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Passing the Time: Other-Regarding Behavior and the Sunk Cost of Time

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Passing the Time: Other-Regarding Behavior and the Sunk Cost of Time *

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Abstract

An extensive literature has theorized about the ways in which individuals incorporate the cost of time in their decision processes. While much of this literature has researched the role of occupied time in decision making and queuing, we analyze the effect of both occupied and unoccupied time on other-regarding behavior in dictator and ultimatum games. Our results find no evidence of an effect due to occupied time. However, we find that unoccupied time reduces individuals' displayed inequity aversion and increases individuals' displayed negative reciprocity. These results are consistent with theories from behavioral decision making, mental accounting, and the study of queuing systems.

KEYWORDS: unoccupied time, mental accounting, other-regarding behavior, psychology of queues

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> To be kept waiting - especially to be kept waiting for an unusually long while - is to be the subject of an assertion that one's own time (and, therefore, one's social worth) is less valuable than the time and worth of the one who imposes the wait.
>
> – Schwartz (1975, p. 30)

> I have noticed that the people who are late are often so much jollier than the people who have to wait for them.
>
> – E. V. Lucas (author, 1868–1938)

> ...when people are waiting, they are bad judges of time, and every half minute seems like five.
>
> – Jane Austen, *Masnfield Park* (1814)

1 Introduction

Imagine waiting for a table at a busy restaurant. While you were told the wait would be five to ten minutes, you end up waiting for twenty minutes with nothing to do. After your meal, you prepare to leave a tip for the waitress. Is the tip more or less than the usual percentage you leave?

Alternatively, imagine you are on vacation, driving along a highway. You arrive at the scene of an accident that blocks the road and requires several minutes to clear. After traffic begins to move, the driver of another car puts on his turn indicator, requesting that you yield and let her into your lane. Are you more or less inclined to yield compared to how you would have felt had there been no delay?

In these examples, the person who is the potential beneficiary of your actions did not cause the delay you experienced. Furthermore, the wait is a sunk cost when encountering the other individual. However, many would not be surprised if in each case you felt less generous toward the prospective recipients of your good will, purely as a result of the past wait endured. While such behavior may not be consistent with standard models of decision making, theories of mental accounting posit that sunk costs will affect subsequent decisions associated with the same mental account (in the above examples, the sunk time cost and the associated "restaurant meal" or "vacation travel" account).[1]

In this paper we present a model and experimental evidence investigating how the (sunk) experience of an unexpected wait influences other-regarding behavior. As part of our analysis, we distinguish between unoccupied time costs (time spent waiting with nothing to do) and occupied time costs (e.g. time spent completing a survey or reading while waiting for an appointment). This distinction is of interest, as unoccupied waits occur in many areas of life (e.g. retail services, transportation systems, health care) and both occupied and unoccupied waits can be induced by managerial policies. For example, credit card call centers often screen clients, leaving less-profitable customers on hold while attending to more valuable customers. While waiting, customers may be "entertained" by music, news broadcasts, or silence.

How such waits affect the attitudes of individuals toward others has been the subject of conjecture but of little organized study. Yet, the effects of

[1] A significant literature in the fields of operations management and consumer research have explored how behavior and perceptions are influenced by waiting time and how wait times and queues should be "optimally managed."

these waits can be important. As cited above, a wait may be interpreted as an assertion of the value of one's time and efforts by another. In the areas of personnel economics and incomplete contracts, unintended and unoccupied waits in employee interactions may influence the ways in which employees perceive the intentions of others and the induced power relationship. This may in turn affect the degree of cooperation or coordination in the workplace, something particularly important when labor relations are incompletely regulated or contracted. A striking example of the effect of waiting on other-regarding behavior is evidenced by instances of "road rage:" unoccupied waits in traffic congestion may yield aggressive behaviors against individuals who bear little or no responsibility for the congestion.

We find that the context in which waits (i.e. time costs) are incurred has a significant effect on the way these sunk costs are manifest in subsequent decision making. According to research on the psychology of waiting and queues, unoccupied waits "feel" longer than occupied waits. As a result, unoccupied waits should yield larger sunk costs than occupied waits and hence bring about distinctly different results with respect to observed other-regarding behavior. Our results confirm support this research: while we fail to identify a sunk costs effect associated with occupied time costs in dictator games, we do observe a significant reduction in inequity aversion accompanying unoccupied time costs. In ultimatum games we find that the presence of sunk costs resulting from an unoccupied wait significantly increases the incidence and depth of negative reciprocity.

The remainder of the paper is organized as follows: Section 2 reviews the literature on the sunk costs, mental accounting, and the perception and valuation of time costs. Sections 3 and 4 present our model and experiment. Section 5 presents our results and section 6 concludes.

2 Time, Sunk Costs, and Fairness

In a series of experiments, Arkes and Blumer (1985) demonstrated that monetary sunk costs matter to individuals when making decisions. In hypothetical situations and in situations involving actual money, subjects in these experiments made decisions not on the basis of prospective expected marginal costs and benefits, but on the basis of expenses already incurred. Thus, participants' decisions were heavily influenced by unrecoverable (i.e. sunk) costs rather than solely being based on the expected net benefit of a given decision. While these experiments dealt with monetary costs, Arkes and Blumer (1985) conjectured that a nonmonetary sunk cost effect might exist. For example, customers at a movie theater may sit through the remainder of a bad movie, in part, because of the time they have already invested in viewing the film.

Such behavior is reflective of mental accounting (Thaler, 1985, 1999), a cognitive process in which individuals open a "mental account" for an activity and tend not to want to leave the account "in the red." That is, if there have been losses incurred in a particular account (the movie account in the above example), the customer's concern will be to try to leave the account with a positive or zero balance rather than to try to maximize net expected returns. As Thaler (1999) states, "a prior (sunk) cost is attended to if the current decision is in the same account."

To this end, we ask if time spent waiting could be considered a loss that requires a counterbalancing gain to settle the mental account. Certainly, lost time cannot be recovered and is gone forever, but it is not clear whether people perceive time as a resource like money. On the one hand, time incurred waiting can be construed as part of the cost of a good or service, and may therefore be a cost associated with a good or service (Leclerc et al., 1995). On the other hand, the difficulty of accurately perceiving and monetarily valuing time may preclude waiting time from being associated with a particular mental account (Soman, 2001). Thus, a paramount issue in understanding the role of time costs in decision making is understanding how individuals value time.

In this pursuit, Larson (1987) and Maister (1985) were among the first to consider the ways in which time and queuing systems affect individuals' incentives and perceptions.[2] Larson (1987) argues that queues intrinsically carry a requirement for social justice, particularly focusing individuals' attention on the ideas of "first come, first served" or "first in, first out." As such, time spent waiting may affect the ways in which an individual recognizes the entitlement or deservingness of others (including oneself) to various goods or services. Allocations which do not conform to these entitlements are considered unfair and may alter an individual's perception of the overall benefits of consuming a good or service.[3]

Similarly, Maister (1985) argues that the manner in which an individual

[2]For reviews of the research regarding the management of consumer waits and queues, see Durrande-Moreau (1999) and Nie (2000).

[3]It is interesting to note that Kahneman et al. (1986) find that individuals consider queuing (presumably under the discipline of "first come, first served") a "more fair" system for the allocation of goods than auctions and lotteries.

waits affects her perception of the wait and, hence, the perceived cost of time. Specifically, Maister (1985) argues that occupied time (e.g. waiting time spent completing questionnaires in a physician's office or watching television in line at the bank) is considered less costly than unoccupied time (in which an individual does nothing and therefore has her attention focused on the passage of time). The key here is that in occupied waits one's attention is distracted from the passage of time, while this is highlighted in unoccupied waits. Similar effects of distraction have been documented in other settings. For example, Chaston and Kingstone (2004) asked subjects to perform two visual search tasks, only one of which required their close attention. Participants' estimates of the time to complete a given task were consistently underestimated, with the greatest underestimation in tasks where their attention was deeply engaged. This result is in agreement with the observation in Maister (1985) that occupied time feels shorter than unoccupied time.[4]

In terms of mental accounting, Leclerc et al. (1995) postulated that "situations that consumers perceive as a waste of time - such as waiting situations - should be encoded as losses" in a mental account.[5] The analysis by Maister (1985) suggests that the sunk cost associated with unoccupied time should exceed that associated with occupied time. As such, if sunk time costs are treated like sunk monetary costs, unoccupied waits require greater counterbalancing benefits to return a mental account to a non-negative balance

[4]Relatedly, Leary et al. (1986) find that individuals perceived as boring by others are rated unfavorably on other unrelated characteristics.

[5]However, their experiments suggest that consumers only code waiting as a loss if the wait exceeds a normal or expected length; otherwise, the wait is simply a cost that must be paid to obtain the good or service. Maister (1985) also suggests that people accept an expected wait, as for an appointment to begin, but become annoyed or anxious when forced to undergo an unexpected or uncertain wait.

than occupied waits. Germane to this question, Soman (2001) considered the effect of occupied time on decision making, proposing that it is difficult for individuals to account for time because (*i*) time cannot be readily inventoried and "held on the books," (*ii*) time is not as easily aggregated as money, and (*iii*) accounting for time is not a routine activity. In a series of experiments, Soman finds no evidence of a sunk cost effect associated with time unless individuals are provided explicitly with a wage schedule (ostensibly permitting them to convert time into money and thereby code a cost in the associated mental account). While Soman's analysis does not address the issue of waiting or the distinction between occupied versus unoccupied time, he points out that "it is possible that the same quantity of time investment may have a different sunk-cost impact in different settings, i.e., when the *quality* of the experience is different." (p. 183, his italics) It is precisely the effect of such quality differences in time (i.e. occupied versus unoccupied time) which we explore below.

3 Time and Other Regarding Behavior

In this section we present a modification to the model of inequity aversion proposed by Fehr and Schmidt (1999) in which we account for the role of time costs in decision making. Following the Fehr-Schmidt model, individuals experience disutility from payoff inequities: in a two-person decision environment, the utility of an agent receiving a payoff y when the other person receives x, is given by

$$U(y,x) = y - \alpha f(x-y) - \beta g(y-x), \tag{1}$$

where the monotone increasing functions $f(\cdot)$ and $g(\cdot)$ represent the costs associated with receiving less than and more than the other individual. Letting $z = x - y$, we assume that $f(z) = 0$ for all $z \leq 0$ and $g(-z) = 0$ for all $z \geq 0$.[6] The parameter $\alpha > 0$ represents the weight an individual attaches to receiving less than the other individual, while $\beta > 0$ represents the weight attached to receiving more than the other individual. Further, it is assumed that $\beta < \alpha$ and $\beta \in (0,1)$.

We make the following additional assumptions on the functions $f(\cdot)$ and $g(\cdot)$. First, we assume $f'(z) = 0$ for all $z \leq 0$ and $g'(-z) = 0$ for all $z < 0$. Secondly, we assume $g''(z) > 0$. The central idea in the latter assumption is that the marginal disutility to an agent of having more than another agent is smaller when there is less inequity. Thus the marginal disutility of having an additional dollar more when an endowment is split 55-45 is smaller than when the endowment is split 70-30. We think that this is a reasonable assumption, particularly when considering behavior in small stakes (i.e. \$10) bargaining games: this assumption captures the idea that, if an individual dislikes having more than another (i.e. $\beta > 0$) and has a preference for equity, then the marginal cost of inequity should be larger when there is a greater disparity in payoffs.

To incorporate the effects of sunk time costs (e.g. waiting) into the deci-

[6] In Fehr and Schmidt (1999), $f(x-y) = \max\{x-y, 0\}$ and $g(y-x) = \max\{y-x, 0\}$.

sion process, we assume that an individual incurs a "time cost" $t \geq 0$ prior to making a decision.[7] This cost represents an exogenous cost incurred by an individual in a given decision environment. For a consumer t may represent the time cost incurred while waiting for a good or service. Alternately, in a negotiation context t may represent the time cost one party imposes on another when delaying an offer. Thus, to the individual in question, t is not a choice variable.

We assume that the weights α and β are functions of the time cost t: that is, $\alpha \equiv \alpha(t)$ and $\beta \equiv \beta(t)$ and utility is represented by

$$U(y, x, t) = y - \alpha(t)f(x - y) - \beta(t)g(y - x) - t. \tag{2}$$

The influence of the sunk cost of time on decision making is captured through the effect of t on α and β: After an individual has incurred the time cost t, this cost affects current decision making by altering the weights an individual assigns to payoff inequities. As before, we assume $\beta(t) < \alpha(t)$ and $\beta(t) \in (0, 1)$ for all t.

Following theories of sunk costs and mental accounting (Arkes and Blumer, 1985; Thaler, 1980, 1999), one might naturally assume that $\alpha'(t) \geq 0$, implying that the greater the time cost, the more important is "negative inequity" in an individual's decision calculus. To illustrate, consider the evidence cited in Larson (1987): the longer individuals wait in a queue for a good or service, the more "disutility" they incur from others' queue-jumping (i.e. individ-

[7]If one wished to relate this directly to an amount of time, one may think of $t \equiv c(\tau)$ where τ is the amount of time incurred and $c(\cdot)$ is the cost function for wait times. We abstract from this and use the notation t to denote a time cost, simplifying the discussion of differences in the way time is perceived and time costs are measured.

uals farther back in the queue receiving goods or services before those at the head of the queue). One interpretation of this change in individuals' regard for others is that the time costs incurred waiting makes individuals more sensitive to the "additional" benefits received by others who have not incurred similar time costs.[8]

Relatedly, if sunk costs matter, it should also be true that "positive inequity" should matter less as time costs increase. Hence we assume $\beta'(t) \leq 0$. That is, an individual who has incurred a significant time cost pays less attention to the cases in which she receive more than others. This is not to say that individuals don't consider the welfare of others or abandon fairness concerns. Rather, one can think of sunk time costs as "narrowing" individuals' attention to positive inequities via the perceived "deservingness" developing as a result of these costs. Thus, if an individual has incurred a time cost for a good (e.g. waiting in a queue) she views herself as more deserving than others who may not have waited (Larson, 1987). When an individual has no information about the time costs of others, her own time costs work in a similar manner and her perceived deservingness to a good may increase.[9] In our model, this is conceptualized through $\beta'(t) \leq 0$: the disutility from having more than another falls with one's own time costs as these costs create a sense of greater deservingness (ceteris paribus) relative to others.[10]

[8] In line with the analysis of Larson (1987) and Kahneman et al. (1986), increased time costs may focus an individual on inequities in which they perceive themselves as having been treated unfairly.

[9] The tie between perceived deservingness and inequity aversion also arises in bargaining experiment with earned wealth (Cherry et al., 2002; Ruffle, 1998).

[10] Note that if $\beta'(t) \geq -1$ then an individual's preferred time cost (if time were a choice variable) is zero.

We now derive the implications of the aforementioned time costs on decision making in dictator and ultimatum games. In the dictator game, a proposer must allocate a portion $x \geq 0$ of an endowment $\omega > 0$ to a (passive) responder. Payoffs to the proposer and responder are given by $y = \omega - x$ and x. In the ultimatum game, the proposer makes the same decision but the responder can either accept or reject the offer x. If the responder accepts the offer, payoffs to the proposer and responder are given by $y = \omega - x$ and x; if the responder rejects the offer, both parties receive zero ($x = y = 0$).

With respect to behavior in the dictator game, we have the following:

Proposition 1 *Greater time costs imply proposers will extend lower offers in dictator games.*

Proof: Note that a proposer's optimal offer in a dictator game x^{DG} will satisfy

$$2\beta(t)g'(\omega - 2x^{DG}) - 1 \leq 0 \tag{3}$$

where the equality is strict for non-zero offers and we have utilized the fact that $y - x = \omega - 2x^{DG}$ and $\alpha > \beta$ (to rule out offers greater than $\frac{\omega}{2}$). Applying the implicit function theorem, one obtains

$$\frac{\partial x^{DG}}{\partial t} = \frac{2\beta'(t)g'(\omega - 2x^{DG})}{4\beta(t)g''(\omega - 2x^{DG})} < 0. \tag{4}$$

Thus, the greater the time cost, the lower the offer extended by a proposer in the dictator game. □

This result is consistent with theories of mental accounting: t is charged to the mental account associated with the bargaining game. In order to leave the account with a non-negative balance, the individual must obtain more in the bargaining game than she would have if $t = 0$.

In ultimatum bargaining, fear of negative reciprocity (i.e. responders rejecting small, unfair offers and leaving both parties with nothing) is a dominant cause for non-zero offers (see Camerer, 2003). To characterize the effects of time costs on reciprocity, we consider a responder's minimum acceptable offer, representing the smallest offer a responder will accept. Thus, if a proposer's offer is less than a responder's minimum acceptable offer, the offer is rejected and each player receives nothing. With an eye towards negative reciprocity, we have the following:

Proposition 2 *Greater time costs will result in larger minimum acceptable offers and hence higher rejection rates.*

Proof: Note that for any offer x, a responder will reject the offer if

$$x - \alpha(t)f(\omega - 2x) < 0. \tag{5}$$

Let y^{UG} be a responder's minimum acceptable offer satisfying

$$y^{UG} - \alpha(t)f(\omega - 2y^{UG}) = 0. \tag{6}$$

If $x \geq y^{UG}$ the responder will accept the offer; if $x < y^{UG}$ the responder will reject the offer.

To explore the effect of time costs on rejections, consider the effect of time costs on a responder's minimum acceptable offer. Applying the implicit function theorem, we obtain

$$\frac{\partial y^{UG}}{\partial t} = \frac{\alpha'(t) f(\omega - 2y^{UG})}{1 + 2\alpha(t) f'(\omega - 2y^{UG})} > 0. \tag{7}$$

Thus, increases in time costs will increase a responder's minimum acceptable offer, thereby increasing the likelihood that a given offer is rejected. □

Greater time costs increase rejection rates in the ultimatum game by increasing the weight of negative inequity in an individual's decision making. In essence, sunk time costs must be compensated and, for a responder in the ultimatum game, this compensation can come in the form of either (*i*) greater monetary payoff to oneself or (*ii*) reducing inequities by implementing equal payoffs of zero. Both these forms of compensation are achieved via larger minimum acceptable offers and, hence, higher rejection rates.

Finally, in line with Maister (1985) and Leary et al. (1986), we distinguish between two types of time costs. First, we denote time spent in occupied situations by t_O. This represents, for example, time spent completing questionnaires in a physician's office prior to receiving service or time spent watching television while in line at a bank. Secondly, we let t_U represent the time cost of unoccupied time. This represents the costs associated with pure waiting, when the individual is aware of the passage of time. The key difference between these time costs is that the individual incurring an occupied time cost has her attention diverted from the passage of time. On the other hand, an individual experiencing unoccupied time has nothing to divert her attention from the passage of time and may experience costly emotions such as boredom or tedium. Following Maister (1985) we assume that, for the same amount of time $t_O < t_U$; that is, unoccupied time weighs heavier than occupied time in individuals' minds and is more costly. For simplicity (and as implemented in our experiment below), when denoting the time costs of occupied time t_O and unoccupied time t_U we will assume that the same amount of time has transpired in each.[11]

In terms of our analysis, the greater weight of unoccupied time ($t_U > t_O$) implies that the effects of sunk costs characterized by propositions 1 and 2 should be magnified when these sunk costs arise in unoccupied versus occupied contexts. Thus, relative to occupied sunk costs, the incidence of sunk unoccupied time should yield smaller offers in the dictator game and larger minimum acceptable offers in the ultimatum game.

4 The Experiment and Hypotheses

To explore the effects of time on other-regarding behavior, we conducted a series of dictator and ultimatum games. In the dictator games, individuals were randomly assigned the role of either proposer or responder. Proposers were asked to choose an amount $x \in [0, 100]$ denominated in lab dollars (1 lab dollar = \$0.10) to allocate to another person. Payoffs were then allocated, with the proposer receiving $100 - x$ lab dollars and the (passive) responder receiving x lab dollars.

In the ultimatum game, participants were again randomly assigned roles of either proposer or responder. Proposers chose an amount $x \in [0, 100]$ to

[11] Using the notation in footnote 7, $t_O \equiv c_O(\tau) < t_U \equiv c_U(\tau)$ where $c_O(\cdot)$ represents the cost function associated with occupied time and $c_U(\cdot)$ represents the cost function associated with unoccupied time.

allocate the responder. Responders provided a minimum acceptable offer $y \in [0, 100]$ (cf. Blount and Bazerman, 1996; Mitzkewitz and Nagel, 1993). If $x \geq y$, the proposer received $100 - x$ and the responder received x. If $x < y$, both the proposer and the responder received zero.[12]

Each of the dictator and ultimatum game experiments were constructed in a 2 (role) × 3 (time) design. Each game had two *role* treatments. That is, individuals were randomly assigned to an experimental session consisting of only proposers or only responders. This was done to increase the degree of anonymity and avoid peer group effects. Our concern was that if individuals knew they were matched with individuals in the same room as themselves, and therefore knew all undergone the same experiences with respect to time (see the discussion of the time treatments below), this knowledge could confound the pure effects of time and waiting on decision making. For this reason proposer and responder treatments were conducted separately with no information provided regarding the time treatment of the person with whom they were matched (see instructions in appendix A).

Three *time* treatments of the games were conducted in which we varied the amount and use of time prior to participants' decision making. The *standard* treatment followed the protocols typically used in such experiments: individuals were read the instructions and then asked to make their offer or minimum acceptable offer choices.

In the *occupied time* treatment participants were read the instructions

[12] For a review of the experimental results in dictator and ultimatum games, see Camerer (2003). Deviations from predictions based on pure self-interested behavior are robust across information conditions, degrees of anonymity, and elicitation methods. See Güth et al. (1982), Hoffman et al. (1994, 1996), and Oxoby and McLeish (2004).

and then asked to complete a series of questionnaires (personality surveys from Brandstätter, 1988; Patton et al., 1995) prior to making offer and minimum acceptable offer decisions. No mention of the questionnaires was made in the instructions. Rather, the questionnaires simply began after the instructions were read. The goal here was to give participants a task which occupied their time prior to making decisions in the game. The questionnaires were given sequentially and terminated after a period of five minutes.

In the *unoccupied time* treatment, participants were read the instructions and had five minutes of unoccupied time prior to making offer or minimum acceptable offer decisions. That is, after receiving instructions the computers screens at each participant station displayed the statement "Please wait for the experiment to continue." This statement remained for five minutes before advancing to the screen asking for participants' decisions.

It should be emphasized that neither proposers nor responders were given any information about the time treatment of the individuals with whom they were randomly matched. Participants were only informed that the person with whom they were matched was in a different experimental session. Thus, participants in each time treatment had the same information regarding their randomly selected partner.

We propose two hypotheses based on the model in section 3. We denote proposers' offers by x_t^g in the dictator ($g = DG$) and the ultimatum ($g = UG$) games under the standard time treatment (i.e. no time, $t = S$), the occupied time treatment ($t = O$) and the unoccupied time treatment ($t = U$). Similarly, we denote responders' minimum acceptable offers by y_t^g in the ultimatum ($g = UG$) game under the standard time treatment (i.e. no time, $t = S$), the occupied time treatment ($t = O$) and the unoccupied time treatment ($t = U$).

With respect to behavior in the dictator game and in line with proposition 1, we expect greater sunk time costs will result in less displayed inequity aversion. That is, we expect to observe subsequently lower offers in the occupied and unoccupied time treatments relative to the standard treatment. Hence we have the following:

Hypothesis 1

$$x_U^{DG} < x_O^{DG} < x_S^{DG}. \tag{8}$$

Since concern over negative reciprocity is a dominating factor in the determination of offers in the ultimatum game and since individuals have identical information regarding the status of receivers in this game, we do not expect to see significant differences in ultimatum game offers across time treatments (i.e. $x_U^{UG} \sim x_O^{UG} \sim x_S^{UG}$).[13] However, given proposition 2 we expect to see the sunk cost of time manifest itself in greater rejection rates via larger minimum acceptable offers. Thus, we have the following:

Hypothesis 2

$$y_S^{UG} < y_O^{UG} < y_U^{UG}. \tag{9}$$

[13]Given that proposers have no information regarding the experiences of responders, there is no ex ante reason to expect differences in offers across time treatments: a common prior on responders' experiences implies proposers have common expectations regarding rejection and hence extend similar offers.

5 Results

The experiments were conducted with undergraduates from our university in the university's experimental economics laboratory. Individuals were recruited through the laboratory's participant registry and randomly assigned to one of the role (proposer, responder) - time (standard, occupied, unoccupied) conditions. A total of 192 individuals participated the in dictator ($n = 96$) and ultimatum ($n = 96$) games, with 16 individuals in each of the role-time treatments of each game. In recruiting, participants were informed that the experiment would last 30 minutes, thereby making all time costs explicit parts of the experiment and reducing the effect of time costs resulting from these waits infringing on other planned activities. In fact each, experiment was completed within 20 minutes. All treatments were conducted over a computer network and programmed in z-Tree (Fischbacher, 1999).

5.1 The Effect of Time on Inequity Aversion

We begin by examining the effect of occupied and unoccupied time on inequity aversion by comparing the distribution of offers elicited in our experiments. Figure 1 presents the distributions of offers elicited in dictator games under each time treatment (standard, occupied, and unoccupied). Comparing the standard dictator game and the occupied time dictator game, a non-parametric Wilcoxon test cannot reject the null hypothesis that the distribution of offers are the same ($p = 0.68$). Thus, we find no evidence that the presence of occupied time prior to decision making affected participants' decisions (cf. Soman, 2001).

Figure 1 about here

However, Wilcoxon tests identify a sharp difference between offers in the unoccupied dictator game relative to both the standard dictator game ($p = 0.018$) and the occupied time dictator game ($p = 0.021$). The presence of unoccupied time prior to decision making significantly reduced participants' displayed inequity aversion. Such a result is consistent with the arguments of Arkes and Blumer (1985) and Thaler (1999) regarding the sunk cost of unoccupied time: individuals felt the need for compensation for their time. This need was only observed when sunk costs resulted from unoccupied time and, in line with Maister (1985), weighed greater in proposers' decision processes.

Figure 2 about here

The distributions of offers for each time treatment of the ultimatum game are presented in Figure 2. Wilcoxon tests were unable to reject the hypothesis that the distributions of offers in the ultimatum game were different: $p > 0.5$ in pairwise comparisons of all distributions of offers across time treatments. This points to the need to explore the effect of time on the extent of negative reciprocity.

5.2 The Effect of Time on Negative Reciprocity

Figure 3 presents the distribution of minimum acceptable offers elicited in the occupied and unoccupied time treatments of the ultimatum game. Wilcoxon tests cannot reject the hypothesis that the minimum acceptable offers in the standard and occupied time treatments are drawn from the same distributions ($p = 0.69$). However, we again observe a marked effect of unoccupied time: the presence of unoccupied time prior to decision making resulted in a sharp increase in negative reciprocity via participants' expressing significantly higher minimum acceptable offers. Indeed, Wilcoxon tests identify a significant difference between the distribution of minimum acceptable offers between the unoccupied time treatment and both the standard ($p = 0.031$) and occupied time ($p = 0.046$) treatments. Thus, while occupied time had no effect on negative reciprocity, unoccupied time increased the incidence and depth of negative reciprocity.

Figure 3 about here

Looking at the distribution of minimum acceptable offers in the time treatments more closely paints a striking picture of the increase in negative reciprocity. In both the standard and occupied time treatments, 100% of responders in the ultimatum game gave minimum acceptable offers of 50 lab dollars or less and 61% of responders gave minimum acceptable offers of 25 lab dollars or less. However, in the unoccupied time treatments, only 88% of responders gave minimum acceptable offers less than 50 lab dollars and 29% gave minimum acceptable offers less than 25 lab dollars.

Strikingly, 12% of responders who had incurred the cost of unoccupied time gave minimum acceptable offers in excess of 50 lab dollars, virtually guaranteeing that neither they nor the proposer would receive any payment for their participation. While this is consistent with the arguments of Maister (1985) and theories of mental accounting, neither of these views point to a reason for wanting to reduce the benefits of others in the way implied by the data.[14]

Finally, note that the presence of time prior to eliciting participants' responses does not appear to have yielded an increase in the observed levels of pure self-interested, Nash behavior. One could conjecture that the presence of time (particularly unoccupied time) gives individuals the opportunity to think and reflect on the nature of the decision problem. This may lead individuals to make normatively "better" (i.e. in line with traditional economic models) decisions as they can engage in more deliberation regarding the decision environment. While this may be consistent with the behavior of proposers in the unoccupied time-dictator game treatment (offers moved towards the Nash prediction), the behavior of responders in the unoccupied time-ultimatum game treatment does not support the prospect of such learning or "deliberation-enhanced rationality."

6 Conclusion

Our experiments suggest that time costs have a profound effect on individual decision making. In essence, time can be "held on the books," at least for short periods, and the context in which time costs are incurred affect the ways in which such sunk costs are valued. As a result, the context of a time

[14] A possible explanation for these extreme forms of negative reciprocity may lie in models emphasizing the role of visceral factors or animal spirits in decision making (Loewenstein, 1996; Loewenstein and O'Donoghue, 2004). Specifically, unoccupied time may increase the salience of visceral factors (e.g. boredom, tedium) or give affective decision processes greater influence in over cognitive processes in overall decision making (Capra, 2004). This may yield the seemingly irrational behavior of minimum acceptable offers in excess of 50% of the endowment.

cost can significantly affect the way an individual considers the well-being of those with whom they interact. In our experiments, when individuals experienced sunk time costs associated with unoccupied waits, we observed a sharp reduction in (unilateral) inequity aversion and a striking increase in the degree of negative reciprocity. Both these observations are consistent with theories of mental accounting (e.g. Thaler, 1999) and the psychology of queues (e.g. Larson, 1987; Maister, 1985).

Schwartz (1975, p. 7) points out that “delay is not only suffered; it is also interpreted.” Our experiments suggest that the manner in which waiting is incurred influences an individual’s interpretation of the cost of time. Moreover, it is this perception which determines the effect of sunk time costs on decision making. In many instances, the imposition of wait time (here, unoccupied waits) can be perceived as an insult, an aggressive act, or a means of establishing a power relationship (Schwartz, 1975). In a consumer choice setting, this has a strong impact on the subsequent evaluation of the “service experience,” as implied by our earlier tipping example. In a negotiation environment or within a principal-agent setting, the imposition of wait times may significantly affect the way intentions and fairness are perceived. For example, in labor markets where incomplete contracts play an important role, sunk time costs may affect perceived intentions and therefore reciprocity in subsequent interactions. As such, our results should inform not only managers concerned with queuing systems, but also researchers and practitioners interested with the behavioral aspects of incomplete contracts and implicit motivations.

References

Arkes, Hal R. and Catherine Blumer, "The Psychology of Sunk Cost," *Organizational Behavior and Human Decision Processes*, June 1985, *35* (2), 124–140.

Blount, S. and Max H. Bazerman, "The Inconsistent Evaluation of Absolute Versus Comparative Payoffs in Labor Supply and Bargaining," *Journal of Economic Behavior and Organization*, 1996, *30*, 227–240.

Brandstätter, H., "Sechzehn Persnlichkeitsadjektivskalen (16 PA) als Forschungsinstrument anstelle des 16PF," *Zeitschrift für experimentelle und angewandte Psychologie*, 1988, *35* (3), 370–391.

Camerer, Colin F., *Behavioral Game Theory*, Princeton NJ: Princeton University Press, 2003.

Capra, C. Mónica, "Mood Driven Distortions in Strategic Interactions," *American Economic Review Papers and Proceedings*, May 2004, *94* (2), 367–372.

Chaston, Anthony and Alan Kingstone, "Time Estimation: The effect of cortically mediated attention," *Brain and Cognition*, 2004, *55*, 286–289.

Cherry, Todd L., Peter Frykblom, and Jason F. Shogren, "Hardnose the Dictator," *American Economic Review*, September 2002, *92* (4), 1218–1221.

Durrande-Moreau, Agnès, "Waiting for Service: Ten Years of Empirical Research," *International Journal of Service Industry Management*, 1999, *10* (2), 171–189.

Fehr, Ernst and Klaus Schmidt, "A Theory of Fairness, Competition, and Cooperation," *Quarterly Journal of Economics*, August 1999, *114* (3), 817–868.

Fischbacher, Urs, "Toolbox for Readymade Economic Experiments," Technical Report IEW Working paper 21, University of Zurich 1999.

Güth, Werner, R. Schmittberger, and B. Schwarze, "An Experimental Analysis of Ultimatum Bargaining," *Journal of Economic Behavior and Organization*, 1982, *3*, 367–388.

Hoffman, Elizabeth, Kevin McCabe, and Vernon L. Smith, "Preferences, Property Rights, and Anonymity in Bargaining Games," *Games and Economic Behavior*, 1994, *7*, 346–380.

_ , _ , **and Vernon Smith**, "Social Distance and Other-Regarding Behavior in Dictator Games," *American Economic Review*, June 1996, *86* (3), 653–660.

Kahneman, Daniel, Jack L. Knetsch, and Richard Thaler, "Fairness and the Assumptions of Economics," *Journal of Business*, 1986, *59* (4), S285–S300.

Larson, R.C., "Perspectives on Queues: Social Justice and the Psychology of Queuing," *Operations Research*, 1987, *35*, 895–905.

Leary, Mark R., Patricia A. Rogers, Robert W. Canfield, and Celine Coe, "Boredom in Interpersonal Encounters: Antecedents and Social Implications," *Journal of Personality and Social Psychology*, 1986, *51* (5), 968–975.

Leclerc, France, Bernd H. Schmitt, and Laurette Dube, "Waiting time and decision making: Is time like money?," *Journal of Consumer Research*, June 1995, *22*, 110–119.

Loewenstein, George, "Out of Control: Visceral Influences on Behavior," *Organizational Behavior and Human Decision Processes*, 1996, *65* (3), 272–292.

_ **and Ted O'Donoghue**, "Animal Spirits: Affective and Deliberative Proceeses in Economic Behavior," working paper 2004.

Maister, David H., "The Psychology of Waiting in Line," in J.A. Czepiel, M.R. Solomon, and C. Suprenant, eds., *The Service Encounter*, Lexington, MA: Lexington Books, 1985.

Mitzkewitz, M. and R. Nagel, "Experimental Results on Ultimatum Games with Incomeplete Information," *International Journal of Game Theory*, 1993, *22*, 171–198.

Nie, Winter, "Waiting: Integrating Social and Psychological Perspectives in Operations Management," *Omega*, 2000, *28*, 611–629.

Oxoby, Robert J. and Kendra N. McLeish, "Specific Decision and Strategy Vector Methods in Ultimatum Bargaining: Evidence on the

Strength of Other-Regarding Behavior," *Economics Letters*, 2004, *84* (3), 399–405.

Patton, Jim H., Matthew S. Stanford, and Ernest S. Barratt, "Factor Structure of the Barratt Impulsiveness Scale," *Journal of Clinical Psychology*, 1995, *51* (6), 768–774.

Ruffle, Bradley J., "More is Better, But Fair is Fair: Tipping in Dictator and Ultimatum Games," *Games and Economic Behavior*, 1998, *22*, 247–265.

Schwartz, Barry, *Queuing and Waiting: Studies in the Social Organization of Access and Delay*, Chicago: University of Chicago Press, 1975.

Soman, Dilip, "The Mental Accounting of Sunk Time Costs: Why Time is not like Money," *Journal of Behavioral Decision Making*, 2001, *14*, 169–185.

Thaler, Richard H., "Towards a Positive Theory of Consumer Choice," *Journal of Economic Behavior and Organization*, 1980, *1*, 39–60.

_ , "Mental Accounting and Consumer Choice," *Marketing Science*, 1985, *4*, 199–214.

_ , "Mental Accounting Matters," *Journal of Behavioral Decision Making*, 1999, *12*, 183–206.

A Instructions

A.1 Dictator game instructions – proposers

This is an experiment in economic decision making. Based on the decisions you make during this experiment, you may receive a monetary payment. Your payment is compensation for both your time and the effort you put into making your decisions.

You have been allocated 100 lab dollars (each worth $0.10). Your task is to decide how much of this amount to offer another individual. Whatever you do not offer the other individuals, you will keep for yourself.

At the start of this experiment, you will be randomly matched with another individual in a different experimental session. You will be asked the amount you wish to offer the other person. This must be a number between 0 and 100. Once you have made your decision, please click on the OK button. Once you click this button, your answer cannot be revised.

After everyone has made their decision, you will receive your payoff: 100 lab dollars less the amount you have offered the other person.

Thank you for participating.

A.2 Ultimatum game instructions – proposers

This is an experiment in economic decision making. Based on the decisions you make during this experiment, you may receive a monetary payment. Your payment is compensation for both your time and the effort you put into making your decisions.

You have been allocated 100 lab dollars (each worth $0.10). Your task is to decide how much of this amount to offer another individual in a different experimental session. This individual can either accept or reject your offer.

- If they accept the offer, you will receive 100 lab dollars less the offer and the other person will receive the offer.
- If they reject your offer, you will each receive nothing.

At the start of this experiment, you will be randomly matched with the information provided by another individual. In a different experimental session, this individual has been asked for their minimum acceptable offer, denominated in lab dollars.

If their minimum acceptable offer is less than or equal to your offer, the offer is considered accepted. If their minimum acceptable offer is greater than your offer, the offer is considered rejected.

Once the experiment begins, you will be asked the amount you wish to offer the other person. This must be a number between 0 and 100. Once you have made your decision, please click on the OK button. Once you click this button, your answer cannot be revised.

You will then be informed of the other person's minimum acceptable offer and your payoff.

Thank you for participating.

A.3 Ultimatum game instructions – responders

This is an experiment in economic decision making. Based on the decisions you make during this experiment, you may receive a monetary payment. Your payment is compensation for both your time and the effort you put into making your decisions.

You will be randomly matched with an individuals in a different experimental session. This individual has been allocated 100 lab dollars (each worth $0.10) and must choose an amount to offer you. You can either accept or reject their offer.

- If you accept the offer, you will receive the offer and the other person will receive 100 lab dollars less the offer.
- If you reject the offer, you will each receive nothing.

Your task is to choose a minimum acceptable offer. If your minimum acceptable offer is less than or equal to the other person's offer, the offer is considered accepted. If your minimum acceptable offer is greater than the other person's offer, the offer is considered rejected.

Once the experiment begins, you will be asked for your minimum acceptable offer. This must be a number between 0 and 100. Once you have made your decision, please click on the OK button. Once you click this button, your answer cannot be revised.

You will then be informed of the other person's offer and your payoff.

Thank you for participating.

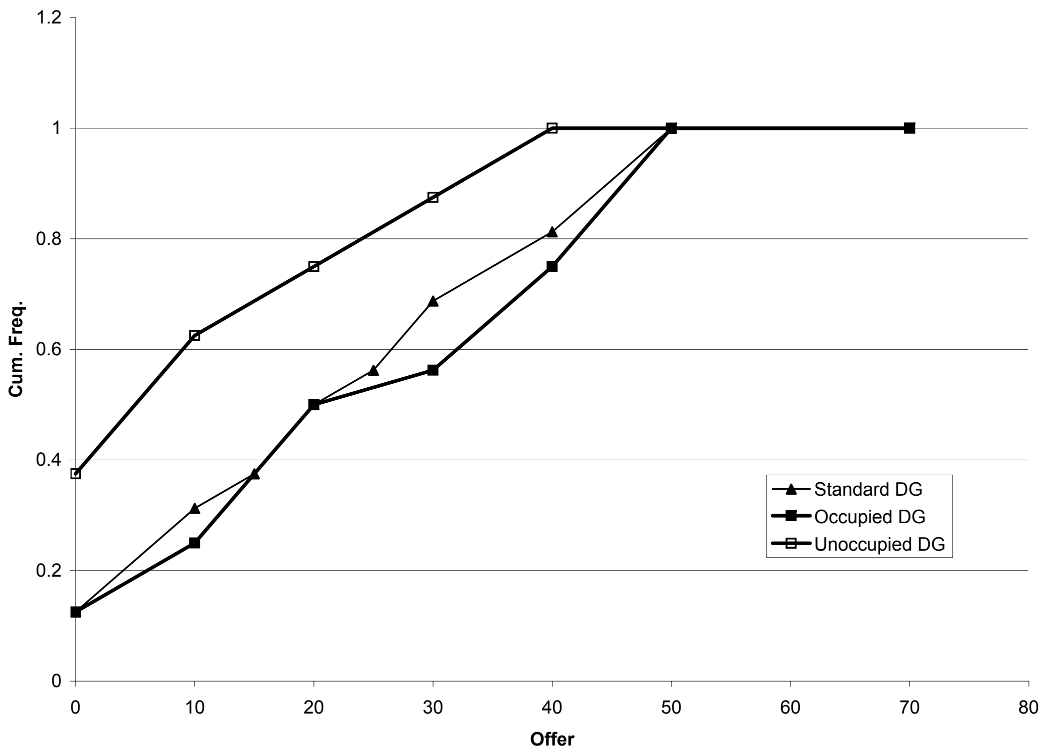

Figure 1: Distributions of offers in dictator games by time treatment.

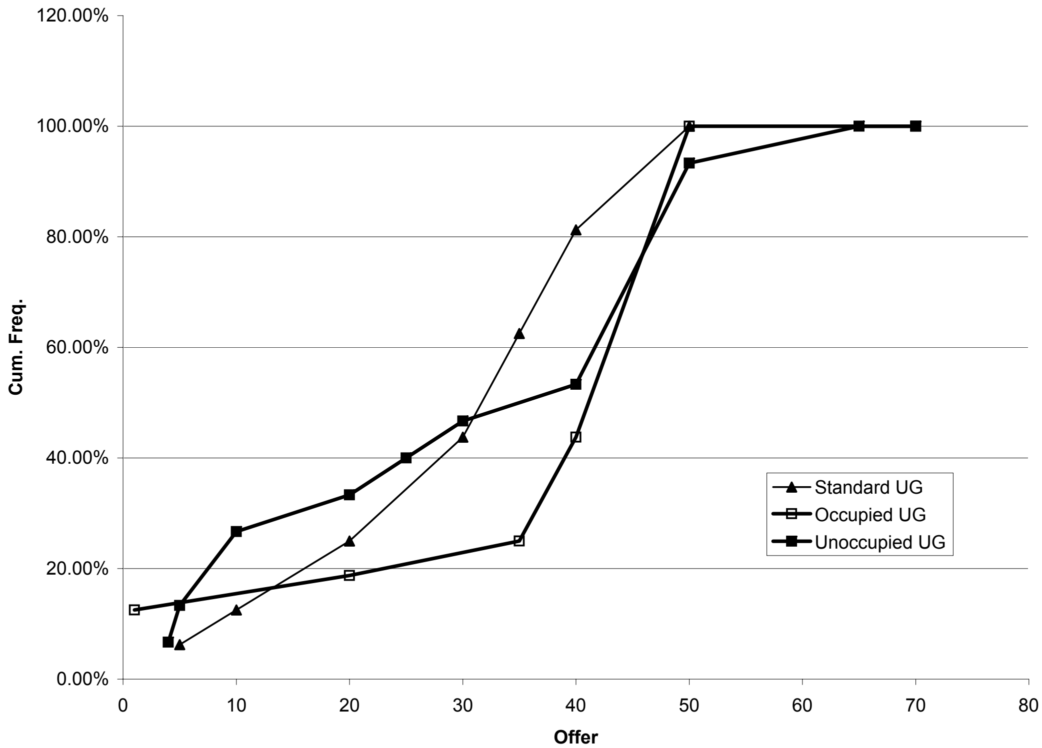

Figure 2: Distributions of offers in ultimatum games by time treatment.

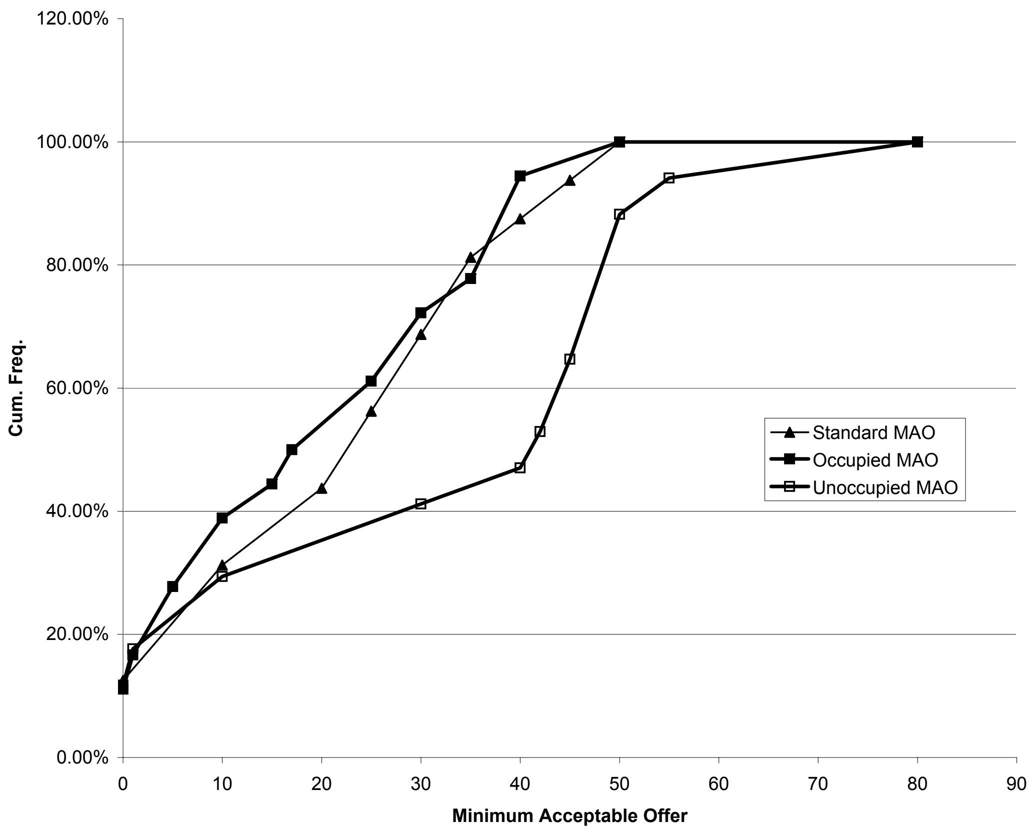

Figure 3: Distributions of minimum acceptable offers in ultimatum games by time treatment.