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An Experiment on Waiting Time and Punishing Behavior

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Abstract

We investigate the implications of waiting time on the decision to punish in a power-to-take experiment. We find that (a) waiting reduces the overall probability of destroying and (b) responders destroy more often in response to higher take rates when the waiting time is longer.

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1. Introduction

People do not generally like waiting. The negative connotation of the waiting experience is recognized by common sense, and is widely documented in experimental and field evidence of psychological and marketing studies in relation to perception of the quality of a service (e.g. Houston *et al*., 1998), attitudes of the consumer towards the service provider (e.g. Hui *et al*., 1998) and emotions experienced by the individual who is waiting (e.g. Voorhees *et al*., 2009). It is reasonable to expect a repercussion of these emotions and attitudes on people's behavior. However, only a few economic studies have analyzed the effects of waiting time on people's behavior, mainly focusing on the impact of waiting time as a cooling-off device when one is asked to wait before taking a decision or to delay a reaction (e.g. Neo *et al*., 2013; Grimm and Mengel, 2011; Oechssler *et al*., 2008; Bosman *et al*., 2001).[1]

This note presents a first study that examines experimentally the impact of waiting time on punishing behavior when people are waiting for a decision by the counterpart and the waiting time extends beyond the subjects' standard expectations. In contrast to the aforementioned literature where subjects were informed about the decision of the counterpart and then asked to wait, in our study the subjects waited before knowing the decision of their co-participant. This waiting experience is common in economic interactions, especially in relation to buyer-seller and principal-agent relationships (e.g. waiting for a service) and bargaining decisions (e.g. waiting for an offer), and could have important methodological implications in economic experiments as it may be a source of potential experimental confounds.[2]

Our vehicle of research is a power-to-take game (PTTG).[3] In this set-up, one subject is the 'take authority' (with income Y_{take}), while the other is the 'responder' (with income Y_{resp}). The take authority first selects a take rate $t \in [0,1]$, which is the proportion of the responder's income that will be transferred to the take authority at the end of the game. The responder is then informed about the take authority's decision and chooses a destroy rate $d \in [0,1]$, which is the proportion of Y_{resp} that will be destroyed. Therefore, the payoffs of the game are $(1-t)(1-d)Y_{resp}$ for the responder, and $Y_{take} + t(1-d)Y_{resp}$ for the take authority. A rational and profit-maximizing responder should not destroy if the take rate is less than 1, and should be indifferent between all possible destroy rates, if the take rate is 1. Hence, the take authority should select $t = 1 - \varepsilon$, where ε is an infinitesimal positive number.

The PTTG is a powerful setting for a first attempt at studying the negative effects of waiting on punishing behavior. First, it has a simple structure which can be easily understood by the subjects. Second, the game is of economic interest in itself since it resembles many economic situations, such as buyer-seller and principal-agent relationships, where waiting time may influence people's behavior.

This note is structured as follows: Section 2 presents the experimental design, Section 3 reports the main results, then Section 4 concludes.

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[1] Two exceptions are Bischak and Oxoby (2009) and Oxoby and Bischak (2005), who studied the impact of occupied and unoccupied waiting on the willingness to pay, and other-regarding behavior respectively.
[2] Note in fact that subjects may experience long intermissions in experiments when they have, for instance, to wait for the experiment to proceed or another subject to make a decision.
[3] See, e.g., Bosman and van Winden (2002).

2. Experimental design

The experiment was conducted during July 2010 at our university. The experiment was fully computerized using z-Tree (Fischbacher, 2007).[4] Both computerized and printed instructions were provided to the subjects. The frame employed in the instructions was as neutral as possible, avoiding any suggestive terms. A total of 96 students participated in 8 sessions (12 subjects per session). Subjects were randomly assigned to computer terminals which were separated by partitions. Before proceeding with the task, the subjects filled in a control questionnaire designed to check their understanding of the instructions. Clarifications were given individually to subjects with incorrect answers. At the end of the experiment a further questionnaire with questions concerning expectations, waiting experience and emotions was provided to the subjects while they were waiting to be paid. On average, subjects earned £7.58 (approximately 11.69 US dollars at that time), including a show-up fee of £2. Each session lasted about 40 minutes when the waiting time was induced by the experimenter, or 30 minutes otherwise.

The experimental design consisted of two treatments: baseline or baseline with extended waiting time (WT). In each treatment, subjects were randomly divided in two groups, participants A (take authorities) and participants B (responders). Random pairs of a take authority and responder were formed to play a one-shot PTTG. In the baseline treatment the length of waiting time that participant B experienced before knowing the decision of participant A was equivalent to the time that the slowest participant A took to make a decision. In the WT treatment, after all participants A had input their choices, participants B faced the waiting screen for another 10 minutes.[5] Thus, in treatment WT, we aimed to artificially create a waiting experience for participants B of at least 10 minutes.

In both treatments, the computer showed the message “please wait your turn” on the waiting screen for participants B. In addition, a timer was displayed on the upper right-hand side of the waiting screen. The timer counted up in milliseconds, seconds and minutes the waiting time that participants B were experiencing. From an economic perspective, the extra information provided by the timer should not have affected behavior. However, it allowed us to control the objective perception of the waiting time. In particular, it ensured to a large extent that all subjects were aware of the real passage of time, and did not engage in subjective assessments of its duration. In addition, subjects were informed both in the recruitment e-mail and at the entrance to the laboratory that they were not allowed to bring any personal items into the room. In particular, we asked them to leave their items in a safe closet before entering the experimental laboratory. This procedure aimed to avoid some participants filling their waiting time with extra activities, such as reading a book or playing with their phone, as filled time could influence the wait perception.

3. Results

Our focus in this paper is on the punishing behavior of responders.[6] Table 1 displays the main descriptive results on the destroy rate for each experimental treatment. On average, we

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[4] The computer screens, experimental instructions, subjects' backgrounds and a complete listing of the final questionnaire items are provided in the on-line appendix.
[5] Subjects were not told who caused the delay. Future research may be devoted to disentangle the consequences of a waiting time generated by the experimenter or other participants.
[6] An analysis of take authorities' behavior and final questionnaire is presented in the on-line appendix.

observed high destroy rates in the WT treatment (25.42%) and low destroy rates in the baseline treatment (11%).

Table 1: Descriptive statistics of destroy rate

Treatment	***N***	***Mean***	***Std. dev.***
BASE	24	11.00	28.68
WT	24	25.42	44.03
Total	48	18.21	37.47

Because of several psychological reasons (e.g. inequality aversion, reciprocity), the decision to punish may be affected by the amount of money taken by the take authority. Hence, it is important to control, in the analysis, for the impact of the take rate on the decision to destroy. If we compare the ratio between destroy and take rates (that is how harsh the punishment is relative to the offence), the proportion of ratios higher than 1 was significantly larger in the WT treatment compared to the baseline (Fisher exact test, p=0.081).[7] This preliminary evidence suggests that punishment was more severe relative to the offence when subjects experienced a longer waiting time. A look at the pattern of the locally weighted regression lines between the destroy and take rates for both baseline and WT supports this evidence for high take rates (Figure 1). In both treatments, we observe a positive relationship between destroy rate and take rate. In other words, it appears that subjects destroyed more when the take rate increased. For low take rates, the trend pattern of the two lines is roughly the same and particularly flat, with the WT line slightly below the baseline line. This suggests that responders who faced low take rates rarely destroyed; normally by selecting low destroy rates. In addition, waiting time seemed to slightly reduce the punishing response when the take rate was low. In contrast, when the take rate is higher the regression line in WT lies considerably above the line in the baseline. This suggests that responders reacted more harshly to high take rates when they experienced a longer waiting time.

We test more formally for this possibility in a regression analysis. In our sample 44 out of 48 subjects (23 out of 24 in WT, and 21 out of 24 in the baseline) chose a destroy rate of either 0 or 1, with only 4 subjects choosing a value in between.[8] This behavior is in line with previous studies on the PTTG where subjects typically destroyed all or nothing (e.g. Bosman *et al*., 2006; Bosman *et al*., 2005; Bosman and van Winden, 2002). Following these previous contributions we analyze this data using a binary choice model, in particular a probit specification. The dependent variable is the variable 'Destroy', which takes value 1 if a responder destroyed income and 0 otherwise. Explanatory variables include the take rate, a dummy for the experimental treatment WT, an interactive variable which captures reciprocity

[7] In treatment WT, 57.14% of responders displayed a ratio higher than 1, while in the baseline treatment no responder displayed a ratio higher than 1.

[8] Specifically, 75% of responders (71% in WT, and 79% in the baseline) chose not to destroy (d = 0), and 17% (25% in WT, and 8% in the baseline) chose to destroy everything (d = 1). Similar proportions for the baseline were observed in previous PTTG studies (e.g. Bosman *et al*., 2006; Bosman *et al*., 2005; Bosman and van Winden, 2002). Note also that the proportion of subjects who destroyed everything (nothing) is higher (lower) in WT compared to the baseline.

effects due to treatment WT, and a dummy for the gender of subjects (=1 for men).[9] Table 2 shows the results of the regression.

Figure 1: Locally weighted regression lines

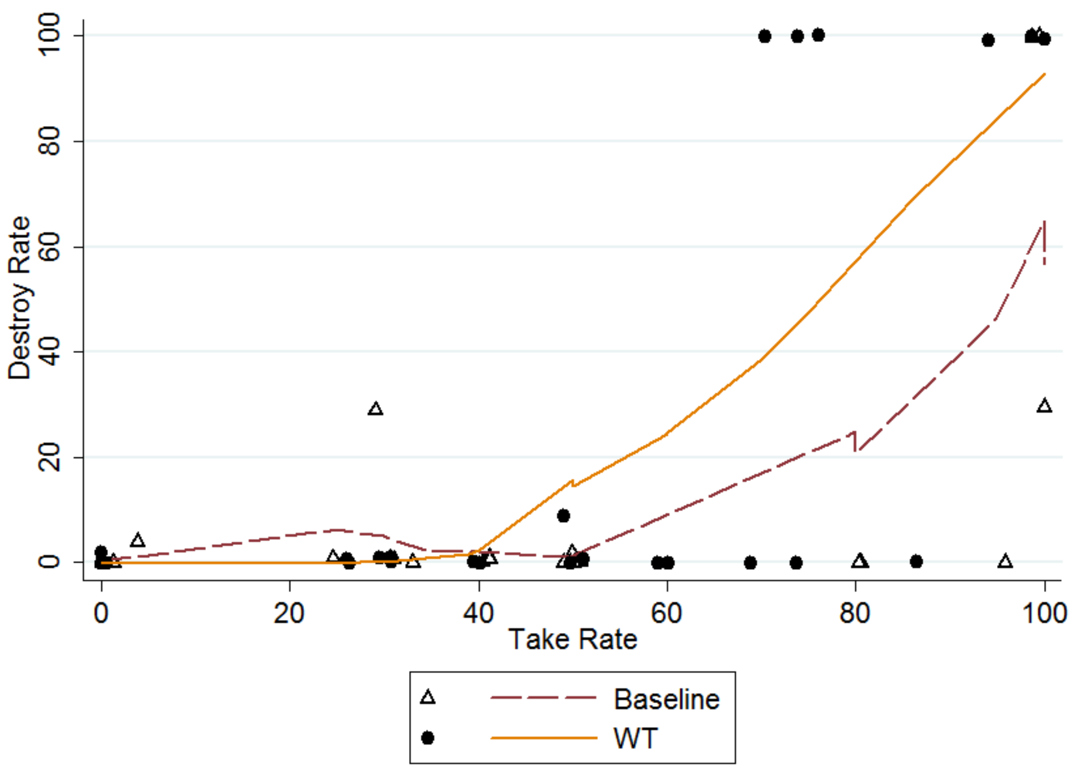

Table 2: Probit model

Variable	*β (se)*
Take rate	0.018*(0.011)
Treatment	-3.142*(1.739)
Take rate × Treatment	0.050**(0.025)
Gender	-1.389**(0.640)
Constant	-1.262**(0.649)
Obs	48
Chi2	21.71***(0.000)
Measure of fit	0.402

[a]Note: * p < 0.1, ** p < 0.05, *** p < 0.01.

The likelihood ratio chi-square of 21.71 with a p-value of 0.000 tells us that our model as a whole is statistically significant; that is, it fits significantly better than a model with no predictors. The interactive variable and gender are statistically significant at the p<0.05 level. Take rate and treatment dummy are statistically significant at p<0.1. If we look at the coefficients, there is evidence that the probability of destroying income rose with the take

[9] 50 females (24 in the baseline, 26 in WT) and 46 males (24 in the baseline, 22 in WT) participated in the experiment.

rate,[10] and is lower for men.[11] In addition, there is evidence that the probability of destroying decreased in the WT treatment. However, as the take rate rises, a longer waiting time induced subjects to destroy more often. In particular, for take rates higher than 63% (3.142/0.05), the probability of destroying is higher under WT than baseline.

4. Conclusion

This note has reported a first attempt to experimentally investigate the influence of waiting on punishing behavior. Our findings suggest that a longer waiting time reduces the overall probability of punishing when take rates are low. However, as take rates rise, punishment becomes more frequent when the waiting time is longer.

The first result is consistent with loss aversion (Kahneman and Tversky, 1979). In particular, as Strahilevitz and Loewenstein (1998) point out, loss aversion may increase the attachment to the own initial endowment as time elapses.[12] As a result, an agent may be less willing to destroy his/her own endowment to punish a counterpart when the waiting time is longer. At the same time, a waiting experience may also trigger negative emotions in the subject, particularly if the wait is accompanied by a hostile action from the counterpart. In particular, subjects may become more sensitive and 'touchy' to higher take rates when the waiting experience is longer. Consequently, they may punish more often when more endowment is taken from them. This second result is consistent with psychological and marketing research suggesting that waiting has a negative impact on behavior.

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[10] This evidence is consistent with models of social preferences, in particular reciprocity and inequality aversion (see Bosman and van Winden (2002) for a discussion of these models in the context of the PTTG).
[11] This evidence is in line with Solnick's (2001) findings on the ultimatum game, where female subjects appeared to be more demanding than male subjects. Note in fact that the PTTG corresponds to an ultimatum game with continuous opportunities for punishing.
[12] For a recent discussion on how waiting time may increase loss aversion, see Neo *et al*. (2013).

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