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Discounting for You, Me and We

Time Preference in Groups and Pairs

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Abstract

In this study, I contrast intertemporal preferences for oneself with such preferences for others. I conduct a laboratory experiment in which I elicit measures of time preference and time-consistency under four experimental choice conditions: deciding for one's own payoff, deciding for another individual (a "partner"), deciding in pairs and deciding in groups of four. Consistent with a simple model of altruism and different preferences for others, I find that individuals are more patient when making savings choices for others or in groups. Also consistent with this model, I find that the effect is pronounced in larger groups. I further consider how individual characteristics and interpersonal relationships affect intertemporal preference for others and the extent to which preferences for others diverge from what the other person would choose for themselves.

1 Introduction

In various ways and to various degrees we influence the intertemporal decisions of other individuals: grandparents gift savings bonds instead of cash on birthdays, spouses plan their retirement together and we commonly offer advice on many trade-offs involving immediate costs and delayed gains, such as dieting, refraining from smoking, completing an academic degree or changing jobs. That people undertake this deliberative process when the outcome has no direct bearing on their own payoffs requires departing from the strict assumption of self-interested behavior. Indeed economists have long recognized the role of altruism and other regarding preferences as motivating behavior (e.g. Becker and Barrow, 1986; Lindbeck and Weibull, 1988; Loewenstein and O'Donoghue, 2004) and an extensive body of experimental evidence confirms the influence of altruism on choice (for a review see Fehr and Schmidt, 2005). Typically altruistic preferences over the contemporaneous consumption of other individuals are modeled as a composite utility function, with one term capturing utility from one's own consumption and other terms representing the utility of others. The utility of others is weighted by the degree of altruism one feels towards those other individuals (e.g. Becker and Barro, 1986; Loewenstein and O'Donoghue, 2004). In addition to preferences over the concurrent consumption of others, preferences over the future consumption of others (for example the consumption of one's heirs) feature prominently in the theoretical literature (e.g. Bernheim et al., 1985; Altonji, Hayashi and Kotlikoff, 1992; Abel and Warshawsky, 1988). In the case of intertemporal altruism, allocation decisions will be governed both by the degree of altruism between individuals as well as individual's discounting of future consumption. While the influence of these dual factors has been recognized, a common assumption is that the future consumption of other's is discounted at the same rate at which one discounts one's own consumption (e.g. Falk and Stark, 2001; Abel and Warshawsky, 1988); in other words that we are equivalently impatient for others as we are for ourselves.

It is not *a priori* clear, however, that individuals should or do discount the utility of others at the same rate at which they discount their own. Although unrelated to time preference, a large body of prior work suggests that individuals have preferences for others which they do not express for themselves when presented with analogous choices (Kray, 2000; Kray and Gonzales, 1999; Krishnamurthy and Kumar, 2002; Hsee and Webber, 1997; Choi et al., 2006). Evidence from neuroeconomics also offers a hint that discounting for the self may diverge from discounting for others. McClure et al. (2004) demonstrate that brain systems associated with reward expectation and delivery activate when considering immediate rewards. It is conceivable that the rewards focused brain centers would not activate when the immediate reward does not accrue to the decision-maker and thus that intertemporal choices one makes for others are different than intertemporal decisions one makes for oneself. With the exception of Pronin et al. (2007), who suggest that individuals have time-preference for other people, in the present moment, which resemble their preferences for themselves in a future moment, there is, to my knowledge, little empirical evidence on the shape or parameterization of the discount function applied to the payoffs of others. The present research aims to illuminate these aspects of inter-personal time preference.

Not only might individuals discount the payoffs of others differently than they do their own, but conceivably they will make "better" choices for others than they do for themselves, in the sense of making decisions which are not influenced by short-run impatience. Schelling (1984) alludes to this possibility in his enumeration of mechanisms by which individuals who exhibit time-inconsistent preferences can overcome self-control problems. His list includes "use buddies and teams" and, presumably for individuals whose future selves may not follow predesignated dietary guidelines, "order each other's lunches."

While individuals may be more patient for others in the abstract (Pronin et al., 2007), evidence shows that the disconnect between one's own preferences and those for others depends sensitively on their relationship to the other individual (Alicke et al., 1995; Small and Loewenstein, 2003). One might imagine that, knowing the present-biased preferences of their friends, individuals would allow others to succumb to temptation above their better judgement in the interest of seeing the friend satisfied, at least momentarily. Additionally, if two impatient friends were simultaneously confronted with temptation, they might "cheat" together (one might imaging two dieting friends ordering chicken wings and chocolate cake for one another).

To provide greater clarity on these questions, I report the results of a laboratory experiment which empirically tests whether individuals discount the payoffs of others differently than they discount those accruing to themselves. The experiment involved presenting a group of respondents, primarily low-income women in Ahmedabad, India, with choices between temporally dated monetary payoffs, designed to mimic savings decisions. These choices were made in a number of conditions: unilaterally making decisions about one's own payments to be received, unilaterally making decisions about the payments to be received by a randomly chosen partner and jointly making decisions about payments to be received by all members of a group. I find that individuals are more patient when deciding the payoffs of others or in groups than when choosing the rewards they will receive themselves. In addition to measuring self-other discrepancies in short run discounting, I also evaluate differences in the expression of time-inconsistent preferences, which have been implicated as generating potentially sub-optimal decisions in a wide variety of economic phenomenon (Laibson, 1997; Meier and Sprenger, 2007; Ashraf et al., 2006; Duflo, Kremer and Robinson, 2008). The results with respect to this outcome are more ambiguous than with respect to discounting in general, although there is suggestive evidence that people are more time-consistent when deciding in groups than when alone.

To motivate the link between differential time preference for other individuals and intertemporal choices made in groups I present a simple theoretical model which presumes that individuals are hyperbolic discounters but have time-consistent preferences for other individuals to whom they are linked by altruism. In terms of structure, the model is similar to that of McClure et al. (2004) but adapted to a between individual, rather than within individual, setting. The implications of this model parallel Klonner (2008) in that the presence of altruism may generate better outcomes: making a choice together can result in a more patient decision even when neither individual would behave as patiently on their own, or a time-consistent choice when each individual would exhibit a preference reversal if deciding alone.

Under the assumptions of the model, when faced with the task of choosing the consumption path for another individual, people will make choices similar to the more patient choices they would make for their long term selves. When involved in a group decision, where the choice will be binding for all group members, individuals maximize a weighted sum of their own inpatient and potentially time-inconsistent preferences and the "rational" set of preferences over the consumption of other group members. Thus, as the size of the group grows, individuals are increasingly swayed by their desires for others and the expression of impatience and inconsistency abates. Thus, it need not be that those lacking self-control must delegate decisions to more patient care takers; more patient and "rational" behavior is possible simply by making decisions in groups, even if the groups are composed of equally impatient individuals.

While there are surely alternative models, the data gathered in this experiment support the assumptions and fit the implications of this model. The results indeed indicate that individuals express more patience when deciding for other individuals and in groups than they do when deciding for themselves. The point estimates imply that weekly discount factors expressed for other individuals or in groups of two are approximately 2 percentage points higher than discount factors estimated from choices made for oneself. Making choices in groups of four generates discount factors which are, on average, 4 percentage points higher than individual discount factors. The relative magnitudes of the two and four person group effects are consistent with the theoretical predictions of the model. I further find that the effects of the choice environment on discount factors is more pronounced and significant for choices involving an immediate payment option, suggesting that the effect operates through shifting preferences away from immediate gratification. The direct evidence on time-inconsistent preferences, including hyperbolic discounting, however is not conclusive, although it is suggestive that time-inconsistent choices are less likely to arise in a group setting. I also show that for a subset of groups the decisions taken were more patient and consistent than any of the group members made on their own.

In further analysis, I explore how differences in discount rates for one's own payoffs and those for the payoffs of others correlate with individual characteristics and interpersonal relationships. I find that knowing other individuals correlates positively with patience. Since this is true both for discount factors for one's own and other's payoffs, I speculate that this is the result of factors correlated with knowing one's partner, such as greater sociability. Finally there is some indication that individuals who know one another are more likely to make choices for the other which resemble what that person would do themselves than pairs who do not know one another. I am unable to conclude whether this is the result of correlation of preferences within self-selected peer groups or an indication that deciding for a close friend undermines the greater patience people tend to have for other's outcomes (in other words that Schelling's dieters would "cheat" together). I leave this question to further study.

While the experimental procedures I employ to explore the nature of time preference for others are, by necessity, abstracted from everyday reality, the implications of the results are not. Many decisions are made in consultation with other individuals, presumably those with some degree of altruism towards the decision-maker; to the extent that preferences for others influence the guidance of the advisor, these preferences will influence the ultimate decision. Moreover, a great number of choices are taken in groups, where the decision of the group has implications for all individuals (financial decisions taken with a spouse for instance). The particular context in which this experiment was conducted, among low-income Indian women, augments the external relevance of the results. A number of studies (Gugerty 2007; Anderson, Baland and Moene, 2009; Ambec and Treich, 2007; Basu, 2008) suggest that present-biased preferences and commitment offer explanations for the prevalence of joint savings groups, which exist in this context, by assuming that communities can sanction those that do not save or that sophisticated hyperbolic discounters use groups as a commitment device. This paper ties into this branch of the literature by providing a complimentary explanation for group savings; groups may be attractive to individuals who seek to influence the decisions of those they care about and more patient decisions will be taken without resorting to group sanctions or necessitating that any member be cognizant of their own self-control problems.

This investigation also relates to studies concerned with the correlates of discount factors and time-inconsistency (Mischel and Metzner, 1962; Benjamin, Brown and Shapiro, 2006; Dohmen et al., 2007). I extend this prior analysis by relating individual characteristics and interpersonal relationships to preferences regarding how others should behave. It also contributes to the broad psychological and economic literature on self-other dichotomies in the expression of preferences (Kray, 2000; Kray and Gonzales, 1999; Krishnamurthy and Kumar, 2002; Hsee and Webber, 1997; Choi et al., 2006). In particular I build on Pronon et al. (2007) by exploring the conditions under which time preference for others will be more patient than time preference for oneself. I consider how interpersonal relationships might affect these preferences and whether individuals have the capacity to credibly force more patient preferences on their friends, exactly at the moment when these friends may not have such preferences for themselves. I also extend this work by directly examining preference reversals and considering the implications of more patient preferences for others in the context of group decisions. Consequently, this study compliments earlier work investigating group dynamics in information processing and the potential role of groups to generate more internally consistent decisions (Irwin and Davis, 1995; Mowen and Gentry, 1980).

Finally, this work furthers our understanding of time-inconsistent preferences and feasible strategies to avoid deleterious choices deriving from these preferences. In particular the results from this carefully controlled laboratory experiment offer evidence that group decision-making is a viable strategy to counteract impatience and time-inconsistency, not only through its commitment properties, but also through the influence of the group setting on the expression of preferences.

2 Theoretical Motivation

In standard models of altruism and intertemporal allocation (variants of which appear in Becker and Barro (1989) and Falk and Stark (2001)) the utility of individual i, who has altruistic preferences over the consumption of individual j, is expressed as

$$U_i = \sum_{t=0}^{\infty} \delta^t u\left(c_{it}\right) + \omega_{ij} \sum_{t=0}^{\infty} \delta^t u\left(c_{jt}\right) \tag{1}$$

where δ is the discount factor, $c_{\{i,j\}t}$ is consumption at time t of person i or j and ω_{ij} denotes the altruistic weight of person i for person j. $u\left(.\right)$ is instantaneous utility from consumption which satisfies the usual assumptions ($u' > 0$ and $u'' < 0$).

To allow for potentially differential discounting of others utility, I extend the model in (1) by allowing for a more general discount function, $\delta\left(t\right)$, and relaxing the constraint that the utility of others is discounted at the same rate as one's own utility.

$$U_i = \sum_{t=0}^{\infty} \delta_i\left(t\right) u\left(c_{it}\right) + \omega_{ij} \sum_{t=0}^{\infty} \delta_{ij}\left(t\right) u\left(c_{jt}\right) \tag{2}$$

where $\delta_i\left(t\right)$ is the discount factor applied to person $i's$ consumption at time t and $\delta_{ij}\left(t\right)$ is the discount factor applied by person i to person $j's$ consumption at time t.[1] For the purposes of discussion, write $\delta_{ij}\left(t\right) = \alpha_{ij}\left(t\right) * \delta_j\left(t\right)$, indicating that individual i scales individual $j's$ time t discount factor by a potentially time varying scalar $\alpha_{ij}\left(t\right)$. Using this representation it is convenient to model various configurations of preferences that person i may have for person j. For instance if $\alpha_{ij}\left(t\right) = 1$ person i desires exactly what person j would want for herself. If $\alpha_{ij}\left(t\right) > 1\ \forall t$ person i is simply more patient for person j than j is

[1] A parallel functional form is proposed in McClure et al. (2007) to describe the discounting performed by two brain regions within the same individual.

for herself. Suppose that person j is present-biased, and has a hyperbolic discount function $\delta_j(t) = \frac{1}{1+\kappa_j t}$, where κ_j parameterizes the degree of discounting. Then if $\alpha_{ij}(t) = \delta(1+\kappa_j t)$ person i exhibits exponential discounting of $j's$ consumption at rate δ while j has time-inconsistent preferences for herself.

Given the dearth of empirical evidence on the form of $\alpha_{ij}(t)$, exploration of the parameter values in (2) is of interest. In what follows, however, I explore the theoretical implications of altruism combined with specific assumptions about $\alpha_{ij}(t)$. In particular I assume that individuals are present-biased with respect to their own consumption, but this effect is muted with respect to their preferences regarding the consumption of others. I show that in the context of a simple savings choice when there is altruism between a pair of individuals making saving decisions together, that it is possible for each individual to be more patient than they would be saving for themselves alone. Moreover, I show that it is possible for altruistic, joint decisions to mitigate hyperbolic discounting *per se* (as opposed to simply making individuals more patient in general) in the sense that it compresses the range of interest rates which generate a preference reversal (a plan to save tomorrow, but subsequent decision not to). A similar result holds when considering a larger group of agents who must abide by the same savings rule (informal savings groups such as ROSCA's[2] perhaps). Again, if there is sufficient altruism, the savings decision taken together may be more patient than any group member would take alone and the likelihood of a preference reversal vanishes as the size of the group increases.

2.1 Joint Savings Decisions

To explore the potential implications of differential discounting for other individuals, I will consider a model which captures the simplest of savings choices; the isolated choice between a given sum of money, x, in hand or saving that sum at the gross interest rate r, receiving $y = r^T x$ at a date T periods hence. For simplicity, I treat this as an all or nothing savings proposition; fractions of x can not be saved. Consider the, imaginatively named, individuals 1 and 2, each with preferences as given by (2), who face this savings choice. Each individual exhibits hyperbolic, or present-biased, preferences over their own consumption, captured by the discount function $\delta_1(t) = \frac{1}{1+\kappa_1 t}$ and $\delta_2(t) = \frac{1}{1+\kappa_2 t}$ respectively, but has time-consistent exponential preferences for the consumption of the other; that is $\delta_{12}(t) = \delta_{21}(t) = \delta$. I presume, and test

[2] "Rotating Savings and Credit Associations"

empirically, that individuals are more patient for others in the short run than they are for themselves, or that $\delta^t \geq \max\{\delta_1(t), \delta_2(t)\} \, \forall t \leq T$. Further assume that individuals have weak preferences for present consumption (or access to another saving technology with gross interest rate greater than or equal to 1) implying that $1 \geq \delta$.

Arbitrarily, let us take the perspective of person 1 (analogous results apply to person 2). Suppose that on payday 1 receives x and faces the choice of whether to cash the check immediately or save it for T days at rate r. Trivially, 1 would choose to save if

$$u(x) < \frac{1}{1+\kappa_1 T} u(y) \tag{3}$$

or at any interest rate, implied by y, such that $u\left(r^T x\right) > (1+\kappa_1 T)\, u(x)$. For small interest earnings a linear approximation[3] of the utility function implies that 1 saves if $r > r_1' \equiv (1+\kappa_1 T)^{(1/T)}$.

Now suppose we asked 1 is she would save or cash next period's paycheck (which, without loss of generality, assume arrives in T days), she would indicate that she plans to save if

$$\frac{1}{1+\kappa_1 T} u(x) < \frac{1}{1+\kappa_1 2T} u(y) \tag{4}$$

or at any interest rate above that implied by $(1+\kappa_1 T)\, u\left(r^T x\right) > (1+\kappa_1 2T)\, u(x)$. Again, taking a linear approximation of the utility function, which I shall do throughout, savings would be planned for $r > r_1'' \equiv \left(\frac{1+\kappa_1 2T}{1+\kappa_1 T}\right)^{(1/T)}$. It is straightforward to verify that $r_1' > r_1''$ and, therefore, for $r \in (r_1'', r_1')$ the person will plan to save facing a future choice, but choose not to save when facing an equivalent choice in the present moment; the well documented phenomenon of preferences reversals.

Given the assumptions about $\delta_{12}(t)$ and $\delta_{21}(t)$ it is not surprising that individuals would make more patient choices for the other if they were able to unilaterally dictate the others savings decision. More interesting is the range of interest rates that individuals find attractive when they are making a joint decision, in the sense that if one person saves, the other must do so as well. In this case, saving a paycheck in hand,

[3] In general this means that I will overestimate the true implied interest rate, since $\frac{u(rx)}{u(x)} > \frac{rx}{x}$. In this study, however, I am mostly concerned with differences in implied discount factors, which are functionally related to implied returns on savings, thus in the empirical results, this overestimate is not a concern provided that the degree of overestimation is always the same.

if it means 2 must save as well, is the preferred option to 1 as long as

$$u(x) + \omega_{12} u(x) < \frac{1}{1+\kappa_1 T} u(y) + \omega_{12}\delta^T u(y) \tag{5}$$

or at any rate such that $r > r_1^* \equiv \left[\frac{(1+\omega_{12})}{\frac{1}{1+\kappa_1 T}+\omega_{12}\delta^T}\right]^{1/T}$. It can also be shown that $r_1^* < r_1'$.

Deciding together, 1 will plan to save a paycheck due in T days as long as

$$\frac{1}{1+\kappa_1 T} u(x) + \omega_{12}\delta^T u(x) < \frac{1}{1+\kappa_1 2T} u(y) + \omega_{12}\delta^{2T} u(y) \tag{6}$$

Following the logic above, planning to save is desirable for any $r > r_1^{**}$ defined by $\left[\frac{\frac{1}{1+\kappa_1 T}+\omega_{12}\delta^T}{\frac{1}{1+\kappa_1 2T}+\omega_{12}\delta^{2T}}\right]^{1/T} \equiv r_1^{**}$.

Exactly how r_1^{**} relates to r_1'' depends on T. In particular if $\delta^T > \frac{(1+\kappa_1 T)}{(1+\kappa_1 2T)}$ then $r_1'' > r_1^{**}$ and otherwise $r_1'' < r_1^{**}$.[4] The intuition is that the interest rate which makes 1 happy to save in a joint decision context is a weighted average of the interest rate at which she would like to save alone, and the interest rate at which she would like her partner to save. The latter is independent of T (and equal to $\frac{1}{\delta}$) whereas the former depends on T. At low values of T the hyperbolic discounter will only save at high interest rates, making it likely that the weighted average lies below the rate at which she would save alone. At high values of T, however, the hyperbolic discounter is very optimistic about saving and will plan to do so at low rates of interest, making it likely that the weighted average is above the rate at which she would plan to save if

[4] $r_1'' > r_1^{**}$ implies

$$\left(\frac{1+\kappa_1 2T}{1+\kappa_1 T}\right)^{(1/T)} > \left[\frac{\left[\frac{1}{1+\kappa_1 T}+\omega_{12}\delta^T\right]}{\left[\frac{1}{1+\kappa_1 2T}+\omega_{12}\delta^{2T}\right]}\right]^{1/T}$$

$$\frac{1+\kappa_1 2T}{1+\kappa_1 T} > \frac{\left[\frac{1}{1+\kappa_1 T}+\omega_{12}\delta^T\right]}{\left[\frac{1}{1+\kappa_1 2T}+\omega_{12}\delta^{2T}\right]}$$

$$(1+\kappa_1 2T)\left[\frac{1}{1+\kappa_1 2T}+\omega_{12}\delta^{2T}\right] > (1+\kappa_1 T)\left[\frac{1}{1+\kappa_1 T}+\omega_{12}\delta^T\right]$$

$$(1+\kappa_1 2T)\,\omega_{12}\delta^{2T} > (1+\kappa_1 T)\,\omega_{12}\delta^T$$

$$(1+\kappa_1 2T)\,\delta^T > (1+\kappa_1 T)$$

$$\delta^T > \frac{(1+\kappa_1 T)}{(1+\kappa_1 2T)}$$

making the choice alone.

This phenomenon is represented visually in Figure 1. The figure plots the interest rate at which saving is weakly preferred to immediate consumption as a function of the savings period (T). This is done separately for immediate choices (deciding whether to consume now or at period T) or long term choices (deciding, from the perspective of today, whether to consume at time T or save until time $2T$). The figure shows that for parameter values which accord with the assumptions made above and for small values of T, deciding in groups leads to more patient choices (lower gross interest rates making saving attractive) than deciding on one's own. The region below the r' curve but above the r'' curve represents the range of gross interest rates which generate a preference reversal for any given T (the individual plans to save, but does not do so when the decision is actually at hand). Similarly the region between the r^{**} and the r^* curve is the region where a preference reversal occurs in a joint decision setting.

What this model implies is that when making a joint savings decision, applicable to both parties, 1 and 2 are more likely to make more patient choices, in the sense of being willing to save at lower interest rates, than they would if they were making savings decisions alone. This will be especially true for choices where the option for sooner consumption is not too distant in the future. Moreover, the model implies that it is possible that linking the savings decisions of the individuals can reduce the likelihood of a preference reversal. The reason is that at high values of T, $r_i^* < r_i'$ while $r_i^{**} > r_i''$, meaning that the range of interest rates where a preference reversal would occur in a joint decision, (r_i^{**}, r_i^*), is smaller than the range of interest rates where a preference reversal would occur if the person were making a choice for themselves alone, (r_1'', r_1'). As can be seen in Figure 1, in the distant future, the r'' curve bounds the r^{**} curve from below and the r' curve lies strictly above the r^* curve; implying that a preference reversal is strictly less likely in a joint decision making environment.

Thus, it is possible that persons 1 and 2 will take a savings decision together which is more patient than either would alone. Also the choice they make together could be time-consistent even if on their own they would plan to save but subsequently fail to execute that plan. Note that the latter result holds whether the individuals are sophisticated or naive hyperbolic discounters as long as they are not present-biased for other's consumption and are linked by altruism.

2.2 Group Saving Decisions

What if 1 and 2 decided to make their savings decisions with $3, 4, 5$ and 6? Let there be G people in a group, each individual, i, has altruism ω_{ik} towards person k. Thus, if the group must make a unified decision, person 1 is willing to save at the rate implied by y as long as

$$u(x) + \sum_{k=1}^{G} \omega_{1k} u(x) < \frac{1}{1+\kappa_1 T} u(y) + \sum_{k=1}^{G} \omega_{1k} \delta^T u(y) \tag{7}$$

linearizing the utility function implies that 1 would like to save at any interest rate above $\left[\frac{1+\sum_{k=1}^{G}\omega_{1k}}{\frac{1}{1+\kappa_1 T} rT + \delta^T \sum_{k=1}^{G}\omega_{1k}}\right]^{1/T}$.

Assuming that $\sum_{k=1}^{G+1}\omega_{1k} > \sum_{k=1}^{G}\omega_{1k}$,[5] as G goes to infinity, the rate which makes 1 willing to save converges to $\frac{1}{\delta}$, or the inverse of the time-consistent exponential discount factor applied to the consumption of others. Intuitively, if a present-biased individual prefers her friends to consume more later than less sooner (although she may want less now for herself), the more friends who will be affected by the group choice, the more likely she is to sacrifice her individual preferences for the utility of seeing her friends do "what is good for them."

The same result applies to a choice of whether to save in the future; as the size of the group goes to infinity, the interest rate making the plan to save optimal converges to $\frac{1}{\delta}$. Therefore, the range of interest rates which would generate a preference reversal when the savings decision is taken in a group collapses to a point as the group size goes to infinity.

3 Empirical Setting and Description of the Experiment

To test the implications of the model developed above, I conducted a field experiment among members of Saath, a microfinance cooperative in Ahmedabad, India. This particular sample was selected in light of the empirical relevance of joint savings decisions for this demographic group. A non-trivial proportion of the study population participates in informal savings groups such as ROSCAs, a type of joint savings and

[5] It is not inconceivable that altruism weights would be independent of the number of people towards which an individual has altrustic preferences and are affected by a particular choice. It is of couse possible that altruism is dissapated as the number of individuals increases however (see e.g. Becker and Barrow, 1968). The result above requires that average altruism towards a particular individual declines at a rate less than $\frac{-1}{G^2}$ so that the sum of the altruistic weights increases with G.

lending group hypothesized to be a commitment device to limit self-control problems (Ambec and Treich, 2007; Gugerty, 2007). The experiment was designed to elicit discount rates. To that end, individuals were presented with a series of choices between temporally dated financial rewards and were informed that the payment they chose in one randomly selected choice would be delivered to them. The response sheets to record these choices consisted of 2 columns depicting different monetary rewards. The rows in the left column show a fixed monetary amount (both numerically and visually) as well as an indication of the date this reward would be received if it was chosen by the respondent (the date is also communicated in written and visual form, using images of calendars to convey time). The rows in the right column depict monetary payments which are to be received at a later date. The payments in the right column increase in increments of 1 to several rupees (1 rupee, or Rs., is approximately 2 US cents) in each successive row. A sample choice sheet is presented in Appendix A. For each row, individuals were asked to indicate whether they would prefer the sooner, smaller reward in the left column or the larger, later reward shown in the right column. As the sum on the right increases, the point at which the individual switches from choosing the sooner to the later reward allows me to estimate their discount factor. These questions were asked for four fixed sooner payments (Rs. 10, 20, 50 and 100) as well as for variable delay intervals (1 or 4 weeks). Although small from a developed country standpoint, Rs. 100 is a non trivial amount in this context. Since the theory suggests that the deciding for or with others may affect the expression of time-inconsistent preferences as well as discount rates in general, each question, with an analogous delay and payment amount, was asked when the sooner payment was immediate or when it was delayed (by a time period equal to the delay between payments). This resulted in a total of 8 questions, which are summarized in Table 1.

To understand the influence of including other individuals in choices about intertemporal monetary trade-offs, while holding other factors constant, the same set of 8 questions were asked in four different settings, which I refer to hereafter as "choice conditions." The first was an "individual" choice condition, where individuals chose the payment they wanted by themselves and for themselves. Another was a "partner" choice condition, where people decided alone, but were choosing the payment to be received by a randomly selected partner. In another choice condition, the "pair" or "Group 2" condition, individuals decided their own payment jointly with this partner; the pair was required to agree on a decision that would determine the payment for both parties. Finally, there was a "Group 4" choice condition, where randomly formed groups of 4 individuals had to make decisions which might be implemented for all members of the group (if that particular choice was selected for actual payment).[6] To prevent the choice conditions from being conflated with learning about the game, spillovers or fatigue, the order in which the choice conditions occurred was randomized and the sequence in which the 8 questions were asked was randomized within choice condition.

To facilitate the experiment, Saath staff invited members to participate in a study related to financial decision making. Saath staff were aware of the general nature of the activities encompassed by the experiment, but were not informed of the specific research questions under study. Participants subsequently arrived at an office set up to facilitate the experiments. Upon arrival, participants were given a general description of the experiment and consented to participate. They were informed that they would be asked to make a series of choices between different monetary payments and that they would be paid according to one of the choices that they made, in addition to Rs. 50 (approximately $US 1) for their time. Basic demographic information on all participants was collected at this point. The introduction was followed by a presentation describing the choices that individuals would face, and instructions on filling in the answer sheets.

At this point response sheets were filled out under each experimental choice condition. To ensure that individuals understood the delays involved with each question and to encourage individuals to spend a moment thinking carefully about their choice, a facilitator led participants through each row of the response sheet with the aid of an overhead projector. In the individual choice condition, respondents sat at divided desks alone to fill in their responses. The partner condition (deciding rewards for another person) was conducted under similar conditions. In the pairs treatment, two randomly matched individuals sat together at a desk to negotiate their choice jointly. In the group setting groups of four randomly selected individuals were formed and each sat in a separate corner of the lab to decide their choices. There were 6 to 7 facilitators (for groups of 10-20 respondents) present in each session to answer respondents' queries and to monitor and discourage communication among respondents when it was not an active part of the experimental protocol.

To break up the sequence of the choice conditions, and to limit spillovers between choice conditions, these choice sessions were interspersed with short additional surveys. After the second set of response sheets had

[6] Due to logistical issues, the 12 participants in the first session arrived in waves, of 5 and 7. In this session there were groups of 3 and 5.

been filled, respondents were presented with a sequence of Ravens Matrices, which is a widely used test of cognitive ability and is thought to correlate with reasoning and problem solving acumen (Carpenter et al., 1990; Gray et al., 2003; Hall, 1957; McLeod and Rubin, 1962). The test displays a sequence of patterns on wedges, the final wedge in the sequence is missing and respondents are asked to choose which of an array of wedges best fits with the pattern sequence.[7] This test was administered in light of prior evidence that cognitive ability correlates with economic preference parameters (Dohmen et al., 2007). My measure of cognitive ability is the fraction of the Ravens questions the respondent answered correctly.

Additionally, before the Group 2 or partner choice condition (whichever came first) participants took a short survey which captured several variables describing the length and depth of their relationship with their randomly selected partner. As one of the hypotheses of this research was that discount factors expressed for others may depend on one's relationship with that person and knowledge of their preferences, this survey was done before the partner response sheets were filled such that individuals would be cognizant of who they were making decisions for.

After collecting responses under each choice condition, participants were administered a final survey, inquiring about financial behaviors (savings and debt), decision making and which also included several other tests of cognitive ability. This survey was completed at the conclusion of the experiment to avoid the possibility that inquiring about savings, or other financial behaviors, would prime respondent to express certain preferences when eliciting discount rates.

Finally, a random line from one of the response sheets was selected publicly by drawing numbers from an urn. Before leaving, each individual was consulted and shown the choice that they, their partner or their group had made for that particular choice. They were informed that they would be paid according to this choice and that the reward would be made available to them on the date specified in the question. To ensure that trust and transaction costs were equalized across immediate and delayed rewards, all rewards were delivered by the research staff to the Saath branch nearest to the respondent. In the case of immediate rewards, prizes were delivered the same day or first thing the following morning in the case that the experimental session did not conclude until after the closing of the Saath branch. All other rewards were

[7] An example question is shown in Appendix B.

delivered to the branch with the specified delay.[8] Respondents were also provided with a slip indicating their prize and mentioning the date they could claim it.

4 Data and Descriptive Statistics

A total of 176 individuals participated in the experiment (see Table 2 for a breakdown by session). Descriptive statistics pertaining to general sample characteristics are shown in Table 3. The average age of participants is 32 years old. In line with the composition of Saath clientele the sample is overwhelmingly (87%) female. Additionally the sample is predominantly Hindu (83%, the remaining sample being almost entirely Muslim) and married (73%). Participants had completed an average of 7.5 years of schooling. In terms of financial behaviors, participant appear fairly active; approximately 20% have one or more outstanding loan, 69% hold an individual savings account (with Saath or another institution), while approximately 20% save in savings groups, over 75% report participating in financial decisions (regarding savings and loans) made by their household and 81% report making weekly or monthly plans regarding saving.

Using the data from the response sheets, I compute various measured of time preference. Firstly, for each question, I assume local risk neutrality and compute bounds on the implied discount factor based on the point at which the individual or group switches to preferring the larger, later reward over the sooner reward. Consider for example the response sheet in Appendix A, if an individual switches from preferring Rs. 10 in 1 week to Rs. 12 in 2 weeks (at row 3), the lower bound on the weekly discount factor is the ratio of the sooner payment in that choice (row) to the later payment, or $\frac{10}{12}$, while the upper bound is the ratio of the sooner payment to the later payment in the previous choice, or $\frac{10}{11}$. If the sooner payment is always preferred, the upper bound on the implied discount factor is the ratio of the sooner payment to the maximum payment offered in that choice (for example if the respondent always preferred the sooner payment of Rs. 10 shown in the Appendix the implied upper bound on the weekly discount factor would be $\frac{10}{14}$). I assume non-negative discount factors, and therefore that the lower bound on the discount factor if the sooner payment is always chosen, is 0. If the later payment is always chosen, the lower bound on the implied discount factor

[8] In practice, for logistical reasons, sometimes rewards were delivered a day or two before the specified date. Respondents, however, were not aware that this would occur ex ante, nor were they informed that it did take place.

is 1 and, while the implied upper bound is infinity, I assume weak preference for present consumption and use 1 as the implied upper bound. To construct a single measure from these bounds, I simply take the midpoint of the implied bounds. In the event that there were multiple switching points, I use the minimum implied lower bound and the maximum implied upper bound. This treatment is justified by interpreting multiple switching behavior as indifference (Andersen et al. 2006). Another interpretation, however, is misunderstanding the task, or cognitive errors; the frequency of multiple switching, however, is quite low (approximately 2% of questions).

Given the hypothesis of this study that discount functions may not only be characterized by different parameters, but also by different functional forms, when the choice is made for another individual or in a group, I adopt a non-parametric approach to estimating discount factors. In particular I calculate bounds and midpoints separately for each delay period (1 or 4 weeks) and whether the choice involves an immediate payment or only the choice between two delayed payments; this measure assumes local risk neutrality and estimates the discount factor as the midpoint of the lower and upper bounds, but it does not impose any parametric specification of how the discount function varies with time. A drawback of this flexible measure, however, is that units are not directly comparable: one can not directly compare the week 0 to week 1 discount factor to the week 4 to week 8 discount factor. To allow for cross-delay comparisons, I assume exponential discounting and construct weekly discount factors for each question by raising the estimated discount factor to a power of one over the number of weeks separating the sooner and later payments.

To assess whether the results are sensitive to approximating time preference with the midpoint of the implied bounds or to alternative discounting functions I construct an alternative estimate of time preference using maximum likelihood. Following Chabris et al. (2009), I assume that individuals have hyperbolic discount functions, $\delta_i(t) = \frac{1}{1+\kappa_i t}$ where κ_i parameterizes the degree of discounting. Individuals therefore choose the sooner payment, X, in t' days in lieu of the later payment, Y, in t'' days whenever $\frac{X}{1+\kappa_i t'} - \frac{Y}{1+\kappa_i t''} > 0$. As in Chabris et al. I further assume that choices are subject to an error process with the logistic distribution and variance $\frac{1}{\omega}$. Thus, the probability of choosing the sooner payment is $F\left(\frac{X}{1+\kappa_i t'} - \frac{Y}{1+\kappa_i t''}\right) = \frac{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\}}{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\}+\exp\left\{\frac{\omega Y}{1+\kappa_i t''}\right\}}$. For each individual, separately when making choices for themselves or for others, and each group I estimate κ_i, or the daily discount rate, by maximizing the following likelihood function

$$\mathcal{L}(\kappa_i) = \prod_{c=1}^{C} \left[\frac{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\}}{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\} + \exp\left\{\frac{\omega Y}{1+\kappa_i t''}\right\}} \right]^{d_{ic}} \left[1 - \frac{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\}}{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\} + \exp\left\{\frac{\omega Y}{1+\kappa_i t''}\right\}} \right]^{1-d_{ic}} \tag{8}$$

where d_{ic} is an indicator that the person or group chose the sooner payment in choice (row) c. The interdependence of choices is subsumed by the clustering of errors at the session level. I also estimate daily exponential discount factors, δ_i, for each individual and group by replacing $\frac{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\}}{\exp\left\{\frac{\omega X}{1+\kappa_i t'}\right\}+\exp\left\{\frac{\omega Y}{1+\kappa_i t''}\right\}}$ in (8) with $\frac{\exp\left\{\omega \delta^{t'} X\right\}}{\exp\left\{\omega \delta^{t'} X\right\}+\exp\left\{\omega \delta^{t''} Y\right\}}$.[9]

I allow the discount parameters to be distinct for each individual depending on whether they are deciding for themselves or for another individual and a separate discount parameter for each group of two and group of four. I do impose, however, that the variance of the error shock, $\frac{1}{\omega}$, is constant across individuals and groups.[10]

Table 3 also provides summary statistics regarding preference parameters elicited in the experiment. The average κ is 0.03 while the average daily discount factor estimated via maximum likelihood is 0.98, which corresponds roughly to the average weekly discount factor imputed from the midpoint of the implied bounds on the discount factor (0.83). The absolute degree of discounting implied by these estimates is extreme; it is not, however, entirely out of line with other experimentally elicited estimates of discount factors (e.g. Reuben et al., 2008; Thaler, 1981). Moreover, the research questions addressed in this study concern the relative magnitude of discount factors elicited under variable conditions rather than making inference or offering prescriptions based on the estimated level of these parameters. In the empirical results which follow, I report estimates using both the midpoint estimates and the maximum likelihood estimates; while the midpoint estimate is likely less precise, it has the advantage of allowing differential degrees of discounting based on payment size and delay length, which prior research (e.g. Thaler, 1981) has shown to matter in the experimental elicitation of preference parameters. Given that the exponential and hyperbolic maximum

[9] Although these are daily discounting parameters, given that the time horizon of the experiment (4 weeks) is rather short, the estimated discounting parameters are fairly similar despite deriving from a different functional form. The reason being that, if we define the exponential parameter from period 1 to the next by the hyperbolic discount function from period 1 to the next, or $\delta = \frac{1}{1+\kappa}$, the functions diverge significantly only at higher values of t.

[10] The value of ω used in the analysis presented below is 0.267, which was estimated via maximum likelihood applied to the entire sample (rather than only to the data pertaining to a single individual).

likelihood estimates are generally similar I often present only results for the hyperbolic parameter estimates (the exponential results are available on request).

Although the hyperbolic functional form implies time-inconsistent choices I also look directly at the prevalence of such preferences, which I define as expressing a different switching point between the sooner and later payment for the same payment magnitude and delay when the choice involves an immediate sooner payment as opposed to two payments in the future. Time-inconsistent preferences are divided into "present-bias" which is defined as expressing more impatient preferences when the choice involves an immediate payment and "future-bias" where the individual is more patient over immediate choices than future ones. About 1/3 of questions generated time-inconsistent preferences, which were more or less equally divided among present-biased and future-biased preferences.

As the canonical behavioral models of time-inconsistency represent only present-bias, the prevalence of future-bias is somewhat surprising, although it has been documented in prior studies (see Sayman and Öncüler, 2009). One possibility is simply that respondents did not fully understand the questions, or that they did not take them seriously (despite the fact that a real monetary reward was linked to their choices). Focus groups conducted after several of the experimental sessions do not suggest that this was the case. For one thing, individuals were cognizant that the experiment offered quite attractive interest rates (several individuals noted that they would make much more by taking the delayed reward than saving the sooner one in a bank). The most common reason given for choosing the delayed reward was not having an immediate need for money, and fearing that cash taken now would be spent regardless. When this response was followed up with questions pertaining to the reasoning used to select the sooner choice among two delayed payments, individuals indicated that they did not know at what point in the future they would have a good use for the money, and thus would prefer to have it sooner. If individuals did indeed have some uncertainty about whether their future needs would make the sooner or later payment optimal, and if they thought there was some chance they would exhibit self-control if they took the sooner payment but did not in fact need the money on that day, then choosing the sooner payment in the future might be optimal. Alternatively, this could simply be ex-post justification for having made mistakes in the choices.

Aside from qualitative responses, statistical evidence suggests that individuals understood the questions and, on average, took their answers seriously. Various prior studies on hyperbolic discounting (e.g. Thaler, 1981; Benzion Rapoport and Yagil, 1989) have documented the tendency for individuals to behave more patiently for larger sums of money. Thus observing whether discount factors are increasing with the magnitude of the rewards at stake provides a check of whether individuals were taking the choices seriously. In Figure 2 I plot average discount factors separately for each sooner payment amount, broken out for questions involving immediate and delayed initial payments. The figure shows that the preferences elicited in this experiment are consistent with prior studies documenting monotonically increasing discount factors with payment amount, suggesting that individuals understood the questions and made considered choices. Furthermore, if time-inconsistency were simply error, rather than underlying preferences, one would expect that each individual would exhibit both present and future-bias, or "make a mistake" in both directions. In Figure 3, I show that approximately 28% of individuals do exhibit both present and future-bias in some instances, but a greater fraction (more than 40%) exhibit either present or future-bias in some delay-value pairs, but not the other bias in a single instance, which is indicative that the phenomenon derives from preferences instead of error.

5 Results

5.1 The Effects of Choice Condition on Time Preference

As an initial look at how time preference varies with choice condition, I plot the average discount parameter, estimated as described above, separately for each choice condition. Figure 4a shows the average midpoint of the implied discount factor bounds for each treatment. The graph does indicate that discount factors are, on average, slightly smaller in the individual choice condition (where individuals decide their own payment alone) as compared to the group settings or when individuals make choices for a partner. Figure 4b presents similar results for the hyperbolic discounting parameters estimated via maximum likelihood.[11] Given that outliers substantively affect the mean, I omit the highest 1% of observations (3 observations) ranked by discount rate to construct this graph. The estimates suggest a difference between the individual choice

[11] The exponential MLE estimates are similar to the midpoint estimates.

condition and the others; with individuals discounting their own payments to a greater extent than they discount the payments of others.

To investigate whether the implied differences in average discount factors across the choice conditions are statistically significant, I turn to regression analysis. In Table 4a I regress the estimated discounting parameters on indicator variables for the different choice conditions. In particular I estimate

$$df_{icq} = \mu + \beta_1 P + \beta_2 G_2 + \beta_3 G_4 + \alpha_i + \varepsilon_s + \varepsilon_{icq} \tag{9}$$

where df_{ic} is the discount factor (calculated as the midpoint of the upper and lower bound) of person i in choice condition c for question q. P, G_2 and G_4 are indicator variables for c being the partner setting, pair setting or four person group setting (the individual setting is the omitted category). Regressions include individual fixed effects, α_i, and standard errors are conservatively clustered at the session level, reflecting the possibility of correlation within session, as modeled by a session specific error term ε_s. Columns 1-4 do not impose a parametric form on the discount function, as was assumed in Figure 4a. These columns show the results from regressing the estimated 1 and 4 week discount factor for immediate or future payment choices on the choice condition indicators and individual level fixed effects.

These estimates can be interpreted as the average difference in an individual's discount factor in a particular choice condition relative to the discount factor they apply to their own future consumption. The inclusion of individual fixed effects is possible since these discount factors vary at the question by choice condition level. The results suggest that people tend to make more patient choices for others or in groups than they do by themselves; for instance the estimated 4-week discount factor in groups of 4 for choices involving an immediate payment is 4% higher than the average discount factor applied by an individual alone. With the exception of the 4 person group choice condition, the difference in these non-parametric discount factors between choice conditions are not consistently statistically different from zero. Columns 5-7 attempt to improve power by standardizing the non-parametric discount factors into weekly discount factors by assuming an exponential discount function. The results in column 5 confirm that individuals are less patient when making decisions alone. The estimated weekly discount factor applied to a partner's payment is 2% higher than the average weekly discount factor when the choice is taken for oneself. The figure for groups of 4 is 4.3%. Columns 6 and 7 suggest that the effect of choice condition on discount factor is especially pronounced when facing choices which involve an immediate payment, as opposed to choices between two delayed payments.

Columns 8 and 9 show the results from regressing the MLE discount parameter estimates on choice condition indicators. The specification is

$$d_i = \mu + \beta_1 P + \beta_2 G_2 + \beta_3 G_4 + \varepsilon_s + \varepsilon_i \tag{10}$$

where d_i is the discount parameter (exponential or hyperbolic) estimated via maximum likelihood using the choice level (meaning each row in a question is an observation) data. These parameters are estimated at the individual level and, therefore, this specification does not include individual fixed effects. Since a few outlying observations appear to substantival affect these results, I omit the highest 1% of the sample ranked by the estimated discount parameter (9 observations in the exponential specification and 3 observations in the hyperbolic specification). The results from the exponential discount function specification are similar to those in column 5. When taking the MLE estimates from the hyperbolic discount function specification as the dependent variable, the point estimates generally accord with the previous results, but the coefficient on the choice setting indicator is only statistically different from zero in the case of the Group 4 setting. While modest, these effect sizes are not trivial; representing 10-20% of the standard deviation of the estimated discount parameters.

As alluded to in the theoretical motivation, it is of interest to understand not only how the discount parameters differ across choice conditions, but also whether the shape of the discount function is better approximated by distinct functional forms which differ by choice condition. Unfortunately, given the fairly short time span of the questions used in the experiment, none of which had a delay until payment of more than 2 months, the exponential and hyperbolic estimates are generally close; meaning that the discount factor implied by the hyperbolic discount rate estimates generally is quite close to the estimated exponential discount factor for the same time delay. Nevertheless, I attempt to measure which functional form fits best by calculating the percent of choices made by an individual or group in each choice condition which are correctly predicted by either the hyperbolic or exponential model. To do so, I calculate the present value of the sooner and later payment in each row of each question using the estimated discount factor or rate for that individual or group. The predicted choice is whichever option has a higher present value. The results, which I relegate to Appendix Table A1, show that the hyperbolic model does slightly better in all choice conditions but, as indicated above, the difference with the exponential model is not marked.

The presence of individual fixed effects in the question level regressions discussed above controls for a host of factors which may be correlated with individual time preference. Moreover, that the set of choices made is consistent across each experimental choice condition ensures that choice-specific characteristics are balanced across these treatments. Nevertheless, I assess the robustness of the question level results to controlling for other factors which predict discount factors (the results are discussed here and presented in Appendix Table A2). Prior studies (Thaler, 1981 for example) document that discount factors are sensitive to both the delay and absolute magnitude of the reward involved in the choice used to elicit these parameters. This phenomenon is demonstrated in Figure 2 which plots the average estimated weekly discount factor by magnitude of the sooner reward size. In light of the influence of payment magnitude and delay, I introduce question fixed effects, which controls for the time delay, magnitude of the reward and whether the choice involves an immediate payment or is a choice between delayed payments. The results are essentially unchanged by the introduction of these controls.

One other factor which may complicate the analysis is spillovers between experimental choice conditions. Since the same choices were made under different choice conditions within the same day, it is possible that there will be spillover from one choice condition to the next. If the influence of the spillover (having made the choice already and recalling that choice) dominates the effect of the experimental condition on changing expressed preferences, the results may be compromised.[12] Such spillovers should not be correlated with any of the choice conditions, however, since choice condition order and question order were both randomized.

Another possibility, however, is that the question position (whether the particular question is asked at the outset of the session or near the end of the session) affects the responses given, for example if individuals learn more about the game, or learn more about their preferences over the course of responding to many choices. To assess whether this might be a concern, in Figure 5 I plot average discount factors against

[12] One way to solve this issue is to use only data from the first choice condition in each session. Unfortunately this approach reduces the sample size substantially and precludes robust inference.

question order. There is some indication of decreasing patience with question order; there is a spike of patience at the 5th through 8th question, which subsequently drops to lower average discount factors. This trend is not especially strong however; average discount factors from the first 4 questions are not statistically different from average discount factors estimated from choices made towards the end of the session. To correct for any difference in the relationship between question order and choice condition order, I include question order fixed effects when estimating (9). The results (also in Appendix Table A2) differ to some extent in terms of point estimates and significance levels, but have parallel implications as Table 4a; that choice are more patient when deciding for a partner or in groups than choices made for oneself alone.

That the effect of choosing payments for another individual or in a group on discount factors is more pronounced when the payment choice involves an immediate option suggests that altruism and preferences for others may influence the expression of time-inconsistent choices. Assuming that the hyperbolic functional form adequately describes discount functions for individuals and in groups, differences in the estimated hyperbolic discounting parameter across choice conditions would be indicative of the relative likelihood of preference reversals in each setting.

I consider time-inconsistent preferences directly in Figure 6. Figure 6a presents the percentage of questions (which is equivalent to the percent of delay-value pairs used to measure time-inconsistency) for which an individual or group exhibits time-inconsistent preferences. Time-inconsistency is defined as switching to preferring the delayed reward at a different point when the choice involves an immediate option (e.g. Rs. 100 today or a larger amount in 4 weeks) than when it involves two delayed payments (e.g. Rs. 100 in 4 weeks or a larger amount in 8 weeks). Present-biased preferences are defined as switching to the larger, later payment earlier (or having a higher discount factor) when both payments are delayed, and future-biased preferences are defined as switching to the larger, later payment later (having a smaller discount factor) when both payments are in the future. The figure shows that a fairly high number of delay-value pairs generate time-inconsistent choices in the individual choice condition; approximately 35%, which is more or less equally distributed across present and future-biased choices. It appears that the expression of time-inconsistent choices is muted slightly when choosing payments for a partner, and is perhaps reduced somewhat more in the group setting. As shown in columns 1-3 of Table 4b, however, these differences are not statistically distinguishable from zero. The table presents the results from a regression of an indicator of time-inconsistency, present-bias or future-bias on choice condition indicators and individual fixed effects; thus it measures the relative probability of an individual making a time-inconsistent choice compared to the individual choice condition. While the coefficients on the choice condition indicators are negative, none enter at conventional significance levels.

Since I observe both the presence and the degree of time-inconsistency, I also consider degree as an outcome. The degree of time-inconsistency is defined as the row where an individual or group switches to the larger, later payment when both payments are delayed minus the row where they switch when one of the two, equivalent, payments is available immediately. For example if an individual switched to preferring Rs. 12 in 2 weeks over Rs. 10 in 1 week, at row 3 in Appendix A, but switched to preferring Rs. 13 in 1 week instead of Rs. 10 today (row 4), the degree of time-inconsistency is $4 - 3 = 1$. There are 5 rows per question but I code a value of $6\,(-6)$ to indicate that the person or group always chooses the sooner(later) reward when one payment is immediate and always chooses the later(sooner) payment when both are delayed. This variable takes integer values from -6 to 6 with negative numbers indicating future-bias, positive number indicating present-bias and zero indicating time-consistent choices. Larger absolute value indicates greater bias. Figure 6b plots the frequency of the degree of time-inconsistency by degree and choice condition. There is some indication that the partner and group choice conditions reduce the degree of time-inconsistency; relative to the individual choice condition there is greater mass at lower degrees of time-inconsistency. Columns 4-6 of Table 4b take the degree of time-inconsistency as the dependent variable, in absolute value and separately where it is greater than or less than 0. The sign of the coefficients suggests that the partner and group choice conditions push the degree of time-inconsistency towards zero. When the degree of present-bias is the dependent variable, the indicator for the group 4 condition enters above a 10% confidence level, but the other coefficients are only marginally significant ($p = 0.13$ for the group 2 and partner choice condition).

The theory also suggests that for groups, the implied discount factor when choosing together can be outside the convex set of individual's discounting parameters, which would not be expected absent altruism or if individuals discounted the utility of others at the same rate as they applied to their own. In Table 5 I investigate this phenomenon. The top panel of the table shows the fraction of implied discount factors for each question in a group setting that are strictly higher than the maximum discount factor calculated for that particular question of any group member. The results suggest that for 10% of the questions, groups of 2 behaved more patiently than either member, while the corresponding figure was 8% for groups of 4. The middle two panels show that similar percentages of groups do not display future or present-bias when all members of the group do on their own. To give these percentages some meaning, I also show the fraction of questions which elicit the bias in the individual condition. The lower panel shows similar results using the estimated hyperbolic discount rates. In this case the unit of observation is the individual and Columns 1 and 2 suggest that the estimated discount rate for groups of 2 or 4 were smaller than the smallest estimated discount rate for any group member for 29% and 9% of groups respectively.

The theory discussed above suggests that the phenomenon of the group choosing more patiently or consistently than any of the individual members derives from greater patience for others and altruism towards them. Another interpretation of the percentages of groups behaving more patiently than their members is that a positive percent has to be expected simply to errors or shocks in the group decision process. To assess whether these results may be due simply to error, or are in fact deriving from preferences consistent with the model above, I conduct this analysis separately for groups where the average rate of time preference expressed for others by group members (for their partners) is higher than the average rate of time preference expressed by the members for themselves and groups where the opposite is true. In other words I restrict to groups that are, on average, more patient for others than themselves (in columns 3 and 5) and groups which are, on average, more patient for themselves than for others (in columns 4 and 6). The results show that groups composed of individuals more patient for others than themselves are more likely to make choices which are more patient than the choices of the most patient group member than groups composed of individuals more patient for themselves than other people. A t-test that the percent of groups who make more patient choices than the most patient member rejects that the percent is equal across these two classifications of groups.

5.2 Preferences for Self and Others

The documented difference in patience when making intertemporal trade-offs for oneself or for another individual begs the question of what drives that difference, and how these factors might influence the intertemporal decisions taken by groups. To shed some light into this puzzle, I consider how the correlates of individual discount parameters compare to the correlates of discount factors for other individuals.

In Table 6 I present some simple correlations between discount parameters estimated in the individual and partner choice conditions and individual characteristics. These estimates are derived by regressing preferences elicited in the individual or partner choice condition on demographic variables and other information gathered in the individual surveys, an indicator that the discount rate was estimated in the partner condition and an interaction of this indicator with demographic variables. Formally I estimate

$$\begin{bmatrix} df_{iq} \\ df_{ijq} \end{bmatrix} = \mu + \boldsymbol{\pi}_1 P + \boldsymbol{\pi}_2 \mathbf{X}_i + \boldsymbol{\pi}_3 P \mathbf{X}_i + \varepsilon_s + \varepsilon_{ijq} \tag{11}$$

where df_{iq} is the discount factor expressed by person i for question q when they are deciding their own payment and df_{ijq} is the discount factor expressed by person i for person j (their partner) on question q. In columns 7-12 I replace df_{iq} and df_{ijq} with the maximum likelihood estimate of the discount parameters. $\mathbf{X}_i$ are individual characteristics of i, including basic demographic variables (age, age squared, gender, marital status) and I separately introduce further variables, such as attitudes towards spending and saving. Standard errors in this analysis are clustered at the session level.

Looking at the coefficients on the variables in $\mathbf{X}_i$ indicates how these characteristics correlate with time preference expressed in the individual condition. These correlations suggest that older individuals tend to be less patient (consistent with Read and Read, 2004), but the effect declines with age. Gender does not appear to influence discount factors, although the sample is predominantly female. Being married is negatively correlated with patience, but the coefficients are statistically different from zero only when considering the question level estimates of discount factors. Interestingly, in this sample I find that education and cognitive ability (as measured by performance on the Ravens Matrices) are negatively correlated with discount factors.

Based on the notion that family circumstances contribute to the determination of preferences, and ultimately financial behaviors, I consider the relationship between time preference and the number of siblings an individual has. I find that an additional sibling is associated with being more patient over monetary rewards (using the question level data, the point estimate implies an additional sibling equates a discount factor which is 3% points higher or, using the maximum likelihood estimates, a daily discount rate 0.6% lower). The table also indicates that time preference correlates as expected with other self-reported behaviors and preferences; individuals who report making a weekly or monthly budget tend to discount monetary payments less, as do those who regret spending and wish to save. These estimates also provide a natural way to assess the magnitude of the effect of choice condition on discounting. The hyperbolic discount rate estimates, for example, suggest that the average difference in patience between the discount rate applied to ones own payment and that used to discount payments in groups of 4 is approximately half as much as the expected difference in patience between an individual who makes a weekly or monthly budget and one who does not.

The coefficients on the interaction terms indicate how the influence of these characteristics differs when choosing payments for one's partner. The coefficients on the interaction terms for basic demographic variables are generally not statistically different from zero, suggesting there is no marked difference in how these variables correlate with time preference for oneself and time preference for others. For the other variables, such as number of siblings, cognitive ability or attitudes towards savings, the coefficient on the interaction term often takes the opposite sign as the coefficient on the main term, indicating that these variables have less of an influence on time preference for others than on intertemporal choices for oneself. Although the differences are often not distinguishable from zero.

Inspecting these results suggests that demographic characteristics of the deciding individual correlate similarly with preferences for others as they do with intertemporal preferences for oneself. This finding indicates that the observed difference between average discount parameters in the individual and partner choice conditions is unlikely to be driven by a differential effect of individual characteristics on expressed time-preference. If not differential influence of individual factors, it is possible that the relationship between individuals influences preferences over the other's consumption. In Table 7 I regress estimated discounting parameters on several variables capturing the nature of the relationship between partners; whether the individual has met their randomly assigned partner before, the strength of their relationship and whether they have shared financial resources.

The estimates in this table indicate that individuals who know their partner discount their partner's payoffs less; the top panel, considering the question level estimates of discount factors, suggests that individuals who know their partner express a weekly discount factor 10% higher for their partner than individuals who do not know their partner and qualitatively similar results are shown in the lower panel, taking the ML estimates of discount rates as the dependent variable. Individuals who know their partner also discount their own payments less (the estimated weekly discount factor is 12% higher for individuals who know their partner). It remains the case that, on average, individuals who know their partner discount the payoffs of their partner less than they discount their own payoffs, but the degree of discounting in both cases is less than for individuals who do not know their partners and the difference is less pronounced.[13] I omit demographic correlates of discounting in these regressions; including them reduces the coefficients somewhat but they remain qualitatively similar.

Since the hypothesis was that these variables would influence only the discount rate applied to other's payoffs, it is of particular concern that these results might be driven by communication between partners in the context of the experiment; for example if partners who knew each other discuss and converge on a more patient strategy. The experiment prohibited and controlled to whatever extent possible such discussion, but nevertheless, I investigate this possibility in columns 7-9. The results presented in these columns replicate the results from columns 1-3, but restrict the sample only to those experimental sessions where the choices the individual made for themselves were taken before they, or anyone else, knew who their randomly assigned partner would be. Similar results obtain in this sub-sample, suggesting that within session communication does not drive the effect. One likely explanation is that knowing one's partner is correlated with some unobserved characteristic which is correlated with discount parameters. Since a person would be more likely to know their partner if they were especially sociable within their community (participants in each session lived in the same general geographic area and were known by the outreach officers of the partner organization operating there) one possibility is that pro-social behavior is correlated with patience.

[13] This is shown in Appendix Table A3 which replicates Table 4 separately for individuals who know their partner and those that do not.

5.3 Alignment of Preferences: by and for oneself

Finally, I consider how what individuals choose for their partner relates to what the partner would choose for themselves. Returning to Schelling's parable, I attempt to ascertain whether a friend ordering another's lunch would select lime sorbet or fried cheesecake for dessert. As an initial look at the discord between the preferences expressed for one's partner and what the partner would choose for themselves when faced with an equivalent choice, Figure 7 plots the frequency of the difference between the weekly discount factor implied by an individuals's choice when facing a particular question and what is implied by what their partner chose for them when facing that same question. As is evident in the figure, it is quite often that the discount factors agree. One possibility is that there was some communication between partners, but individuals did not sit by their partners when making this choice and monitors were present throughout the session to discourage such communication. Moreover, in what follows I present evidence suggesting that this was not the case. Or it might be that there was some spillover, leading to consensus discount factors when the choices were made for the partner, but the analysis in Figure 5 does not support this notion. To investigate a related scenario, where there is a certain default, or set of default, discount factors driving the concordance between discount factors, Figure 8 shows the distribution of discount factors restricting only to the cases where the discount factor expressed for the partner matches the discount factor expressed by the partner. The figure does reveal that much of this concordance is driven by cases where individuals deciding for their partners and the partners themselves invariably choose the later payment (a discount factor of 1), but it also reveals a considerable number of cases where the discount factors agree at other values. Finally, it may simply be that individuals are able to estimate their partner's discount factor reasonably well; the degree of concordance would be especially striking if measured discount factors where entirely continuous, but the nature of the method of elicitation requires only that an individual choose the same range of discount factor for their partner as is chosen by their partner for themselves in order to generate this concordance.

I also consider the role of the relationship between partners in determining agreement on what one of them should do when facing a given choice. In Figure 9 I replicate Figure 7 separately for partners who knew each other prior to meeting at the experimental session and those that do not. The figure suggests shifting mass towards zero, indicating greater agreement, for partners who have met before. To address the issue of overestimating agreement, which occurs due to the granularity of discount factor bounds, I also consider concordance between the hyperbolic discount parameter estimated from the choices an individual makes for themselves and from the choices their partner made for them, which agree perfectly only in 7 cases. Also, since Figure 9 does not show any systematic difference on either side of 0, I present the differences as absolute values. In Figure 10 I plot the cumulative distribution function for the difference in discount parameters separately for individuals who know their partner and those that do not. The distribution for those that do know each other lies above the other, suggesting that individuals who know their partner tend to make choices closer to those the partner makes for themselves.

To assess whether this pattern is statistically significant I estimate

$$df_{jjq} - df_{ijq} = \mu + \boldsymbol{\delta}\mathbf{Z}_{ij} + \varepsilon_{ij} + \varepsilon_{ijq} \tag{12}$$

where $\mathbf{Z}_{ij}$ is the vector of variables capturing the relationship between i and j. I also run this regression taking the absolute value of $df_{jjq} - df_{ijq}$ as the dependent variable and parallel regressions at the individual, rather than question, level for the ML estimates. In other words I consider how the difference between the discount factor expressed for that choice by the person for themselves (person j for person j) and the discount factor implied by the choices made by their partner for them (person i for person j) relates to the relationship between partners. Table 8 presents the results. When taking the difference in the weekly discount factors as the dependent variable the coefficients on the variables measuring strength of the relationship between the partners generally do not enter at conventional significance levels. But when considering the ML estimates, it appears that partner's who know each other are more likely to make choices for their partner which are closer to those that their partner would make for themselves.

Finally, in columns 4 and 8 of the table I regress the difference in discount parameters on whether they know their partner, whether the two person group choice condition (which was conducted with the same individual) preceded the partner choice condition and an interaction of these two binary variables. If the results discussed above were simply driven by partners who knew each other previously communicating and coordinating on choices for each question, then one would expect that pairs which made choices as a group together before making choices for the other on their own would have been able to increase this coordination.

But I do not find that having had this chance to coordinate increases the concordance between their choices for themselves and the choices the other makes for them.

Although the above suggests that the results are not spuriously generated by the experimental protocol, one caveat in interpreting these results is in order. In light of previous findings on the correlation between knowing one's partner and one's own discount factor, it is not necessarily true that knowing one's partner *per se* allows one to make choices for them closer to what they would make for themselves. Rather knowing one's partner may proxy for some variable which generates choices closer to the partners own choice. There may simply be a greater degree of concordance in preference parameters in endogenously selected peer groups. I leave this question for future study.

6 Conclusion

In this study I evaluate whether individuals discount for others as they discount for themselves. I find that the answer to this question is no; that individuals are generally more patient when making savings decisions for other individuals.

Using data collected in a laboratory experiment, I also show that decisions made in groups are more patient than savings decisions made individually. This result is consistent with a theory of greater patience for others and altruism towards others. Also consistent with that theory, I find the group effect is stronger in larger groups. I provide suggestive evidence that, in addition to increasing patience, a group decision setting can decrease the likelihood of preferences reversals (planning to do something, but not implementing that plan). Finally, I show that in some fraction of groups, the choices taken as a group were more patient than the choices of the most patient member; this is especially true in groups of individuals who are more patient for others than for themselves, consistent with the theoretical framework.

This research ties into a large body of evidence on self-other dichotomies in expressed preferences. In particular I consider the context of time preference for monetary payoffs, expanding on prior research by examining the phenomenon of preference reversals and considering the implications of such preference dichotomies for group decisions. This study is also related to studies concerned with the correlates of time preference, my focus shifts from how individual characteristics correlate with individual time preference to examining the correlates of preferences for others and considering how the social environment in which choices are made affects the expression of preferences. Finally, this study peers inside the black box of groups as commitment mechanisms. Prior research has commented on the phenomenon of groups serving as a commitment device, allowing impatient and time-inconsistent individuals to force themselves to make "better" choices. This study examines this notion more closely and suggests that the effect of groups on decisions may operate through preference formation. The results confirm that decisions delegated to others or made in groups lead to more patient decisions and may mitigate the expression of present-biased choices.

References

Abel, A. B. and M. Warshawsky (1988). Specification of the joy of giving: Insights from altruism. *Review of Economics and Statistics 70*(1), 145.

Alicke, M. D., M. Klotz, D. L. Breitenbecher, T. J. Yurak, and D. S. Vredenburg (1995). Personal contact, individuation, and the better-than-average effect. *Journal of Personality and Social Psychology 68(5)*, 804–825.

Altonji, J. G., F. Hayashi, and L. J. Kotlikoff (1992). Is the extended family altruistically linked? direct tests using micro data. *The American Economic Review 82*(5), 1177–1198.

Ambec, S. and N. Treich (2007). Roscas as financial agreements to cope with self-control problems. *Journal of Development Economics 82*, 120–137.

Andersen, S., G. Harrison, M. Lau, and E. Rutstrom (2006, December). Elicitation using multiple price list formats. *Experimental Economics 9*(4), 383–405.

Anderson, S. and J.-M. Baland (August 2002). The economics of roscas and intrahousehold resource allocation. *The Quarterly Journal of Economics,*, 963–995.

Anderson, S., J.-M. Baland, and K. O. Moene (2009). Enforcement in informal saving groups. *Journal of Development Economics 90*(1), 14–23.

Aron, A., E. N. Aron, M. Tudor, and G. Nelson (1991). Close relationships as including other in the self. *Journal of Personality and Social Psychology 60(2)*, 241–253.

Ashraf, N. (2009, September). Spousal control and intra-household decision making: An experimental study in the Philippines. *American Economic Review 99*(4), 1245–77.

Ashraf, N., D. Karlan, and W. Yin (May 2006). Tying odysseus to the mast: Evidence from a commitment savings product in the Philippines. *The Quarterly Journal of Economics 121(2)*, 635–672.

Basu, K. (2008). Hyperbolic discounting and the sustainability of rotational savings arrangements. Technical report.

Becker, G. S. (1974). A theory of social interactions. *Journal of Political Economy 82*(6), 1063.

Becker, G. S. and R. J. Barro (1986). Altruism and the economic theory of fertility. *Population and Development Review 12*, 69–76.

Benjamin, D. J., S. A. Brown, and J. M. Shapiro (2006). Who is behavioral? cognitive ability and anomalous preferences. Levine's working paper archive, David K. Levine.

Benzion, U., A. Rapoport, and J. Yagil (1989). Discount rates inferred from decisions: An experimental study. *Management Science 35*(3), 270–284.

Bernheim, B. D. (1991). How strong are bequest motives? Evidence based on estimates of the demand for life insurance and annuities. *The Journal of Political Economy 99*(5), 899–927.

Bernheim, B. D., A. Shleifer, and L. H. Summers (1985, December). The strategic bequest motive. *Journal of Political Economy 93*(6), 1045–76.

Carpenter, P. A., M. A. Just, and P. Shell. (1990). What one intelligence test measures: A theoretical account of the processing in the Raven progressive matrices test. *Psychological Review. 97*(3), 404–431.

Chabris, C. F., D. Laibson, C. L. Morris, J. P. Schuldt, and D. Taubinsky (2009). The allocation of time in decision-making. *Journal of the European Economic Association 7*(2-3), 628–637.

Choi, J., B. K. Kim, I. Choi, and Y. Yi (2006). Variety-seeking tendency in choice for others: Interpersonal and intrapersonal causes. *Journal of Consumer Research 32*, 590–595.

Dohmen, T., A. Falk, D. Huffman, and U. Sunde (2007, April). Are risk aversion and impatience related to cognitive ability? IZA Discussion Papers 2735, Institute for the Study of Labor (IZA).

Duflo, E. (2006). Field experiments in development economics. *MIT mimeo*.

Duflo, E., M. Kremer, and J. Robinson (January 2008). How high are rates of return to fertilizer? Evidence from field experiments in Kenya. *American Economic Association Meetings, New Orleans*.

Falk, I. and O. Stark (2001, November). Dynasties and destiny: On the roles of altruism and impatience in the evolution of consumption and bequests. *Economica 68*(272), 505–18.

Fehr, E. and K. Schmidt (2005). The economics of fairness, reciprocity and altruism- experimental evidence and new theories. *University of Munich Discussion Paper* (2005-20).

Gray, J., C. Chabris, and T. Braver. (2003). Neural mechanisms of general fluid intelligence. *Nature Neuroscience Advanced Online Publication.*.

Gugerty, M. K. (2007). You can't save alone: Commitment in rotating savings and credit associations in Kenya. *Economic Development and Cultural Change 55(2)*, 251–82.

Hall, J. (1957). Correlation of a modified form of Raven's progressive matrices (1938) with the Wechsler Adult Intelligence Scale. *Journal of Consulting Psychology. 21*(1).

Hsee, C. K. and E. U. Weber (1997). A fundamental prediction error: Self-others discrepancies in risk preference. *Journal of Experimental Psychology: General 126(1)*, 45–53.

Irwin, J. R. and J. H. Davis (1995). Choice/matching preference reversals in groups: Consensus processes and justification-based reasoning. *Organizational Behavior and Human Decision Processes 64*(3), 325 – 339.

Jones, B. and H. Rachlin (2006). Social discounting. *Psychological Science 17*(4), 283–286.

Karlan, D., N. Ashraf, N. Gons, and W. Yin (July 2003). A review of commitment savings products in developing countries. *Asian Development Bank Economics and Research Development Working Paper, 45.*

Klonner, S. (2008). Private information and altruism in bidding roscas. *The Economic Journal, 118*, 775–800.

Kovarik, J. (2009, March). Giving it now or later: Altruism and discounting. *Economics Letters 102*(3), 152–154.

Kray, L. and R. Gonzales (1999). Differential weighting in choice versus advice: I'll do this, you do that. *Journal of Behavioral Decision Making 12*, 207–217.

Kray, L. J. (2000). Contingent weighting in self-other decision making. *Organizational Behavior and Human Decision Processes 83(1)*, 82–106.

Krishnamurthy, P. and P. Kumar (2002). Self - other discrepancies in waiting time decisions. *Organizational Behavior and Human Decision Processes 87(2)*, 207–226.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics 112*(2), 443–477.

LeBoeuf, R. and E. Shafir (2009). Anchoring on the "here" and "now" in time and distance judgments. *Journal of Experimental Psychology: Learning, Memory and Cognition 35*(1), 81–93.

Lindbeck, A. and J. W. Weibull (1988). Altruism and time consistency: The economics of fait accompli. *The Journal of Political Economy 96*(6), 1165–1182.

Loewenstein, G. and T. O'Donoghue (2004). Animal spirits: Affective and deliberative processes in economic behavior. *Mimeo*.

Mazzocco, M. (2007). Household intertemporal behaviour: A collective characterization and a test of commitment. *Review of Economic Studies 74*, 857–895.

McClure, S., D. Laibson, G. Loewenstein, and J. Cohen (2004, October). Separate Neural Systems Value Immediate and Delayed Monetary Rewards. *Science 306*, 503–507.

McClure, S. M., K. . Ericson, D. I. Laibson, G. Loewenstein, and J. D. Cohen (2007, May). Time Discounting for Primary rewards. *The Journal of Neuroscience 27*(21), 5796–5804.

McLeod, H. and J. Rubin. (1962). Correlation between Raven progressive matrices and the WAIS. *Journal of Consulting Psychology. 26*(2), 190–191.

Meier, S. and C. Sprenger (March 2007). Impatience and credit behavior: Evidence from a field experiment. *Federal Reserve Bank of Boston Working Paper No. 07-3*.

Miles, S. and V. Scaife (2003). Optimistic bias and food. *Nutrition Research Reviews 15*, 3–19.

Mischel, W. and R. Metzner (1962). Preference for delayed reward as a function of age, intelligence, and length of delay interval. *The Journal of Abnormal and Social Psychology. 64*(6), 425–431.

Mobius, M. M. and T. S. Rosenblat (2006). Why beauty matters. *American Economic Review 96(1)*, 222–235.

Mowen, J. C. and J. W. Gentry (1980). Investigation of the preference-reversal phenomenon in a new product introduction task. *Journal of Applied Psychology. 65*(6), 715–722.

Pronin, E., C. Y. Olivola, and K. A. Kennedy (2008). Doing unto future selves as you would do unto others: Psychological distance and decision making. *Personality and Social Psychology Bulletin 34*, 224–236.

Read, D., S. Frederick, B. Orsel, and J. Rahman (2005). Four score and seven years from now: The date/delay effect in temporal discounting. *Management Science 51*(9), 1326–1335.

Read, D. and N. L. Read (2004, May). Time discounting over the lifespan. *Organizational Behavior and Human Decision Processes 94*(1), 22–32.

Reuben, E., P. Sapienza, and L. Zingales (2008, July). Time discounting for primary and monetary rewards. MPRA Paper 10650, University Library of Munich, Germany.

Rosenblat, T. S. (October 2008). The beauty premium: Physical attractiveness and gender in dictator games. *Negotiation Journal*, 465–481.

Sayman, S. and A. Öncüler (2009). An investigation of time inconsistency. *Management Science 55*(3), 470–482.

Schelling, T. C. (1984). Self-command in practice, in policy, and in a theory of rational choice. *The American Economic Review 74*, 1–11.

Small, D. A. and G. Loewenstein (2003, January). Helping a victim or helping the victim: Altruism and identifiability. *Journal of Risk and Uncertainty 26*(1), 5–16.

Stark, O. and I. Falk (2000, October). Dynasties and destiny: On the roles of altruism and impatience in the evolution of consumption and bequests. Economics Series 88, Institute for Advanced Studies.

Takahashi, T. (2007). Non-reciprocal altruism may be attributable to hyperbolicity in social discounting function. *Medical Hypotheses 68*(1), 184 – 187.

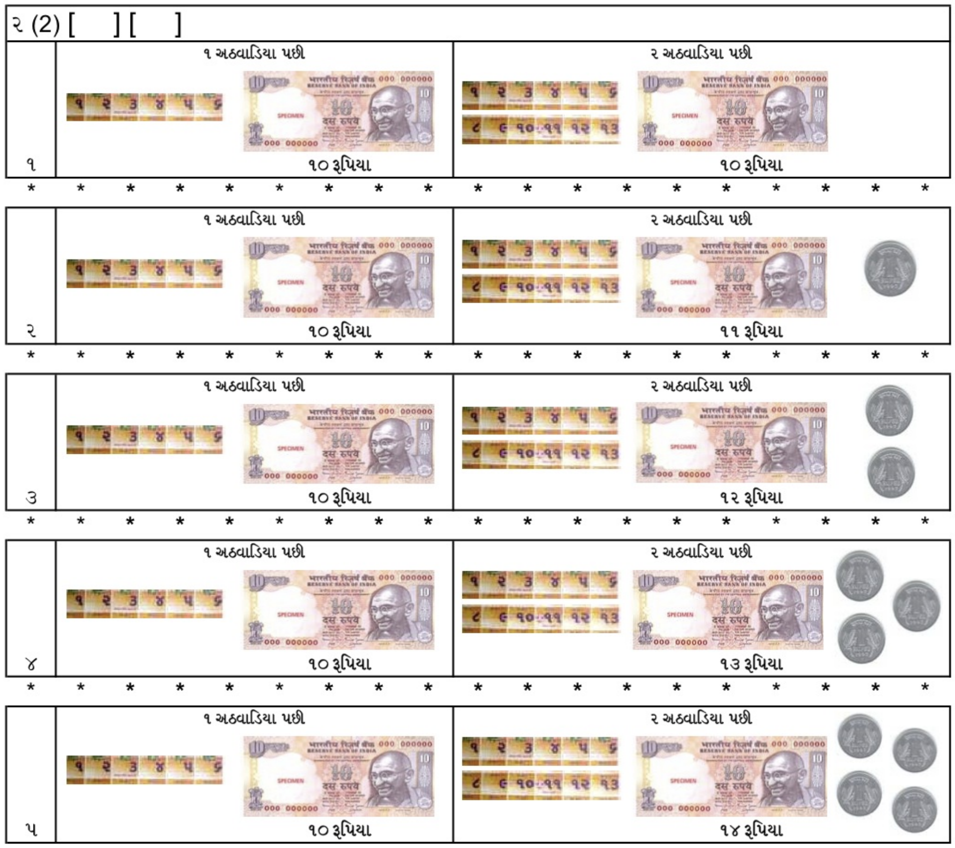
Thaler, R. (1981). Some empirical evidence on dynamic inconsistency. *Economics Letters 8*(3), 201–207.

vanDellen, M. R. and R. H. Hoyle (2009). Regulatory accessibility and social influences on state self-control. *Personality and Social Psychology Bulletin 36*(2), 251–263.

Zikmund-Fisher, B. J., B. Sarr, A. Fagerlin, and P. A. Ubel (November 13, 2005). A matter of perspective: Choosing for others differs from choosing for yourself in making treatment decisions. *Society for*

Judgment and Decision Making (annual meeting).

Appendix A: Sample Response Sheet



Appendix B: Sample Ravens Test Question

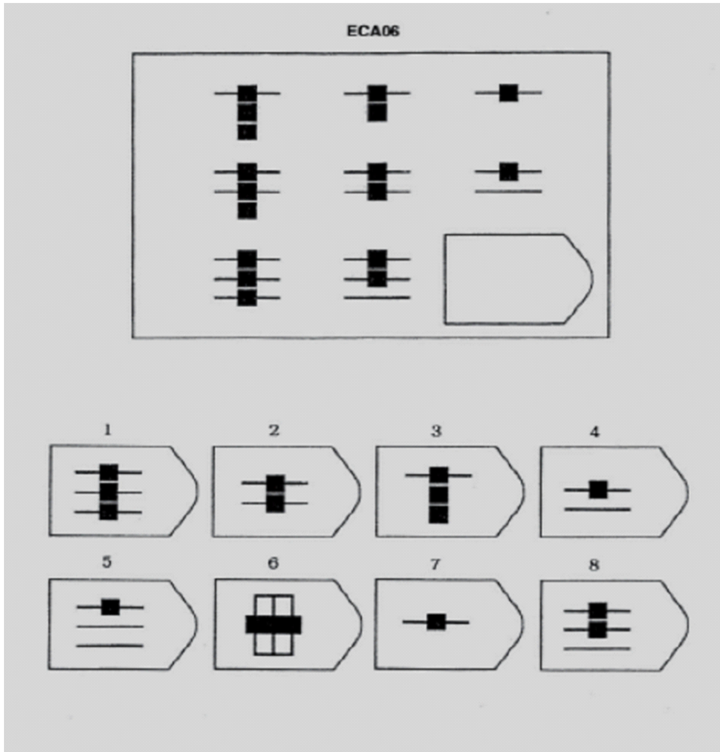
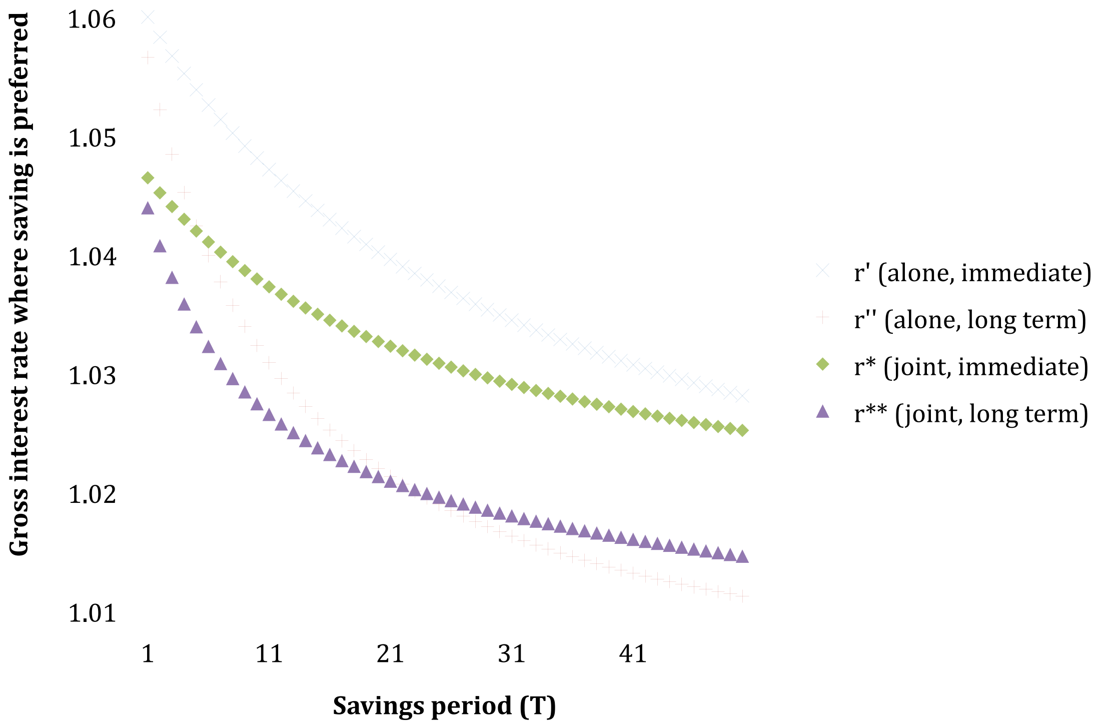
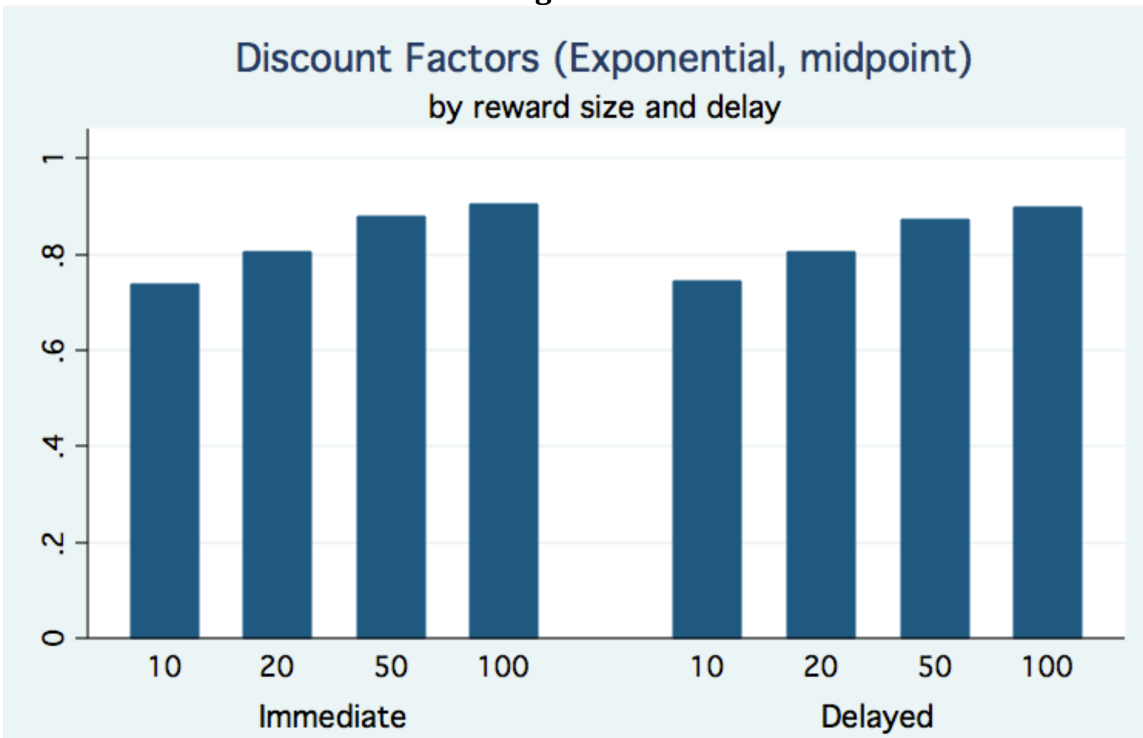


Figure 1



Note: The figure plots r', r'', r* and r** as defined in Section 2 of the text against *T*. This figure supposes ω=0.5 δ=0.98 and κ=0.06.

Figure 2



Mean discount factor by payment magnitude. Discount factors are estimated at the question level and standardized as a weekly discount factor assuming exponential discounting. Separately for choices involving an immediate payment and those that do not.

Figure 3

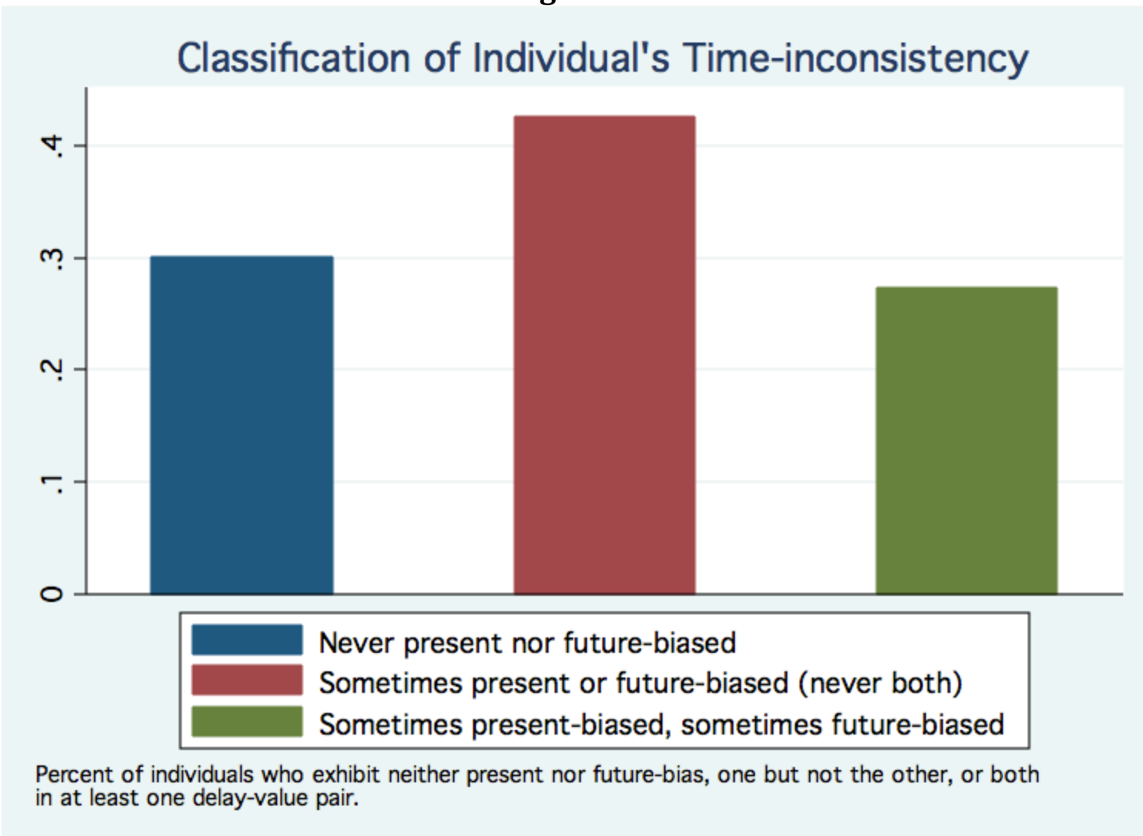

Classification of Individual's Time-inconsistency
0
.1
.2
.3
.4
Never present nor future-biased
Sometimes present or future-biased (never both)
Sometimes present-biased, sometimes future-biased
Percent of individuals who exhibit neither present nor future-bias, one but not the other, or both in at least one delay-value pair.

Figure 4a

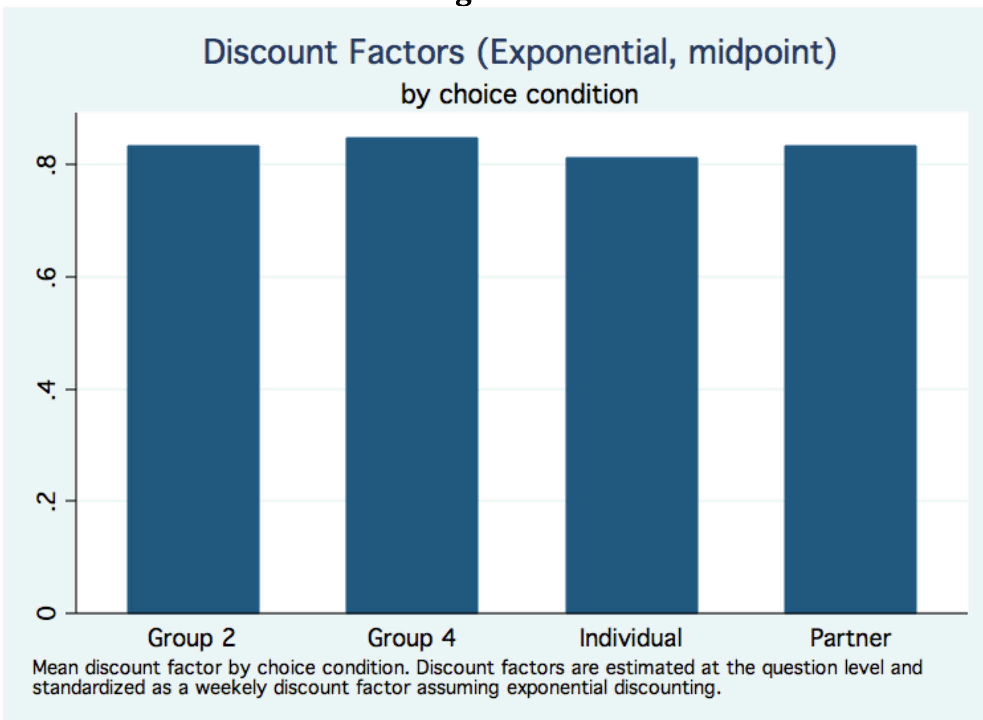


Figure 4b

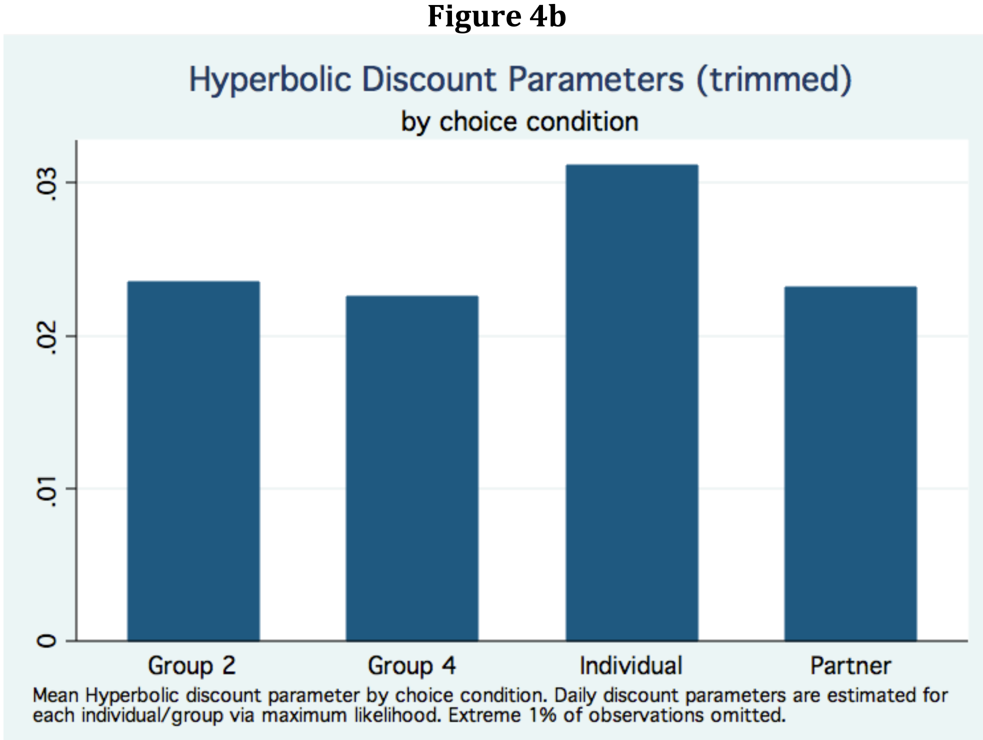
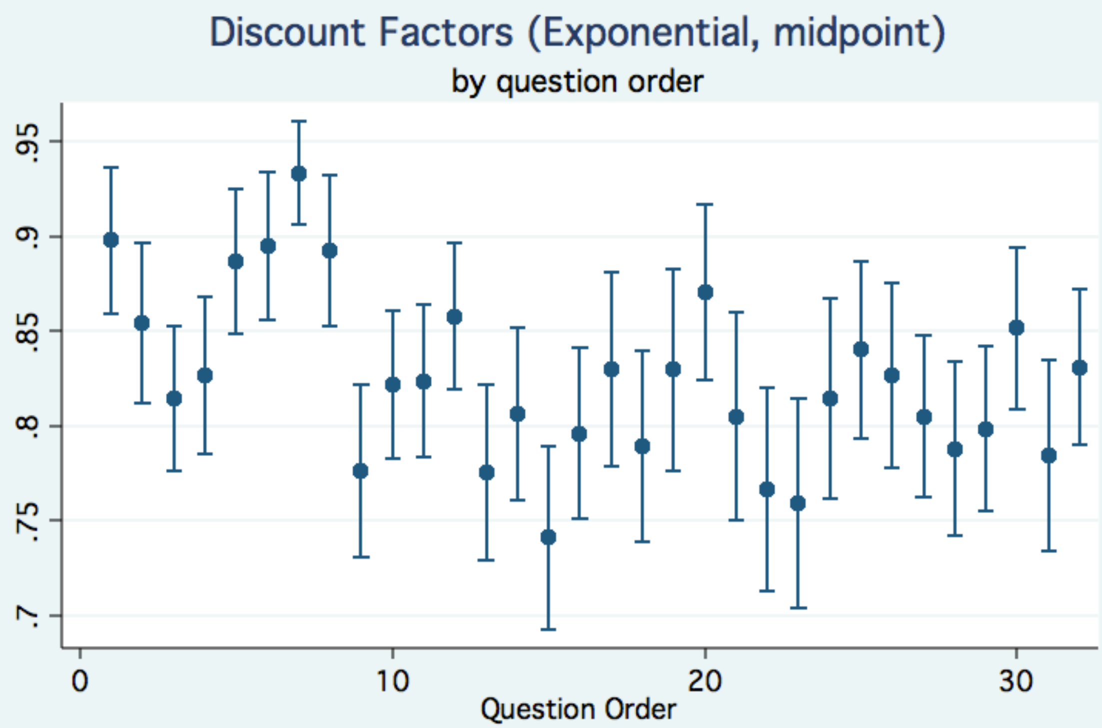


Figure 5



Mean and 95% confidence bound of weekly discount factor by question order. Discount factors estimated at the question level assuming exponential discounting.

Figure 6a

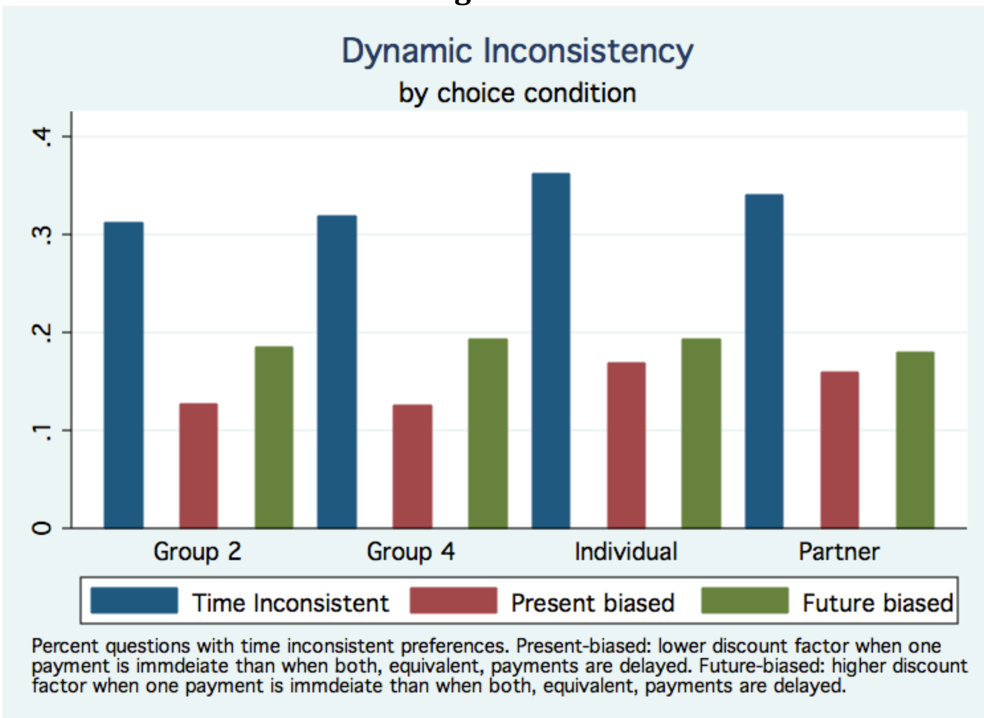


Figure 6b

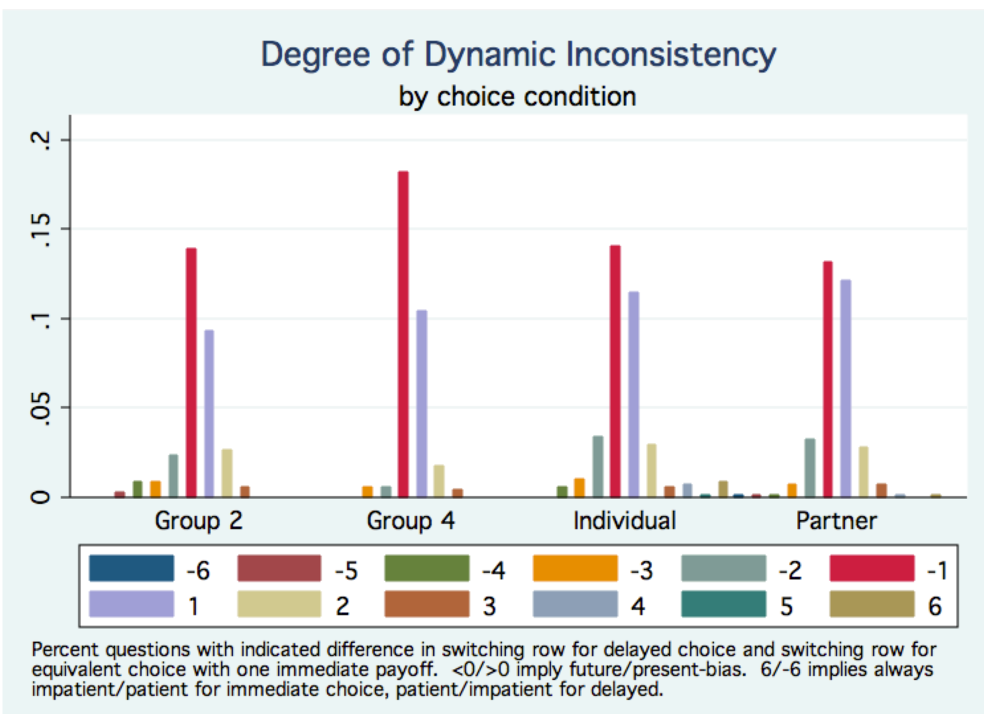


Figure 7

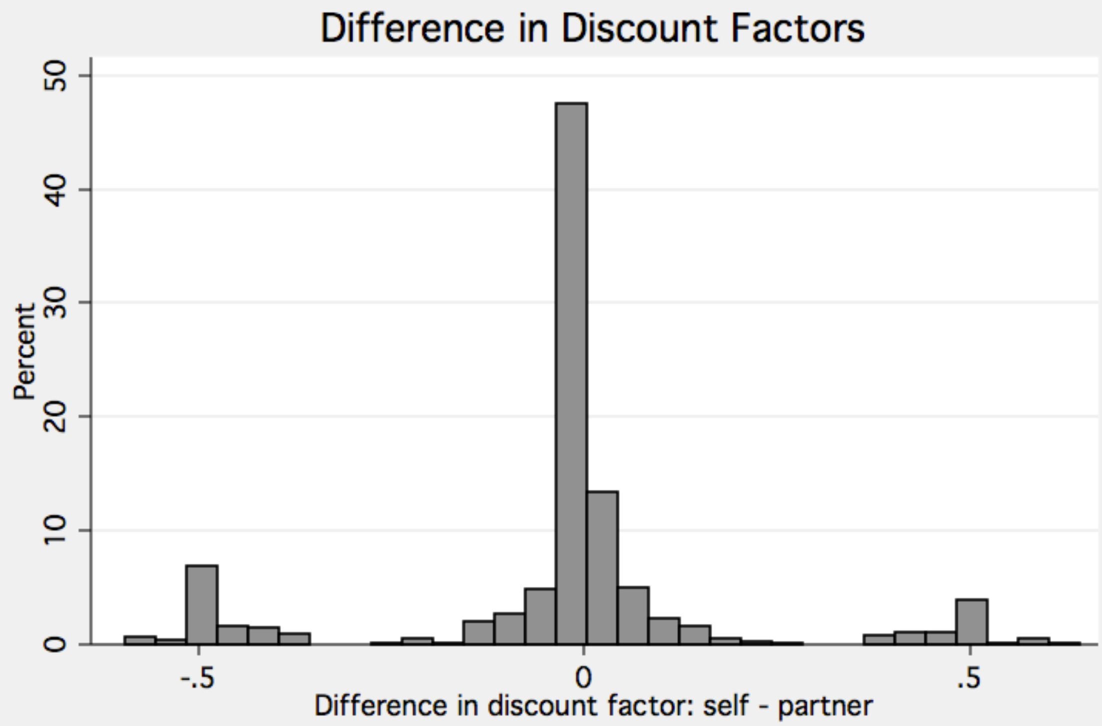


Figure shows frequency of the difference in the discount factor, estimated at the question level, implied by the choice individuals make for themselves and the choice their partner made for them.

Figure 8

Figure shows the distribution of estimated discount factors where estimates from choices made by individual and by their partner for them agree.

Figure 9

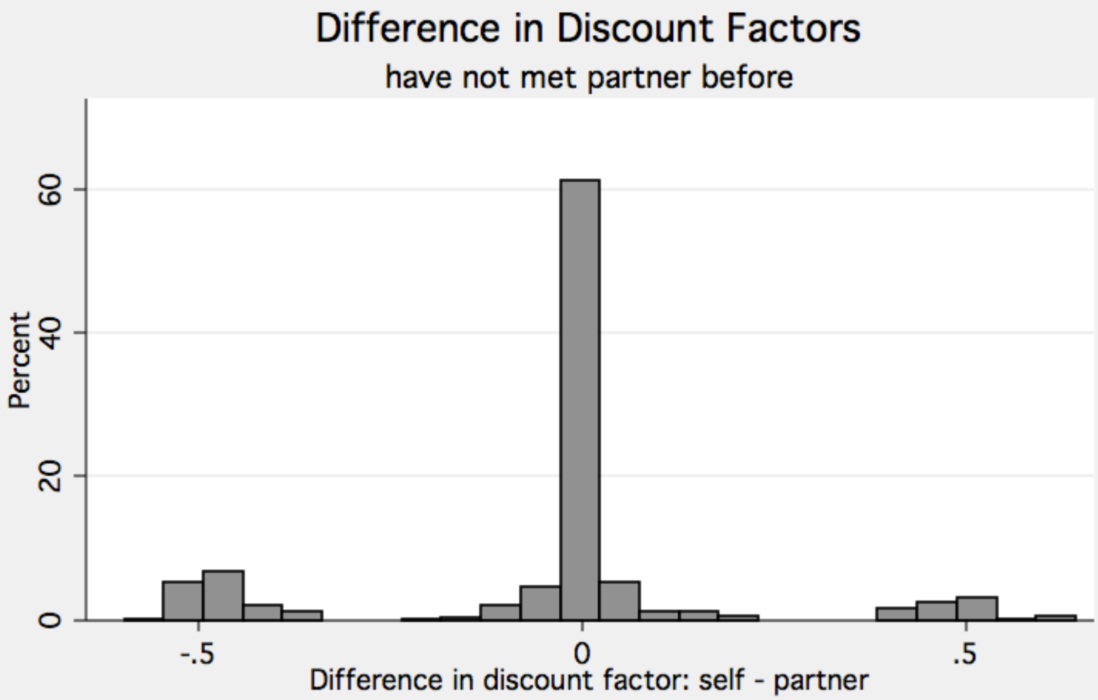


Figure shows frequency of the difference in the discount factor, estimated at the question level, implied by the choice individuals make for themselves and the choice their partner made for them. Restricted to partners who don't know each other.

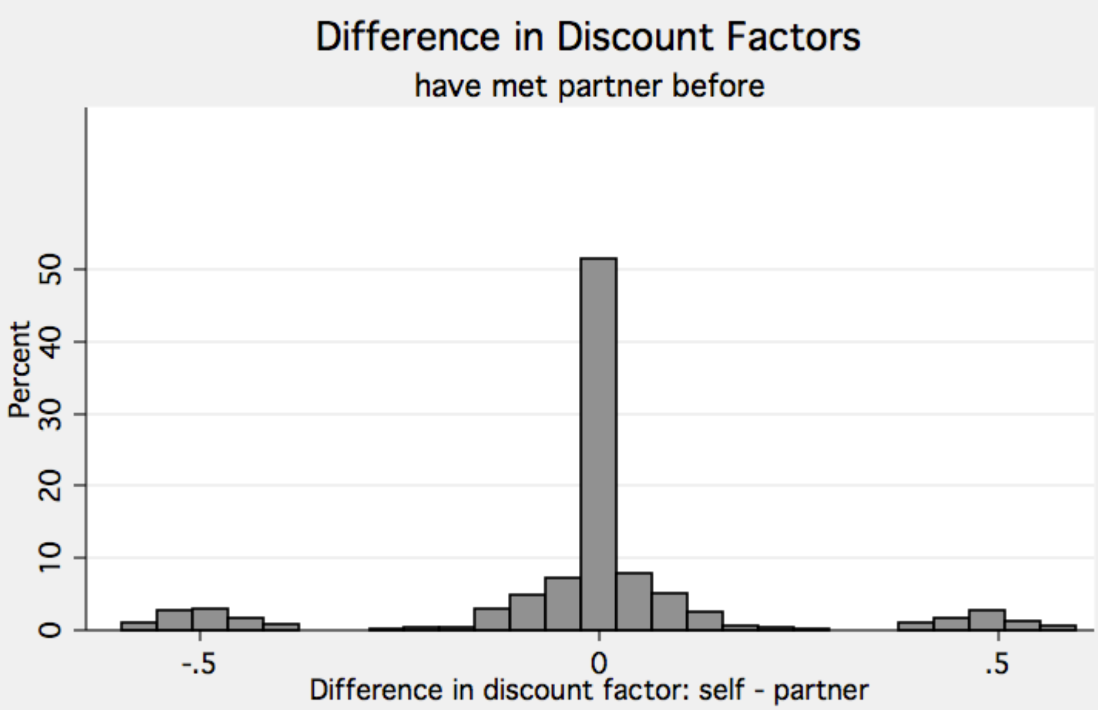


Figure shows frequency of the difference in the discount factor, estimated at the question level, implied by the choice individuals make for themselves and the choice their partner made for them. Restricted to partners who know each other.

Figure 10

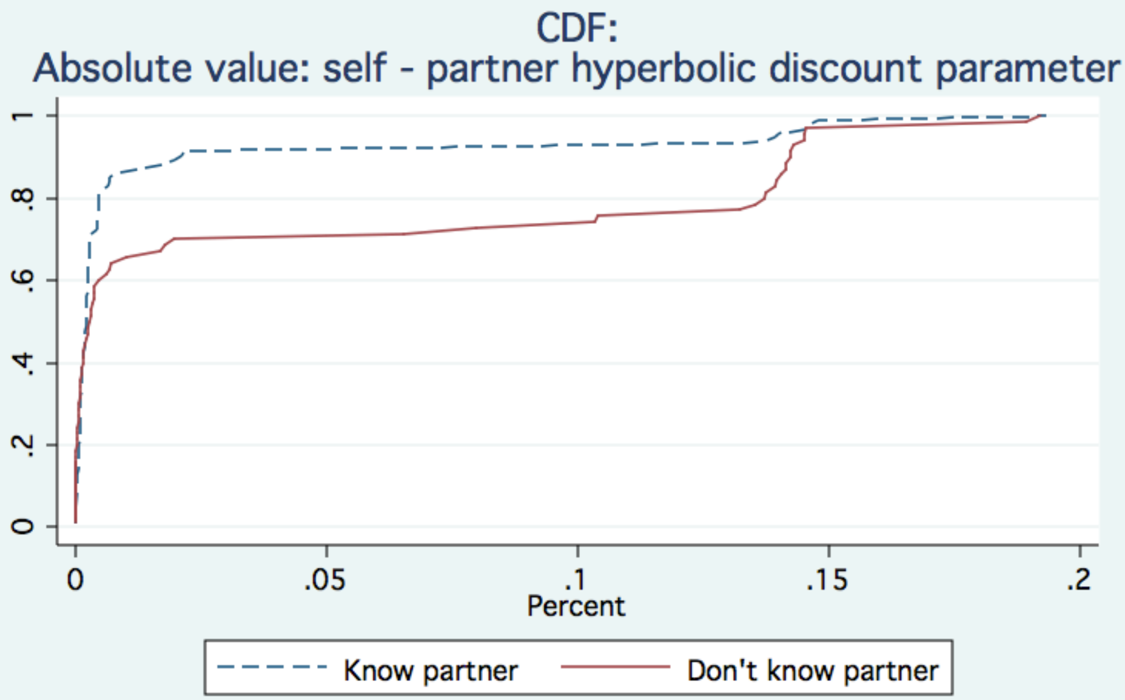


Figure shows cumulative density of the abs. value of the difference between estimated hyperbolic discount parameter from choices made by individual for themselves and from choices made for them by their partner.

Table 1: Summary of Payment Choice Questions

Question Number	Sooner reward (Rs)	Increment (Rs.)	Immediate Reward Option	Delay (weeks)
1	10	1	Yes	1
2	10	1	No	1
3	20	1	Yes	1
4	20	1	No	1
5	50	2	Yes	4
6	50	2	No	4
7	100	5	Yes	4
8	100	5	No	4

Notes: The table shows the parameters of the 8 questions asked in each choice condition. Each question consists of 5 lines. The left column of each line offers the "Sooner Reward" deliverable immediately (as indicated) or in the specified delay. The right of each line offers the "Sooner reward" plus a multiple of the increment at a later date: either in the time indicated by "Delay" if the choice is immediate, or in 2 times the number of weeks indicated in the "Delay" column if the choice does not have an immediate payment option. Respondents indicated their preference for the sooner or later payment in each line. See Appendix A and the text.

Table 2: Sessions and Attendance

Session Date	Number of Participants	Percent of Total
27-Jul-09	12	6.82
3-Aug-09	12	6.82
4-Aug-09	16	9.09
17-Aug-09	16	9.09
18-Aug-09	16	9.09
19-Aug-09	16	9.09
20-Aug-09	16	9.09
21-Aug-09	16	9.09
22-Aug-09	16	9.09
24-Aug-09	20	11.36
25-Aug-09	20	11.36
Total	***176***	***100***

Notes: The table shows the number of participants who attended each experimental session.

Table 3: Summary Statistics

	N	Mean	sd
Individual level variables			
What is your age?	176	31.89	8.57
Male (0-1 indicator)	176	0.13	0.34
Unmarried (0-1 indicator)	176	0.27	0.44
Hindu (0-1 indicator)	176	0.83	0.38
Years of schooling	176	7.53	3.7
Number of siblings	176	4.14	2.04
Make weekly/monthly budget (0-1 indicator)	174	0.81	0.39
Do you belong to any savings groups?	173	0.19	0.39
Agree (1 to 10): Regret spending, wish saved.	174	2.39	2.87
One or more outstanding loans (0-1 indicator)	175	0.21	0.41
Savings with formal bank, cooperative or post office (0-1 indicator)	174	0.69	0.46
Makes decisions about financial savings (0-1 indicator)	176	0.89	1.14
Makes decisions about taking loans (0-1 indicator)	175	0.76	1.37
Percent correct responses to Raven's Test questions	176	0.38	0.23
Have met partner before (0-1 indicator)	176	0.56	0.5
Months have known partner	176	68.26	92.69
Number times talked or visited in last 30 days	176	12.54	20.22
Ever given or received financial assistance?	176	0.18	0.39
Question level variables			
Midpopint 1 week discount factor, delayed choice	1401	0.77	0.22
Midpopint 4 week discount factor, delayed choice	1398	0.84	0.2
Midpopint 1 week discount factor, immediate choice	1401	0.77	0.22
Midpopint 4 week discount factor, immediate choice	1403	0.84	0.21
Weekly discount factor (midpoint)	5603	0.83	0.22
Time inconsistent (0-1 indicator)	5504	0.33	0.47
Present-biased (0-1 indicator)	5504	0.15	0.35
Future-biased (0-1 indicator)	5504	0.19	0.39
Maximum Likelihood Estimates			
MLE Exponential Discount Factor	458	0.98	0.1
MLE Hyperbolic Discount Rate	458	0.03	0.05

Table 4a: Effect of Choice Condition on Discount Parameters

	Midpopint 1 week discount factor, delayed choice (1)	Midpopint 4 week discount factor, delayed choice (2)	Midpopint 1 week discount factor, immediate choice (3)	Midpopint 4 week discount factor, immediate choice (4)	Weekly discount factor (midpoint) (5)	Weekly discount factor (midpoint) (6)	Weekly discount factor (midpoint) (7)	MLE Exponential Discount Factor (8)	MLE Hyperbolic Discount Rate (9)
Two person group condition	-0.004	0.031	0.029	0.023	0.02	0.025	0.015	0.027	-0.008
	(0.02)	(0.016)*	(0.02)	(0.01)	(0.01)	(0.013)*	(0.01)	(0.012)**	(0.01)
Four persons group condition	0.018	0.037	0.044	0.041	0.035	0.043	0.028	0.03	-0.009
	-0.017	(0.017)**	(0.019)**	(0.017)**	(0.013)**	(0.016)**	(0.013)**	(0.013)**	(0.002)***
Partner condition	0.015	0.019	0.015	0.032	0.02	0.023	0.017	0.029	-0.008
	(0.01)	(0.02)	(0.01)	(0.014)**	(0.009)*	(0.010)**	(0.01)	(0.013)**	(0.01)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Observations	1401	1398	1401	1403	5603	2804	2799	458	458
R-Squared	0.7	0.68	0.67	0.72	0.59	0.6	0.59	0.02	0.01
Mean of dependent variable	0.77	0.84	0.77	0.84	0.83	0.83	0.83	0.98	0.03

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: Colums 1-7 show the results from a regression of the discount factor, estimated at the question level, on indicators for choice condition. Column 6 is restricted to immediate choices, column 7 is restricted to delayed choices. Columns 8 and 9 show the results from regressions of the MLE discount parameters, estimated at the group or individual level, on the choice condition indicators. The highest 1 percent of observations, ranked by estimated discount parameter, are omitted in columns 8 and 9. Standard errors clustered at the session level.

Table 4b: Effect of Choice Condition on Time-consistency

	Time inconsistent (0-1 indicator) (1)	Present-biased (0-1 indicator) (2)	Future-biased (0-1 indicator) (3)	Degree of time inconsistency (abs. value of difference in switching line) (4)	Degree of present-bias (difference in switching line where>0) (5)	Degree of future-bias (difference in switching line where<0) (6)
Two person group condition	-0.053	-0.042	-0.011	-0.126	-0.12	0.005
	(0.04)	(0.03)	(0.03)	(0.01)	(0.07)	(0.05)
Four persons group condition	-0.045	-0.045	0.00	-0.186	-0.133	0.052
	-0.058	(0.03)	(0.04)	(0.11)	(0.071)*	(0.05)
Partner condition	-0.025	-0.009	-0.015	-0.089	-0.064	0.024
	(0.02)	(0.02)	(0.02)	(0.06)	(0.04)	(0.04)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5504	5504	5504	5478	5478	5478
R-Squared	0.21	0.13	0.14	0.2	0.14	0.14
Mean of dependent variable	0.33	0.15	0.19	0.45	0.2	-0.24

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: The table shows the results from a regression of indicators of dynamic inconsistency, present-bias or future-bias, determined at the question level, on indicators for choice condition. Present-bias/future-bias is defined as switching to the later, larger payment at a later/sooner line when the choice involves one immediate payment than for an equivalent choice when both payments are delayed. See text for further explanation. In columns 4-6 the dependent variable is the difference in the line number at which the individual or group switches to the later, larger payment between the question involving both delayed payments and the equivalent question involving one immediate payment (0 indicates time-consistent preferences). Standard errors clustered at the session level.

Table 5: Preferences Out of the Convex Set

	(1)	(2)	(3)	(4)	(5)	(6)
	Midpoint of Discount Factor (estimated at question level)					
	Group 2 discount factor for question (+bound) > max of members discount factors	Group 4 discount factor for question (+bound) > max of members discount factors	Group 2 discount factor for question (+bound) > max of members discount factors	Group 2 discount factor for question (+bound) > max of members discount factors	Group 4 discount factor for question (+bound) > max of members discount factors	Group 4 discount factor for question (+bound) > max of members discount factors
Observations	694	1046	250	444	857	189
Percent	0.1	0.08	0.18	0.05	0.09	0.01
t-test (p-value)	.	.	0.00	0.00	0.00	0.00
	Present-bias in Groups					
	Group 2 not present-biased, all members are	Group 4 not present-biased, all members are	Group 2 not present-biased, all members are	Group 2 not present-biased, all members are	Group 4 not present-biased, all members are	Group 4 not present-biased, all members are
Observations	684	350	244	440	163	187
Percent	0.082	0.04	0.123	0.059	0.049	0.032
% Individual questions present-biased	0.17	0.17				
t-test (p-value)	.	.	0.00	0.00	0.42	0.42
	Future-bias in Groups					
	Group 2 not future-biased, all members are	Group 4 not future-biased, all members are	Group 2 not future-biased, all members are	Group 2 not future-biased, all members are	Group 4 not future-biased, all members are	Group 4 not future-biased, all members are
Observations	684	350	244	440	163	187
Percent	0.096	0.034	0.119	0.084	0.031	0.037
% Individual questions future-biased	0.19	0.19				
t-test (p-value)	.	.	0.13	0.13	0.73	0.73
	Hyperbolic Discount Rate (MLE estimates at group/individual level)					
	Group 2 MLE hyperbolic discount rate < min of members discount rate	Group 4 MLE hyperbolic discount rate < min of members discount rate	Group 2 MLE exponential discount factor > max of members discount factors	Group 2 MLE exponential discount factor > max of members discount factors	Group 4 MLE exponential discount factor > max of members discount factors	Group 4 MLE exponential discount factor > max of members discount factors
Observations	84	44	77	8	40	4
Percent	0.29	0.09	0.32	0	0.1	0
t-test (p-value)	.	.	0.06	0.06	0.52	0.52

Notes: The top panel of the table shows the percentage of question for which the decision taken by the group indicated in the column heading was strictly more patient than the choice taken by the most patient group member for that same question. The middle two panels show the percentage of questions for which the group was not present-biased or future-biased, where all members did express present or future-bias for that particular question. The lower panel show the percentage of groups for which the estimated discount parameter (estimated via maximum likelihood) reflects strictly more patient preferences than the estimated parameter for the most patient group member. Columns 3 and 5 are restricted to groups where the average discount parameter of individuals for their partner is greater than the average discount parameter of individuals in the group for themselves. Columns 4 and 6 are restricted to groups where the average discount parameter of individuals for their partner is less than the average discount parameter of group members for themselves. 't-test (p-value)' is the p-value from a t-test of equal percentages between the groups defined by columns 3 and 4 or 5 and 6.

Table 6: Correlates of Discount Parameters for Self and Partner (I)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Weekly discount factor (midpoint)						MLE Hyperbolic Discount Rate					
Partner condition	0.099	0.077	0.061	0.048	0.073	0.042	-0.008	0.01	0.015	0.014	0.012	0.034
	(0.09)	(0.09)	(0.08)	(0.09)	(0.08)	(0.10)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)
What is your age?	-0.034	-0.038	-0.036	-0.04	-0.037	-0.039	0.009	0.011	0.01	0.012	0.011	0.013
	(0.014)**	(0.013)**	(0.014)**	(0.015)**	(0.015)**	(0.014)**	(0.005)*	(0.005)*	(0.005)*	(0.005)**	(0.005)*	(0.005)**
Age squared (1000s)	0.477	0.541	0.51	0.565	0.53	0.555	-0.131	-0.151	-0.15	-0.17	-0.162	-0.178
	(0.201)**	(0.198)**	(0.206)**	(0.214)**	(0.223)**	(0.204)**	(0.071)*	(0.074)*	(0.070)*	(0.078)*	(0.078)*	(0.075)**
Male (0-1 indicator)	-0.043	-0.038	-0.036	-0.049	-0.039	-0.03	0.023	0.022	0.022	0.028	0.022	0.021
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Married (0-1 indicator)	-0.048	(0.04)	-0.042	-0.055	-0.053	-0.034	0.012	0.01	0.009	0.015	0.014	0.01
	(0.016)**	(0.011)***	(0.017)**	(0.016)***	(0.017)***	(0.017)*	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Number of siblings	0.03	0.031	0.028	0.031	0.03	0.028	-0.006	-0.006	-0.005	-0.006	-0.006	-0.006
	(0.009)***	(0.009)***	(0.008)***	(0.010)***	(0.009)***	(0.009)***	(0.003)*	(0.003)*	(0.00)	(0.003)*	(0.003)*	(0.003)*
Years of schooling	-0.01		-0.009	-0.01	-0.01	-0.005	0.003		0.003	0.003	0.003	0.001
	(0.005)*		(0.01)	(0.005)*	(0.005)*	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
For partner X What is your age?	-0.004	-0.003	-0.002	0	-0.002	-0.001	0.001	0	0	-0.001	-0.001	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
For partner X Age squared (1000s)	0.064	0.048	0.02	0.00	0.031	0.015	-0.011	0.003	0.01	0.016	0.017	0.027
	(0.08)	(0.08)	(0.07)	(0.08)	(0.07)	(0.08)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
For partner X Male (0-1 indicator)	-0.007	-0.008	-0.005	-0.005	-0.003	-0.003	-0.013	-0.012	-0.015	-0.015	-0.012	-0.013
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
For partner X Married (0-1 indicator)	0.005	0.003	0.007	0.008	0.004	0.005	0.006	0.007	0.004	0.005	0.005	0.004
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
For partner X Number of siblings	-0.008	-0.008	-0.008	-0.008	-0.007	-0.008	0	0	0	0	0	0
	(0.003)**	(0.002)***	(0.003)**	(0.003)**	(0.003)**	(0.003)**	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
For partner X Years of schooling	0.002		0.002	0.002	0.002	0.001	-0.002		-0.002	-0.002	-0.002	-0.001
	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Percent correct responses to Raven's Test questions		-0.208				-0.156		0.056				0.04
		(0.082)**				(0.085)*		(0.028)*				(0.02)
For partner X Percent correct responses to Raven's Test questions		0.053				0.032		-0.041				-0.029
		(0.04)				(0.04)		(0.019)*				(0.015)*
Make weekly/monthly budget (0-1 indicator)			0.068			0.076			-0.022			-0.026
			(0.05)			(0.05)			(0.010)*			(0.012)*
For partner X Make weekly/monthly budget (0-1 indicator)			0.006			0.011			-0.009			-0.009
			(0.02)			(0.02)			(0.01)			(0.005)*
Do you belong to any savings groups?				0.008		-0.013				-0.009		-0.003
				(0.03)		(0.03)				(0.01)		(0.01)
For partner X Do you belong to any savings groups?				-0.015		-0.015				0.008		0.009
				(0.02)		(0.02)				(0.01)		(0.01)
Agree (1 to 10): Regret spending, wish saved.					0.003	0.003					-0.002	-0.002
					(0.01)	(0.01)					(0.001)*	(0.00)
					0.002	0.002					0.001	0.002
					-0.003	-0.003					-0.001	-0.001
Observations	2807	2807	2776	2760	2776	2744	340	340	337	335	337	333
R-Squared	0.12	0.13	0.14	0.13	0.13	0.16	0.12	0.13	0.16	0.14	0.13	0.19
Mean of dependent variable	0.82	0.82	0.82	0.82	0.82	0.82	0.03	0.03	0.03	0.03	0.03	0.03

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: The table show the results from a regression of the discount factor, estimated at the question level, or the ML estimate of the discount parameter at the individual level in the individual and partner condition on individual characteristics and these characteristics interacted with an indicator for the partner choice condition. Standard errors clustered at the session level.

Table 7: Correlates of Discount Parameters for Self and Partner (II)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Discount factor chosen by self			Discount factor chosen for partner			Discount factor chosen by self		
Have met partner before (0-1 indicator)	0.125			0.097			0.116		
	(0.0556)**			(0.0484)*			(0.0509)*		
Number times talked or visited in last 30 days		0.003			0.002			0.003	
		(0.0011)**			(0.0010)**			(0.0015)	
Ever given or received financial assistance?			0.064			0.053			0.07
			(0.05)			(0.05)			(0.04)
Observations	1404	1404	1404	1403	1403	1403	479	479	479
R-Squared	0.07	0.06	0.01	0.05	0.05	0.01	0.05	0.11	0.02
Mean of dependent variable	0.81	0.81	0.81	0.83	0.83	0.83	0.83	0.83	0.83
	Hyperbolic discount parameter chosen by self			Hyperbolic discount parameter chosen for partner			Hyperbolic discount parameter chosen by self		
Have met partner before (0-1 indicator)	-0.0337			-0.0234			-0.0193		
	(0.0202)			(0.0121)*			(0.0129)		
Number times talked or visited in last 30 days		-0.0007			-0.0006			-0.0006	
		(0.0004)*	(0.01)		(0.0003)**			(0.0003)	
Ever given or received financial assistance?			0.02			-0.0199			-0.0126
			(0.0145)			(0.0110)*			(0.0130)
Observations	170	170	170	170	170	170	59	59	59
R-Squared	0.09	0.06	0.01	0.05	0.05	0.02	0.02	0.07	0.01
Mean of dependent variable	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: The top panel shows a regression of discount factors estimated at the question level for choices taken by an individual for themselves or choices taken for their partner on characteristics of the relationship between the individual and their partner. The lower panel shows the results of a regression of the hyperbolic discount parameter estimated for an individual based on the choices them made in the individual choice condition or in the partner choice condition on characteristics of the relationship between the individual and thier partner. The final 3 columns replicate the analysis from the first 3 columns using only data where the individual's choices for themselves were made before they had knowledge of who their partner was. Standard errors clustered at the session level.

Table 8: Determinates of Distance from Partners Own Choice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Difference in discount factor: self - partner				Absolute value differnce in discount factor: self - partner			
Have met partner before (0-1 indicator)	0.03			0.02	-0.02			-0.03
	(0.0151)*			(0.01)	(0.03)			(0.05)
Number times talked or visited in last 30 days		0.00				-0.001		
		(0.00)				(0.001)		
Ever given or received financial assistance?			0.01				0.02	
			(0.02)				(0.04)	
Group 2 choices preceeded partner choices				-0.01				-0.06
				(0.03)				(0.06)
Group 2 choices preceeded partner choices X Know partner				0.02				0.01
				(0.03)				(0.05)
Observations	1399	1399	1399	1399	1399	1399	1399	1399
R-Squared	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Mean of dependent variable	-0.02	-0.02	-0.02	-0.02	0.11	0.11	0.11	0.11
	Self - partner hyperbolic discount parameter				Absolute value: self - partner hyperbolic discount parameter			
Have met partner before (0-1 indicator)	-0.0095			-0.0048	-0.0278			-0.0200
	(0.01)			(0.01)	(0.0089)***			(0.01)
Number times talked or visited in last 30 days		-0.0001				-0.0005		
		(0.00)				(0.0001)***		
Notes: The top panel of the table shows the percentage of ques			0.0038				-0.0029	
			(0.01)				(0.01)	
				0.0133				0.0058
				(0.02)				(0.02)
Group 2 choices preceeded partner choices X Know partner				-0.0093				-0.0177
				(0.02)				(0.02)
Observations	164	164	164	164	164	164	164	164
R-Squared	0.01	0.00	0.00	0.01	0.07	0.03	0.00	0.08
Mean of dependent variabl	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: The top panel shows a regression of the difference and the absolute value of the difference in the discount factor, estimated at the question level, implied by the choice individuals make for themselves and the choice their partner made for them on charisteristics of the relationship between partners. The lower panel shows the results of a regression of the difference and the absolute value of the difference in the hyperbolic discount parameter estimated for an individual based on the choices them made for themselves and the estimated discount parameter based on choices their partner made for them on characteristics of their relationship. Standard errors clustered at the session level.

Table A1: Percent of Choice Correctly Predicted by Model

Model	Individual	Partner	Group_2	Group_4
% choice correct (exponential)	0.67	0.66	0.67	0.70
% choice correct (hyperbolic)	0.69	0.67	0.68	0.72

Notes: Table shows the percent of choices correctly predicted for each discount function model and each choice condition. To calculate the percent correctly predicted, a predicted choice was constructed by calculating the present value of the sooner smaller payment and the larger later payment using the individual or group's estimated discount parameter (according to the indicated model). The predicted choice was whichever offered the highest present-discounted value. Percent correct is the percent of predicted choices which match actual choices.

Table A2: Effect of Choice Condition on Discount Parameters Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Midpopint 1 week discount factor, delayed choice	Midpopint 4 week discount factor, delayed choice	Midpopint 1 week discount factor, immediate choice	Midpopint 4 week discount factor, immediate choice	Weekly discount factor (midpoint)	Weekly discount factor (midpoint)	Weekly discount factor (midpoint)
				Panel A			
Two person group condition	-0.004	0.031	0.029	0.023	0.02	0.025	0.015
	(0.02)	(0.016)*	(0.02)	(0.01)	(0.01)	(0.013)*	(0.01)
Four persons group condition	0.018	0.037	0.044	0.041	0.035	0.043	0.028
	(0.02)	(0.017)**	(0.019)**	(0.017)**	(0.013)**	(0.016)**	(0.013)**
Partner condition	0.015	0.019	0.015	0.032	0.02	0.023	0.017
	(0.01)	(0.02)	(0.01)	(0.014)**	(0.009)*	(0.010)**	(0.01)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.7	0.68	0.67	0.72	0.59	0.6	0.59
				Panel B			
Two person group condition	-0.005	0.032	0.029	0.02	0.02	0.025	0.015
	(0.01)	(0.015)*	(0.02)	(0.012)*	(0.01)	(0.012)*	(0.01)
Four persons group condition	0.017	0.037	-0.006	0.04	0.034	0.041	0.028
	(0.02)	(0.015)**	(0.019)**	(0.016)**	(0.013)**	(0.016)**	(0.012)**
Partner condition	0.015	0.02	0.015	0.033	0.021	0.024	0.017
	(0.01)	(0.01)	(0.01)	(0.013)**	(0.009)**	(0.009)**	(0.01)
				Panel C			
Two person group condition	-0.004	0.031	0.029	0.023	0.02	0.025	0.014
	(0.02)	(0.016)*	(0.02)	(0.01)	(0.01)	(0.013)*	(0.01)
Four persons group condition	0.018	0.037	0.044	0.041	0.035	0.043	0.028
	(0.02)	(0.017)**	(0.019)**	(0.017)**	(0.013)**	(0.016)**	(0.013)*
Partner condition	0.014	0.019	0.015	0.032	0.02	0.024	0.017
	(0.01)	(0.02)	(0.01)	(0.014)**	(0.009)*	(0.010)**	(0.01)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
				Panel D			
Two person group condition	0.004	0.059	0.057	0.032	0.021	0.031	0.014
	(0.02)	(0.010)***	(0.020)**	(0.012)**	(0.011)*	(0.011)**	(0.01)
Four persons group condition	0.025	0.066	0.054	0.053	0.036	0.048	0.026
	(0.02)	(0.012)***	(0.021)**	(0.015)***	(0.011)***	(0.012)***	(0.011)**
Partner condition	0.006	0.038	0.021	0.038	0.016	0.024	0.01
	(0.01)	(0.013)**	(0.02)	(0.018)*	(0.01)	(0.01)	(0.01)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question Order Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1401	1398	1401	1403	5603	2804	2799
R-Squared	0.73	0.7	0.71	0.74	0.67	0.69	0.69
Mean of dependent variabl	0.77	0.84	0.77	0.84	0.83	0.83	0.83

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: The table show the results from a regression of the discount factor, estimated at the question level, on indicators for choice condition and various fixed effects. Column 6 is restricted to immediate choices, column 7 is restricted to delayed choices. Standard errors clustered at the session level.

Table A3: Effect of Choice Condition on Discount Parameters, By Partner Relationship

	Midpopint 1 week discount factor, delayed choice (1)	Midpopint 4 week discount factor, delayed choice (2)	Midpopint 1 week discount factor, immediate choice (3)	Midpopint 4 week discount factor, immediate choice (4)	Weekly discount factor (midpoint) (5)	Weekly discount factor (midpoint) (6)	Weekly discount factor (midpoint) (7)	MLE Exponential Discount Factor (8)	MLE Hyperbolic Discount Rate (9)
Restricted to individuals who don't know their partner									
Partner condition	0.016	0.044	0.03	0.052	0.036	0.042	0.031	0.037	-0.015
	(0.02)	(0.021)*	(0.02)	(0.027)*	(0.015)**	(0.015)**	(0.017)*	(0.019)*	(0.01)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Observations	311	308	311	312	1242	623	619	5760	5760
R-Squared	0.81	0.77	0.81	0.78	0.66	0.68	0.67	0.02	0.01
Mean of dependent variable	0.7	0.77	0.69	0.77	0.76	0.76	0.76	0.96	0.04
Restricted to individuals who know their partner									
Partner condition	0.014	0.001	-0.006	0.017	0.008	0.009	0.007	0.022	-0.001
	(0.01)	(0.02)	-0.014	(0.009)*	(0.01)	(0.01)	(0.01)	(0.012)*	(0.00)
Individual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Observations	392	390	392	391	1565	783	782	7520	7520
R-Squared	0.83	0.8	0.78	0.78	0.65	0.64	0.7	0.01	0
Mean of dependent variable	0.83	0.87	0.82	0.006	0.87	0.87	0.87	0.98	0.01

* Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level

Notes: Colums 1-7 show the results from a regression of the discount factor, estimated at the question level, on indicators for choice condition. Column 6 is restricted to immediate choices, column 7 is restricted to delayed choices. Columns 8 and 9 show the results from regressions of the MLE discount parameters, estimated at the group or individual level, on the choice condition indicators. The highest 1 percent of observations, ranked by estimated discount parameter, are omitted in columns 8 and 9. Standard errors clustered at the session level.