Doing it Now or Later with Payoff Externalities: Experimental Evidence on Social Time Preferences

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Abstract

We report experimental evidence on the effects of social preferences on intertemporal decisions. To this aim, we set up an intertemporal Dictator Game and investigate whether (and how) subjects change their choices, compared with those they had taken in absence of any payoff externality in a previous stage of the experiment. We run two treatments -INFO and BELIEF, respectively- depending on whether Dictators know -or are asked to elicit- their assigned Recipients' risk and time preferences. We find that high (own) risk aversion is associated with low (own) discounting. We also find that (heterogeneous) social time preferences are significant determinants of choices, in that Dictators display a marked propensity to account for the Recipients' intertemporal concerns.

Keywords: intertemporal decisions, time preferences, social preferences.

JEL classification numbers: C91, D70, D81, D91.

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"At the first time of sexual union the passion of the male is intense, and his time is short [...]

With the female, however, it is the contrary, for at the first time her passion is weak, and then her time long [...]

If a male be a long-timed, the female loves him the more, but if he be short-timed, she is dissatisfied with him."

"The Kama Sutra of Vatsyayana" - Burton *et al.* [16]

1   Introduction

In their infuential article *Doing it now or later*, O'Donoghue and Rabin [46] show (in a very elegant manner) that subjects' incentives to undertake or delay a particular action could be affected by i) their perception about their future behavior and ii) the existence of immediate-cost or immediate-rewards. The aim of our paper is to provide clean evidence on *the effects of social preferences on intertemporal decisions*. More in detail, we are interested in better understanding how much and in which direction individuals' preferences for anticipating or delaying an action could be affected by the existence of payoff externalities on others.

Real-life examples abound where concerns for others may affect our incentives to follow exclusively our own time preferences in adopting the timing of a specific action. Couples living together can surely confirm that that is the case when they choose to buy a car, sell a house, or think about being in a pension plan. In Economics, it is well documented (see, e.g., Abdellaoui *et al.* [1], Browning [14], Mazzocco [44], [45]) that "family" household saving patterns may strongly differ from "single" household saving patterns, even after controlling for individual characteristics (e.g., own risk aversion, or discounting) of household members. Along similar lines, policy makers could have a theoretical *a priori*, and also personal or political preferences, about the best timing to implement a particular policy (e.g., tax reductions or public investment during a crisis). But what crucially matters, in terms of effectiveness of a policy, is the way it affects people expectations and behavior, according to their intertemporal preferences (which have an impact on the life path distribution of consumption and savings, or on the income distribution between present and future generations). These considerations are topical in the current debate regarding European governments' impatience in reducing public debts, as policymakers may account for citizens' intertemporal preferences.[1]

As these examples illustrate, *social* (i.e., interpersonal) concerns may affect the timing of choices: decision makers may try to accommodate others' intertemporal concerns, when decisions affect the latter's prospects

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[1]This, in turn, calls for a balanced compromise to accommodate short-term and long-term goals related with growth and employment. Following Paul Krugman [42]: *"Every time you hear some talking head declare that we have a long-term problem that can't be solved with short-term fixes, you should know that while he may think he sounds wise, he's actually being both cruel and foolish"*.

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and welfare. Clearly, these examples lead to a broader concept of social preferences, compared with its current usage in the flourishing -mainly experimental- literature on these matters, where social preferences are usually restricted to people's interest on *"the fairness of their own material payoff relative to the payoff of others..."* (Fehr and Schmidt [28], p. 819). In contrast with this literature, concerns for others may not only involve others' *material consequences* (e.g., monetary outcomes, consumption bundles), but also others' *concerns and inclinations* (e.g., risk aversion, or discounting). This, in turn, calls for modeling social preferences *as mapped directly on others' individual utilities* (Di Cagno *et al.* [25]).

This modeling approach -basically- frames subjects' behavior as maximizing *a social welfare function*, which requires an operational solution of the delicate issue of interpersonal comparison of utilities (which is, probably, the reason why the mainstream literature on social preferences has always preferred to model utility as defined over the physical outcome space). The empirical literature we just cited -take, e.g. Mazzocco [45], eq. (3)- posits that households maximize a linear combination of the individual ("selfish") utilities of their members, which are assumed to be derived as different parametrizations -depending on individual characteristics- of the same functional, with Pareto weights interpreted as proxies of each member's bargaining power within the household.[2]

Along these lines, we run a controlled-laboratory experiment to investigate the connection between social and time preferences by way of Multiple Price Lotteries (MPLs, see Holt and Laury [38], [39]). Because time and risk preferences are interwined, we follow Coller *et al.* [22] by eliciting (own) risk and time preferences by way of separate tasks in the first two stages of the experiment. As for time preferences, subjects are asked to choose between an immediate-smaller reward and an increasing later-larger reward (see, among others, Anderson *et al.* [3] [4], Harrison *et al.* [34], Sutter *et al.* [51]). The novelty of our approach relies on incorporating a *social dimension* to this protocol. Thus, once subjects have completed these two stages, we match them in pairs and assign the roles of Dictators and Recipients. Then, Dictators go through, once again, the same sequence of intertemporal decisions knowing that, this time, their choices will also be implemented for their assigned Recipient.[3] Our experimental design is built around the structural estimation exercise of Section 3.2, in which subjects' behavior is framed by way of a convex linear combination between the individual utilities of the Dictator and the Recipient. By contrast with the Applied Microeconomic literature cited earlier, here Pareto weights reflect the Dictator's concern about the Recipient's risk aversion and discounting in her objective function. In this respect, experimental methods may prove to be very effective

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[2]A similar argument is applied in Rodriguez-Lara [49] to *social time preferences*, in a simple model that expands upon the original idea of O'Donoghue and Rabin [46].

[3]Also Recipients go through the same sequence of decisions, although it is made clear that Recipients' decisions have no monetary consequences on either party.

in the identification of the (within-subject) "selfish" risk and time concerns' estimation by manipulating subjects' incentive structure in the various stages of the experiment.

Subjects' information on others' risk and time preferences defines our treatment conditions. In one of the two treatments (INFO), Dictators make their choices after being informed of what their associated partner had chosen in the first two stages of the experiment. In the alternative condition (BELIEF), before deciding for the pair, subjects go through an additional stage in which we elicit their beliefs on their associated partners' risk and time preferences.[4]

1.1 Literature review

The main scope of our research is to study the impact of social preferences on intertemporal choices. This consideration notwithstanding, our methodology is closely related with the emerging literature that applies experimental methods to study the links between risk and time preferences (e.g., Andreoni and Sprenger [9], [10], Halevy [33]).[5] A noteworthy contribution in this field is the work of Andersen *et al.* [3], where it is shown that it is crucial to control for the curvature of the utility function when eliciting discount rates (see also Frederik *et al.* [31]). These authors use a *Double Multiple Price List* approach to elicit risk and time preferences *separately* -that is, with two independent tasks: one MPL over lotteries paid off at the time of the experiment, another intertemporal MPL of certain monetary payoffs paid off at different points in time. We follow this procesure as in Andersen *et al.* [2], [4], Harrison *et al.* [34], Cheung [20], Coller *et al.* [22], and Sutter *et al.* [51].[6]

Andreoni and Sprenger [10], instead, apply a more sophisticated identification strategy between risk and time preferences, where the allocation of a budget of tokens between "sooner" or "later", involve *always* risky prospects (i.e., subjects face two lotteries that reward at different points in time). With this design, the null hypothesis of risk neutrality is also rejected. Other methods to elicit time preferences are presented in Benhabib *et al.* [12], where subjects are asked to elicit *intertemporal equivalents*, i.e., the amount of money that received today (in the future) that would make them indifferent to some amount paid in the future (today) or Laury *et al.* [43], where the elicitation of risk preferences does not require any assumption

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[4] We elicit all subjects' beliefs in Phase 3, with Dictators and Recipients roles being publicly revealed after beliefs are elicited.

[5] In the field, there exists some articles that elicit risk and time preferences to see their predictive power on individual achievement or economic outcomes (e.g., Cardenas and Carpenter [18], Sutter *et al.* [51], Tanaka *et al.* [52]).

[6] Importantly, most of the experimental literature that elicit time preferences assumes risk neutrality in payoffs (e.g., Coller and Williams [21], Tanaka *et al.* [52]). We use the Double Multiple Price List approach to elicit risk and time preferences separtately. As suggested by Andreoni et al. (2013), this is a succesful elicitation tool that should perform as well as the convex-budget set method (Andreoni and Sprenger [9], [10]).

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on the form of the utility function. Along similar lines, we mention here an emerging literature that, by way of joint elicitation of risk and social preferences, claims that the empirical content of the latter may be severely reduced in economic environments which are also characterized by the presence of some (strategic, or environmental) uncertainty (Winter *et al.* [53],[54], Cabrales *et al.* [17] and Frignani and Ponti [32]).[7]

To the best of our knowledge, our paper is the first one that directly elicit discount rates in a model of social preferences. The only related precedents we are aware of are the papers of Phelps and Pollack [48] and Kovarik [41]. Phelps and Pollack [48] propose an intergenerational model in which each generation cares about the consumption of future generations, which is discounted in a non-linear manner. Kovarik [41] collects evidence on the relationship between altruism and discounting, showing that donations in a Dictator Game decrease as the moment for receiving payments is delayed. This contradicts standard theories of time preferences, including exponential and hyperbolic discounting.

Last, but not least, given that our estimation strategy involves the joint elicitation of risk, time and social preferences by way of separate experimental tasks, our findings are to be compared with those of some recent papers whose aim is to establish empirical correlations among these -among others- behavioral traits. In this respect, our finding are consistent with those of Sutter *et al.* [51], in that *subjects with a comparatively lower degree of risk aversion discount the future significantly more* (see also Burks *et al.* [15], Dean and Ortoleva's [24]). Because our debriefing questionnaire collects a wide variety of individual characteristics, we can also establish a positive correlation between the willingness to accept the delayed payment and the score in the cognitive skills, as also reported by Anderson *et al.* [5] or Burks *et al.* [15].

1.2 Flight plan

The remainder of this paper is arranged as follows. In Section 2 we describe our experimental design, whereas Section 3 reports our empirical findings. First, Section 3.1 reports some descriptive statistics summarizing subjects' behavior in the various stages of the experiment. Here we find, consistently with Sutter *et al.* [51] and Dean and Ortoleva [24], that individual (own) risk and time preferences are highly correlated, in that risk averse subjects are also more patient. Data from our BELIEF treatment also show that subjects believe that the others are less risk averse and more patient than themselves (Eckel and Grossman [26], Hsee and Weber [40]). Finally, we also show that Dictators' intertemporal choices significantly move in the direction of their matched Recipients when they have to decide on their behalf.

This preliminary evidence supporting the empirical content of "social time preferences" is further inves-

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[7]Andersson et al. [6], [7] or Chakravarty *et al.* [19] are recent examples on the investigation of social preferences in the risk dimension.

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tigated by way of the structural estimation exercise of Section 3.2. Here we frame subjects' choices within the realm of random utility maximization problem, whose parameters are estimated by maximum likelihood using standard techniques. Our estimation excercise is applied to *i)* individual decisions (and elicited beliefs) of Stages 1 to 3, as well as *ii)* Dictators' intertemporal choices of Stage 4. As for the former, our evidence is consistent with previous findings in that our subjects exhibit, on average, (Constant Relative) Risk aversion (Holt and Laury [38], Hey and Orme [37]) and non-exponential discounting (Coller *et al.* [22], Benhabib *et al.* [12]). In addition, we also find (consistently with Dean and Ortoleva [24] and Burks *et al.* [15]) that risk averse subjects discount the future significantly less and that subjects' beliefs under(over)estimate the average population RA (discounting), respectively. In addition, our structural estimates confirm the empirical content of social time preferences, as the estimated Pareto weight is positive and highly significant.

Finally, Section 4 concludes, followed by Appendices containing information on the identification strategy, the experimental instructions, the debriefing questionnaire and supplementary experimental evidence.

2 Experimental design

2.1 Sessions

Four experimental sessions were run at the Laboratory for Research in Experimental Economics (LINEEX), at the Universidad de Valencia. A total of 192 subjects (48 per session) were recruited within the undergraduate population of the University. The experimental sessions were computerized. Instructions were read aloud and we let subjects ask about any doubt they may have had. All sessions concluded with a debriefing questionnaire to distill subjects' individual socio-demographics and social attitudes.[8] Each session lasted, on average, 1 hour and 40 minutes.

2.2 Treatments

Our subject pool is equally split among two treatment conditions: INFO and BELIEF. Stages 1 and 2, common to both treatments, are used to elicit individual (own) risk and time preferences, respectively. After Stage 2, participants are randomly paired. In the BELIEF treatment, subjects face an additional stage (Stage 3) in which we elicit their beliefs on (own) risk and time preferences of their assigned groupmate. Then, in Stage 4 (common to both treatments), we assign a Dictator and a Recipient for each pair, and let

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[8]The experiment was programmed and conducted with the software z-Tree (Fischbacher [29]). Translated versions of the instructions and the debriefing questionnaire can be found in Appendix B.

all subjects go through the same sequence of decisions of Stage 2. Now it is publicly known that, within each pair, only the Dictator's decision is binding.

2.3 Stage 1. Own risk preference elicitation

We elicit subjects' individual risk preferences by way of a MPL in which subjects face the ordered array of binary lotteries shown in Figure 1.

Fase 1 - Elige una opción (A o B) para cada par.

DECISION 1:	A: 0% de 100 euros, 100% de 80 euros ☐	B: 0% de 190 euros, 100% de 5 euros ☐
DECISION 2:	A: 10% de 100 euros, 90% de 80 euros ☐	B: 10% de 190 euros, 90% de 5 euros ☐
DECISION 3:	A: 20% de 100 euros, 80% de 80 euros ☐	B: 20% de 190 euros, 80% de 5 euros ☐
DECISION 4:	A: 30% de 100 euros, 70% de 80 euros ☐	B: 30% de 190 euros, 70% de 5 euros ☐
DECISION 5:	A: 40% de 100 euros, 60% de 80 euros ☐	B: 40% de 190 euros, 60% de 5 euros ☐
DECISION 6:	A: 50% de 100 euros, 50% de 80 euros ☐	B: 50% de 190 euros, 50% de 5 euros ☐
DECISION 7:	A: 60% de 100 euros, 40% de 80 euros ☐	B: 60% de 190 euros, 40% de 5 euros ☐
DECISION 8:	A: 70% de 100 euros, 30% de 80 euros ☐	B: 70% de 190 euros, 30% de 5 euros ☐
DECISION 9:	A: 80% de 100 euros, 20% de 80 euros ☐	B: 80% de 190 euros, 20% de 5 euros ☐
DECISION 10:	A: 90% de 100 euros, 10% de 80 euros ☐	B: 90% de 190 euros, 10% de 5 euros ☐
DECISION 11:	A: 100% de 100 euros, 0% de 80 euros ☐	B: 100% de 190 euros, 0% de 5 euros ☐

Fig. 1. Stage 1 user interface

As Figure 1 shows, subjects face a sequence of 11 binary lotteries, one for each row. The entire sequence is characterized by the fact that the "risky" option (B) is increasingly more profitable, as the probability of the best payoff (€ 190, in our parametrization) grows in probability, and so is falling the expected payoff difference between A and B. In decision 1 (11) lotteries are degenerate, giving probability 1 to the lower (larger) prize for lottery A and B, respectively. This allows us to check for the overall consistency of subjects' decisions. In particular, subjects should choose option A (B) in decision 1 (11), respectively, switching only

once along the sequence.[9] A risk-neutral subject should be switching from option A to B in row 6, when the expected payoff difference between option A and option B goes negative. The latter the switching point, the more risk averse the subject is.

2.4 Stage 2. Individual time preference elicitation

MPLs are also used to elicit time preferences. Subjects go through 10 rounds of MPLs, each of which characterized by a specific time delay, τ, ranging from 1 to 180 days. For each MPL, τ, subjects face 20 binary choices, k, and choose between receiving € 100 in the day of the experiment (hereafter "today") and € $100\left((1 + \frac{i_k}{365})^\tau\right)$ in τ days, where the Annual Interest Rate (AIR), i_k, constant across rounds, τ, varies from 2% to 300%. Figure 2 reports the user interface of the MPL corresponding to a delay of 90 days.[10]

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[9]Following the original design of Holt and Laury [38], [39], subjects are allowed to switch back for option A before choosing option B. We discuss this feature of our design in Section 3.1.3.

[10]Contrary to other studies (e.g., Anderson *et al.* [3] [4], Coller and Williams [21], Coller *et al.* [22]) the AIR is not shown to subjects in the user interface. Another important difference with respect to these papers is that subjects do not make a unique intertemporal decision (with different delays presented to different subjects), but instead *all* subjects went through a sequence of 10 intertemporal decisions. This is the procedure in Tanaka *et al.* [52] or Sutter *et al.* [51], among others. The interested reader can see the full set of MPLs of Phase 2 in Appendix C.

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Fase 2 - Ronda 8: 90 días.

DECISION 1:      A: 100.00 euros hoy.  ☐      B: 100.49 euros dentro de 90 dias.  ☐
DECISION 2:      A: 100.00 euros hoy.  ☐      B: 100.74 euros dentro de 90 dias.  ☐
DECISION 3:      A: 100.00 euros hoy.  ☐      B: 100.99 euros dentro de 90 dias.  ☐
DECISION 4:      A: 100.00 euros hoy.  ☐      B: 101.24 euros dentro de 90 dias.  ☐
DECISION 5:      A: 100.00 euros hoy.  ☐      B: 101.87 euros dentro de 90 dias.  ☐
DECISION 6:      A: 100.00 euros hoy.  ☐      B: 102.50 euros dentro de 90 dias.  ☐
DECISION 7:      A: 100.00 euros hoy.  ☐      B: 103.13 euros dentro de 90 dias.  ☐
DECISION 8:      A: 100.00 euros hoy.  ☐      B: 103.77 euros dentro de 90 dias.  ☐
DECISION 9:      A: 100.00 euros hoy.  ☐      B: 104.41 euros dentro de 90 dias.  ☐
DECISION 10:     A: 100.00 euros hoy.  ☐      B: 105.05 euros dentro de 90 dias.  ☐
DECISION 11:     A: 100.00 euros hoy.  ☐      B: 106.36 euros dentro de 90 dias.  ☐
DECISION 12:     A: 100.00 euros hoy.  ☐      B: 109.01 euros dentro de 90 dias.  ☐
DECISION 13:     A: 100.00 euros hoy.  ☐      B: 113.11 euros dentro de 90 dias.  ☐
DECISION 14:     A: 100.00 euros hoy.  ☐      B: 120.29 euros dentro de 90 dias.  ☐
DECISION 15:     A: 100.00 euros hoy.  ☐      B: 127.92 euros dentro de 90 dias.  ☐
DECISION 16:     A: 100.00 euros hoy.  ☐      B: 136.03 euros dentro de 90 dias.  ☐
DECISION 17:     A: 100.00 euros hoy.  ☐      B: 144.64 euros dentro de 90 dias.  ☐
DECISION 18:     A: 100.00 euros hoy.  ☐      B: 163.53 euros dentro de 90 dias.  ☐
DECISION 19:     A: 100.00 euros hoy.  ☐      B: 184.84 euros dentro de 90 dias.  ☐
DECISION 20:     A: 100.00 euros hoy.  ☐      B: 208.90 euros dentro de 90 dias.  ☐
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Fig. 2. Stage 2 user interface

Contrary to what happens in Stage 1, subjects make only one decision for MPL, in that they are simply asked to indicate their "switching point" (if any) from option A (€ 100 "today") to option B € $\left(100\left((1+y_k)^{\frac{\tau}{365}}\right.\right.$) in τ days). In other words, time consistency within each MPL (but not across MPLs) is artificially imposed by our experimental design.

2.5   Stage 3. Belief elicitation (BELIEF only)

As we explained earlier, at the end of Stage 2 subjects are randomly matched in pairs. As for the BELIEF treatment, all subjects are asked to predict their matched partner's decisions in Stages 1 and 2. Subjects' predictions are incentivized, as detailed in Section 2.7.

2.6   Stage 4. Social time preference elicitation

In Stage 4, for each pair, subjects are assigned the role of Dictator or Recipient. Then, both Dictators and Recipients go -once again- through the same sequence of MPLs as in Stage 2, with the only difference that,

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now, Dictators' choices are also implemented for their assigned Recipient.

The matching protocol and the information available at the time of decision depends on the treatment.

- In the INFO treatment we use data from Stage 2 to compute the average switching point per subject across all 10 decision rounds, τ, where average switching point is taken as a proxy of individual discounting (the higher the switching point, the lower the discounting). We then match the most patient subject with the most impatient, the second most patient with the second most impatient, and so on. This design features makes that Dictators are the most patient in half of the couples, to provide sufficient dispersion/variability in the data. This design choice minimizes the possibility of matching subjects with very similar time preferences, thus making social preferences very hard to identify.

- In the BELIEF treatment matching is completely random.

As for information available in Stage 4, all subjects are reminded about their own choices in Stages 1 and 2. In the INFO treatment, they are also informed about their partner's choices in Stages 1 and 2; in the BELIEF treatment they are reminded about their own predictions. Figure 3 reports Stage 4 user interface (treatment BELIEF, $\tau = 90$ days).

Fig. 3. Stage 4 user interface

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As Figure 3 shows, the top (bottom) screen provides information about lottery (intertemporal) choices, for both the deciding subject -"Jugador A"- and her assigned partner, where the information about the latter refers to the recipient's actual choice (or the dictator's elicited belief, Creencias) depending on the treatment (INFO or BELIEF, respectively). Dictators make their choice for both subjects choosing a switching point in the column "Ambos".

2.7   Financial rewards

Subjects receive € 10 just to show up. For the payment of Stages 1 and 2, we use a random lottery incentive procedure by which one choice (i.e., one row) is paid out, by implementing the selected lottery (Stage 1) or intertemporal choice (Stage 2). By analogy, in Stage 3 we randomly pick one row of Stage 1 MPL *or* one delay (out of 10) of Stage 2. A prize of € 100 is paid in case of a correct prediction, with no prize otherwise.[11] Finally, the payment of Stage 4 follows the same payment protocol as in Stage 2. One couple and one time decision is selected at random and both, the Dictator and the Recipient, are paid according to the Dictator's choice.

All choices are paid at the end of the experiment, when we randomly select 2 subjects per stage for the payment of a randomly selected decision.[12] Thus, a total of 12 subjects (16 subjects) receive additional payments associated with their choices in the INFO (BELIEF) sessions, respectively.

The show-up fee and the decisions for Stages 1 and 3 are paid in cash at the end of the experiment. By contrast, we take extreme care with the payment of Stages 2 and 4, as we are concerned with the transaction costs associated with receiving delayed payments (including physical costs and payment risk).[13] To make all choices equivalent except for the timing dimension, all payments are made by way of a bank transfer to the subjects' account. This is to minimize transaction costs and equalize them across periods, including payments for subjects who opt for the payment "today".[14]

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[11] This, in turn, implies that our protocol to elicit beliefs is indepedent of risk aversion (see Andersen et al. [?])

[12] Although this method yields a compound lottery over the various phase decisions, there exists substantial evidence showing that this does not create a response bias (see, among others, Starmer and Sugden [50], Cubitt *et al.* [23] and Hey and Lee [36]).

[13] This is a major aspect in all experiments that elicit time preferences, as discussed in Coller *et al.* [22], Dean and Ortoleva [24] or Andreoni and Sprenger [9], among others.

[14] We run all sessions at 10 a.m. to ensure that subjects could receive the bank transfer the day of the experiment in the case this was selected for payment. To control for credibility in the payment method, we add a formal legal contract between the legal representative of the laboratory (LINEEX) and the subjects who were selected for payment. This contract is privately received by the subjects in an envelop and includes a formal statement on a 20% compensation if payments do not take place at the stated date, as agreed.

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3 Results

Section 3.1 provides summary statistics of our behavioral data, stage by stage, while in Section 3.2 we perform a structural estimation exercise, where our subjects' risk, time and social concerns are framed within the realm of a parametric welfare function consisting in the convex linear combination between the Dictator's and the Recipient's "selfish" utilities. As we shall see, both sections unambiguously show that *i)* our subject pool displays a marked (between-subject) heterogeneity across all dimensions, *ii)* some of these dimensions are highly correlated and *iii)* social time preferences are empirically relevant choice determinants.

3.1 Descriptive statistics

3.1.1 Risk preferences

Figure 4 plots the relative frequencies of subjects selecting Option A across all 11 lotteries in Stage 1 and Stage 3 (treatment BELIEF). Figure 4 also reports optimal choices under Risk Neutrality (RN), which correspond to the lottery with the highest expected value (i.e., Option A in the first 5 decisions and Option B thereafter).
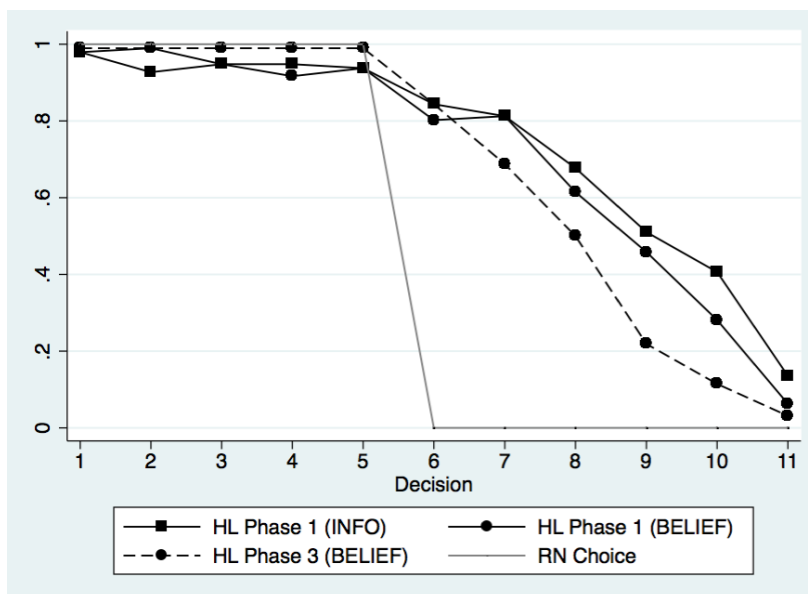
Fig. 4. Aggregate behavior in the lottery tasks

As Figure 4 shows, subjects display, on average, risk aversion, in that switching to Option B occurs at a

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slower pace, compared with the RN benchmark (p-values$<1/10,000$).[15] We also do not detect (as expected) significant treatment conditions (p-value$=0.1314$), while we see that subjects' beliefs underestimate aggregate risk aversion, as forecasts assign a lower frequency of risky choices in later lotteries (p-value$<1/1,000$). In this respect, our evidence is in line with previous findings suggesting that experimental subjects are risk averse (see, among others, Holt and Laury [38] and Harrison and Rustrom [35]) and believe themselves to be more risk averse than their peers (Eckel and Grossman [26], Hsee and Weber [40]).

3.1.2 Time preferences

Remember that, for each of the 10 delays, subjects select the amount of money that they would need to receive (if any) in the future against the possibility of receiving an immediate bank transfer of € 100. Figure 5 summarizes subjects' behavior in Stages 2 and 4, together with beliefs in Stage 3 (treatment BELIEF). In the horizontal axis we represent the delay in the payment (ranging from 1 day to 180 days). In the vertical axis, we report the subject pool's "average switching point", that is, the first choice for which subjects express their preference for the delayed payment.[16]
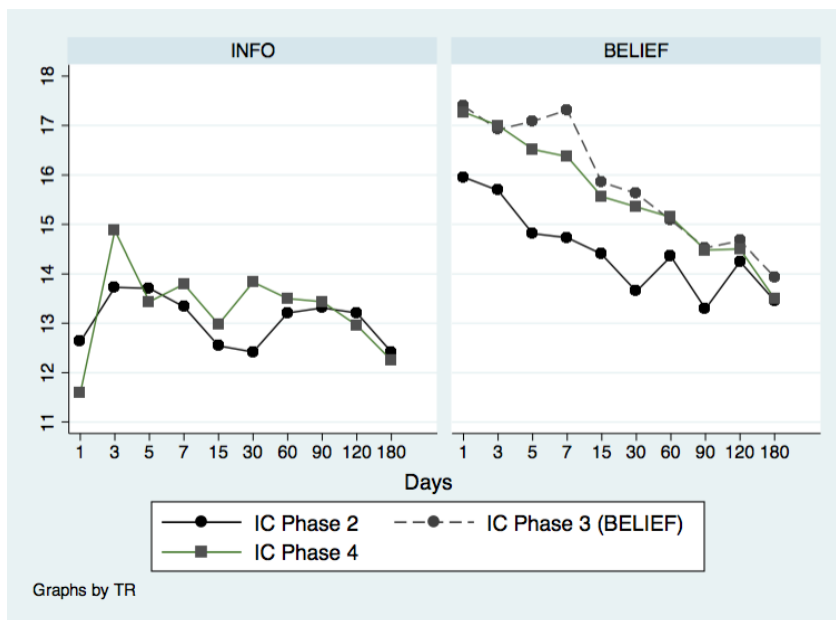
Fig. 5. Aggregate behavior in the time preference tasks

[15] All the reported p-values in this section correspond to the non-parametric Wilcoxon signed ranks test or the Wilcoxon-Mann Whitney test (two-tailed analysis).

[16] If a subject does not switch, showing her preference for the immediate payment for any particular delay, we assign this choice with "option 21", which is also averaged out in Figure 5 with all other decisions. The frequency of choices that are in favor of the immediate payoff is presented in Appendix D.

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As Figure 5 shows, subjects display a remarkable difference in intertemporal behavior across treatments, in particular with reference to Stage 4 behavior. Specifically, while in INFO average switching stays roughly constant across delays (this indicating stability of time preferences across delays) in the BELIEF treatment, *i)* average switching points decrease with delay (i.e., subjects are willing to wait longer only for increasing interest rates) and *ii)* subjects' behaviors in Stage 2 and Stage 4 are remarkably different. As for *i)*, notice that such evidence is (not) consistent with hyperbolic (exponential) discounting, respectively. As for *ii)*, a higher switching point in Stage 4 indicates that subjects tend to ask for a higher interest rate when their choices affect others.[17] Subjects' elicited beliefs (Stage 3) are also above own behavior (Stage 2).[18] Strikingly enough, subjects' behavior in Stage 4 seems, on average, to mimic average beliefs, rather than individual decisions.

3.1.3 Irrational behavior

To the extent to which, in the statistical analysis of Section 3.2, we frame subjects' behavior within the realm of a specific parametric model, we are interested in a prior check on whether observed behavior satisfies basic *rationality* requirements consistent with our postulated theoretical construction.

In the MPL of Stage 1 standard behavioral restrictions (namely, first-order stochastic dominance and transitivity) require that subjects who face in Stage 1's MPL satisfy the following

Condition 1 *A subject should choose option A in the first row, option B in the last row, and switch from option A to B only once along the sequence.*[19]

Thus, subjects whose behavior does not meet these basic consistency requirements should be looked at with special care, also with the additional interest of whether such "lack of rationality" in behavior translates into significantly different estimated social concerns.

We shall also look at the intertemporal decisions along similar lines. Remember that our experimental design forces subjects to switch at most once within each MPL, i.e., some basic rationality requirement is artificially imposed *within* delays, τ, by the same experimental design. No further restriction is imposed by the experimental protocol when comparing choices *across* MPLs. In this respect, a natural rationality condition is contained in the following

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[17]The differences in behavior cannot be explained by differences in the frequency of choices that are in favor of the immediate payoff (see Appendix D).

[18]The interested reader can see subjects' belief accuracy in the Appendix D. Our results indicate that subjects underestimate their groupmate's patience, although this effect fades away as delay increases.

[19]Condition 1 is not imposed in the original design of Holt and Laury [38], [39] but it is sometimes considered when eliciting discount rates (see Andersen *et al.* [2]).

Condition 2 *If a subject prefers € 100 today (compared with any higher amount € x at some point τ in the future), then, for all τ' > τ, she should never prefer € x' < x to € 100 today.*[20]

Table 1 presents an overview of our data with regard to irrational behavior, as defined by Conditions 1 and 2. We consider four different categories, depending on whether subjects are rational (or irrational) either in the risk or the time preference task. We report the total number of subjects within each category for the INFO and BELIEF treatment, respectively.

	INFO	BELIEF	POOLED
Fully Rational	22	20	42
%	0.458	0.417	0.438
Irrational in Phase 1	5	6	11
%	0.104	0.125	0.115
Irrational in Phase 2	15	17	32
%	0.313	0.354	0.333
Fully irrational	6	5	11
%	0.125	0.104	0.115
	48	48	96

Notes. Fully rational subjects satisfy conditions 1 and 2. Irrational in Phase 1 (Phase 2) satisfy condition 2 (condition 1) but do not satisfy condition 1 (condition 2), respectively. Fully irrational subjects do not satisfy condition 1 or 2.

Tab. 1. Rational Behavior

As Table shows, roughly 40% of our subject pool (73 out of 196) passes both our rationality tests. The next -rather delicate- question is what to do with the rest. In this respect, contrary to other papers in this literature (take, e.g. Dean and Ortoleva [24] or Sutter *et al.* [51]) we prefer not to discard these observations that -by no means, given the overall critical mass- cannot be simply be discarded as mere outliers. On the other hand, the structural estimation exercise carried out in Section 3.2 posits even stronger rationality conditions, whose violation may affect numerical estimations in unexpected directions.

Our proposed solution is to include "irrational" subjects in the dataset, although isolating their effect in the "main" estimation protocol, by introducing a dummy variable ($irratDUMMY$) that takes the value 1 if Dictators behave irrationally in the risk or the time-preference task. A significant estimated parameter associated with this dummy, rather than indicating a directed deviation with respect to rational behavior, flags a sufficiently high difference in observed behavior, whose precise identification goes beyond the scope

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[20]Condition 2 is akin to what Tanaka *et al.* [52] define as "time-inconsistent behavior". Another way to interpret Condition 2 is to consider that, when a subject decides to ask for € x at some point τ in the future (compared to € 100 today), then she *should never* ask for an amount € x' < x at some point τ' > τ.

of this paper.[21]

3.1.4 Social Time Preferences: Some preliminary Evidence

In this section we shall look directly at our behavioral data and present some preliminary evidence in favor of our working conjecture: subjects exhibit social time preferences in that they move their switching point in the direction of that of their matched partner (INFO) or stated belief (BELIEF), respectively. The evidence we report in this Section (and in Section 3.2.3) is restricted to Dictators, the only subjects whose decisions in Stage 4 were incentivized.

Since we look directly at behavioral data (i.e., elicited switching points), the analysis of this section neglects any influence of risk attitudes, which will be controlled for in Section 3.2. Let $\varphi_{Pk}^{\tau} \in \{1, ..., 21\}$ define the switching choice (from "now" to "later") when the payoff is delayed τ days in Stage k. Given that φ_{Pk}^{τ} is bounded both above and below, we use a double censored tobit model (clustered for subjects) by which

$$\varphi_{P4}^{\tau} = (1 - \alpha)\varphi_{P2}^{\tau} + \alpha\varphi_{P3}^{\tau} + \varepsilon_{\tau},$$

where φ_{P3}^{τ} defines the matched Recipient's switching point (INFO), or the Dictator's elicited belief (BELIEF). We condition the estimation of α to our irrationality dummy.

	INFO α	BELIEF α	POOLED α
Constant	0.127*** (0.047)	0.458*** (0.174)	0.168*** (0.050)
irratDUMMY	0.045 (0.074)	0.182 (0.222)	0.103 (0.082)

Notes. ***, **, * denote significance at the 1%, 5%, 10% level, robust standard errors parentheses. Clustered on the level of individual subjects. We have 480 observations in each treatment (960 observations when we pool the data).

Tab. 2. Tobit regressions

As Table 2 shows, α is positive and highly significant in both treatment conditions, this confirming our working definition of social time preferences, as Dictators' thresholds move in the direction of those of their

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[21]On the correlation between irrational behavior and some individual characteristics (e.g., gender or cognitive reflection) the interested reader can consult Appendix D4. This includes correlation between irrational behavior or individual characteristics and risk and time preferences.

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groupmates. Consistently with our finding in Figure 6, estimated α is higher in the BELIEF treatment. As for the estimates of Table 2, our irrationality dummy does not seem to play a major role.

3.2 Structural estimations

The aim of this section is to provide the preliminary evidence in favor of social time preferences of Table 2 a more formal dress, by framing Dictators' behavior as maximizing a parametric welfare function, which includes both the individual utility of the Dictator, as well as the Recipient. We follow Andersen *et al.* [2] by conditioning our estimation upon the following stationarity condition:

$$u_i(M_0) = \Delta_i(\tau)u_i(M_\tau), \tag{1}$$

where $u_i(x) = x^{1-\rho_i}/(1 - \rho_i)$ is a standard (time independent) CRRA utility function, where $\rho_i \neq 1$ is the CRRA coefficient. With this parametrization, $\rho_i = 0$ identifies risk neutrality (RN), with $\rho_i > 0$ ($\rho_i < 0$) identifying risk aversion (RA) and risk loving (RL) behavior, respectively. As in Coller *et al.* [22], the discount factor is $\Delta_i(\tau) = \beta_i/(1+\delta_i)^\tau$, with $\beta_i = 1$ ($\beta_i < 1$) in the case of exponential (quasi-hyperbolic) discounting, respectively.

The estimations we report in the remainder of this section follow a standard "maximum likelihood" approach, by which the estimated parameters are those which (jointly) maximize the likelihood of observed choices in the different stages of the experiment, conditional on the structural parametrization, (1), and the auxiliary assumption that choices made by the same subject across different stages are statistically independent.[22]

In Section 3.2.1-2 we collect pool estimates of ρ, β and δ using evidence from Stages 1 to 3. As for social time preferences, Section 3.2.3 estimates the Pareto weights of a social welfare function where individual risk and discounting parameters are estimated separately for each subject participating to the experiment.

3.2.1 "Private" decisions: Stages 1 and 2

Table 3 replicates Table 2 in Coller *et al.* [22] by estimating pool parameters of our specification (1) using observation from Stages 1 and 2. We collect estimations from three different models. The first one imposes $\beta = 1$ (i.e., it assumes exponential discounting in all observations). We remove this assumption in our second specification, which allows for quasi-hyperbolic discounting). A "mixture model" that estimates the ex-ante probability of each individual observation to be an independent draw from either of the two data generating process is also considered.

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[22] A detailed description of our identification strategy is presented in Appendix A.

	Exponential discounting		Quasi-Hyperbolic discounting			Mixture Model			
	ρ	δ	ρ	δ	β	ρ	δ	β	π
Constant	0.836***	1.025***	0.867***	0.203***	0.842***	0.838***	0.935***	0.646***	0.278***
	(0.014)	(0.132)	(0.014)	(0.045)	(0.014)	(0.017)	(0.041)	(0.023)	(0.028)
irratDUMMY	0.080***	-0.580***	0.082***	-0.134**	0.070**	0.089***	-0.517***	0.182***	
	(0.024)	(0.205)	(0.024)	(0.056)	(0.030)	(0.028)	(0.050)	(0.025)	

Notes. ***, **, * denote significance at the 1%, 5%, 10% level, robust standard errors parentheses. Clustered on the level of individual subjects.

Tab. 3. Estimates of time preferences: Structural Model and individual behavior (Stages 1 and 2).

As for the exponential discounting model, we observe that our estimates, qualitatively, confirm Coller *et al.*'s [22] findings: our subjects exhibit significant (CR)RA and discounting. Similar considerations hold for our second model: β is significantly smaller than 1, thus providing empirical content to quasi-hyperbolic discounting. By the same token, the estimated value of δ significantly drops with respect of the estimate of the exponential discounting model, as it occurs in Coller *et al.*'s [22]. When we consider the mixture model, defined as the probability-weighted average of exponential and quasi-hyperbolic discounting, we find that the probability of the latter model being the correct one, π, is estimated to be 0.278, rejecting the null hypothesis that choices can only be explained by exponential discounting at 1% confidence.[23]

We now move to between-subject heterogeneity, which we study by estimating model (1) for each individual subject participating to the experiment. Due to lack of observations, we can only get estimates of our "minimal" specification by imposing $\beta = 1$ (i.e., we have to impose exponential discounting).

Let $\hat{\delta} = \frac{1}{1+\delta}$ denoting the individual discount factor. Figure 6 reports the scatter diagram of all the estimated $(\hat{\delta}, \rho)$ characterizing all individual participating to the experiment.

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[23] We note that our estimate for π is significantly lower than the one reported by Coller *et al.* [22] (Point estimate: 0.59; Std. Err. 0.072; 95% confidence interval (0.45,0.74)). This, in turn, seems to be in line with recent findings (e.g., Harrison et al. [4]) suggesting that present-bias preferences may be less prominent than previously suggested by the literature.

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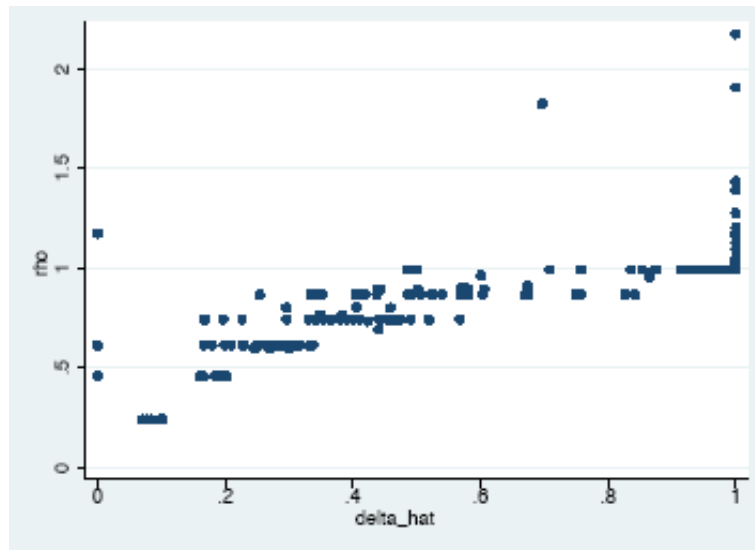
Fig. 6. Individual parameter distribution: $\hat{\delta}$ vs. ρ

As Figure 6 shows, $\hat{\delta}$ and ρ are highly correlated: *more patient subjects turn out to be also more RA*. If we calculate the Spearmann correlation coefficient between $\hat{\delta}$ and ρ we get a value of 0.778 ($p-value < 0.0000$). In this respect, our evidence is consistent with that of Dean and Ortoleva's [24], Burks *et al.* [15] and Epper *et al.* [27]. By the same token, our data confirm the result in Anderson *et al.* [5] that cognitive skills are correlated with delayed acceptance, with subjects with a higher score in the CRT being more willing to accept a delayed payment (p-value=0.0247).

Table D1 (in Appendix D) reports correlation coefficients between our individual (point) estimates of $\hat{\delta}$ and ρ and other variables of interest. As Table D1 shows, ρ is positively correlated with our irrational dummy (indicating higher estimated RA for irrational subjects). We also detected significantly lower performance of female subjects in Frederick's [30] *Cognitive Reflection test* (CRT), with borderline positive correlation between gender (=1 for female) and estimated ρ. Also irrational subjects score significantly less in CRT, with no correlation between gender and irratDUMMY.

3.2.2 Beliefs: Stage 3

Table 4 replicates Table 3 using belief data from Stage 3. As we explained in Section 2, our scoring rule is -basically- neutral to RA specification, in that subjects either win the price or receive nothing. As a consequence, maximizing expected payoffs is equivalent to maximize the probability of winning the prize (i.e., our scoring rule only serves the purpose of eliciting the mode of subjects' belief distribution). As a

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result, if we assume that subjects formulate their beliefs using the same behavioral model, (1), we use to frame their own behavior, we can map subjects' beliefs in the same (ρ, δ) behavioral space. By analogy, Table 4 considers the same three econometric specifications as in Table 3.

	Exponential discounting		Quasi-Hyperbolic discounting			Mixture Model			
	ρ	δ	ρ	δ	β	ρ	δ	β	π
Constant	0.809***	1.259***	0.278***	0.495***	0.872***	0.766***	1.421***	0.687***	0.174***
	(0.020)	(0.163)	(0.028)	(0.103)	(0.021)	(0.026)	(0.049)	(0.022)	(0.021)
irratDUMMY	-0.010	-0.055	-0.010	0.124	0.029	-0.022	0.040	-0.001	
	(0.034)	(0.242)	(0.034)	(0.173)	(0.025)	(0.044)	(0.061)	(0.031)	

Notes. ***, **, * denote significance at the 1%, 5%, 10% level, robust standard errors parentheses. Clustered on the level of individual subjects.

Tab. 4. Estimates of time preferences: Structural Model and beliefs (Stage 3).

Our estimates for exponential discounting confirm the reported evidence in Figures 4 and 5, as subjects' beliefs under(over)estimate the average population RA (discounting), respectively, that is, the estimated values of ρ and δ are larger Stage 3 than in Stage 2. As for quasi-hyperbolic discounting, the noticeable different is that δ is not as low as in Table 3, although still significantly lower to the estimated value in the model of exponential discounting. We find that the irrational dummy is no longer significant in both specifications and the null hypothesis of $\beta = 1$ can easily be rejected ($p - value < 0.000$). Interestingly enough, our mixture model estimates reveal that subjects' beliefs underestimate the relevance of quasi-hyperbolic discounting in their groupmates' decisions, as the estimated value for the probability of the quasi-hyperbolic discounting model being the true data generating process π falls from roughly 28% to 17% (although maintaining as highly significant).

3.2.3 Social decisions: Stage 4

As anticipated, Dictators' choices in Stage 4 are framed as maximizing a welfare function of their own and their assigned Recipient's risk and intertemporal concerns (precisely, the individual specific parameters reported in Figure 6). In other words, our model assumes that dictators maximize their following objective function:

$$v_i^k(\tau) = (1 - \alpha_i)\Delta_i(\tau)\left(\frac{x(\tau)^{1-\rho_i}}{1-\rho_i}\right) + \alpha_i\Delta_j(\tau)\left(\frac{x(\tau)^{1-\rho_j}}{1-\rho_j}\right). \tag{2}$$

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where ρ_j and $\Delta_j(\tau)$ correspond to the risk and discount individual parameters of i's assigned Recipient estimated (elicited) in treatment INFO (BELIEF), respectively. In this respect our estimation strategy consists in two Stages: we first estimate the parameter profile (ρ_i, δ_i) which better suits the behavioral data of associated with each of our 192 subjects in Stages 1 and 2, together with the elicited beliefs for those subjects participating to the BELIEF sessions. We then condition the (pool) estimate of α_i in (2) to the (point) estimated individual parameters, to take at best into account the specific information set available to each subject when taking choices in Stage 4, and their between-subject heterogeneity.

Once estimates for each subject are (independently) obtained -as reported in Figure 6-, we estimate the probabilities that any given Dictator i in Stage 4 resolves the same sequence of intertemporal decisions, by assuming that i is maximizing a (noisy) welfare function, (2), derived as the convex linear combination between her own utility and that of her matched groupmate, j, whether using directly j's estimated parameters (treatment INFO), or the elicited parameters of Stage 3 (treatment BELIEF).

By analogy with Table 2, Table 5 reports the estimation results for Dictators, conditioning for our irrationality dummy.

	α
Constant	0.490**
	(0.231)
Irrational	-0.438*
	(0.245)

Notes. ***, **, * denote significance at the 1%, 5%, 10% level, robust standard errors parentheses. Clustered on the level of individual subjects.

Tab. 5 Structural Model III: social time preferences (Stage 4).

By analogy with the results of Table 1, we confirm our working conjecture by which Dictators exhibit "social time preferences" in that their intertemporal choices move in the direction of their associated groupmate. We also see that -contrary to the results of Table 1- once we control for the Dictators' and Recipients' estimated risk aversion, our "irrational" dummy turns out to be (marginally) significant, making the Pareto weight estimated for irrational Dictators not significantly different than zero.

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4 Conclusion

Our results indicate that *social time preferences matter*, as Dictators change their own intertemporal decisions to accommodate for Recipients' preferences (or their projected images). This evidence is clear in our data, whether or not we control for subjects' own risk aversion and discounting. We also find that risk and time preferences are highly correlated, as more patient subjects turn out to be also more risk averse. In our BELIEF treatment, our data also suggest that Dictators believe that Recipients are less risk averse and more impatient than they are. This, in turn, makes Dictators become less patient when it comes to decide for the pair, so that their behavior mimics very closely that of their elicited beliefs (as we know from Figure 5).[24]

Although these findings are collected in a too abstract economic environment to be -as such- considered as guidance for policy considerations, we are confident that our evidence is supported by observed behavior in several different environments. Addictions have been frequently modeled as decision-making problems that involve intertemporal concerns (see, e.g., Becker and Murphy [11], Bernheim and Rangel [13], O'Donoghue and Rabin [46],[47]). In this respect, the fact that less patient subjects become more patient (and less hyperbolic, as a result) when they think about others justifies, for instance, policies for quitting habits that rely on inducing people to think about their relatives, peers, friends, etc...

Our experimental environment is certainly ad hoc in some respects (take, for example, our decision to elicit risk and time own concerns "orthogonally", without collecting observations -as in Andreoni and Sprenger [9],[10]- where subjects express preferences over lotteries that pay off at different points in time. By the same token, also our welfare parametric function (2), together with our inability to identify quasi-hyperbolic discounting at the individual level, may induce errors, first of all, in the measurement of Pareto weights.[25] However, we also report that the empirical content of social time preferences is robust to two different specifications: one -less demanding- in which we directly look at actions, another -more sophisticated-in which we frame subjects' behavior in more standard economic terms. In this respect, our results are encouraging, because a relatively parsimonious model of individual decision making seems capable of organizing consistently the evidence from a complex experiment, across various treatment conditions.

As for avenues for future research, we consider our results as groundwork for exploring *endogenous* matching processes, where people, when considering intertemporal decisions with payoff externalities, may

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[24] This is probably the reason why our numerical algorithms failed to converge whenever we attempted to identify a treatment effect in the regression of Table 5.

[25] Also notice that, in the estimations of Table 5, we were not able to identify treatment effects in the Pareto weights, most likely because of lack of variability in the observations related with the BELIEF treatment (see Figure 5).

cluster or delegate time decisions depending on others' time preferences.

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Additional Material
Not For Publication

5 Appendix A. Identification strategy

In what follows, we shall build up -Stage by Stage- our estimation strategy.

5.1 Stage 1: Own (CR)Risk Aversion

Let $L_0(k) = \{x_{01}, x_{02}; p(k), 1 - p(k)\}$, and $L_1(k) = \{x_{11}, x_{12}; p(k), 1 - p(k)\}$, $p(k) = \frac{k}{10}$, $k = 0, 1, ..., 10$ be an MPL a' la Holt and Laury [38] [39].[26] Subject i's decision in Stage 1 is a sequence of binary choices, $y_i^k \in \{0, 1\}$, where $y_i^k = n$ if $L_n(t)$ is selected in decision (row) k.

We denote by $v_i(L_n(k))$ i's expected utility associated to lottery $L_n(k)$ in Stage 1, that is,

$$v_i(L_n(k)) = \frac{(x_{n1})^{1-\rho}}{1 - \rho} p(k) + \frac{(x_{n2})^{1-\rho}}{1 - \rho} (1 - p(k)), \tag{3}$$

where ρ denotes subjects' (CR) risk aversion coefficient.

Given (3), the probability of selecting lottery $L_n(k)$ follows a logit distribution,

$$\Pr\left[y_i^k = n \,|\rho\right] = \frac{\exp\left[v_i(L_n(k))\right]}{\exp\left[v_i(L_0(k))\right] + \exp\left[v_i(L_1(k))\right]}. \tag{4}$$

We note that in Stage I we do not impose any "consistency" condition in subjects' choice (i.e., we treat each decision as independent to each other when we evaluate the likelihood function for Stage 1). As we shall see, this is not the same as in the subsequent stage.

5.2 Stage 2: Individual Discounting Elicitation

In Stage 2 subjects face a sequence of 10 MPLs, each of which is characterize by a specific time delay, τ. Within each MPL, τ, there is a sequence of 20 binary choices, in which the present payoff, $x_0 = 100$, is compared with a future reward $x_\tau(k)$, with

$$x_\tau(k) = x_0 \left(1 + \frac{i_k}{365}\right)^\tau$$

of intertemporal decisions, with of the same pattern: choosing between $x_0 = 100$ now or $x_\tau(k)$ in τ days, with $t = 1, ..., 20$.[27] These 20 alternatives (of increasing value) are calculated as future values at time τ with

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[26] In our parametrization, we set $x_{01} = 100, x_{02} = 80, x_{11} = 190$, and $x_{12} = 5$.

[27] The delay refers to $\tau = 1, 3, 5, 7, 15, 30, 60, 90, 120, 180$ days.

increasing (annual) interest rates i_k ranging from $i_1 = 3\%$ to $i_{20} = 300\%$, i.e., subject i's values for x_0 and $x_\tau(k)$ are $v_i(x_0) = \frac{(x_0)^{1-\rho_i}}{1-\rho_i}$ and $v_i(x_\tau(k)) = \Delta_i(\tau)\frac{(x_\tau(k))^{1-\rho_i}}{1-\rho_i}$, respectively, where $\Delta_i(\tau) = \delta_i^\tau$ $(\Delta_i(\tau) = \beta\delta_i^\tau)$ if we assume exponential (quasi-hyperbolic) discounting, respectively.[28]

By analogy with Stage I, the probability of selecting the delayed payoff when payments are delayed τ days $y_i^k(\tau) = 1$, follows a logit distribution,

$$\Pr\left[y_i^k(\tau) = 1 \,\middle|\, \rho_i\right] = \frac{\exp\left[v_i(x_\tau(k))\right]}{\exp\left[v_i(x_0)\right] + \exp\left[v_i(x_\tau(k))\right]}. \tag{5}$$

In this stage, we do impose consistency within each delay meaning that if $y_i^k(\tau) = 0$, then $y_i^s(\tau) = 0$ for all $s < k$ and, similarly, if $y_i^k(\tau) = 1$ then $y_i^s(\tau) = 1$ for all $s > k$. However, we do not impose consistency across delays as discussed in Section 3.1.3.

5.3 Stage 3: Belief Elicitation (*BELIEF* only)

In Stage 3, each subject has to make two different sets of decisions: one related to the lottery played by her matched participant in Stage 1, the other related with the intertemporal decisions in Stage 2. We shall look at both in turn.

5.3.1 Stage 1 prediction

Subjects face the full sequence of decisions in Stage 1, with each subject i guessing the choice of her matched partner j. Subject i's decision in Stage 3 is then a sequence of binary choices, $\hat{y}_i^k \in \{0, 1\}$, where $\hat{y}_i^k = n$ if subject i thinks that $L_n(k)$ was selected by subject j in row k, where and $n \in \{0, 1\}$ and $k = 0, 1, ... 10$.

Denote by $\pi_i(\hat{y}_i^k \,|\, y_j^k)$ player i's monetary payoff associated to bet $\hat{y}_i^k$ (conditional on j's actual decision being y_j^k), that is,

$$\pi_i(\hat{y}_i^k \,|\, y_j^k) = \begin{cases} (1 - \hat{y}_i^k)C & \text{if } y_j^k = 0; \\ \hat{y}_i^k C & \text{if } y_j^k = 1, \end{cases} \tag{6}$$

where C is a fixed prize (€ 100 in the experiment). As long as beliefs are incentivized using an incentive compatible mechanism (that is independent on the subject i's degree risk aversion) we shall estimate subject i's beliefs about j's (CR) risk aversion ρ_j using the same behavioral model in (4).

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[28] In our experiment, $i = (i_k)_{k=1}^{k=20} = (2\%, 3\%, 4\%, 5\%, 7.5\%, 10\%, 12.5\%, 15\%, 17.5\%, 20\%, 25\%, 35\%, 50\%, 75\%, 100\%, 125\%, 150\%, 200\%, 250\%, 3$

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5.3.2 Stage 2 prediction

Subjects face also the sequence of 10 MPLs in Stage 2, characterized by the delay τ. Within each MPL, τ, each subject i predicts the behavior of his/her matched partner. Again, subject i's monetary payoff associated to bet $\hat{y}_i^k(\tau)$ in τ days (conditional on j's actual decision being $y_j^k(\tau)$), is given by (6). As a result, we shall estimate subject i's beliefs about j's discount rate $\Delta_j(\tau)$ using the behavioral model in (5).

5.4 Stage 4: Social Time Preference Elicitation

We here assume that player i, the Dictator, brings from previous observation estimates of the risk and discounting parameters of her matched partner j. In the $INFO$ treatment, these estimates correspond to subject i observing what j has actually done in Stage 1 and 2, whereas in the $BELIEF$ treatment, ρ_j and $\Delta_j(\tau)$ are elicited in Stage 3.

We shall consider that Dictators make an intertemporal decision in Stage 4 maximizing a linear combination of individual ("selfish") utility and recipient ("social") utility; so that the Dictator's final decision can be assumed to maximize the following objective function:

$$v_i(\tau) = (1 - \alpha_i)\Delta_i(\tau)\left(\frac{x(\tau)^{1-\rho_i}}{1 - \rho_i}\right) + \alpha_i\Delta_j(\tau)\left(\frac{x(\tau)^{1-\rho_j}}{1 - \rho_j}\right). \tag{7}$$

where ρ_j and $\Delta_j(\tau)$ correspond to the risk and discount individual parameters of i's groupmate estimated (elicited) in treatment INFO (BELIEF), respectively. In our specification, α_i measures the relative weight of the other's utility parameters (e.g., Mazzocco [45]). The value of α_i determines then the importance of "social" time preferences for Dictator's decision.

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Appendix B. Experimental instructions and debriefing

In what follows we present the experimental instructions (originally in Spanish) for the BELIEF treatment[29] and the questionnaire that subjects faced at the end of each experimental session.

Experimental Instructions

This is an experiment to study decision making. We are not interested in your particular choices but, rather, on subjects' aggregate behavior. All through the experiment you will be treated anonymously. Neither the experimenters nor the people in this room will ever know your particular choices. Please do not think that we expect any particular behavior from you. However, keep in mind that your behavior will affect the amount of money you can win. The instructions will be read aloud. It is important that you understand the experiment before starting because this can help you to earn money. If you have any questions, raise your hand and remain silent. You will be attended to by the experimenter as soon as possible. Any other kind of communication during the experiment is strictly forbidden.

General Instructions

• The current experiment is composed by four stages. Before starting each of them, you will receive instructions that explain how the experiment unfolds in that stage and how you can earn money.

• After finishing the four stages, you will be asked to complete a questionnaire. Then, you will be announced your earnings privately.

• Because of participating and filling out a questionnaire you will receive 10 Euros in cash at the end of the experiment. Besides that, we will randomly pick 8 people in this room to pay their decisions during the experiment.

• Since everybody has the same probability of being selected for the final payment, we ask you to choose in each stage your preferred option, having in mind that this option could be paid to you at the end of the experiment.

• It is important for you to know that this is not a skill-test in the sense that there is not a correct answer. Your choice will depend on your personal tastes, which do not need to coincide with the taste of other people in this room.

• Before starting the first stage, we would like to remind you that you can get part of your earnings in your bank account, as you were informed when you signed to participate in this experiment. You should

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[29]The instructions for the INFO treatment are very similar but do not include phase 3.

provide us with your bank account at the end of the experiment to receive your earnings.

Stage 1

- In this stage, we present you a list of lotteries that assigns probabilities to two different prizes.

- For each pair of lotteries in the list, Option A will always assign probabilities of earning the prizes 100 Euros and 80 Euros. Option B will always assign probabilities to the prizes 190 Euros and 5 Euros.

- Next, we show you a screenshot of Stage 1:

Fase 1 - Elige una opción (A o B) para cada par.

DECISION 1:	A: 0% de 100 euros, 100% de 80 euros	B: 0% de 190 euros, 100% de 5 euros
DECISION 2:	A: 10% de 100 euros, 90% de 80 euros	B: 10% de 190 euros, 90% de 5 euros
DECISION 3:	A: 20% de 100 euros, 80% de 80 euros	B: 20% de 190 euros, 80% de 5 euros
DECISION 4:	A: 30% de 100 euros, 70% de 80 euros	B: 30% de 190 euros, 70% de 5 euros
DECISION 5:	A: 40% de 100 euros, 60% de 80 euros	B: 40% de 190 euros, 60% de 5 euros
DECISION 6:	A: 50% de 100 euros, 50% de 80 euros	B: 50% de 190 euros, 50% de 5 euros
DECISION 7:	A: 60% de 100 euros, 40% de 80 euros	B: 60% de 190 euros, 40% de 5 euros
DECISION 8:	A: 70% de 100 euros, 30% de 80 euros	B: 70% de 190 euros, 30% de 5 euros
DECISION 9:	A: 80% de 100 euros, 20% de 80 euros	B: 80% de 190 euros, 20% de 5 euros
DECISION 10:	A: 90% de 100 euros, 10% de 80 euros	B: 90% de 190 euros, 10% de 5 euros
DECISION 11:	A: 100% de 100 euros, 0% de 80 euros	B: 100% de 190 euros, 0% de 5 euros

- Please look at decision 1. Option A offers a sure payoff of 80 Euros (with 100% probability) whereas Option B offers a sure payoff of 5 Euros (with 100% probability).

- Now, look at decision 2. In that case, Option A pays 100 Euros with 10% probability and 80 Euros with 90% probability. This means that if we pick a random number between 1 and 10, Option A would pay 100 Euros if the selected number was 1 and 80 Euros if the selected number was between 2 and 10 (both included). Option B would pay 190 Euros if the selected number was 1, and 5 Euros if the selected number was between 2 and 10 (both included).

- The other decisions are similar but note that as you move down in the table the probability of getting the highest payoff of each option increases. Thus, in decision 11 the Option A involves a sure payoff of 100 Euros and Option B a sure payoff of 190 Euros.

- In this first stage of the experiment we ask you to choose your preferred option (Option A or Option B) for each pair of lottery. Once you choose your preferred option in each row you should confirm your choice

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by clicking OK. Afterwards, please remain in silent and wait until the rest of participants finished this stage to start Stage 2.

How much money can I get from Stage 1? • At the end of the experiment the computer will randomly select two people to pay (in cash and at the end of the experiment) their decisions of Stage 1. Since the people who are paid are going to be randomly selected, everybody has the same probability of being selected for the payment, regardless of their decisions.

• If you are one of the two people who will be paid for Stage 1, the computer will randomly select one of the 11 decisions (i.e., one of the rows). The computer will show you the option that you chose in that case (Option A or Option B).

• Afterwards, the computer will automatically choose a random number between 1 and 10, and you will receive the amount of money that corresponds to your choice in the selected lottery.

• **Examples**:

Assume you are selected for the payment of Stage 1 and the decision 5 is randomly selected for the payment by the computer.

  o Option A: 40% of 100 Euros, 60% of 80 Euros

  o Option B: 40% of 190 Euros, 60% of 5 Euros

The computer will then pick up a random number between 1 and 10.

  o If the number is 2, you will get 100 Euros if you chose Option A and 190 Euros if you chose Option B.

  o If the number is 7, you will get 80 Euros if you chose Option A and 5 Euros if you chose Option B.

  o If the number is 10, you will get 80 Euros if you chose Option A and 5 Euros if you chose Option B.

Stage 2

• In this second stage we ask you to choose your preferred option between receiving an amount of money in your bank account in a "early moment" or an amount of money in your bank account in a "future period".

• This stage has a total of 10 rounds. In each of them the "early moment" for receiving the money will always be the same: today. The "future period" for receiving the money will change across rounds, being of 1, 3, 5, 7, 15, 30, 60, 90, 120, 180 days from now.

• In each round you will see a list with 20 decisions. Option A always refers to receiving 100 Euros today in your bank account. Option B always refers to the future period, which will change across rounds. Next, we show you a screenshot for this stage. This is just an example. The numbers that will appear in might be different.

Fase 2 - Ronda 1: 100 días.

DECISION 1:	A: 100.00 euros hoy. ☐	B: 100.55 euros dentro de 100 días.	☐
DECISION 2:	A: 100.00 euros hoy. ☐	B: 100.83 euros dentro de 100 días.	☐
DECISION 3:	A: 100.00 euros hoy. ☐	B: 101.10 euros dentro de 100 días.	☐
DECISION 4:	A: 100.00 euros hoy. ☐	B: 101.38 euros dentro de 100 días.	☐
DECISION 5:	A: 100.00 euros hoy. ☐	B: 102.08 euros dentro de 100 días.	☐
DECISION 6:	A: 100.00 euros hoy. ☐	B: 102.78 euros dentro de 100 días.	☐
DECISION 7:	A: 100.00 euros hoy. ☐	B: 103.48 euros dentro de 100 días.	☐
DECISION 8:	A: 100.00 euros hoy. ☐	B: 104.19 euros dentro de 100 días.	☐
DECISION 9:	A: 100.00 euros hoy. ☐	B: 104.91 euros dentro de 100 días.	☐
DECISION 10:	A: 100.00 euros hoy. ☐	B: 105.63 euros dentro de 100 días.	☐
DECISION 11:	A: 100.00 euros hoy. ☐	B: 107.09 euros dentro de 100 días.	☐
DECISION 12:	A: 100.00 euros hoy. ☐	B: 110.06 euros dentro de 100 días.	☐
DECISION 13:	A: 100.00 euros hoy. ☐	B: 114.67 euros dentro de 100 días.	☐
DECISION 14:	A: 100.00 euros hoy. ☐	B: 122.79 euros dentro de 100 días.	☐
DECISION 15:	A: 100.00 euros hoy. ☐	B: 131.47 euros dentro de 100 días.	☐
DECISION 16:	A: 100.00 euros hoy. ☐	B: 140.76 euros dentro de 100 días.	☐
DECISION 17:	A: 100.00 euros hoy. ☐	B: 150.70 euros dentro de 100 días.	☐
DECISION 18:	A: 100.00 euros hoy. ☐	B: 172.71 euros dentro de 100 días.	☐
DECISION 19:	A: 100.00 euros hoy. ☐	B: 197.90 euros dentro de 100 días.	☐
DECISION 20:	A: 100.00 euros hoy. ☐	B: 226.72 euros dentro de 100 días.	☐

• Let's consider the example above, where the future moment refers to 100 days. The first decision consist of choosing your preferred option between receiving 100 Euros today in your bank account (Option A) and 100.55 Euros in your bank account in 100 days (Option B). The second decision consists of choosing between 100 Euros today in your bank account or 100.83 Euros in 100 days. The same logic can be followed as you move down. Thus, decision 20 consists of choosing between 100 Euros today in your bank account or 226.72 Euros in 100 days in your bank account.

• Please notice that once you choose Option B in one of the rounds, the computer will automatically select Option B in all subsequent decisions of that round. This is done because if you prefer an amount of money in a future period to 100 Euros today, you should also prefer any higher amount in the future period to 100 Euros today. In any case, you can choose Option A or Option B until you click the button OK.

How much money can I get for this stage? • At the end of the experiment the computer will randomly select two people to pay them (in a transfer to their bank account) their decisions of Stage 2. Since the people who are paid are going to be randomly selected, everybody has the same probability of being selected for the payment, regardless of their decisions (except those who received the money in Stage 1, how will be excluded from the raffle).

• If you are one of the two people who will be paid for Stage 2, the computer will randomly select one of the 10 rounds of this stage (1, 3, 5, 7, 15, 30, 60, 90, 120, 180 days) and one of the 20 decisions (rows) for

the payment. If you chose Option A for the selected option, you will receive today the money in your bank account. If you chose Option B, you will receive the bank transfer with the amount selected the day chosen for the payment (we will explain you in detail how you will receive this money at the end of the experiment).

• To be sure that you will receive the amount of money today or in the future period in your bank account, you will receive a legal contract, which is signed by Professor Dr. Ismael Rodriguez-Lara of the University of Valencia, and the director of the LINEEX, Dr. Penélope Hernández Rojas. This document will be received by you anonymously if you are selected for the payment and will serve as a legal private contract between you and the experimenters and can be used in case you do not receive the payments.

• Since you can be selected for the payment of this stage at the end of the experiment, we ask you to choose your preferred option in each of the cases.

Stage 3

• In Stage 3 the computer will randomly match you with other person in this room to form a couple (that will remain the same hereafter). One of the members of the couple will randomly be assigned by the computer as Player A and the other one will be randomly assigned as Player B for all the experiment.

• Regardless of whether you are selected as Player A or Player B, you will be presented with the same screens of Stage 1 and Stage 2.

• Stage 3 has a total of 11 rounds. In the first one (that we call Round 0), you will be shown the same screen of stage 1. In the next rounds, you will be shown the 10 rounds of Stage 2 (each of these rounds correspond to the present payment of 100 Euros and the future payment of a larger amount in 1, 3, 5, 7, 15, 30, 60, 90, 120, 180 days).

• In Stage 3 we ask you to state your belief about the decision of the other member of your couple in previous stages. Thus, for the case of stage 1, you will need to state if the other member of your couple chose Option A or Option B in each of the lotteries. In the 10 rounds that correspond to Stage 2, we also ask you to state your belief about what the other member of your couple chose (i.e., you would need to guess when did he/she chose Option B for the first time, if he/she did it).

How much money can I get for this stage? • At the end of the experiment the computer will randomly select one couple of two people to pay them (in cash and at the end of the experiment) their decisions of Stage 3. Since the couple that is being paid would be randomly selected, everybody has the same probability of being selected for the payment, regardless of their type (player A or B) and their decisions (except those who received the money in Stages 1 and 2, how will be excluded from the raffle).

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• If you are one of the two people who will be paid for Stage 3, the computer will randomly select to pay you either for your choices in Stage 1 or for your choices in Stage 2. Both stages are equally likely to be selected for the payment.

• If you are selected for the payment your earnings will depend both on the selected stage and the accuracy of your beliefs as follows:

o If Stage 1 is selected for the payment, the computer will automatically select one of the 11 rows for which you make a decision (all the rows are equally likely to be selected). You will receive 100 Euros if you guess correctly the decision of the other member of your couple. You will receive nothing if your guess is not correct.

o If Stage 2 is selected for the payment, one out of the ten rounds will automatically be selected for the payment. All the ten rounds (1, 3, 5, 7, 15, 30, 60, 90, 120, 180 days) are equally likely to be selected. Once the round is selected, you will receive 100 Euros if you guess correctly the point at which the other member of your couple switched from A to B. You will receive nothing if your guess is not correct.

Stage 4

• In Stage 4 you remain being matched with the same person in this room to form a couple. If you were selected by the computer as Player A, we will ask you to choose your preferred option between both members of the couple receiving a monetary payoff today in your bank accounts in a "early moment" or both members of the couple receiving a monetary payoff in a future period in your bank account.

• As in stage 2 there are a total of 10 rounds. In each round, the "early moment" refers to a payment today in the bank accounts of both members of the couple, whereas the future period will change across rounds being of 1, 3, 5, 7, 15, 30, 60, 90, 120, 180 days from now.

• This stage of the experiment is therefore similar to stage 2 for Player A with one important difference: his or her choice refers now to a payment for both members of the couple. Player B will also need to choose his/her preferred option for both members of the couple but this decision will not be taken into account for the final payment, which would only depend on the Player A's choice for both members of the couple.

• Regardless of whether you are Player A or Player B, you will be informed about your decisions in stage 2 of the experiment. You will also be informed about your stated beliefs of stage 3. Next, we show you a

screenshot of this stage. The numbers that you will see in the experiment might be different to these ones.

● At the top of the screen you can see what Player A chooses and what he/she thinks that Player B did in the first part of the experiment (the first column always refer to your decision and the second to the other member's one). Player A's decisions and his/her beliefs for stage 2 are summarized at the bottom of the screen.

● In this stage, each player would need to choose his/her preferred option for the payment that involves both members of the couple in the column "Both". Using the same procedure of Stage 2, once Option B is selected in a round, this will be selected in all subsequent decisions of that round. This is done because if you prefer that both members of the couple receive an amount of money in a future period of 100 Euros today, you should also prefer any higher amount for both members in the future period to 100 Euros today. In any case, you can choose Option A or Option B until you click the button OK.

How much money can I get for this stage? ● At the end of the experiment the computer will randomly select one of the couples of two people to pay them (in a transfer to their bank account) the Player A's choice for Stage 4. Since the couple that is going to be selected for the payment will be randomly selected, everybody has the same probability of being selected for the payment, regardless of their decisions (except those who received the money in previous stages that will be excluded from the raffle).

● If you are one of the two people who will be paid for Stage 4, the computer will randomly select one of the 10 rounds of this stage (1, 3, 5, 7, 15, 30, 60, 90, 120, 180 days) and one of the 20 decisions (rows) for the payment. If Player A chose Option A for the option that will be paid, both members of the couple will

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receive today the money in their bank account. If Player A chose Option B, both members of the couple will receive the bank transfer with the amount selected the day chosen for the payment (we will explain you in detail how you will receive this money at the end of the experiment).

• To be sure that you will receive the amount of money today or in the future period in your bank account, you will receive a legal contract, which is signed by Professor Dr. Ismael Rodriguez-Lara of the University of Valencia, and the director of the LINEEX, Dr. Penélope Hernández Rojas. This document will be received by you anonymously if you are selected for the payment and will serve as a legal private contract between you and the experimenters and can be used in case you do not receive the payments.

• Since you can be selected for the payment of this stage at the end of the experiment, we ask you to choose your preferred option in each of the cases.

Debriefing

At the end of each session, subjects were asked to answer a detailed questionnaire from which we distilled the following variables, which are used in Section **??**.

Q1: What is your age?. . . years.

Q2: What is your gender?

    (00 male, 01 female)

Q3: Which is your university degree?. . .

(01 Economics, 02 Jurisprudence, 03 Political science, 04 Other)

Q4: How many years have you been studying at the university?

(00 Graduate)

Q5: What is the highest level of education you expect to complete?

    (01 Laurea triennale, 02 Laurea specialistica, 03 Master/PhD)

Q6: What was the highest level of education that your father completed?

(00 Nothing, 01 Elementary, 02 Middle school, 03 High school, 04 University, 05 Master/PhD)

Q7: What was the highest level of education that your mother completed?

    (00 Nothing, 01 Elementary, 02 Middle school, 03 High school, 04 University, 05 Master/PhD)

Q8: What is your marital status?

    (00 Single, never married, 01 Married, 03: separated/divorced/widowed)

Q9: What is your relationship with the main income source in your household?

(01 Me, 02 Housband/wife, 03 son/daughter, 04 Father, 05Mother, 06 No family relationship, 07 No relation)

Q10: What was the education level of the main income source in your household?

(00 Nothing, 01 Elementary, 02 Middle school, 03 High school, 04 University, 05 Master/PhD)

Q11: What is the occupation of the main income source in your household?

(01 pensioner, 02 Unemployed(searching work), 03 Unemployed (no searching work), 04 self-employed, 05 employee, 06 Student, 07 housewife, 08 Other)

Q12: How many people live in your household?_ _ _NUMBER

Q13: How many rooms does the house have you are living in?_ _ _NUMBER

Q14: Did you work during the last week?

(00 no, 01 (<5 hours), 02 (5-10 h), 03 (10-15h), 04 (15-30h), 05 (>30h))

Q15: On average, what is your weekly budget?

Q16: Do you currently smoke cigarettes?

(01 yes, 02 no)

Q17: If yes, approximately how much do you smoke in one day? (Cigarettes)

Q18: A bat and a ball cost e 1.10 in total. The bat costs e 1.00 more than the ball. How many cents does the ball costs? . . . cents.

(Answer: 5)

Q19: If it takes 5 machines, 5 min to make 5 widgets, How many minutes would it take 100 machines to make 100 widgets?. . .minutes.

(Answer: 5)

Q20: In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how many days would it take for the patch to cover half of the lake . . . days.

(Answer: 47)

Q21: "I believe that fate will mostly control what happens to me in the years ahead."

(01 Strongly disagree, 02 Disagree, 03 Slightly disagree, 04 Slightly agree, 05 Agree, 06 Strongly Agree)

Q22: "I am usually able to protect my personal interests."

Q23: "When I get what I want, it's usually because I'm lucky."

Q24: "In order to have my plans work, I make sure that they fit in with the desires of people who have power over me."

Q25: "I have mostly determined what has happened to me in my life so far."

Q26: "Whether or not I get into a car accident depends mostly on the other drivers."

Q27: "Chance occurrences determined most of the important events in my past."

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Q28: "I feel like other people will mostly determine what happens to me in the future."

Q29: "When I make plans, I am almost certain to make them work."

Q30: "Getting what I want requires pleasing those people above me."

Q31: "Whether or not I get into a car accident depends mostly on how good a driver I am."

Q32: "Often there is no chance of protecting my personal interests from bad luck."

Q33: "When I get what I want, it's usually because I worked hard for it."

Q34: "Most of my personal history was controlled by other people who had power over me."

Q35: "Whether or not I get into a car accident is mostly a matter of luck."

Q36: "I think that I will mostly control what happens to me in future years."

Q37: "People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups."

Q38: "It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune."

Q39: "How do you feel in this moment with your life?"

(1-7-scaled answer from 1 (very satisfied) to 7 (Not at all satisfied)

Q40: Taking everything into consideration, would you call yourself...

(01 not very happy, 02 quite happy, 03 very happy)

Q41: Do you discuss about political issues with friends?

   (00 Never, 01 Sometimes, 02 Frequently)

Q42: Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?

(01 Most people can be trusted, 02 Need to be very careful)

Q43: Consider the following situation: Two secretaries with the same age do exactly the same work. However, one of them earns 20 euros per week more than the other. The one that is paid more is more efficient and faster, while working. Do you believe it is fair that one earns more than the other?

(00 No, 01 Yes)

Q44: Generally speaking, earned income should be. . .

   (1-7-scaled answer from 1(equal) to 7 (max incentive))

Q45: Independently of the qualities and deficiencies of parents,

(1-7 scaled from 1 "they should always be loved and respected" to 7 "Parents who have not earned the love by their attitudes and behavior should not be loved"

Q46: Parent's duty toward children...

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(1-7-scaled from 1 "Parent's duty is to give the best for their children, even to sacrifice their welfare" to 7 "they should live their life, they can renounce to their wealth")

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Appendix C: MPL of Stage 2

We follow Coller and Williams [21] in eliciting time preferences (see also Anderson *et al.* [3] [4] and Coller *et al.* [22]).

In our design, subjects face 10 MPL. Each of these MPL gives subjects the possibility of receiving 100 Euros "today" against the possibility of receiving a larger payoff in $\tau = 1, 3, 5, 7, 15, 30, 60, 90, 120, 180$ days. In order to calculate the payoffs for each particular delay, τ, we use the same annual interest rate (AIR), ranging from 2% to 300%. We detail in Table C.1 all the different alternatives.

	(Today)	(AIR)	(1 day)	(3 days)	(5 days)	(7 days)	(15 days)	(30 days)	(60 days)	(90 days)	(120 days)	(180 days)
1	100	2,00%	100,01	100,02	100,03	100,04	100,08	100,16	100,33	100,49	100,66	100,99
2	100	3,00%	100,01	100,02	100,04	100,06	100,12	100,25	100,49	100,74	100,99	101,49
3	100	4,00%	100,01	100,03	100,05	100,08	100,16	100,33	100,66	100,99	101,32	101,99
4	100	5,00%	100,01	100,04	100,07	100,10	100,21	100,41	100,83	101,24	101,66	102,50
5	100	7,50%	100,02	100,06	100,10	100,14	100,31	100,62	101,24	101,87	102,50	103,77
6	100	10,00%	100,03	100,08	100,14	100,19	100,41	100,83	101,66	102,50	103,34	105,05
7	100	12,50%	100,03	100,10	100,17	100,24	100,51	101,03	102,08	103,13	104,19	106,36
8	100	15,00%	100,04	100,12	100,21	100,29	100,62	101,24	102,50	103,77	105,05	107,68
9	100	17,50%	100,05	100,14	100,24	100,34	100,72	101,45	102,92	104,41	105,92	109,01
10	100	20,00%	100,05	100,16	100,27	100,38	100,83	101,66	103,34	105,05	106,79	110,36
11	100	25,00%	100,07	100,21	100,34	100,48	101,03	102,08	104,19	106,36	108,56	113,12
12	100	35,00%	100,10	100,29	100,48	100,67	101,45	102,92	105,92	109,01	112,19	118,83
13	100	50,00%	100,14	100,41	100,69	100,96	102,07	104,19	108,56	113,11	117,85	127,94
14	100	75,00%	100,21	100,62	101,03	101,45	103,13	106,35	113,11	120,29	127,93	144,70
15	100	100,00%	100,27	100,82	101,38	101,93	104,19	108,55	117,84	127,92	138,86	163,64
16	100	125,00%	100,34	101,03	101,72	102,42	105,26	110,80	122,77	136,03	150,72	185,04
17	100	150,00%	100,41	101,24	102,07	102,91	106,34	113,09	127,90	144,64	163,58	209,22
18	100	200,00%	100,55	101,65	102,77	103,90	108,54	117,81	138,80	163,53	192,66	267,41
19	100	250,00%	100,68	102,07	103,47	104,89	110,78	122,73	150,62	184,84	226,85	341,67
20	100	300,00%	100,82	102,49	104,18	105,90	113,06	127,83	163,42	208,90	267,05	436,41

Note. The column (AIR) reports the annual interest rates that were used to compute the future payoffs for each possible delay.

Tab. C1. MPLs in Stage 2.

Notice that, when the payment is delayed $\tau = 1$ day, the (AIR) for rows 1 to 4 yields the same payoff; i.e., subjects are offered 100,01 Euros for any AIR between 2% and 5%, since our rounding rule does not allow di doscriminate between such small differences in payoff when interest is low and delay is short. This is why, when we compute the "average switching point" (see Figure 5 in the main text), we assume that switching in any of these options is like switching in row 2.5 (for an interest rate of 3,5%). The same logic is followed if the payment is delayed $\tau = 1$ day ($\tau = 3$) for rows 6 and 7, and 9 and 10 (rows 1 and 2), respectively.

Appendix D: Data

This appendix contains further details of our experimental data.

D1. Frequency of immediate payoffs

In Stage 2, subjects were allowed to opt for the immediate payment of € 100 today in their bank account rather than getting a higher amount in their bank account in τ days. Figure D1 reports the relative frequency of choices in favor of the immediate payment for each possible delay, $\tau = 1, 3, 5, 7, 15, 30, 60, 90, 120, 180$.
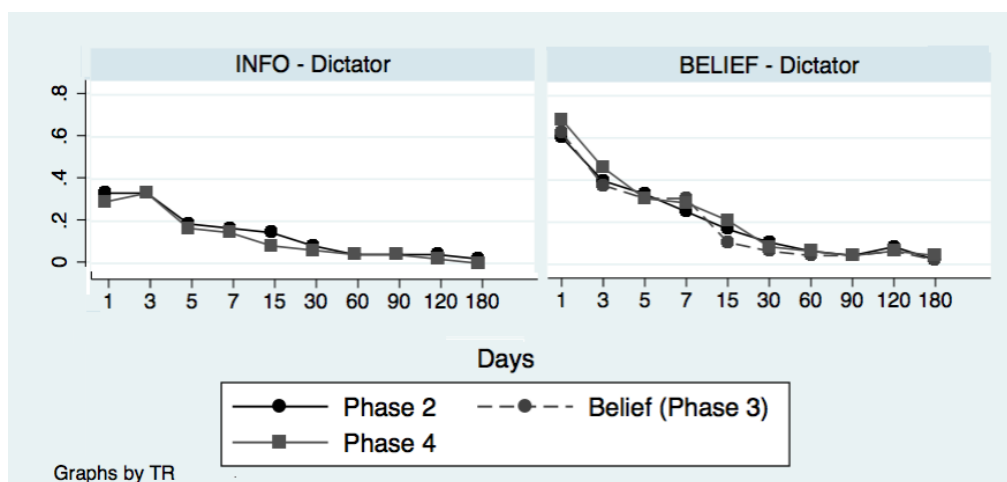

Fig. D1. Preferences for immediate payment.

As Figure D1 shows, the relative frequency of choices in favor of the immediate payment decreases as future payment is delayed. More specifically, when future payment is postponed 3 days, roughly 40% of our sample opt for the immediate payment but when the future payment is delayed 30 days, less than 10% of the sample decided to take the € 100 today. We also see that i) decisions in Stage 2 and Stage 4 are roughly similar, and ii) subjects believe that others choose the immediate payoff with the frequency as themselves. This, together with our findings of Section 3.1.2, suggests that Dictators are not opting for the immediate payment more or less frequently when they choose for others. Instead, Dictators are likely to ask for a higher interest rate when their choices involve others. Similarly, we can infer from Dictators' choices that they do not believe that others will get the immediate payment with more frequency then themselves. However, Dictators think that others are more patient than themselves and are therefore asking for a higher interest rate (see the next section in this appendix).

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D2. Belief accuracy

In the BELIEF treatment, subjects were matched in pairs and incentivized to predict their partner's behavior in Stage 1 and 2. Next we plot the difference between elicited beliefs (in terms of switching points) and actual decisions for each possible delay (i.e., choice panels) for both Dictators and Recipients.[30]
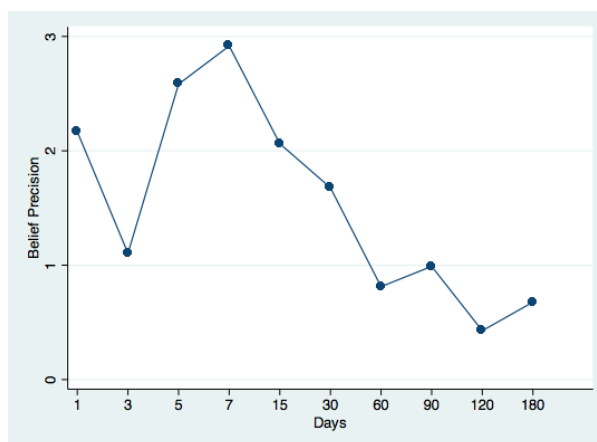

Fig. D2. Belief accuracy.

As Fig. D2 shows, on average, subjects underestimate their groupmate's patience, although this effect fades as delay increases.

D3. Individual behavior

In this section, we report our behavioral data at the individual level.

3.1. Risk Preferences (Stage 1 and 3)

First, we present subjects' individual behavior in Stage 1 to Stage 3. For each of the 11 lotteries of Stages 1 and 3. Figure D3-5 report subjects' decision on the vertical axis. By analogy with Figure 4 in the main

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[30]Since roles were assigned in Phase 4 both Dictators and Recipients were in the same role during Phase 3. The graph for Dictators is very similar to the one reported in the figure.

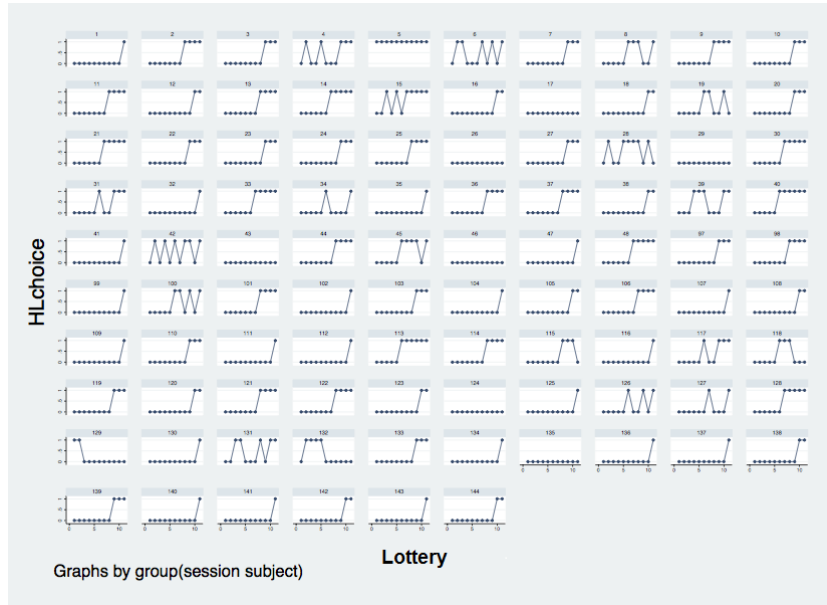text, the latter takes the value 0 (1) if subject selects Option A (Option B), respectively.

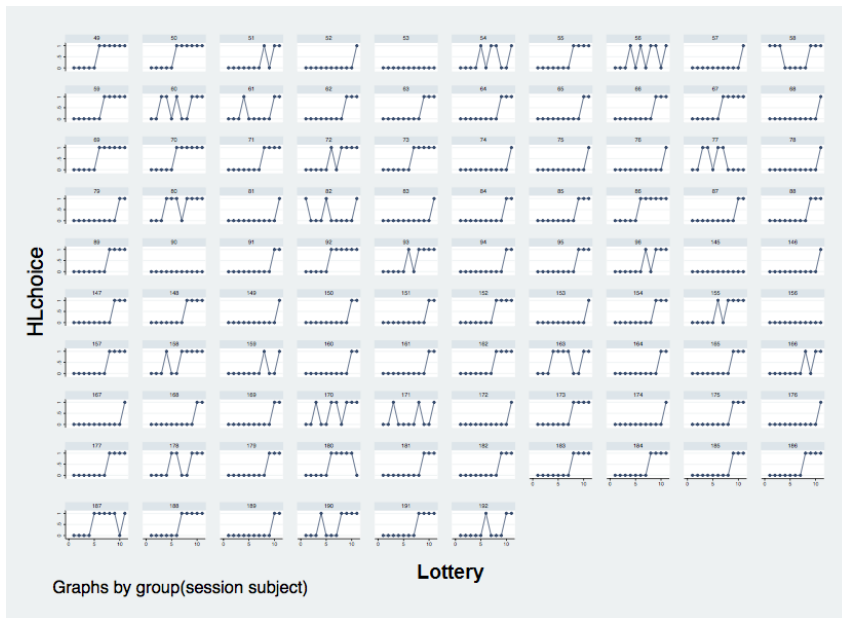**Fig. D3.** Individual choices in Stage 1. Treatment INFO

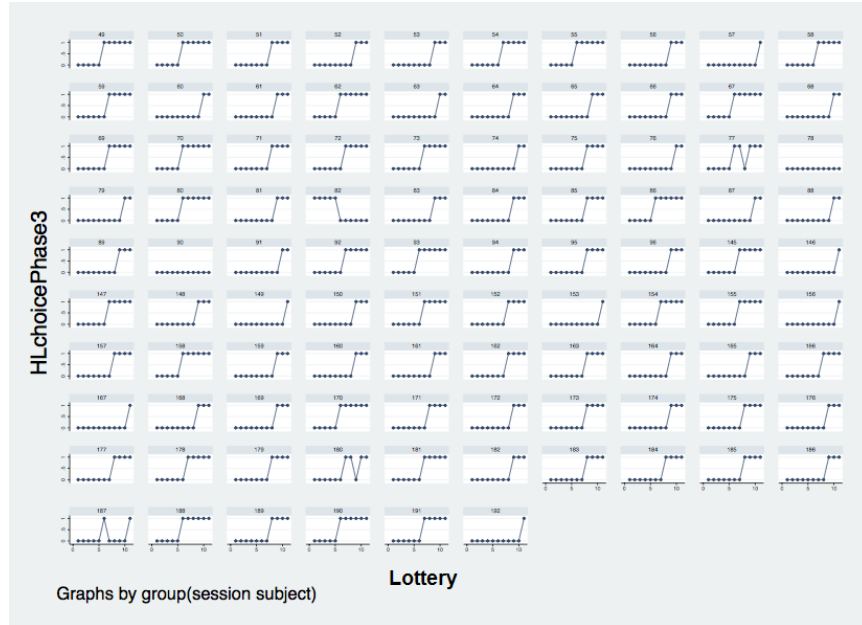**Fig. D4.** Individual choices in Stage 1. Treatment BELIEF

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Fig. D5. Individual choices in Stage 3. Treatment BELIEF

3.2. Time Preferences (Stages 2-4)

The behavioral data for Stage 2 and Stage 4 are presented in the next figures. For each of the 10 intertemporal decisions that correspond to delaying the payment $\tau = 1, 3, 5, 7, 15, 30, 60, 90, 120, 180$ days, we plot in the horizontal axis the amount that a subject would like to receive if the payment is delayed. Rational behavior, as discussed in Section 3.1.3, implies that further delays should result in requiring a higher amount of money

for switching (i.e., the amount of money asked for switching should be non-decreasing).
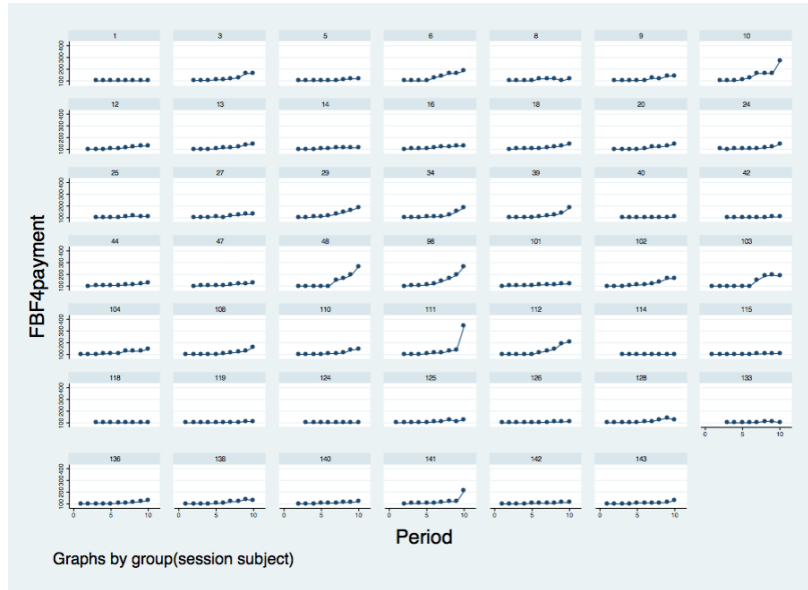

Fig. D5. Individual choices in Stage 1. Treatment INFO
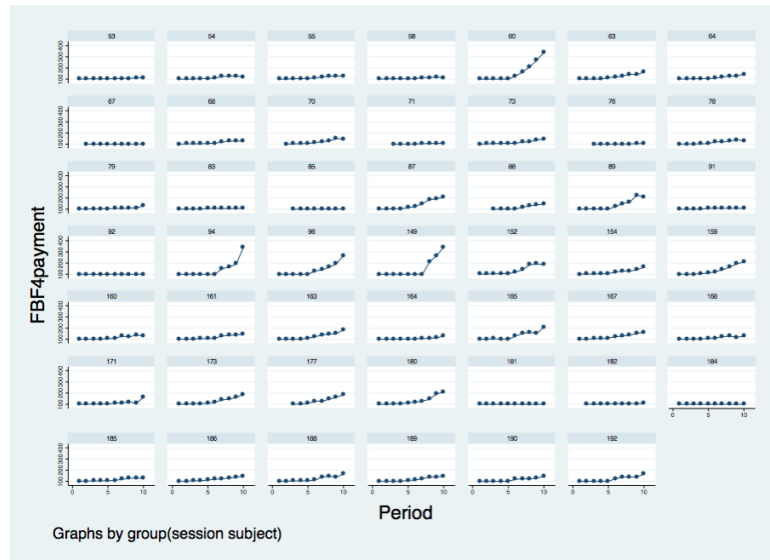
Choices in Stage 4: BELIEF treatment (only Dictators)

Fig. D6. Individual choices in Stage 4. Treatment BELIEF

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D4. Socio-Demographics

In the following table we report correlation between individual characteristics and our estimates for discounting and risk aversion.

	Risk aversion (ρ)	Discounting (δ)	irratDUMMY	Gender	WB	RSR
Discounting (δ)	0.778***					
irratDUMMY	0.147**	0.092				
Gender	0.118	0.049	0.078			
WB	-0.054	-0.026	-0.001	-0.082		
RSR	-0.022	0.008	-0.005	0.030	0.148**	
CRT	-0.040	-0.0358	-0.191***	-0.248***	0.149**	-0.003

Notes. ***, **, * denote significance at the 1%, 5%, 10% level. Gender is a dummy variable that takes the value 1 for women. WB denotes the weekly Budget, RSR is the ratio between the number of rooms in the primary residence and the number of household members and CRT reports the relative frequency of correct answers in the cognitive reflection test.

Tab. D1. Correlation Table

In Table D1, Gender takes the value 1 for females. WB ("Weekly Budget") corresponds to subjects' weekly disposable income; RSR ("RoomSizeRatio") is the ratio between the number of rooms of the primary residence and the number of household members; CRT is the score of Frederick's [30] *Cognitive Reflection Test.* The **CRT** is compound of three simple questions, which are easy in that their solution are easily understood when explained, but to arrive at the right answer subjects need to suppress the first response that springs 'impulsively' to their mind and instead work it out logically. Thus, beyond the basic mathematical skills necessary to answer the three questions, the test is meant to measure the ability to overcome impulsive answers. It is also a good indicator of how patient subjects are and how good they are at making decisions. The test yields an index, **CRT**$\in [0,1]$, reporting the relative frequency of correct answers (i.e. higher **CRT** indicates higher cognitive reflection).

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