimension only, cannot explain their results).

The related phenomenon of the WTP-WTA gap is addressed by Plott and Zeiler (2005). When subjects are asked to report their maximum willingness to pay (WTP) for an object, this is frequently much lower than their reported willingness to accept (WTA) for parting with the identical object if it is in their possession. Besides the fact that objects are exchanged for money, rather than for another object, the main difference is that an incentive compatible mechanism is required to elicit individual values. The mechanism typically used is the Becker-DeGroot-Marschak (BDM) mechanism (Becker et al., 1964). Essentially, such an experiment thus consists of an exchange made through a sophisticated trade mechanism. Hence, it is likely that subjects perceive substantial trade uncertainty. Importantly,

Plott and Zeiler show that the WTP-WTA gap disappears with sufficient training, and conclude that subjects' misconceptions are central for the effect. This corresponds to trade uncertainty being diminished by better explanation of the trade mechanism.

The particular case where the goods at stake are lotteries deserves a comment. In the set of experiments we have described so far, market experience – as well as a proper control for subjects' misconceptions – is supposed to eliminate, or at least reduce, any kind of uncertainty. Thus, the way individuals behave in uncertain situation loses relevance with experience. This is no longer the case if the goods to be sold or bought are lotteries.¹³ There is a substantial inherent uncertainty that cannot be resolved with market experience. In such situations, some anomalies might survive with market experience and some others can even be created, as the results in Braga et al. (2006) suggest.

The distinction between choice uncertainty and trade uncertainty parallels the different interpretations of their experimental results by List on the one hand and by Plott and Zeiler on the other. An “endowment effect” driven by choice uncertainty would suggest that the effect is “real” (in the sense of being a systematic deviation from rational choice models), but can diminish as traders gain experience and become more sure of their preferences, as List suggests. Choice uncertainty can be accounted for by classical economic theory with incomplete information about the objects available for trade. This can cause biases such as the “endowment effect” if subjects obtain biased signals, for example through specific decisions of the experimenter, as Plott and Zeiler (2007) argue. The reduction of choice uncertainty as observed in List's experiments can be captured by learning models in a sort of “learning by trading” model. Choice uncertainty should then diminish only with substantial experience and the resolution of choice uncertainty through learning should be good-specific.

¹³In particular, see Braga et al. (2006), Loomes et al. (2007) and Isoni et al. (2008)

Trade uncertainty, however, is rather along the lines of subject misconceptions and artifacts of the experimental procedures (though the misconceptions in this case are not about the procedures but about the risks related to them), which Plott and Zeiler showed to be a major factor underlying the “endowment effect”. Accounting for the strategic mistakes of subjects who are prone to those misconceptions in a theoretical model is a very challenging task. Nevertheless, we can make some general inferences how overcoming biased behavior in the face of trade uncertainty can look like. As subjects can understand through experimentation that different strategies can be more successful, learning to overcome these mistakes and misconceptions related to trade uncertainty can be sudden and – depending on the complexity of the trade mechanism – fast and does not have to be good-specific. Indeed in our experiment, forced trade appears to let subjects learn in an indirect way about the strategic errors, as they are strongly encouraged to experiment with different trading strategies and the “endowment effect” thus disappears with little experience.

An important issue is the question of what our results mean for a possible “endowment effect” outside the lab. We note, first, that in spite of the relation of trade uncertainty and subject misconceptions, an “endowment effect” caused by trade uncertainty can nevertheless be “real”, because trade uncertainty may naturally be present on markets. In contrast, if an “endowment effect” observed in experiments is just an artifact of experimental design as suggested by Plott and Zeiler (2007), there is in general no reason to believe that it occurs outside biased experimental settings. Second, one might argue that our “forced-trade” treatment just shifts the expectation of subjects about what the experimenter wants them to do from not trading to trading, thus undermining a naturally occurring “endowment effect”. While subjects’ expectations might be affected, this only supports the more fundamental point of our distinction into choice uncertainty and trade uncertainty, namely, that concerns that are unrelated to the choice between the two objects are relevant to the

decision whether to trade. Wanting to satisfy the expectation of the experimenter has nothing to do with subjects' uncertainty regarding their preferences or the fact that they are endowed with one good, but with issues regarding the social interaction of the trading process itself. And arguably, typical designs will tend towards suggesting that the experimenter holds expectations of the subjects not trading. Hence our experiment as such does not disprove the existence of an “endowment effect” outside experimental settings, but suggests that previous explanations are insufficient. This may or may not affect expectations regarding its relevance in the field.

5 Conclusions

We have argued that recent experiments on the robustness of the “endowment effect” can be better understood by distinguishing between two different types of uncertainty involved in trading. Specifically we argue that these results point to a major role for what we call trade uncertainty, but that what we call choice uncertainty cannot provide a consistent explanation of these results.

Our own experiment provides a further test of the roles of these two types of uncertainty. We have shown that a simple design feature, “forced trade”, eliminates the “endowment effect” in an environment where the same amount of experience with simple “free trade” yields a significant and substantial exchange asymmetry. This complements and extends recent results by List (2003, 2004) who shows that substantial trade experience can eliminate the “endowment effect”. Specifically, we show that much more limited experience than that recorded by List can be effective in eliminating the “endowment effect”. Moreover, our results support our hypothesis that trade uncertainty rather than choice uncertainty is fundamental to the “endowment effect” because opportunities for learning with respect

to choice uncertainty are comparable between the two treatments, whereas forced trade, but not free trade, provides incentives for learning new trading strategies and hence for reducing trade uncertainty. These results support the view that it is possible to overcome the “endowment effect” with relatively little experience but that a free market is a poor teacher for this.

Interpreting our experiment from the perspective of Plott’s (1996) discovered preference hypothesis, what traders appear to discover are not their preferences regarding the goods they can trade, but rather their preferences regarding trade itself. For example, they might need to learn their risk aversion with respect to the trading process. And if traders can freely choose whether to trade or not, they will generally shy away from the trades that would help them discover their preferences.

Obviously, the present experiment and discussion do not provide the ultimate answer to the question of what drives the “endowment effect”, but through new insights into what can be learned by market experience they provide a promising starting point and useful terminology for further research into possible underlying causes.

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