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by

Alexander Morell, Andreas Glöckner & Emanuel Towfigh*

Abstract

Legal regulations concerning unfair competition and antitrust policy often still rely on the assumption of a rational consumer, although other models may better account for people's decision behavior. We investigate the influence of target rebates on consumers based on the alternative Cumulative Prospect Theory (CPT), both theoretically and experimentally. CPT predicts that target rebates could harm consumers by impeding rational switching from an incumbent to an outside option (e.g., a market entrant). In a repeated trading task, participants decided whether or not to enter a target rebate scheme and to continue buying within that scheme. Reaching the target was uncertain. Target rebates considerably reduced the likelihood that participants switched to a higher-payoff outside option later. We conclude that target rebates may inflict substantial harm on consumers and might even have an underestimated potential to foreclose consumer markets.

Keywords: Consumer protection, Rebates, Unfair competition, Antitrust policy, Rebates, Biases, Prospect theory

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Introduction

"Children", the Supreme Court wrote in its *FTC vs. R.F.Keppel* judgment dealing with a promotion scheme turning a simple purchase of candy into a lottery, are "too young to be capable of exercising an intelligent judgment of the transaction." Evidence from both psychology and economics shows that irrational behavior and biases in judgments and decision making are, of course, not limited to children, and that adults (Tversky & Kahneman, 1974) and even expert decision makers (Koehler, Brenner, & Griffin, 2002) have serious trouble to judge intelligently in situations of risk and uncertainty (see Rabin, 1998, for a review). It has, for example, been shown that the prices to buy or sell a product are dependent on whether persons own the good or not (i.e., endowment effect; Thaler, 1980); that prices of consumers and professional car dealers are anchored on arbitrary prices (e.g., Mussweiler, Strack, & Pfeiffer, 2000; Russo, 2010), and that consumers systematically distort attribute information concerning products (e.g., Russo, Meloy, & Medvec, 1998; D. Simon, Krawczyk, & Holyoak, 2004). Being widely accepted in psychological decision research, the systematic deviations from rational choice led economists to conclude that the "orthodox economic model […] does a poor job of predicting the behavior of the average consumer" (Thaler, 1980, p. 58). Alternative models have been suggested to account better for consumer behavior. The most influential approaches are Prospect Theory (Kahneman & Tversky, 1979) and its advancements (Schmidt, Starmer, & Sugden, 2008; Tversky & Kahneman, 1992); and strategy selection models (Beach & Mitchell, 1978; Bettman, Luce, & Payne, 1998; Gigerenzer & Todd, 1999) in the tradition of the bounded rationality approach (H. A. Simon, 1955).

Findings on deviations from rational choice assumptions have been the backbone of the behavioral law and economics approach (e.g., Jolls, Sunstein, & Thaler, 1998; Korobkin, 2003; Rachlinski, 2000, 2004). The advanced understanding of decision processes has been fruitfully applied to decision making in court (e.g., Daftary-Kapur, Dumas, & Penrod, 2010; Englich, Mussweiler, & Strack, 2005, 2006; Guthrie, Rachlinski, & Wistrich, 2000, 2007; Hastie, Schkade, & Payne, 1999a, 1999b; Rachlinski, 2000), but also to various public policy issues. The prevalence of biases has, for instance, been shown for peoples' thinking about taxes (McCaffery & Baron, 2006) and suggestions have been made to debias through law (Jolls & Sunstein, 2006). Interestingly, however, the findings have not been very influential in unfair competition law or antitrust (but see Incardona & Poncibò, 2007). This fact is all the more surprising as consumers are important players in both fields of law. And as it has been shown in the research mentioned above, it is the consumer in particular who often lacks the resources and technology to overcome difficulties in dealing with risk and ambiguity. In the current paper, we make an empirical contribution that bridges this gap by investigating the influence of targeted rebates on consumers' behavior using Cumulative Prospect Theory (Tversky & Kahneman, 1992) as a theoretical basis.

Targeted rebates have been argued to appeal unduly to the gambling sentiments and to compromise the rationality of the purchasing decision, making such rebates illegal under Art. 4 of the directive concerning unfair business-to-consumer practices in the internal market

2005/29/EC and its corresponding norms in the law of the member states (Köhler, 2008). Similarly, US law bans practices inflicting substantial harm on consumers. We investigate whether specific rebate schemes take advantage of customers' irrationality, which might cause financial loss to them. In antitrust, a certain antagonism even seems to evolve between the US and the European regime. While US antitrust authorities tend to see buyers as generally rational, European antitrust authorities worry about the "psychologically weak position" (COMP/E-2/36.041/PO — Michelin, no. 224) in which rebates place buyers, and the European authorities are also concerned about buyers being at the mercy of the "suction effect" of rebates (see also Petit & Neyrinck, 2010). Hence, the question whether consumers are indeed capable of exercising an intelligent judgment of the transaction when confronted with targeted rebate schemes, or whether they are rather prone to suffer economic harm, is key to determining the legal assessment of rebates under unfair competition law. It may even influence the way antitrust law is applied vis-à-vis targeted rebates. The current paper tries to provide empirical data for the key questions: do individuals stick to target rebate schemes, even when switching to an outside option yields a higher expected payoff? It also intends to ascertain which factors influence the degree of stickiness.

Legal Assessment and Regulation of Target Rebates in the EU and the US

There exist quite different kinds of rebates (e.g., Motta, 2009) that might need different regulation. We exclusively focus on a type of rebates referred to as *target rebate* (also known as "all-unit discount", "rollback rebate" or "threshold rebate", each name stressing a different feature of basically the same rebate type). *Target rebate* describes a pricing scheme that grants a significant price reduction on all units bought during a certain reference period if the customer transgresses a certain threshold in purchases within that reference period. Such rebates place the customer in a situation of risk or even uncertainty[1] about the price if he cannot predict his demand during the reference period with sufficient precision.

The central condition to prohibiting certain conduct under EU unfair competition law is that such conduct materially distorts the economic behavior with regard to the product of the average consumer who is targeted (Art. 4, directive 2005/29/EC). It is seen as a material distortion of this kind to limit the freedom of choice by any inappropriate influence. It has been argued that targeted rebates, which may unduly appeal to the gambling sentiments of consumers, can be illegal under Art. 4 of the Directive and under the law of the member states corresponding to it, if they can compromise the rationality of the purchasing decision (Köhler, 2008). Under Sec. 5 of the US Federal Trade Commission Act, a particular kind of conduct may be prohibited as unfair if it causes substantial consumer injury that consumers themselves could not reasonably have avoided and that is not outweighed by countervailing benefits to consumers

1 We distinguish risk from uncertainty in that under risk, probabilities are known at least in reasonable approximation, while under uncertainty, probabilities are unknown.

or competition that the practice produces (Beales, 2003). Rebates apparently have not (yet) been identified as a major problem under US unfair competition law. On the other hand, it should be straightforward that consumers suffer substantial injury when confronted with a pricing scheme that exploits certain properties of human reasoning. This has been established for consumer-aimed promotional practices like certain lotteries, games and contests (McManis, 2004). Indeed target rebates have a striking similarity to lotteries when the consumer does not know in advance whether his requirements will allow him reasonably to reach the target threshold within the reference period.

Beneficial effects of targeted rebates found in business-to-business retail markets will not be present on consumer markets. The need for harmonization of interests of upstream and downstream suppliers, which commonly drives the welfare-increasing effects of rebates, will not exist between consumers and sellers (see, for example, with regard to double marginalization Kolay, Ordover, & Shaffer, 2004; see as well, with similar conclusions, Greenlee, Reitman, & Sibley, 2008).

In antitrust matters, US Courts have taken a rather lenient position towards rebates, for example in *Concord Boat v. Brunswick*. The position of US authorities towards rebates is far from settled, though (see Olson et. al, 2002). In Europe, the Commission and the Courts have suppressed target rebates applied by dominant companies (*Hoffmann-LaRoche v. Commission; Michelin v. Commission I.; British Airways v. Commission*; *Michelin v. Commission II.; Intel v. Commission*).

Target rebates are very common on consumer markets. Several European fashion stores (e.g., Anson's, Peek & Cloppenburg) run a target rebate scheme. They often include several targets that yield increasing rebates. Airlines and railway carriers offer "frequent-traveler programs", requiring passengers to gather a certain amount of miles or points within a certain period of time to acquire premiums, gifts or the entitlement to supreme services. When consumers predict their demand in one of these schemes, they might not be certain about their exact demand. Ultimately, deciding about how reasonable it is for them to buy into the rebate scheme involves risk.

Prospect Theory Predictions Concerning the Stickiness of Rebates

Standard rational choice theory (RCT) predicts that rebates could lead to a suction effect (OECD, 2002; European Commission, 2009), which means that once a consumer has bought a sufficiently large quantity in the rebate scheme, it can eventually be profit-maximizing for the consumer to keep buying exclusively in the rebate scheme, because the potential rebate is so large that no competitor can make a better offer. Enforcement agencies consider that dominant incumbents can use this effect to foreclose markets for small entrant firms (OECD, 2002; European Commission, 2009). The literature on rebates cited above assumes that buyers strictly maximize payoffs according to RCT, and it discusses the resulting problems mainly for antitrust. We argue that from a behaviorally informed perspective, the effect of rebates should, however, be much worse than predicted by RCT. According to CPT, rebates should induce irrational stickiness of consumers due to reference point shifts – on top of the issues already discussed in the literature. Preferences should depend on reference points, which are influenced by hopes (Thaler, 1985; Tversky & Kahneman, 1981; Kahneman & Tversky, 1979), goals (Heath, Larik, & Wu, 1999) and expectations (Abeler, Falk, Götte, & Huffmann, 2009).

Buyers will hope to reach the rebate and adopt reaching the rebate threshold as their goal. Hence, they will consider a failure to reach the rebate as a loss. In the loss frame, individuals usually seek risks (Kahneman & Tversky, 1979) and are therefore likely to prefer the risky option (i.e., stay in the rebate) over a safe outside option with equal expected value. Hence, prospect theory predicts that persons buy in target rebate schemes longer than would be predicted by RCT. We will refer to this as the *stickiness effect* of rebates. Based on CPT using standard parameters and assuming that the rebate payoff is adopted as reference point, we prove in Appendix A that irrational stickiness should be observed for all rebates for which not reading the rebate is sufficiently likely (i.e., the probability of reaching the rebate must be smaller than 76%; see fourfold pattern of risk attitudes, Tversky & Kahneman, 1992; see also Schmidt & Zank, 2008). Furthermore, stickiness should increase with increasing magnitude of the rebate, that is, the difference between the overall payoffs for reaching vs. not reaching the rebate. Finally, when taking into account individual differences, stickiness should increase with increasing loss aversion.

We investigate experimentally whether stickiness can be empirically observed and whether its size can be experimentally influenced. We thereby manipulate the magnitude of the rebate (e.g., overall 10 € rebate instead of 5 € rebate) and we investigate the influence of mere buying frequency in the rebate scheme (e.g., buying 10 instead of 5 objects) while holding the differences in total payoffs (rebate magnitude) constant.

It should be noted that behavioral effects that go beyond what is captured in prospect theory, such as routine effects (Betsch, 2005; Betsch, Brinkmann, Fiedler, & Breining, 1999; Betsch, Haberstroh, Glöckner, Haar, & Fiedler, 2001), sunk cost effects (Arkes & Blumer, 1985), or cognitive dissonance (Festinger, 1957; Shultz & Lepper, 1996), might contribute to stickiness effects as well. We will focus our investigation on predictions by CPT, because of its prominence and because, in contrast to the other models, it is sufficiently well specified in mathematical terms. However, we take into account these effects to construct strong hypotheses for a critical test of CPT.

Previous Findings

The predictive power of prospect theory for decision behavior has been supported by ample evidence using student participants (e.g., Glöckner & Betsch, 2008; Kahneman & Tversky, 1979; Tversky & Kahneman, 1992), but also using representative samples of the Dutch population (Booij, Van Praag, & Van de Kuilen, 2010) and "in the wild" (e.g., Camerer, 2005). However, some limitations have also been demonstrated: Using a critical property approach, it could, for instance, been shown that CPT cannot account for several systematic effects in three-outcome gambles (Birnbaum, 2006, 2008a, 2008b). Furthermore, recent research indicates that some effects predicted by CPT disappear in decisions from experience (Erev, Ert, & Yechiam, 2008; Hertwig, Barron, Weber, & Erev, 2004). Furthermore, process analysis indicates that CPT should not be considered to be a process model for decision making (Glöckner & Herbold, in press). Nevertheless, many findings, including the ones mentioned above, suggest that CPT is a reasonable paramorphic (as-if) model for choices in two-outcome prospects with stated probabilities.

In contrast to the large literature on CPT, specific work on the effect of rebates is scarce. There is, however, one experiment that already demonstrated non-rational attraction effects of threshold rebates before (Beckenkamp & Maier-Rigaud, 2006). For simulated retail markets Beckenkamp and Maier-Rigaud showed that subjects stuck to a rebate scheme as well as to a discount scheme, even if maximizing the expected payoff suggested exiting. Our approach differs in four crucial respects: we focus on consumer decisions and unfair competition issues in contrast to retailer decisions; related to this issue, participants' decision involved a kind of stock optimization, whereas we focus on simple consumer decisions; third, we investigate factors eventually influencing the magnitude of the effect based on predictions of CPT; fourth, in our task consumers decided themselves whether to enter the rebate or not which was not the case in the previous study.

We thereby stripped down the design to the very essentials of a consumer target rebate scheme setting. The situation. we aim to capture is the following: a consumer has the possibility to enter a target rebate scheme for a product he intends to buy repeatedly in a certain time period. If he reaches the target (e.g., buying 10 items), the rebate will be granted for all items bought and the overall price will be extremely low; if he does not reach the target, however, the rebate will not be granted and the price will be high. The price of the outside option is between these two prices. After some time, a random event ("external shock") decreases the likelihood that he or she can reach the target, so that it becomes rational to switch. We measure whether persons switch or stick to the rebate.

We realize this by consecutive buying decisions (*rounds*) concerning tokens connected by a rebate condition and two chance moves in the *critical round* and in the *last round* representing the uncertainty about consumers' demands. The critical round is omitted with a certain probability. Options are constructed so that according to RCT people should switch to a safe outside option if the critical round is omitted. The chance move in the last round is necessary to induce uncertainty even after the realization of the critical round. We manipulate the number of repetitions (rounds) of buying and the magnitude of the rebate granted as between subjects' conditions.

In the experiment, we use rebate schemes with a sufficiently high probability for not reaching the rebate (after the critical round was omitted). As explained above, and as shown in Appendix A, CPT predicts:

Stickiness Hypothesis (H1): subjects who have consistently bought tokens up to the critical round do not exit the rebate scheme even if exit yields a higher expected payoff due to omission of the critical round.

Beyond investigating the mere existence of the stickiness effect, we were interested whether CPT can also predict its severity. We thereby constructed our material to test two further hypotheses, including manipulations for which an effect was predicted and one for which a null-effect was predicted. The second manipulation was also selected to test an assumption underlying core arguments recently used in the regulation of rebates.

According to CPT, the stickiness effect should increase with increasing difference between the total payoffs of reaching vs. not reaching the rebates (see Appendix A). We therefore predict:

Magnitude Hypothesis (H2): A rebate of larger magnitude leads to greater stickiness.

According to CPT, the stickiness of rebates should mainly depend on magnitude, that is, the difference between high and low payoff (see Appendix A). It should not be influenced by the mere number of repetitions of previous buying. CPT therefore predicts the following null-hypothesis:

Repetition Null-Hypothesis (H3): The stickiness of rebates does not increase with the mere number of repetitions of buying if the magnitude of the rebate is constant.

Note, that this is a strong null hypothesis. Previous findings indicate increased routine effects with repeated buying (Betsch, et al., 2001) which speaks against the CPT prediction. Additionally, with more repetitions subjects "invest" more money into the rebate. This may trigger a sunk cost effect (cf. Arkes & Blumer, 1985) that also works against the specific CPT prediction. This hypothesis is also particularly interesting for practical reasons, because it captures the claim by the Court of Justice of the European Union that a longer reference period of a target rebate may lead to more market foreclosure (*Michelin v. Commission I.* no. 82; *Michelin v. Commission* II. no. 85). Of course, in the situations meant by the Court of Justice of the European Union, the number of rounds and the differences between total payoffs will most likely be confounded. It is nevertheless relevant to differentiate between effects of magnitude and repetition.

Method

Participants and design. Participants were recruited from a subject pool of about 900 individuals using ORSEE (Greiner, 2004). The majority of participants were students of the University of Bonn, from a wide variety of subject backgrounds. A total of 64 participants (mean age: 24, 37 female) took part in the 6 sessions. The study lasted between 60 and 90 minutes and participants received a performance-contingent payoff (range: 0.94 € to 17.80 €; approximately USD 1.40 to 26.70)[2] in exchange for their participation. Participants were randomly assigned to one of four conditions of a 2 (repetition in buying: low vs. high) x 2 (rebate magnitude: low vs. high) between-subjects design.

Procedure. First, participants read the experimental instructions and answered a control questionnaire to ensure that they had understood the instructions and were able to calculate the possible payoffs. Subjects were provided with pocket calculators they could use at any time during the entire experiment. The main instructions are given in Appendix B. Payoffs in the experiment were stated in Euro. In each round of the experiment, participants could buy either a rebate token or choose an outside option. In two of the rounds, however, buying a token was only possible with a certain probability which induced uncertainty about whether a person would reach the rebate or not. Persons were informed about the probabilities of both random events which could turn out positive (i.e., decision between token or outside option possible) or negative (i.e., round omitted). The critical round took place with a probability of $p_C = .83$. The last round took place with a probability of $p_L = .15$. p_C and p_L were independent and this was common knowledge to all subjects. In order to receive the rebate for the tokens, the person needed to buy tokens in all but one round. Stated differently, the rebate was still granted if one of the random draws turned out negative. Hence, the prior probability of reaching the rebate was high ($p_R = p_C + (1\text{-}p_C)p_L = .86$). Nevertheless, if the critical round did not take place, this probability was reduced dramatically to $p_R^* = p_L = .15$.

The payoffs and probabilities were set in such a way that if the critical round was omitted (for a subject who bought tokens in every previous round), RCT and CPT would make contrary predictions about staying or quitting the target rebate option: the expected payoff for continuing to buy tokens was lower than that for choosing the outside option. Hence, RCT predicts rational switching to the outside option (see Table 1, second-last row). In contrast, CPT predicts a stickiness effect of rebates and continued buying of rebate token (see Table 1, last row). We used buying behavior in the round after the critical round as the main dependent measure.

Choice data in the following round was only informative if the critical round was indeed omitted. To avoid data loss for cases in which this was not the case, we incorporated a strategy method. Thereby prior to the realization of the random event in the critical round, subjects committed themselves to what they would do if it turned out that the critical round was omit-

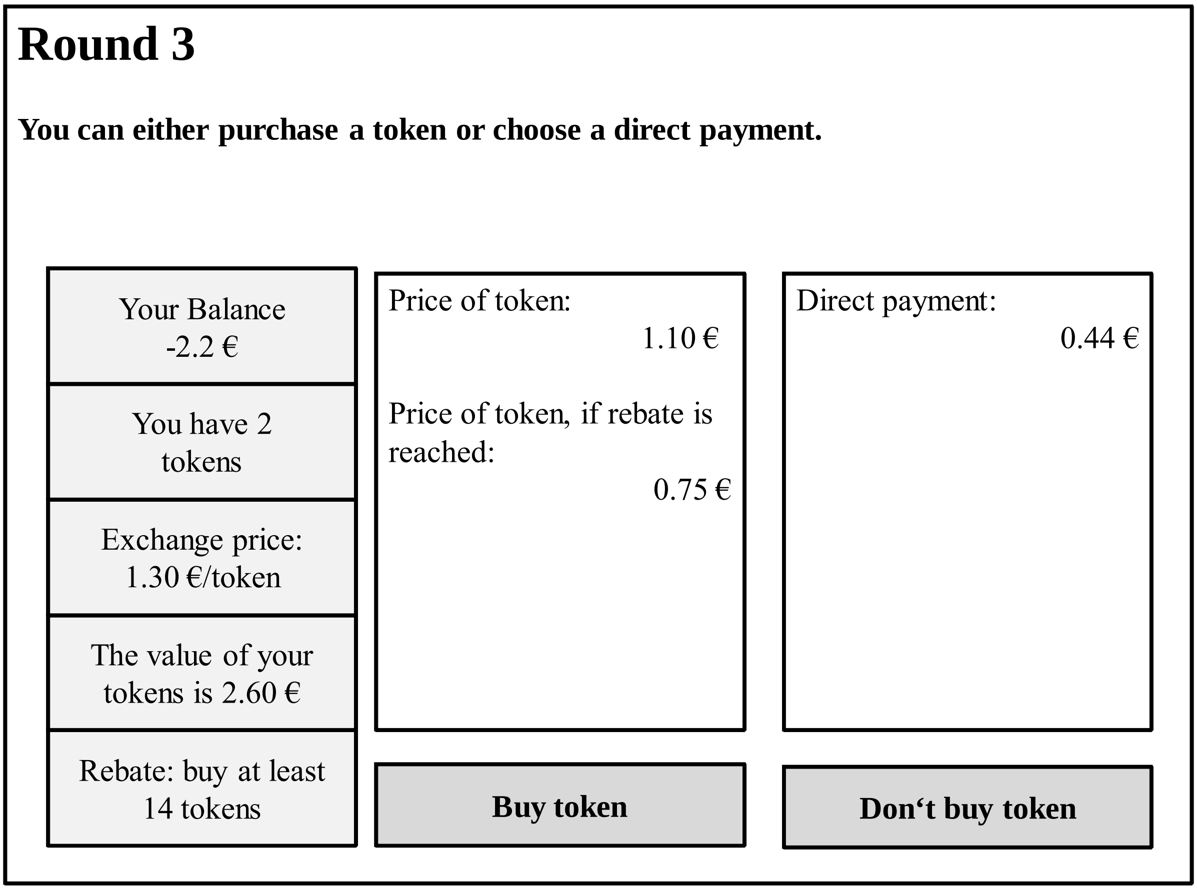
2 These payoffs include the gains and losses subjects incurred when they chose and played the lotteries measuring their risk preferences and loss aversion.

ted. If a round was omitted, it was not possible to choose the outside option either; the random event and the buying behavior in the following round was realized, and persons continued buying in subsequent rounds.

After subjects had gone through the experiment, we elicited risk preferences and the loss aversion parameter λ using the incentivized scales developed by Holt and Laury (2002) and Gächter, Johnson, and Herrmann (2007). The Holt-Laury scale measures risk aversion by letting subjects choose between 10 pairs of lotteries. Each pair contains a low-risk lottery yielding 2 € with probability π and 1.60 € with probability $1-\pi$ and a high-risk lottery yielding 3.85 € and 0.10 € with the same probabilities ($\pi = 0.1, 0.2, \ldots, 1$). The number of choices for the low-risk lottery is used as a measure for risk aversion. If, for example, a participant chooses the low risk lottery in 7 (out of the overall 10) decisions, he has a risk-aversion score of 7 (which refers to a specific range of relative risk aversion scores; see Holt & Laury, 2002). The Gächter-Johnson-Herrmann-scale is based on six choices between playing a lottery or rejecting it. Each lottery has a fifty-fifty chance of winning 6 € or losing between 2 and 7 €. If the subject is, for example, not willing to play a lottery offering a 50:50 chance of winning 6 € and losing 3 €, it is assumed that the person has a $\lambda > 2$.

Material. In each round, participants had to decide whether to buy a token or to select an outside option while being provided with detailed information (Figure 1). The outside option was to earn 0.44 € per round in which it was chosen. For each token they bought, participants received 1.30 € at the end of the experiment. This value represented the consumption utility of the token. Dependent on condition, the buying price before the rebate was either 1.10 € or 1.25 €. Hence, without a rebate, the payoff of the outside option was much higher than that of the tokens. If the rebate threshold was reached, however, the effective buying price was substantially reduced, so that then the payoff for each token was higher than the outside option. We manipulated the number of rounds in which tokens could be bought from low (10 rounds) to high (15 rounds).

Figure 1: Information display in the decision tasks



To make the results comparable between conditions, we held the incentives for leaving the rebate scheme after the critical round, as well as the number of remaining rounds after the critical round, constant across conditions. Consequently, in the low repetition condition the critical round was Round 5, whereas it was Round 10 in the high repetition condition. Furthermore, for all conditions the difference in expected payoffs for remaining in the rebate scheme vs. quitting was held constant (except for small rounding differences).

Table 1: Manipulations and Expected Payoffs

	Rebate Magnitude			
	Low		High	
	Repetition in Buying			
	Low	High	Low	High
Rebate Magnitude in € (after critical round omitted)	5.06	5.10	9.05	9.01
Repetitions in Buying (rounds)	10	15	10	15
x_1 (price per token w/o rebate)	1.10 €	1.10 €	1.25 €	1.25 €
x_2 (price per token with rebate)	0.56 €	0.75 €	0.25 €	0.61 €
Prospect of staying in rebate (after critical round omitted)	(6.66€; .15; 1.60€)	(7.70€; .15; 2.60€)	(9.45€; .15;.40€)	(9.66€; .15;.65€)
Prospect of quitting rebate option (after critical round omitted)	(2.56€; .15; 3.00€)	(4.00€; .15; 3.56€)	(2.40€; .15; 1.96€)	(2.65€; .15; 2.21€)
EV for staying / quitting in €	2.36/<u>2.63</u>	3.36/<u>3.63</u>	1.76/<u>2.03</u>	2.00/<u>2.28</u>
CPT *V* for staying / quitting (see Appendix A)	<u>-6.13</u>/-7.53	<u>-6.17</u>/-7.60	<u>-10.22</u>/-13	<u>-10.18</u>/-12.93

Note. Prospects are given in the format (payoff 1; probability 1; payoff 2).

Results

Out of 64 subjects, eleven switched back and forth between the rebate and the outside option at least once before the critical round. For these subjects, both RCT and CPT predicted to leave the rebate after the critical round was omitted. Four subjects did not buy a token in Round one and kept choosing the outside option consistently until the last round. This behavior of avoiding a rebate scheme can be explained by a strong aversion to risk (see Table 3, below). The remaining 49 subjects (76%), which we will call *target persons* (because they are most informative for testing our hypotheses), entered the rebate scheme and started buying rebate tokens constantly until the critical round.

In line with previous findings (e.g., Holt & Laury, 2002), our participants were mainly risk-averse with an average score of 6.03 (SD=1.79), which corresponds to a relative risk aversion of $0.41 < r < 0.68$. Moreover, the Gächter-Johnson-Herrmann-scale showed that the subjects displayed loss aversion to a normal degree ($\lambda = 2.18$, SD= 0.65; cf. Appendix A). Four persons answered inconsistently (i.e., did not show a unique switching point, but switched back and forth between accepting and not accepting) and for them no loss-aversion score could be calculated.

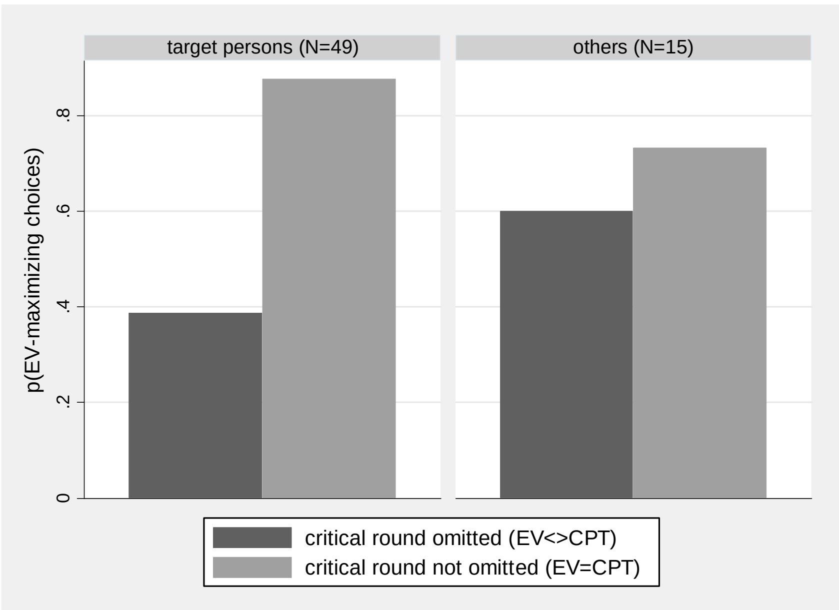
Stickiness of Rebates

Our main dependent measure was subjects' choices immediately after the critical round, which were assessed using a strategy method. In case the critical round had taken place, for target persons it yields a higher expected payoff to buy a rebate scheme token than choosing the outside option and CPT makes the same prediction. If the critical round is omitted, however, the outside option will yield a higher expected payoff and it would be rational to switch to the outside option. CPT, by contrast, predicts sticking with the rebate. For both situations (i.e., critical round omitted or not), we coded whether persons choose the option that maximizes their expected payoff (expected value / EV), that is, whether they decided in line with RCT or not.

The results indicate a stickiness effect. The proportion of EV-maximizing choices was much higher if the critical round took place as compared to being omitted (Figure 2). In line with the CPT prediction, target persons (Figure 2, left) continued to buy in the rebate even if the critical round was omitted and it was EV-maximizing to quit the rebate. The proportion of EV-maximizers, if the critical round was not omitted and RCT and CPT made the same predictions, is much higher. This difference in proportions turned out significant in a McNemar test, $\chi^2_{df=1} = 16.91$, $p < .001$. Hence, we find strong support for our hypothesis H1 indicating that target rebates are sticky. In accordance with the predictions of CPT, our subjects opted for the choice that yielded greater risk and lower expected payoff.

For the other persons (Figure 2, right) it was always rational not to buy the token what the majority of them also did, regardless of whether the critical round was omitted or not. There was no significant difference in proportions, McNemar $\chi^2_{df=1} = 1.0$, $p = .32$.

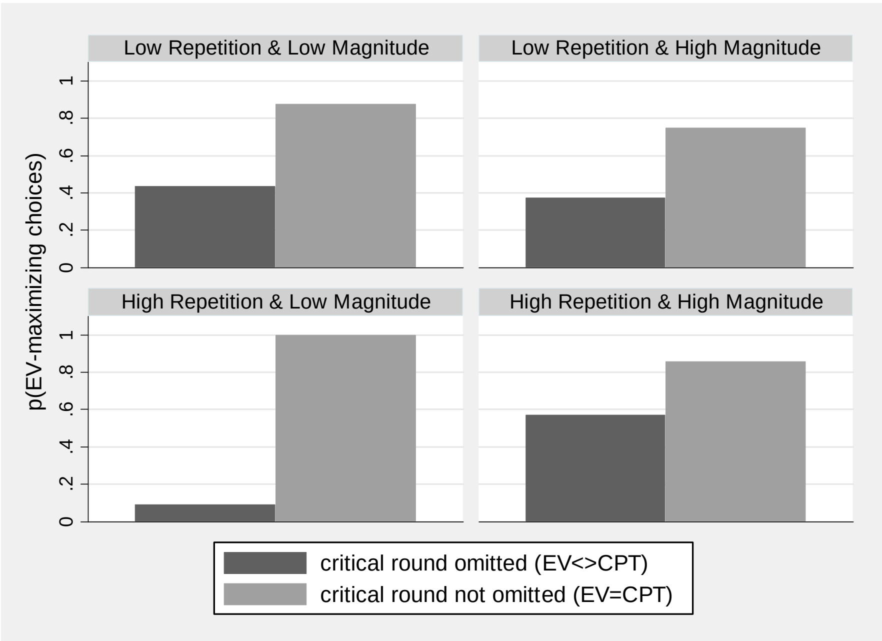
Figure 2: Choices after the critical round



Effects of Magnitude and Repetition on Stickiness

To test our hypotheses H2 and H3, which state that stickiness increases with magnitude of the rebate, but not with mere repetition in buying, we analyzed choice behavior in the critical round separately for the four conditions, considering the target persons only (Figure 3). A tendency towards a stickiness effect was found in all four conditions, although the effect reached conventional significance levels for the two low-magnitude conditions only (low magnitude & low repetition: McNemar $\chi^2_{df=1;N=16} = 4.45$, p = .035; high magnitude & low repetition: McNemar $\chi^2_{df=1;N=8} = 1.80$, p = .18; low magnitude & high repetition: McNemar $\chi^2_{df=1;N=11} = 10.0$, p = .001; high magnitude & high repetition: McNemar $\chi^2_{df=1;N=14} = 2.00$, p = .16).

Figure 3: Choices after the critical round by condition



For a regression-based analysis, we generated a sticky-buying score. The score was set to 1 if the person bought the token after the critical round was omitted and 0 otherwise. The score hence indicated whether persons performed sticky-buying (1) or not (0). We conducted a logistic regression[3] with this sticky-buying score as dependent variable and the two condition variables and their interaction as predictors and risk aversion, loss aversion and gender as further control variables (Table 2).

3 We estimated the equation $Y = \beta_0 + \beta_1 X_1 + ... + \beta_n X_n + \varepsilon$ with logit. A value of Y=1 indicated the decision to keep buying in the rebate scheme, Y=0 indicated the decision not to buy in the rebate scheme. The variables X1 to X7 are the variables and interactions listed in the regression Table 2.

Table 2: Three Logistic Regression Models Predicting Stickiness

	(1) Sticky-Buying	(2) Sticky-Buying	(3) Sticky-Buying
Repetition high	0.772	1.142	1.141
(0-no, 1-yes; centered)	(1.01)	(1.39)	(1.19)
Magnitude High	-1.194	-1.413+	-1.955*
(0-no, 1-yes; centered)	(-1.59)	(-1.77)	(-2.06)
IE Repetition*Magn.	-2.850+	-3.356*	-3.196+
	(-1.91)	(-2.07)	(-1.79)
Gender		-1.576*	-2.051*
(0-female, 1-male)		(-2.28)	(-2.53)
Risk Aversion Score			0.280
(0-10)			(0.79)
Loss Aversion (λ)			-0.522
			(-0.81)
Constant	0.762*	1.578**	1.273
	(1.97)	(2.86)	(0.58)
Observations	49	49	45
Pseudo R^2	0.108	0.193	0.278

Note. Raw coefficients for a logistic regression on sticky-buying (buying choices after the critical round, i.e., when round 5 or 10 was omitted). Buying indicates stickiness preventing subjects from maximizing expected payoffs. *z*-statistics in parentheses. Robust standard errors were used. Model 3 includes four observations less due to missing loss-aversion scores. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

We find a significant effect of our magnitude manipulation on stickiness. In contrast to the magnitude hypothesis H2, however, stickiness decreases with increasing magnitude of the rebate (see Figure 3) and H2 has to be rejected. There was no significant effect of repetition on stickiness that allows remaining the null-hypothesis H3. However, it has to be taken into account that the power of the analysis was relatively low ($1 - \beta = .56$; assuming: odds-ratio = 2, $p(Y=1|X=1)_{H0}=.5$; two-sided test) (Faul, Erdfelder, Lang, & Buchner, 2007). Further experiments with more power are necessary to double-check this result.

We also find a (marginally) significant interaction effect of magnitude and repetition, which was not predicted by CPT. High magnitude combined with high repetition frequency decreased the stickiness of a rebate and led to considerably more rational buying behavior.

Additionally we find a significant gender effect. Female subjects were more inclined to stick to the rebate than male subjects, once they had entered the rebate scheme. Risk aversion and loss aversion had no effect on stickiness (after the person entered the rebate), although CPT predicts that increasing loss aversion should lead to higher stickiness (see Appendix A).

Individual Differences in Entering the Rebate

We were further interested in the question whether there were individual differences in entering the rebate scheme in the first place, dependent on people's risk aversion and loss aversion. One might expect that more risk-averse and loss-averse persons avoid entering rebate schemes already in the first place. As mentioned above, the large majority of persons entered the rebate scheme and bought in it until the critical round (N=49), but there was also a minority of persons who avoided the rebate altogether and chose the outside option from the beginning (N=4). We found higher risk aversion in these rebate avoiders (M=7.2, SE=1.18) compared to target persons (M=5.8, SE=0.17), which was marginally significant in a nonparametric test (Mann-Whitney: p =.07; one-sided). Similarly, rebate avoiders had higher loss aversion (M=2.47, SE=0.53) compared to target persons (M=2.17, SE=0.08), which was also marginally significant (Mann-Whitney: p =.08; one-sided).

Interpretation and Discussion

In this paper, we report results from a first experiment that investigates target rebates in a comprehensive task mirroring the particularities of consumer purchases. We used Cumulative Prospect Theory (CPT) to derive predictions concerning buying behavior in rebates. The core finding of this paper is that, in line with CPT predictions, target rebates induce a stickiness effect in that they impede customers switching from the rebate product to better (payoff-maximizing) outside options. Therefore, target rebates have an underestimated potential to harm consumers. The stickiness effect seems to be strong in that it led more than 60% of the (target) persons to choose the option with the lower expected value.

Furthermore, we investigated the influence of rebate magnitude and buying repetition on the size of the stickiness effect. Stickiness significantly decreases with increasing magnitude of the rebate, although CPT predicts the opposite effect. A null-effect of repetition on stickiness was in line with CPT predictions. Note, however, that the latter cannot be considered clear evidence in favor of the theory because the power of the analysis was relatively low.

We observed an interaction effect of rebate magnitude and repetition on stickiness in that stickiness was particularly reduced if both factors were high. This effect was not predicted by CPT. A possible explanation for this effect might be that a high number of repetitions and a high magnitude place the subjects in a situation where much of the payoff was at risk. One could speculate that this risk may have increased subjects' general alertness and awareness towards changes in the environment.

Furthermore, we found that people's loss aversion had no effect on stickiness. CPT would have predicted a positive relation. Interestingly, there was a gender effect, as female participants showed a higher stickiness to rebates (even when controlling for differences in risk aversion and loss aversion). Finally, we found preliminary support that there seem to be individual differences which determine people's willingness to enter rebate schemes in the first place. Rebate avoiders seem to be more risk-averse and loss-averse persons compared to persons entering a rebate scheme.

Implications for the Regulation of Target Rebates

The first and most important implication is that target rebates induce a stickiness effect in consumers. A model that assumes agents to maximize expected payoffs is not well-suited to predict the effects of target rebates on consumers. This fact increases the potential of target rebates to inflict substantial harm on consumers, and to compromise the rationality of consumers' purchasing decision because consumers will end up with less rent on average than they would end up with in the absence of the rebate scheme. This can make targeted rebates illegal under US and EU legislation on unfair competition. It may even increase the potential of targeted rebates to foreclose consumer markets to entrants: the entrant has to compensate the additional attraction of rebates that we call stickiness by selling his product even more cheaply than he would do otherwise.

We found no support for the Court of Justice of the European Union's opinion that a longer reference period that would induce increased repetitions in buying increases the potential for market foreclosure. There was no effect on stickiness with regard to the instances of buying repetitions.

Implications for Modeling Choice Behavior for Target Rebates

The stickiness effect predicted by CPT (with the additional assumption that reference points are shifted to the rebate payoff) was clearly supported by the data. However, we also find that the reversed effect of rebate magnitude, the interaction between magnitude and repetition, and the null effect for loss aversion on stickiness cannot be easily explained by CPT. Hence, although CPT explains the data better than rational-choice theory, there is a need for further refinements and rebate-specific extensions in order to develop a more comprehensive model for buying decisions in rebate environments, namely one that fully accounts for our findings.

Caveats

In our experiment, subjects act in an environment of risk, knowing precisely all of the probabilities involved in the procedure. In repeated purchasing situations outside of the lab, this will hardly ever be the case. Buyers will rather act under uncertainty – not knowing the probabilities with which they reach a demand set. Similarly, they do not know whether a cheaper offer will be available in the future. Considering that uncertainty about probabilities adds another layer of complexity to the problem, it seems reasonable to assume, however, that a finding of non-rational behavior under risk will generalize to an environment of uncertainty.

Furthermore, it should be noted that we used a one-shot experiment. This was to prevent subjects from playing strategies of hedging risks by diversification and to induce subjects to take the one shot they had as seriously as possible. Diversification strategies would render the data noisy and divert the findings from what we actually wanted to investigate. However, it might be argued that our one-shot method did not allow subjects to learn the task. To circumvent this problem, we took great care that our subjects understood the task immediately from the instructions and let them calculate the expected payoff in a sample task to assure a high level of comprehension.

Because our experimental task shares the crucial features of buying in rebate schemes in retail markets, its results can cautiously be generalized to them as well. Especially when retail units are small and decisions are made by individuals, our results are likely to apply. This condition seems to be fulfilled in the *Michelin* cases because retailers apparently included small car repair shops. The European Commission therefore appears to be right not to have ignored the psychological state of (retailing) buyers in its decision.

Conclusions

Overall, we conclude that the stickiness effect predicted by CPT is robust, but further research is necessary to investigate the determinants of its strength, to explore possible underlying processes, and to develop more comprehensive models. Our results indicate that a regulation of target rebates that assumes rational consumers will underestimate their potential harm. Consequently, previous arguments that have been made based on the rationality assumption should be supplemented by considering behavioral effects. Specifically, the demonstrated stickiness effect of target rebates should be taken into account in their regulation, since it might cause harm to consumers and could even lead to market foreclosure.

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Appendix A

Let x_1 and x_2 be the possible monetary outcomes (payoffs) for a prospect and assume p_1 and $1-p_1$ to be the probabilities that the respective outcomes realize. The expected value for this prospect is given by:

$$EV = p_1 x_1 + (1 - p_1) x_2 \tag{1}$$

and according to rational choice theory persons should be indifferent between this prospect and any equivalent cash amount c:

$$c = EV\,. \tag{2}$$

According to CPT, the value V of a prospect with outcomes $x_1 \leq \ldots \leq x_k \leq 0 \leq x_{k+1} \leq \ldots \leq x_n$ is given by:

$$V = \sum_{i=1}^{k} \pi_i^- v(x_i) + \sum_{j=k+1}^{n} \pi_j^+ v(x_j)\,, \tag{3}$$

with v as continuous and strictly increasing *utility function* satisfying $v(0) = 0$, and π^+ and π^- as *decision weights*, for gains and losses respectively. Decision weights result from rank-dependent transformation of the outcome probabilities, considering gains and losses separately. This means that the same probability can result in different decision weights, dependent on whether it belongs to a high or a low outcome. Decision weights are defined by:

$$\begin{aligned}
\pi_1^- &= w^-(p_1) \\
\pi_n^+ &= w^+(p_n) \\
\pi_i^- &= w^-(p_1 + \ldots + p_i) - w^-(p_1 + \ldots + p_{i-1}) \quad \text{for } 1 < i \leq k \\
\pi_j^+ &= w^+(p_j + \ldots + p_n) - w^+(p_{j+1} + \ldots + p_n) \quad \text{for } k < j < n
\end{aligned}\,. \tag{4}$$

with w^+ and w^- being the probability weighting function for gains and losses, respectively. Hence, the lowest negative outcome and the highest positive outcome are transformed using the respective transformation functions described in the next section. The weights for probabilities of losses (i.e., $i < k$) conceptually represent the marginal contribution of the respective probability to the total probability of worse outcomes and the weights for probabilities of gains (i.e., $j > k$) represent the marginal contribution of the respective probability to better outcomes.

For CPT, several functional forms of v, and w^+/w^- have been suggested (see Stott, 2006, for an overview). We use the classic one-parameter implementation of the value function and the weighting function suggested by Tversky and Kahneman (1992):

$$\begin{aligned}
v(x) &= x^{\alpha} && \text{if } x \geq 0 \\
v(x) &= -\lambda(-x)^{\beta} && \text{if } x < 0
\end{aligned} \tag{5}$$

and

$$\begin{aligned}
w^+(p) &= \frac{p^{\gamma}}{(p^{\gamma} + (1-p)^{\gamma})^{1/\gamma}} \text{ if } x \geq 0 \\
w^-(p) &= \frac{p^{\delta}}{(p^{\delta} + (1-p)^{\delta})^{1/\delta}} \text{ if } x < 0
\end{aligned}\,. \tag{6}$$

The risk-aversion parameters α and β capture the curvature of the s-shaped value function. The parameters γ and δ capture the inverted s-shape of the weighting function, in the domains of gains and losses, respectively. The loss-aversion parameter λ induces the increased steepness of the value function in the domain of losses. Tversky and Kahneman (1992) suggested the following parameters: $\alpha = \beta = .88$, $\gamma = .69$, $\delta = .61$, $\lambda = 2.25$.

Let us assume that x_2 is adopted as a reference point and payoffs are perceived as differences from x_2. Consequently, x_2 has a utility of zero and x_1 has a negative (or zero) utility and the value V_P of the prospect is given by:

$$V_P = v(x_1 - x_2)\pi_1^- = -\lambda(-(x_1 - x_2))^\beta w^-(p_1) \ . \quad (7)$$

Choosing the cash equivalent c of the prospect (equation 2) will be considered a sure loss because it will also always be smaller than x_2. According to core predictions of prospect theory, people will prefer a risky option over a sure loss with equal expected value which follows from the fact that the utility function v is convex for losses. Formally, this results in the following value of the cash equivalent V_c:

$$V_c = v(c - x_2) = -\lambda(-(c - x_2))^\beta \quad (8)$$

And when substituting c by equations 1 and 2:

$$V_c = -\lambda(-(x_1 p_1 + x_2(1 - p_1) - x_2))^\beta = -\lambda(-(x_1 - x_2))^\beta p_1^\beta \ . \quad (9)$$

The difference between V_P and V_c is given by:

$$V_P - V_c = -\lambda(-(x_1 - x_2))^\beta w^-(p_1) - \lambda(-(x_1 - x_2))^\beta p_1^\beta \ , \quad (10)$$

which can also be written as:

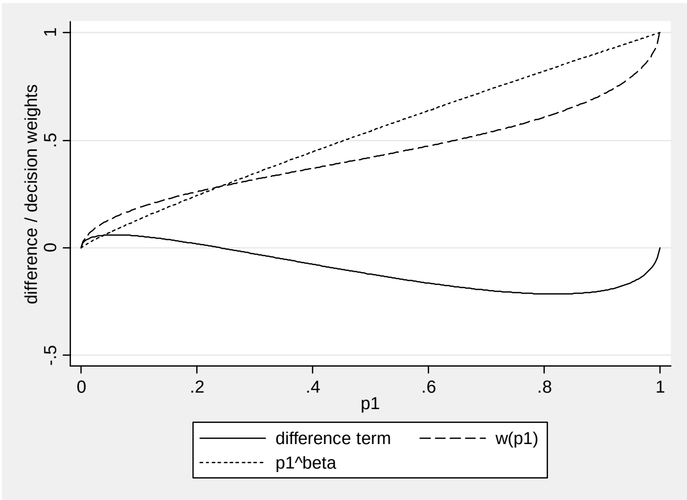
$$V - V_c = \left(-\lambda(-(x_1 - x_2))^\beta\right)\left(w^-(p_1) - p_1^\beta\right). \quad (11)$$

The first term of equation 11 will be negative for all $x_2 > x_1$ and its magnitude increases with increasing difference between x_1 and x_2. Taking into account the values for parameters $\beta = .88$ and $\delta = .61$, mentioned above, the second term is negative for all probabilities $p_1 > .24$; which is where the functions $w^-(p_1)$ and p_1^β intersect (Figure A1). Hence, for all $p_1 > .24$ the value of the prospect is higher than its cash equivalent and (everything else being equal) the difference increases with increasing difference between x_2 and x_1.

Choices between the prospect and the cash equivalent will most likely not be deterministic. It is more likely that they follow a probabilistic function such as a logistic-choice function in which the probability for choosing one option over the other increases with its advantage in V_P (i.e., the absolute difference between $V_P - V_c$).

Taking an individual differences perspective and considering only prospects with sufficiently likely lowest outcomes to prefer the prospect over the cash equivalent, the degree to which the risky prospects are preferred over the cash equivalent should increase with increasing loss aversion λ. Increasing risk aversion β increases the magnitude of the first term, but decreases the magnitude of the second term in equation 11, and the overall effect is therefore complex.

Figure A1: Difference in decision weights according to the second term in equation 11 as a function of probability of the lower outcome for the domain of losses.



Relation to Rebates

If one accepts that rebates lead to adopting the payoff of reaching the rebate (i.e., x_2 = the maximal payoff) as reference point, then, according to CPT, rebates should induce persons to continue buying in the target rebate scheme, even if an outside option has the higher expected value. This, however, should only hold when considering rebates with sufficiently large probability of failing to reach the rebate ($p_1 = 1 - p_R > .24$). Hence, in our paradigm CPT predicts entering the rebate because $1 - p_R = .14$ and stickiness to the rebate after the critical round was omitted because $1 - p_R^* = .85$. The probability to stick to the rebate (i.e., staying in the rebate although it does not maximize expected value) should increase with increasing difference between V_P and V_c which is a monotonously increasing function of the difference between the high and the low overall payoff that can be reached with the rebate option. It should be independent of the repetitions of buying when holding the difference in payoffs constant. From an individual-difference perspective, stickiness should increase with increasing loss aversion and might be influence in a complex way by risk aversion.

Appendix B

In the first part of the experiment, you can make a buying decision in each round. There are 10 buying decisions in total. The decision is whether or not to purchase a token. You will receive information about the repeated decision in the form presented below. [Figure omitted]

Please read this information carefully now and during the experiment. In this situation, each token costs 1.10 € and has an exchange value of 1.30 €; that is, at the end of the experiment you will be credited 1.30 € for each token that you purchased during the experiment. In each round, you may purchase one token for the price of 1.10 €. Alternatively, you can also decide not to purchase a token. For each round in which you decide not to buy a token, you will be credited 0.44 € immediately as direct payment.

At the end of the experiment, you will be granted a rebate of 49% on all purchased tokens, provided that you have purchased at least 9 tokens during the first part of the experiment. In this case, the purchase price, which you spent on the tokens, will be reduced by 49% to 0.56 €.

[Figure omitted] Rounds 5 and 10 are omitted with certain probabilities. If a round is omitted, you can neither buy a token nor choose the direct payoff. Round 5 is omitted with a probability of 17% and Round 10 is omitted with a probability of 85%. [Figure omitted] Dependent on whether Round 5 is omitted or not, the probability for your being able to play 9 rounds varies. Because the experiment can take different directions, depending on whether Round 5 is omitted, after Round 4 you will be asked how you will decide in Round 5 if it takes place, and how you will decide in Round 6 if Round 5 takes place. After these decisions, the computer will determine whether or not Round 5 takes place and you will make the decisions you indicated. If you decide not to buy in Round 5 and the round is played, the computer will only allow you to make this decision. If Round 5 is omitted, the computer will, for Round 6 also, only allow you to make the decision you indicated. In the following rounds, similar to Rounds 1 to 4, you can again choose between buying the token and the direct payment.

Your payment for the first part is calculated as follows:

If the rebate is granted:

Rounds in which tokens were bought x (Exchange value of the tokens – Price of the tokens) + Rounds in which direct payment was chosen x Value of the direct payment + Price of the tokens x Rounds in which tokens were bought x Rebate

If the rebate is not granted:

Rounds in which tokens were bought x (Exchange value of the tokens – Price of the tokens) + Rounds in which direct payment was chosen x Value of the direct payment

[Instructions for measures of risk aversion and loss aversion and example calculations are omitted.]