Intertemporal Altruism[*]

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Abstract

Most prosocial decisions involve intertemporal tradeoffs. Yet, the *timing* of prosocial utility flows is ambiguous and bypassed by most models of other-regarding preferences. We study the behavioral implications of the time structure of prosocial utility, leveraging a conceptual distinction between *consequence-dated* and *choice-dated* utility flows. We conduct a high-stakes donation experiment that comprehensively characterizes discounting behavior in self-other tradeoffs and allows us to identify different prosocial motives from their distinct time profiles. Our data can only be explained by a combination of choice- and consequence-dated prosocial utility. Both motives are pervasive and negatively correlated at the individual level.

Keywords: Altruism, Donation, Intertemporal Decision-Making, Time Inconsistency

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1 Introduction

In prosocial decisions, choices and consequences are typically separated in time. Donations, for example, tend to create immediate costs to the donor and delayed benefits for others. Consider climate change charities, which routinely face the choice between adaptation and mitigation projects. The benefits from adaptation projects tend to accrue much earlier than those from mitigation projects. If donors only care about the timing of the donation itself, then the different planning horizons of such projects should not affect their willingness to contribute. If, on the other hand, individuals do care about the timing of benefits, then charities are well-advised to take the different time frames into account. Other prosocial decisions are similarly associated with characteristic time profiles. A commitment to voluntary work implies both costs to the donor and benefits to others with a delay. Similarly, repeated interactions such as reciprocal exchange naturally involve intertemporal considerations: I may expect to reciprocate a favor from someone else later on, trading off an earlier benefit against a delayed cost. In practice, recent trends in charitable giving highlight the importance of timing, such as the rise in donor-advised funds (e.g., Andreoni, 2018) that disentangle the timing of tax advantages to the donors and benefits to the donation recipients; or fundraising interventions that lift donations or shift their composition and timing (Scharf et al., 2022). The inherent intertemporal nature of prosocial choices begs the question of the actual timing of prosocial utility flows, and what its implications are for the choice environments of charitable giving.

Notably, the existing theoretical literature on prosocial preferences largely abstracts from the time dimension of utility flows. For example, outcome-based models of inequity aversion do not specify how to evaluate inequality that occurs across two points in time (see, e.g. Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). To illustrate, consider a simple donation or dictator game with a delayed payment to the recipient. Do inequity-averse donors discount the corresponding recipient's utility in the same way as they discount their own utility? Do their social preferences apply to the discounted utility stream (of self and recipient), or do they care about period-specific inequality? These timing-related considerations are not unique to inequity aversion, but apply to other forms of social preferences alike. In formal models of reciprocity (Charness and Rabin, 2002; Falk and Fischbacher, 2006; Dufwenberg and Kirchsteiger, 2004), social interactions are conceptualized as being inherently timeless. Returning a favor one year later is considered just as worthwhile as returning a favor now. The concept of warm glow (Andreoni, 1989, 1990) posits that utility may derive from the act of choice itself rather than the prosocial externality. Yet, theories of warm glow do not (aim to) distinguish between the timing of utility flows related to choices and delayed consequences. Similarly, models of image concern (e.g., Bénabou and Tirole, 2006) are mute on whether image utility accrues at the point of prosocial choice or at the time of its consequences or observability. The common practice of modeling prosocial behavior as *atemporal* limits our scope for understanding prosocial behavior in practice, which typically features a separation of choices and consequences over time as in the motivating examples. This gap in the literature calls for more discipline on the role of delays in theoretical and empirical work on prosocial behavior.

We provide a theoretically guided empirical investigation of discounting behavior in a high-stakes donation context. Unlike related empirical work, we do not focus on partial delays in dictator games (Dreber et al., 2016; Kovarik, 2009), the role of commitment (Breman, 2011; Rogers and Bazerman, 2008), or time inconsistency and present bias (Kölle and Wenner, 2018; Andreoni and Serra-Garcia, 2021). Instead, our experimental approach allows us to characterize entire discount functions in self-other tradeoffs in a comprehensive and novel manner. Our analysis proceeds in three steps. First, we develop a conceptual distinction between *consequence-dated* and *choice-dated* utility in modeling intertemporal prosocial choice. This formal distinction leverages existing theoretical and empirical work and provides a guiding framework for our own empirical exercise. If utility is consequence-dated, then it accrues with a delay that corresponds to when the actual utility consequences for others materialize. If utility is choice-dated, then it is realized in temporal proximity to the act of giving. We derive qualitative predictions of models with choice- and consequence-dated utility in different contexts. Second, we conduct a controlled laboratory study and establish a set of reduced-form patterns in atemporal and intertemporal donation behavior that directly speak to our model predictions. Third, we implement a structural model and estimate an explicit intertemporal utility function that reproduces the core qualitative patterns in our data and allows us to assess the relative importance of consequence-dated and choice-dated utility in determining prosocial behavior. Our experiment is purposefully designed to provide transparent identification of the different utility components (in the spirit of, e.g., DellaVigna, 2018).

To experimentally study the intertemporal dimension of prosocial choice in a meaningful way, we implement a choice paradigm with far-ranging real-world implications. In our incentivized, high-stakes donation paradigm, each participant could save human lives by individually causing donations of up to 375 euros for the treatment of tuberculosis patients by a designated charity and earn up to 125 euros for themselves. The unusually high incentives serve to make both the donation context and the implemented delays meaningful to subjects. For all choice tasks, we use a variant of the widely used multiple price list methodology.[1] The experiment comprises two parts: a series of intertemporal choice tasks in which participants decide between dated certain payments to themselves or the charity for delays of up to twelve months, and a series of atemporal risky choice tasks to characterize participants' multi-attribute utility function representing preferences over "self-euros" and "charity-euros." The first part is further divided into three stages. Across stages, we vary whether choices present (a) tradeoffs between earlier and later payments in a single utility domain (only self-euros or only charity-euros), (b) tradeoffs between payments in different domains that involve a unique, common payment date in the future, and (c) tradeoffs across domains and payment dates that require self-other comparisons across time. This setup systematically examines behavior when either (a) only time matters, (b) only cross-attribute comparisons matter, or (c) both time and cross-attribute comparisons matter. To our knowledge, this is the first experiment providing data rich enough to allow for sharp tests of the discounted utility model in the multi-attribute case of self-other tradeoffs.

We purposefully opted for a design with monetary pay-offs because (i)

[1]There are alternative methodologies, such as convex time budgets (Andreoni and Sprenger, 2012). While convex time budgets do not require a separate estimation of the utility function, we prefer the "double multiple price list" method of characterizing the atemporal utility function using separate choices (e.g. Andersen et al., 2008). In so doing, we can examine the features of the multi-attribute atemporal utility function in more detail and circumvent the issue of bunching at the boundaries and choice inconsistencies frequently observed with convex time budgets (Chakraborty et al., 2017).

prosocial utility flows are not typically associated with primary consumption by the decision-maker such as food; (ii) we aim to characterize discount functions comprehensively, including for time horizons in excess of one month, which has not been accomplished with real-effort designs so far;[2] and (iii) our interest is partly in the application to monetary donations, which is the most widespread form of altruistic behavior in practice and has direct implications for charities. The recent methodological review by Cohen et al. (2019) discusses situations in which money designs may be preferable to real-effort paradigms, which we argue includes our case of studying prosocial utility flows that are typically not yoked to primary consumption by the decision-maker.[3] Our design deliberately abstracts from the issue of present bias and the phenomenon of extreme short-run impatience by implementing payments as wire transfers. Even the soonest possible experimental payment was subject to a delay of two days, which the literature conventionally considers as being "in the future."

We start with a discussion of our reduced-form findings and document non-parametric evidence compatible with consequence-dated as well as choice-dated prosocial utility. First, in smaller-sooner, larger-later choices involving either only self-euros or only charity-euros, subjects discount both delayed self-euro and delayed charity-euro payments. The notion that delayed donations are less valuable to subjects implies that valuations of charity-euros are linked to their payment date, pointing towards the existence of a consequence-dated component of prosocial utility flows. This qualitative devaluation pattern of delayed donations obtains for *all* intertemporal decisions that involve a time tradeoff, including cross-attribute intertemporal decisions. More strikingly, net present values measured for delayed self-euros and equally delayed charity-euros are statistically indistinguishable. Non-parametric analyses imply that our combined data from choices involving time tradeoffs are specif-

[2]Real effort experiments have been conducted for short-time horizons of up to a few weeks for logistical reasons that mainly concern trust issues and attrition (Augenblick, 2019; Augenblick and Rabin, 2018).

[3]It has long been acknowledged that money designs may confound the timing of payments with the timing of primary consumption (Cubitt and Read, 2007; Chabris et al., 2008). An active literature debates the importance of fungibility of money for interpreting intertemporal choice data from monetary tradeoffs (Sprenger, 2015; Halevy, 2014; Epper et al., 2020; Andreoni et al., 2018). Cohen et al. (2019) suggests that the empirical evidence for the so-called "consume-on-receipt" assumption is mixed, with various findings at odds with the strict consume-on-receipt model.

ically in line with the discounted utility specification of consequence-dated utility, i.e. an intertemporal utility function that applies the same discount function to future utility streams generated by self-euro and charity-euro payments. Second, however, when identically-dated self-euro and charity-euro payments are jointly delayed into the future, subjects become increasingly more willing to give up self-euros for charity-euros as the delay increases. These choices that create a cross-attribute but no time tradeoff imply a declining subjective exchange rate between charity-euros and self-euros. To our knowledge, we provide the first dataset that allows documenting such a pattern based on experimental variation. This finding is incompatible with a stationary flow utility function as posited by the discounted utility model where identically-dated utility flows are subject to the same discount factor: the effect of discounting cancels out, and we expect a constant, time-invariant exchange rate. Instead, our finding of a declining forward exchange rate suggests that the prosocial utility derived from donating money has a choice-dated component that is not subject to discounting due to, for example, warm glow or self-image concerns. We can only rationalize a declining subjective exchange rate if prosocial utility from donating (partly) accrues at the time of choice and is independent of the timing of the actual payment. Hence, our reduced-form findings suggest both a consequence-dated and a choice-dated component of prosocial utility. Yet, none of the existing models of prosocial behavior are compatible with this combination of motives.

We fill this gap and develop a simple model of intertemporal prosocial choice that accommodates both consequence-dated and choice-dated prosocial utility flows. We fit this model to our data using structural estimations at both the population and the subject level. The structural analysis adds two insights. First, our estimated structural model replicates the distinctive qualitative choice patterns identified in our reduced-form analysis. Most importantly, we are able to replicate a declining forward exchange rate because the share of the choice-dated utility in the discounted (prosocial) utility increases. As choice-dated utility is not discounted, the overall prosocial utility thus declines less quickly in the delay than the discounted utility from equally-delayed self-euros. Compellingly, our parameter estimates for standard preferences parameters are in line with existing work. Second, the structural analysis sheds light on the individual-level variation of parameters, revealing that the different forms of prosociality display marked heterogeneity. We find that 80% of subjects exhibit positive consequence-dated prosociality, and just below 60% of subjects show positive choice-dated prosociality. Strikingly, there is a strong negative correlation between the two parameters at the subject level. This negative relationship indicates that differently-dated prosocial motivations might characterize distinct "types" of subjects. Some are primarily driven by consequence-dated motives such as pure altruism, whereas others seem to follow choice-date motivations such as image concerns or the feeling of warm glow.

We build on and contribute to several stands of the literature. Our conceptual distinction between consequence-dated and choice-dated prosocial motives complements existing research on what motivates contributions to public goods and charitable giving. While departing from existing work in terms of our focus on the time dimension rather than, for example, the impact of one's generosity and the corresponding "neutrality" hypothesis (Andreoni, 1989), we view the distinction drawn here as a natural extension and re-interpretation of the work on warm glow and pure altruism. Focusing exclusively on intertemporal arguments leads us to conclude the existence of mixtures of both motives, which resonates with previous work that documents mixed motivations, i.e. "impure altruism" (Andreoni, 1993; Bolton and Katok, 1998; Konow, 2010).

The distinction between choice-dated and consequence-dated prosocial utility provides a productive framework to extend models of prosocial behavior to an intertemporal context. It predicts that the motivations for prosocial behavior *change* with the temporal delay. While considerations of consequences will be more important when they are realized in temporal proximity, the choice-dated component of prosocial utility will drive choices involving consequences that are temporally distant. This switch implies that simply extrapolating previous evidence on the relative importance of different prosocial motives from atemporal contexts to intertemporal settings may lead to inaccurate conclusions.

We also provide the first comprehensive experimental dataset on intertemporal prosocial behavior using a fully-crossed design of choices involving single vs. cross-attribute tradeoffs—self-euro vs. charity-euro payments—and short vs. long delays. The concept of a forward exchange rate characterizes behavior for increasing, *common* delays, which provides a non-parametric test of the discounted utility model. Accordingly, our experimental approach allows us to address questions about the nature of intertemporal prosocial tradeoffs that cannot be answered with a subset of this data. Previous empirical research has focused on different aspects of intertemporal self-other tradeoffs as outlined above (Dreber et al., 2016; Kovarik, 2009; Breman, 2011; Rogers and Bazerman, 2008; Kölle and Wenner, 2018; Andreoni and Serra-Garcia, 2021). While our account rationalizes some of this evidence through the implied time patterns of flow utility rather than, e.g., a hyperbolic shape of the discount function, we view our work as fruitfully complementing this emerging body of evidence that has different objectives and focuses on different phenomena such as time inconsistency and present bias.[4]

Additionally, our findings inform work on intertemporal multi-attribute utility more generally. The literature has only recently started to explore the ramifications of multi-attribute utility functions for modeling intertemporal choice (Andersen et al., 2018). Although related empirical work studies the patterns of multi-attribute, intertemporal choices (Cubitt et al., 2018), it focuses on typical consumption goods rather than self-other tradeoffs and—unlike our paper—does not quantify preferences using structural estimation. While our results from single-domain discounting choices are in line with a unique, domain-general discount function, which is a key assumption of the discounted utility model, previous studies report discounting patterns that sometimes differ across goods (Chapman, 1996; Frederick, 2006; Hardisty and Weber, 2009; Kim et al., 2013; McClure et al., 2007). These studies have different objectives from ours, and consequently, they do not separately account for the shape of the atemporal utility function and do not rely on high-stakes experimental designs. Also related is the literature on preferences for giving in different forms such as money versus time (Lilley and Slonim, 2014; Andreoni et al., 1996; Brown et al., 2019), which we abstract from here by

[4]The perhaps most closely related works are Kölle and Wenner (2018) and Andreoni and Serra-Garcia (2021), both of which focus on the issue of dynamic consistency. Unlike Kölle and Wenner (2018), we abstract from immediate rewards (and thus present bias) and instead characterize the nature and relationship between future flows of utility from payments to the self and donations. Similar to us, Andreoni and Serra-Garcia (2021) embrace the idea that utility from donations can be enjoyed at different points in time. They focus on the specific role of signaling effects in generating “social rewards” from donations, and study its impact for commitment demand.

focusing on monetary donations.

The paper proceeds as follows. Section 2 lays out a theoretical framework for our argument. Section 3 describes the experimental design and procedures. We present our reduced-form results in Section 4 and the structural analyses in Section 5. Section 6 concludes.

2 Conceptual framework

We develop a simple formal framework that is not intended as an exhaustive theoretical characterization of intertemporal prosocial choice and that we do not consider a primary contribution of the paper. Instead, the objective of this section is twofold: first, it carves out our central conceptual distinction between consequence- and choice-dated utility flows in a tractable and generalizable fashion. Second, the framework disciplines and guides our subsequent empirical analysis.

Standard economic theory assumes that individuals derive utility from the consumption of goods and services. However, prosocial choices such as donations are usually not associated with primary rewards and require additional assumptions about the sources of utility. Consequently, research in psychology allows for a broader notion of consumption that is not limited to physical consumption but instead involves forms of conceptual consumption that occur entirely in the mind (Ariely and Norton, 2009; Schelling, 1988). In line with this approach, the economic literature on prosocial preferences puts forward a variety of motives such as intentions (Falk and Fischbacher, 2006) or image concerns (Bénabou and Tirole, 2006) that are independent of primary consumption by the decision-maker. This variety of prosocial motivations naturally lends itself to distinguish between the time structures of corresponding utility flows. We apply the canonical notion of dated period utility from intertemporal choice theory but disentangle two constituent elements of prosocial behavior. We introduce an explicit distinction between the act of making a prosocial choice and the consequences of this choice for others. In this framework, we refer to utility flows as *choice-dated* if they are realized at the time of giving and as *consequence-dated* if they accrue when the consequences for others actually materialize.

We seek to understand what this conceptual distinction implies for intertemporal prosocial choice and what we can learn from observed choices about the nature of prosocial preferences. In a first step, we address these questions and contrast the implications of models in which decision-makers receive *only* consequence-dated prosocial utility or *only* choice-dated prosocial utility. In a second step, we consider the mixed case where both types of prosocial utility are present.

Let t index the current period in which a choice is made, and τ denote the time relative to the choice period. Let $s_{t+\tau}$ represent a dated payment to the decision-maker at time $t+\tau$ ("self-euros") and let $c_{t+\tau}$ denote a dated payment to a charity at time $t+\tau$ ("charity-euros"). The decision-maker has preferences over dated payment streams $z_t = (s_{t+\tau}, c_{t+\tau})_\tau$ represented by an intertemporal utility function $U(z_t)$. We do not assume a specific form of prosocial preferences at this stage and treat self-euros and charity-euros as direct inputs to the utility function. For simplicity and acknowledging an active debate in the experimental literature on time preferences estimated from monetary tradeoffs (Sprenger, 2015; Halevy, 2014; Epper et al., 2020; Andreoni et al., 2018), payment dates in our model serve as a proxy for the conversion of money into utility for the self or others. A common view is that subjects narrowly bracket their decisions and treat money in experiments as proxy for utils. We embrace this narrow bracketing view, which allows us to interpret payment dates as representing the corresponding consumption dates and also abstracts from the possibility of donations within the experiment crowding out private donations. Appendix E.2 discusses the role of fungibility of money in more detail and shows how such fungibility would create a bias against some of our predictions.

Moreover, we specify payments to others as a direct input into the utility function of the decision-maker. However, this approach is also consistent with an interpretation that the decision-maker's prosocial utility truly depends on the utility—rather than just the payment—consequences for others. Our conclusions remain unchanged as long as the recipient's utility is monotonic in the payments that they receive and approximated in time by the payment dates. Thus, we refrain from specifying the recipient's utility function for simplicity.[5]

[5] If we assume that the other person's utility is, ceteris paribus, a monotone function $g(c)$ of donations, we can substitute $g(c)$ for c in the utility function and study the reduced form.

2.1 Consequence-dated prosocial utility

In the case of consequence-dated prosocial utility, the utility of a donation to charity $c_{t+\tau}$ at time $t + \tau$ will also accrue at $t + \tau$, even if caused by a choice at an earlier point in time t. In this case, choosing between two dated payments to a charity with different payment dates requires an intertemporal comparison of prosocial utility flows. We can draw on standard economic tools and assume that the decision-maker behaves as if she maximizes her discounted intertemporal utility. The following intertemporal utility function then characterizes models of consequence-dated prosocial utility:

$$U_t^{\text{consequence}} = \sum_{\tau=0}^{T} D(\tau) u(s_{t+\tau}, c_{t+\tau}). \tag{1}$$

We make the standard assumptions that there is a stationary discount function $D(\tau)$ that applies to future utility flows (Cohen et al., 2019). The flows are represented by a stationary flow utility function, $u(s_{t+\tau}, c_{t+\tau})$, which captures the decision-maker's concern for herself and others.

Two remarks about this specification are in order. First, while we remain agnostic about the precise psychological motives underlying consequence-dated prosocial utility, pure altruism provides a natural interpretation of Equation (1). A pure altruist cares about the welfare consequences of her choices, which is determined by $c_{t+\tau}$ in the model. Any self-other tradeoff then involves interpersonal utility comparisons, suggesting the interpretation of u as the decision-maker's subjective welfare function for evaluating contemporaneous consequences of her choices to the self and others. Second, a complementary perspective on the intertemporal utility function in Equation (1) is the natural extension of the workhorse model of intertemporal choice—discounted utility—to the multi-attribute case, because it conceptualizes self-euros and charity-euros as conventional arguments of the flow utility function. Consequently, the interpretation of prosocial behavior in an intertemporal context through the lens of multi-attribute discounted utility is akin to adopting the perspective of consequence-dated prosocial utility.

2.2 Choice-dated prosocial utility

In the case of choice-dated prosocial utility, the utility of a dated donation $c_{t+\tau}$ accrues in the period t in which it was caused through a choice, even if the payment is executed only at a later date $t+\tau$. This implies that earlier and later donations to charity generate the same utility to the decision-maker. It introduces a theoretical distinction between consequence-dated and choice-dated prosocial utility that allows us to obtain sharp qualitative descriptions.[6] We can then represent choice-dated prosocial utility with the following intertemporal utility function:

$$U_t^{\text{choice}} = \sum_{\tau=0}^{T} \alpha\left(c_{t+\tau}\right) + \sum_{\tau=0}^{T} D(\tau) v(s_{t+\tau}), \tag{2}$$

where $\alpha\left(c_{t+\tau}\right)$ is the choice-dated and immediate prosocial utility that results from causing a potentially delayed donation today. Note that for our illustrative purposes here, we rule out complementarities between self-euros and charity-euros.[7] Again, we do not take a stance on the psychological motives of choice-dated utility and its specific relationship to the size of a donation. However, our formulation naturally encompasses a wide range of motives. They include the feeling of warm glow that is explicitly defined as being related to the act of giving (Andreoni, 1989, 1990) and self- or social-image concerns that are routinely characterized as being linked to the act of donating rather than to the instrumental value of charitable funds. Finally, recognizing the importance of commitment (e.g., Andreoni and Serra-Garcia, 2021), we assume that choice-dated prosocial utility accrues only after irrevocable commitment to a donation. This implies that, in the context of the experiment, opting for a payment to the self with the plan to donate privately later does not lead to an immediate flow of choice-dated utility (but may of course do so in the fu-

[6]It is possible that donations with longer delays provide lower choice-dated prosocial utility. However, choice-dated prosocial utility should devalue at a *lower rate* than consequence-dated utility, as it is otherwise indistinguishable from consequence-dated considerations. This means that as the delay increases, the prosocial motivation in choice-dated models will be relatively more stable compared to the prosocial motivation in consequence-dated models. Our results only require this *relative* property. To simplify the exposition, we directly assume that choice-dated utility is independent of the delay.

[7]One could accommodate these complementarities using more general classes of utility functions such as $U_t^{\text{choice}} = F\left(G(a) + b\right)$ where a and b represents the two sums in Equation (2).

ture), because the subject cannot irrevocably commit to the private donation while in the experiment.[8] In Appendix E.1, we discuss choice-dated prosocial utility more extensively under weaker assumptions and obtain qualitatively similar predictions.

2.3 Qualitative predictions

We contrast the implications of models of choice-dated and consequence-dated prosocial utility for intertemporal choices involving self-euros and charity-euros. In Figure 1, each axis represents one of the following three tradeoffs: (1) pure time tradeoffs (univariate discounting, UD_τ), (2) pure across-domain tradeoffs (subjective exchange rates, F_τ) and (3) mixed across-time and across-domain tradeoffs (multivariate discounting, MD_τ).

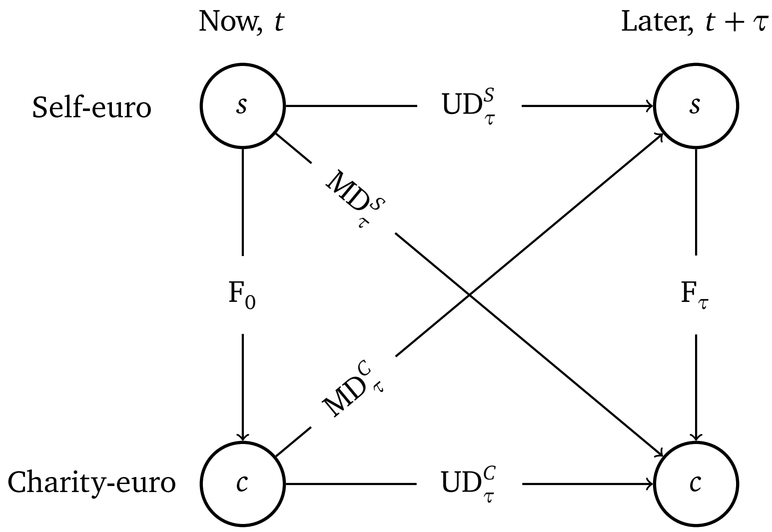

Figure 1: This figure displays three intertemporal self-other tradeoffs.

We begin with the horizontal axes in Figure 1, which capture the standard case of univariate discounting (UD_τ). The decision-maker can choose

[8]This furthermore implies that any potential utility gain from taking money and privately donating later with accrued interest is counteracted by the discounting of *all* prosocial utility flows, including choice-dated utility that only accrues after the final, irrevocable commitment to a private donation in the future. Appendix E.3.4 discusses this point.

between receiving c_t charity-euros (s_t self-euros) at time t or receiving a larger payment of $c_{t+\tau}$ charity-euros ($s_{t+\tau}$ self-euros) at a later time $t+\tau$. The prediction of consequence-dated prosocial utility is that the value of charity-euros (self-euros) decreases by $D(\tau)$ with the delay τ. While choice-dated prosocial utility necessarily makes the same qualitative prediction for univariate discounting of self-euros, the immediate gratification from giving money to charity is not subject to discounting.

Prediction 1. *Delayed charity-euros are discounted in consequence-dated models, but not in choice-dated models of prosocial behavior. Both models predict discounting of delayed self-euros.*

Next, we turn to the vertical axes in Figure 1 and consider the exchange rate F_τ, which describes the decision-maker's subjective conversion rate between self-euros and charity-euros that are identically delayed by τ periods. It is defined as $F_\tau = c^*_{t+\tau}/s_{t+\tau}$ whenever the decision-maker is indifferent between $c^*_{t+\tau}$ and $s_{t+\tau}$.[9] In a choice-dated model, the corresponding indifference condition is

$$D(\tau)u(s_{t+\tau},0) = D(\tau)u(0,c^*_{t+\tau}). \tag{3}$$

As the discount factor $D(\tau)$ cancels from this expression, the exchange rate F_τ does not depend on τ. Note that this holds irrespective of the shape of the flow utility function, providing the distinctive prediction of a constant exchange rate for models of consequence-dated prosocial utility. By contrast, in models of choice-dated prosocial utility, the defining equation of the exchange rate takes the following form:

$$D(\tau)v(s_{t+\tau}) = \alpha(c^*_{t+\tau}). \tag{4}$$

As the delay τ of both payments increases, the decision-maker increasingly discounts the value of self-euros on the left-hand side, while the choice-dated prosocial utility remains unaffected. Thus, $c^*_{t+\tau}$ decreases, causing the exchange rate F_τ to decrease in τ.

Prediction 2. *Consequence-dated models predict a constant exchange rate, whereas choice-dated models of prosocial behavior predict a declining exchange rate.*

[9]The exchange rate will depend on the level of payments unless the utility function satisfies homogeneity, but we omit the dependence for ease of exposition.

Finally, we turn to the diagonal axes in Figure 1, which capture multivariate discounting (MD_τ). Similar to the exchange rate, this intertemporal tradeoff only arises in the multi-attribute case. The decision-maker receives s_t self-euros (c_t charity-euros) at time t and is then asked to state the dated payment $c^*_{t+\tau}$ of charity-euros ($s^*_{t+\tau}$ self-euros) to be received at a later time $t+\tau$ that makes her indifferent. This decision involves a choice between payments to different recipients at different points in time, and provides an implicit multivariate conversion factor of $c^*_{t+\tau}/s_t$ ($s^*_{t+\tau}/c_t$) between earlier self-euros (charity-euros) and later charity-euros (self-euros). The larger the conversion factors, the stronger the multivariate discounting of delayed payments. As in the case of univariate discounting, consequence-dated models will discount the value of the later payment, irrespective of whether it is denominated in self-euros or charity-euros. In both cases, we expect to see multivariate discounting, i.e. increasing conversion factors. If the earlier payment involves self-euros, the indifference condition is $u(s_t,0) = D(\tau)u(0,c^*_{t+\tau})$. The right-hand side decreases with τ, while the left-hand side is constant, causing multivariate discounting. In the reverse case, we have the symmetric condition $u(0,c_t) = D(\tau)u(s^*_{t+\tau},0)$. For models of choice-dated prosocial utility, we obtain the same prediction of multivariate discounting only when the early payment is denoted in charity-euros, because then the value of delayed self-euros is also discounted. However, we expect no multivariate discounting if the early payment involves self-euros. The reason is, again, that the immediate, choice-dated prosocial utility is unaffected by the delay τ of charity-euros, which implies the following indifference condition:

$$v(s_t) = \alpha(c_{t+\tau}).$$

Prediction 3. *Consequence-dated models predict multivariate discounting, whereas choice-dated models of prosocial behavior predict multivariate discounting if the later payment involves self-euros and no multivariate discounting if the later payment involves charity-euros.*

Figure 1 summarizes the predictions that we now explore in our tailored experimental setting. It is straightforward to obtain qualitative predictions for the mixed case of both choice-dated and consequence-dated prosocial utility.

Table 1: Predictions of different models

	Type of prosocial utility		
Prediction	Choice-dated	Consequence-dated	Both
Univariate discounting of self- and charity-euros		✓	✓
Declining exchange rate	✓		✓
Multivariate discounting for both self- and charity-euros as today's numeraire		✓	✓

3 Experimental design and procedures

We set up a tightly controlled experiment that allows the precise manipulation of payment dates, including a credible implementation of future payments and donations. At the same time, the stakes remain quantitatively meaningful even when payments are delayed substantially.

3.1 Saving a Life donation paradigm

To make delays in experimental outcomes relevant to subjects, our design attempts to take prosocial decision-making in a controlled setting to the limits: we developed a high-stakes donation paradigm in cooperation with the Indian non-profit organization Operation ASHA, which specializes in the treatment of tuberculosis, the world's deadliest bacterial infectious disease (World Health Organization, 2020). Operation ASHA's model for treating tuberculosis has received extensive public acclaim and worldwide media coverage. Under conservative assumptions, a donation of 350 euros—roughly 400 US dollars at the time—covered all costs incurred by Operation ASHA to identify, treat and cure five patients, which is equivalent to saving one additional human life in expectation.[10]

Our experimental instructions provided detailed information about the

[10]We estimated the all-inclusive cost of a life saved by Operation ASHA based on public information on the charity's operations in combination with estimates from peer-reviewed epidemiological studies on tuberculosis mortality (Straetemans et al., 2011; Tiemersma et al., 2011; Kolappan et al., 2008). We conferred our donations as a restricted grant ensuring that no money is used to cover overhead costs and that the donations flow immediately into scaling up the Operation ASHA's treatment model. See also Falk and Graeber (2020) for further information on the experimental paradigm.

causes, prevalence, and implications of tuberculosis and Operation ASHA.[11] All information on tuberculosis was verifiable and came from highly reputed sources referenced in the experimental instructions, in particular the *World Health Organization*. We initiated transfers of all donations to Operation ASHA's bank account on the exact day specified in the experiment and offered subjects the opportunity to inspect proof of the bank transfer.

3.2 Design

The experiment comprises two consecutive parts: intertemporal choices (Part A) and atemporal choices under risk (Part B). Across both parts of the experiment, each subject completed a total of 36 decision screens, 21 involving intertemporal choices and 15 involving choices under risk. In each part, one randomly-chosen row of the price list on a randomly-chosen decision screen was selected by the computer and added to the subject's earnings. Before we provide the implementation details on both parts, two general remarks about the experimental design are in order.

First, we implement choices involving monetary payments to the subjects and the charity, rather than primary consumption such as effort or food. While most research on discounting behavior has relied on financial rewards, the recent experimental literature emphasizes that the discounted utility model posits discounting of *utility*, and that monetary payments only enter utility via primary consumption. Cohen et al. (2019) review this literature and conclude that studies using financial flows tend to find lower discount rates and a less hyperbolic discount function, implying smaller present bias. In the present study on self-other tradeoffs in the context of donations, we use monetary payments, because most charitable donations in practice are denominated in money. Our interest lies in time horizons exceeding two months, which has previously not been studied using primary consumption due to the logistical complications. Furthermore, we aim to circumvent the issue of genuine present bias to identify choice-related utility flows. The differences between discounting of financial flows and primary consumption are most pronounced for very early rewards, and most previous experimental work has proceeded by assuming that monetary rewards that do not occur in the immediate fu-

[11]See our experimental instructions in the Appendix.

ture are treated as consumption (Augenblick, 2019; Halevy, 2014; Sprenger, 2015; Andreoni et al., 2018). Building on this debate, our deliberate design choice of avoiding utility consequences from consumption "in the present" allows for the simplifying assumption that delayed payments directly enter the utility function. In our setting, even the earliest payment date in our experiment lies "in the future". Specifically, we execute payments as bank transfers. This means that even the earliest payment with an indicated transfer date of "today" is available to subjects no sooner than at least two days following the day of the experiment.[12] During the registration for the experiment as well as in the introductory instructions, we clarified that all payment dates will refer to dates on which a bank transfer is initiated, so that the money would be credited to their bank accounts within two to three days following this date.

Second, we use the widely-established multiple price list method for all intertemporal and risky choice tasks (Attema et al., 2016; Holt and Laury, 2002; Schubert et al., 1999; Dohmen et al., 2017). On each decision screen, subjects faced a list of binary decisions between a fixed left-hand-side amount and a right-hand-side option with increasing amounts from the top to the bottom of the list. It is well established in the intertemporal choice literature that estimates of discount rates from simple "money earlier versus later" choices alone are confounded by small-stakes risk aversion. Several approaches address this issue (Montiel Olea and Strzalecki, 2014; Ericson and Noor, 2015), including the recently popular paradigm of convex time budgets, which does not require a separate elicitation of the utility curvature (Andreoni and Sprenger, 2012). We instead rely on the "double price list method", which estimates the shape of the atemporal flow utility function from separate risky choices, extending the approach of Andersen et al. (2008) to the multi-attribute case. While both methods have been shown to perform well in practice (Andreoni et al., 2015), we primarily resort to using separate risky choices due to our objective of precisely characterizing the multi-attribute atemporal utility function.[13]

[12]While all monetary payments were received with a delay of at least two days—and are thus "in the future"—choice-dated prosocial utility accrues immediately. Appendix Section D.3 discusses how this affects the interpretation of our results.

[13]Note that both methods have practical disadvantages. While choices from convex time budgets produce substantial bunching at the boundaries and choice inconsistencies (Chakraborty et al., 2017), the price list methodology can create patterns of switching in the middle of the list (Beauchamp et al., 2020) and a minority of subjects who switch mul-

3.2.1 Part A – Intertemporal choices

We study intertemporal choices involving payments of self-euros and charity-euros by implementing a fully-crossed design with decisions involving cross-attribute vs. no cross-attribute tradeoffs and differential delays vs. no differential delays. Using multiple price lists such as those shown in Appendix Figure A.1, we elicit indifference points between certain self-euro or charity-euro payments at different, precisely specified delays. Part A comprises five stages presented in randomized order.

Univariate discounting includes two stages, *UD – SELF* and *UD – CHARITY*, in which we separately elicit net present values of delayed payments of self-euros or charity-euros, respectively. On each decision screen of stage *UD – SELF*, subjects face a list of binary choices between a fixed payment of 50 self-euros to be received by bank transfer initiated on the day of the experiment and increasing amounts of self-euros transferred at a fixed later point in time. The delay of the later payment varies across decision screens and may be either 1, 3, 6, or 12 months, in randomized order. Subjects complete four decision screens in stage *UD – SELF*. Stage *UD – CHARITY* is identical to *UD – SELF* except that both the earlier and later payments involve donations to charity, which would be made by bank transfer on the specified dates in a way that could be verified by subjects later on. In our univariate discounting choices, individuals face a tradeoff between two payments for the *same* recipient (either self-euros or charity-euros) that occur at *different* points in time.

We measure subjective exchange rates between self-euro and charity-euro payments at different points in time in stage *ER*. On each decision screen, subjects face a list of binary choices between a payment of 50 self-euros at a specified point in time and increasing amounts of charity-euros at the *same* point in time. Time points include bank transfers initiated on the same day (the *spot exchange rate*) that would be credited to the recipient with the shortest delay of two to three days, as well as bank transfers initiated in 1, 3, 6, or

tiple times in a single list, at odds with monotonic preferences (e.g. Bruner, 2011). Here we circumvent the complications associated with multiple switching points in the data by enforcing a unique switching point. This was implemented using an auto-completion function that filled in remaining choices as soon as a subject switched from the fixed left-hand-side option to the increasing right-hand-side option.

12 months (*forward exchange rates*). These five decision screens provide measures of how many charity-euros subjects demand per contemporaneous self-euro for different delays from today's perspective. Note that the choices about the subjective exchange rate present individuals with tradeoffs between two payments for *different* recipients, but occurring at the *same* points in time.

Finally, we measure tradeoffs between two payments – one denominated in self-euros and one in charity-euros – with different delays. Stages *MD – SELF* and *MD – CHARITY* thus capture the common situation in which individuals face tradeoffs between giving and taking, but the corresponding payment flows occur at different times. On each decision screen in stage *MD – SELF*, subjects face a list of binary choices between a fixed payment of 50 self-euros at the earliest delay and increasing amounts of charity-euros at a fixed later point in time. Conversely, in stage *MD – CHARITY*, subjects face a list of binary choices between a fixed payment of 50 charity-euros at the earliest delay and increasing amounts of self-euros at a fixed later point in time. As before, the later time points include 1, 3, 6 and 12 months. Multivariate discounting choices create tradeoffs between two payments for *different* recipients, occurring at *different* points in time.

Within Part A, both the order in which stages occur and the order of decisions within each stage are randomized at the individual level.[14] Right-hand-side options in the price lists range from a simple annualized discount rate of 0% to 150% (relative to a 50 euros left-hand-side option) in increments of five percentage points for univariate discounting (*UD-SELF* and *UD-CHARITY*) and from zero to 200 euros in increments of 10 euros for the exchange rates (*ER*). In the multivariate price lists, switching points are affected both by discounting and the relative preferences for self-payments versus charity payments. Right-hand-side payments range from from zero euros to an annualized discount rate of 150% (relative to a 50 euros left-hand-side option) in *MD – CHARITY*. Relative to *MD – CHARITY*, the right-hand-side amounts in *MD – SELF* are multiplied by a factor of three to reflect the prior evidence on a strong relative preference for self-payments over charity payments.

Appendix Table B.1 provides an overview of all price lists used within the experiment, including their dates, ranges and the share of observations indi-

[14]To avoid confusion, all decision screens belonging to the same stage appeared consecutively (in randomized order).

cating switching close to the midpoint of the price lists, among other things. On average across these lists, we only observe 7% of decisions close to the midpoint (defined as switching points falling within 5% of the midpoint relative to the range of the price list). This low fraction indicates that a heuristic of consistently switching around the middle of the lists is not an important driver of behavior in our data.

In presenting our results, we transform the data from different stages to make them more comparable. For choices from stage UD, we calculate the net present value (expressed in today's numeraire) of a dated future payment of one euro from subjects' smaller-sooner-larger-later choices. Specifically, the net present value is $50/m^*$, where m^* is the subject's switching point.[15] For choices from stage MD, we present "conversion factors", which is the amount of the delayed currency that is worth to subjects as much as one unit of the non-delayed currency. For choices from stage ER, we calculate the (forward) exchange rate $m^*/50$, i.e. the rate of charity-euros per identically-dated self-euro.

3.2.2 Part B – Risk apportionment

The objective of Part B is to characterize individuals' multi-attribute utility functions using atemporal decisions, i.e. choices that do not involve differently-dated payments. Note that the intertemporal choices in Part A only identify discounting behavior under the assumptions that flow utility is linear.

We take the approach of eliciting utility curvature using a separate set of atemporal risky choice tasks. While this approach has been popular in the recent experimental literature on intertemporal choice (starting with, e.g., Andersen et al., 2008), note that some evidence suggests that utility curvature elicited under risk might be more pronounced than curvature elicited directly from choice over time (Cheung, 2020). The calibration of utility curvature, however, is not our primary object of interest here, and robustness analyses in Appendix D.4.3 suggest that our core findings on intertemporal choice are robust to different estimated utility curvature.

To elicit utility curvature, we adopt the recently popularized experimental paradigm of risk apportionment (e.g., Eeckhoudt and Schlesinger, 2006),

[15]The value of the earlier payment (option A) in the multiple price list is always 50 euros. We use the midpoint of the interval where the subjects switched from option A to option B.

which allows for non-parametric testing conditions on the nature of the utility function. Risk apportioning has the desirable feature that the measurement remains valid even if expected utility theory fails (Ebert and van de Kuilen, 2015; Starmer, 2000). We measured univariate risk aversion individually for self-euros and for charity-euros (stages *RA – SELF* and *RA – CHARITY*, respectively), univariate prudence (stages *PR – SELF* and *PR – CHARITY*), and multivariate risk aversion (stage *X – RA*). All details on the design of the risk apportionment tasks, which closely follows existing work, are relegated to Appendix B.2.

3.2.3 Procedures

We recruited 244 subjects from the student subject pool of the *BonnEconLab* at the University of Bonn. Table A.1 provides summary statistics for the full sample. We collected data in nine sessions from September 19 to September 22, 2016. The experiment was fully computerized and conducted using the software oTree (Chen et al., 2016). Subjects were seated in separate cubicles to create full privacy so that no other person could see their screen during the experiment. They could ask questions to an experimenter at any time. The average completion time was 65 minutes.

Subjects received a fixed amount of five euros for their participation in the experiment. All payments were made as bank transfers initiated on the precise day indicated for the payment. On average, each participant earned 59 euros (39 euros at the earliest delay and 20 euros at later time points) and caused donations of 70 euros (40 euros at the earliest delay and 30 euros at later time points). Average earnings and average donations together corresponded to fifteen times the federal hourly minimum wage at the time, or more than 10% of the median monthly household income reported by our sample.

4 Reduced-form results

We now document the main qualitative patterns in our data. Our primary objective is to disentangle the consequence-dated and choice-dated models of prosocial utility by testing their distinctive predictions. We start with the analysis of choices under risk and then turn the intertemporal decisions. Details on the construction of confidence intervals are relegated to Appendix C.1.

4.1 Choice under risk

As the behavior in risky choice tasks is not our main object of interest, we here restrict our attention to reporting the main pattern revealed in the risk apportionment data that we use in our subsequent analysis of intertemporal choices, and relegate all other results and analyses to Appendix C.2.

More than 80% of subjects display second- and third-order risk aversion for self-euros and charity-euros. We cannot reject the null hypothesis that risk preferences for both types of payments are equally distributed (Kolmogorov–Smirnov test, $p = 0.786$). In the following, we will thus assume that the single-attribute utility functions representing utility from self-euros and charity-euros only differ by a multiplicative constant.

Result 1. *Subjects exhibit highly similar attitudes towards risk in payments of self-euros and charity-euros. This observation implies that the corresponding single-attribute utility functions have similar curvature.*

4.2 Intertemporal choice

Result 1 on the similar curvature of single-attribute utility functions allows us to derive slightly more general conclusions than under the nested case of linear utility.

We start with the univariate discounting tasks (stages *UD-CHARITY* and *UD-SELF*). Here, subjects only face a time tradeoff, but no tradeoff across domains. Figure 2 shows the net present values of delayed payments of self-euros and charity-euros. We plot the average stated amounts for the subjective evaluation in self-euros m^S for a payment of one self-euro that is delayed by τ months. We report the same result for the subjective evaluation in charity-euros m^C for a donation of one euro that is also delayed by τ.

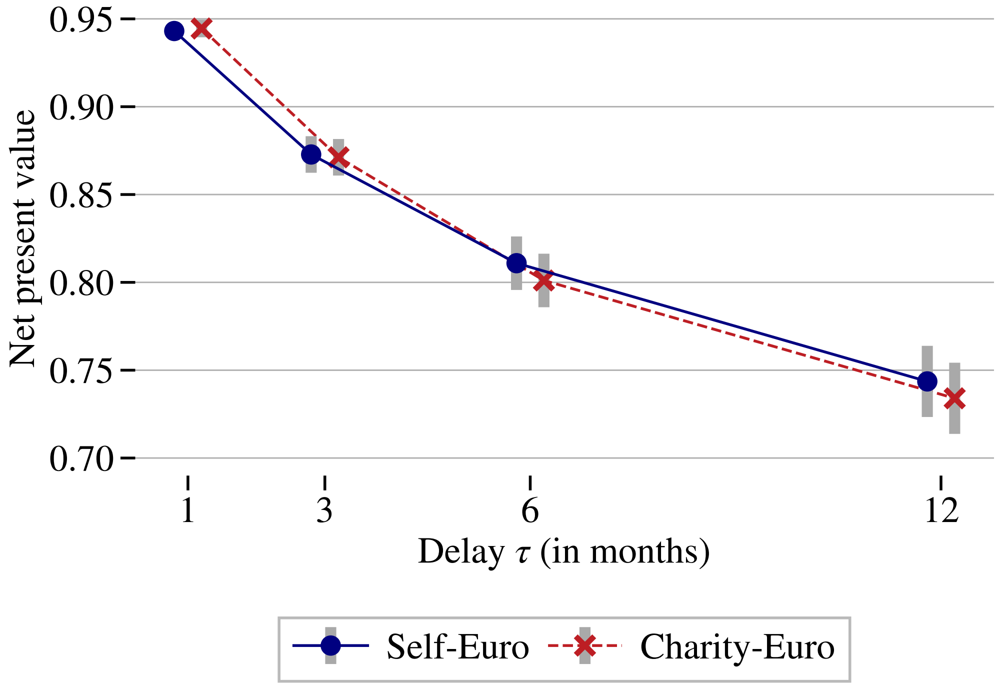

Figure 2: This figure displays the net present value of a dated payment of one self-euro (blue markers) and the net present value of one charity-euro (red markers) with different delays (N = 244). The net present values are calculated from choices between smaller-sooner and larger-later payments to the subjects, or donations. 95% confidence intervals of the mean are calculated according to Morey (2008) and Cousineau (2005). We horizontally offset the markers in this figure to aid the visual comparisons of net present values.

We find that net present values are identical between the two domains and decreasing with time. The average stated amounts for m^S and m^C are statistically indistinguishable for all delays τ (paired Wilcoxon signed-rank test, $p > 0.58$ for any τ). This result has two implications related to Prediction 1. First, a decreasing net present value for delayed charity-euro payments is incompatible with the pure choice-dated model. If prosocial utility flows are entirely choice-dated, then delays in implementing the donation payment would be irrelevant. Our finding is in line with consequence-dated prosocial utility flows. Second, and more compellingly, the canonical discounted utility version of consequence-dated utility can accommodate identical net present values for delayed self-euros and charity-euros and identical curvatures of the single-attribute utility functions (Result 1). This suggests that the same discount factors, $D(\tau)$, are applied to future utility from self-euros and charity-euros. We can rule out the alternative explanation that there are separate discount factors for each domain as, established in Result 1, the univariate utility functions for self-euros and charity-euros have the same curvatures.

Result 2. *In univariate discounting tasks, net present values for delayed self-euro and charity-euro payments are identical and decreasing in the delay. Both patterns are consistent with consequence-dated, but not with choice-dated, prosocial utility.*

We next turn to the choice tasks designed to determine subjective exchange rates between self-euros and charity-euros for different delays (stage *ER*). In these tasks, subjects only face a cross-attribute tradeoff, since the delays of the payments are identical. Figure 3 shows the average subjective exchange rates F_τ between contemporaneous self-euros and charity-euros.

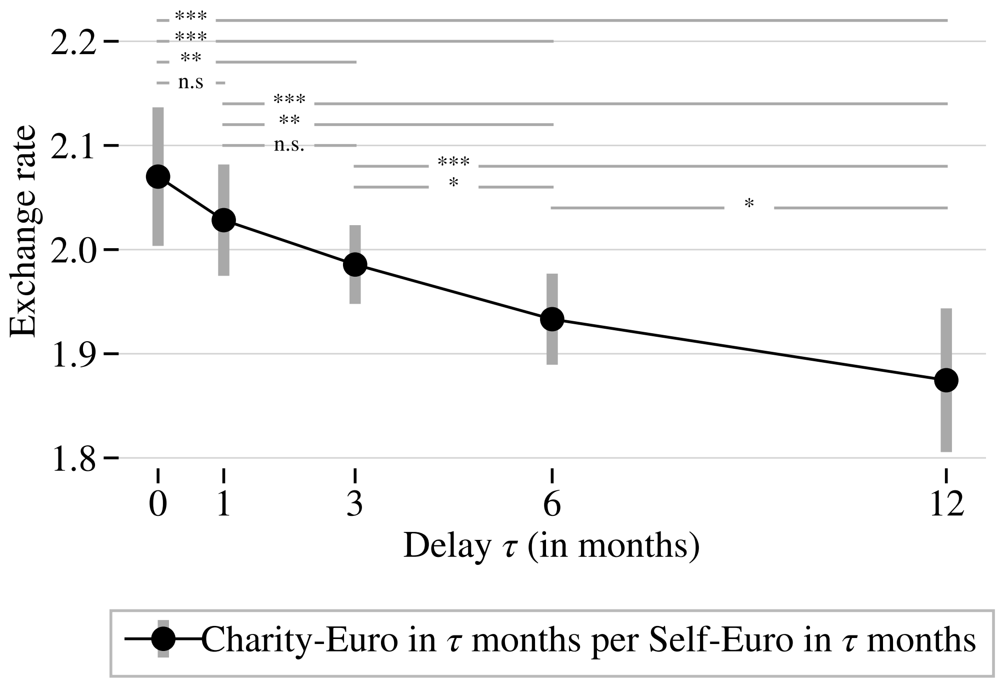

Figure 3: This figure displays the estimated subjective exchange rates between contemporaneous payments to the subjects and donations, i.e. the number of charity-euros per contemporaneous self-euro. Note that "0 months" indicates payments initiated as bank transfers on the day of the experiment, so that they are credited to the recipient's account between two and three days after that. 95% confidence intervals of the mean are calculated according to Morey (2008) and Cousineau (2005). Horizontal bars indicate significance levels of paired t tests for pairwise comparisons. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The level of the subjective exchange rate is always above one, indicating that subjects on average prefer payments to themselves over equally-sized and equally-delayed donations (t tests at each delay, $p < 0.001$). For the earliest payment receipt date of 2-3 days, subjects exhibit an exchange rate of approximately $F_0 = 2.07$. One self-euro is valued about twice as much as one charity-euro. More strikingly, we find that the valuation of a self-euro per contemporaneous charity-euro decreases in the delay τ (paired t tests for the change in delay τ relative to the base period of 0: $p_1 = 0.245$, $p_3 = 0.031$, $p_6 = 0.003$, $p_{12} < 0.001$). This means that when the common delay of two payments—one denominated in self-euros and one in charity-euros—increases, our subjects develop a relative preference for charity-euros. Put differently, in these types of choices that only involve the same delay τ in both domains, subjects discount self-euros faster than charity-euros. To assess the economic significance of the fall in the exchange rate, note that the 12-month exchange rate is estimated at roughly 0.9 of the spot exchange rate. Comparing this to a typical estimate of the long-run yearly discount factor north of 0.9 (cf. Cohen et al., 2019), we conclude that the documented temporal pattern of the exchange rate is economically meaningful.

A declining forward exchange rate has two implications regarding Prediction 2. First, we cannot rationalize this pattern with the discounted utility version of consequence-dated prosocial utility. If we apply the same discount function to self-euros and charity-euros, the discount factors cancel out whenever the delays in the two payments are the same. Second, this finding is distinctly compatible with choice-dated prosocial utility. If delayed self-euro payments generate delayed utility flows that are discounted, but delayed donations are only associated with choice-dated utility flows, an increase in the common delay will affect the discounted utility from self-euros, while leaving the utility derived from donations unaffected. Note that we do not have to invoke the shape of the utility function for this argument: the exchange rate finding is incompatible with discounted utility irrespective of utility curvatures.

Result 3. *Subjective exchange rates between self-euros and charity-euros are declining over time, i.e. a common delay makes self-euros relatively less valuable than charity-euros. This pattern is explained by choice-dated, but not by consequence-dated, prosocial utility.*

Finally, recall that choice tasks on multi-attribute discounting (stages *MD – CHARITY* and *MD – SELF*) combine a cross-attribute tradeoff with a time tradeoff within a single decision. Our participants had to decide what amount in one domain payable at a later date would make them indifferent to a given amount in the other domain payable at an earlier date. Figure 4 shows the average conversion factor between delayed charity-euros and self-euros today (and vice versa).[16]

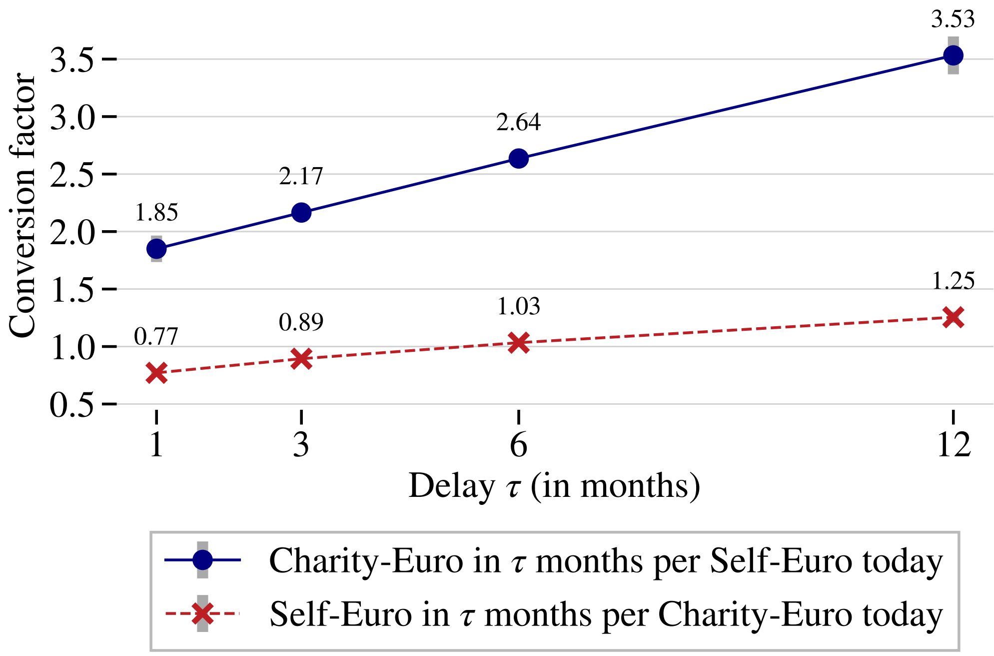

Figure 4: This figure displays estimated conversion factors between delayed payments in one currency to an immediate payment of one euro in the other currency (N = 244). Red markers indicate the conversion factors from one charity-euro today to self-euro payments of different delays. Blue markers indicate the conversion factors from one self-euro today to charity-euro payments of different delays. 95% confidence intervals of the mean are calculated according to Morey (2008) and Cousineau (2005).

There are three notable patterns in our data. First, subjects on average demand less compensation in self-euros at the earlier date for giving up a donation at a later date than vice versa (paired t test for each delay, $p < 0.01$).[17] Intuitively, given that subjects value one self-euro roughly twice as much as a

[16] A conversion factor of λ_τ means that the subject is willing to exchange 1 self-euro (charity-euro) today for λ_τ charity-euros (self-euros) in τ months.

[17] Specifically, the average WTA for giving up self-euros today for charity-euros tomorrow (WTA_τ^{sc}) is higher than the average WTA for giving up charity-euros today for self-euros tomorrow (WTA_τ^{cs}). In particular, we have $\min_\tau \text{WTA}_\tau^{sc} > \max_\tau \text{WTA}_\tau^{cs}$.

contemporaneous charity-euro, they will require less compensation in their preferred category (self-euros) than in the inferior category (charity-euros). Second, the conversion factors increase in the delay of the later payment, implying that payments of both self-euros and charity-euros are valued less as their delay increases (paired t-tests between adjacent delays, $p < 0.01$). Third, we find that the conversion factors for delayed charity-euros increases more quickly in the delay τ than the conversion factors for delayed self-euros (paired t-tests for the difference in rates of change for compensations in self-euros and charity-euros for each time difference, $p < 0.01$).

These results relate to Prediction (3) as follows: an increasing conversion factor for delayed charity-euros is at odds with pure choice-dated prosocial utility, as the payment date of charity-euros should be inconsequential in that case. However, all three patterns are compatible with consequence-dated prosocial utility. An increasing conversion factor for more delayed donations naturally follows from stronger discounting. The level differences as well as the difference in slopes are predicted by a lower marginal utility from charity-euros compared to self-euros.

Result 4. *In cross-attribute intertemporal decisions, conversion factors for delayed charity-euro payments are increasing in their delay, and they are higher and increase more quickly than those for delayed self-euros. These patterns are explained by consequence-dated, but not by choice-dated, prosocial utility.*

In summary, our reduced-form analyses provide qualitative evidence for the existence of *both* choice-dated and consequence-dated components of prosocial utility. Our combined reduced-form results naturally beg the question whether subjects behave "consistently" across choices that present different types of tradeoffs. Appendix E.3 presents corresponding analyses and documents that our subjects indeed exhibit remarkable internal consistency across different combinations of tradeoffs.

Next, we develop and estimate a structural model that (i) reproduces the documented patterns with a single set of preferences and (ii) allows us to compare the relative magnitudes of these prosocial utility components.

5 Structural estimation

Our structural analysis has two objectives (DellaVigna, 2018). First, we assess the ability of our proposed model of intertemporal prosocial utility to generate the qualitative reduced-form patterns with a quantitatively reasonable parameterization. Second, the estimated model allows us to assess the relative importance of choice-dated and consequence-dated prosocial utility flows. We first outline and motivate the functional form of our utility function, provide details about our estimation routine, and discuss the results from a representative agent model before we turn to individual-level estimations.

5.1 Setup

Building on our conceptual framework and reduced-form results, we posit the following parametric form for our intertemporal utility function:

$$V_t = \underbrace{\alpha \mathbb{1}\left(\sum_{\tau=0}^{T} c_{t+\tau} > 0\right)}_{\text{choice-dated}} + \underbrace{\sum_{\tau=0}^{T} \delta^{\tau}\left(w s_{t+\tau}^{\beta} + (1-w) c_{t+\tau}^{\beta}\right)}_{\text{consequence-dated}}. \tag{5}$$

The first part represents choice-dated prosocial utility, while the second part captures consequence-dated utility. In this parameterization, α is the choice-dated prosocial utility derived from donating, and δ denotes the one-month utility discount factor.[18] We capture pure altruism by $1-w$, as it describes the relative value of one charity-euro to a current self-euro. $1-\beta$ refers to the coefficient of univariate relative risk aversion.

The key elements of our specification follow our reduced-form analysis and the existing literature.[19] First, our earlier findings suggest that we include both choice- and consequence-dated utility. Second, for the flow utility function, we document in our reduced-form analysis that the curvature of the univariate utility from self-euros and the univariate utility from charity-

[18]While all monetary payments were received with a delay of at least two days—and are thus "in the future"—choice-dated prosocial utility accrues immediately. Appendix Section D.3 discusses how present-bias would affect the interpretation of α. We show that present-bias might lead to an upward bias for α and derive bounds suggesting that this bias is small.

[19]Andreoni and Miller (2002), Andersen et al. (2018), and Fisman et al. (2007) use a similar functional form.

euros have the same curvature and only differ in scale. We, therefore, assume a common parameter, β, to capture the curvature of the utility function when choices involve only one recipient. Finally, we assume standard exponential discounting as our data only includes payment dates in the future, allowing us to abstract from present bias and to economize on parameters in our baseline specification.[20]

Our baseline specification assumes amount-independent choice-dated prosocial utility based on two main considerations. First, amount-independence has the benefit of parsimony, capturing the notion of choice-dated utility in a single, interpretable parameter α. Second, without theoretical guidance on the possible shape of the choice-dated prosocial utility component, this is a natural starting point if one wishes to obtain a first-order estimate of the relative *quantitative* importance of choice-dated utility compared to consequence-dated utility. Appendix Section D.4.2 documents the robustness of our findings when we allow choice-dated utility to depend on the size of the donation.

We drop a small number of questions and individuals from our estimation sample. First, some subjects display a very high degree of risk aversion. As highlighted in Wakker (2008), a CRRA utility function has difficulties matching this behavior, as a constant relative risk aversion greater than one is outside the theoretical range of our structural model. Thus, we exclude 45 subjects with an average normalized switching point greater than 0.9 in the stages *RA – SELF* and *RA – CHARITY* to avoid corner solutions.[21] Second, we exclude the choice data from the three multiple price lists from the stage *X – RA* from the estimation, as those are the only choices for which the above assumption of additive separability of the consequence-dated utility component matters. We refrain from modeling non-separability in our baseline specification because our primary focus is on intertemporal prosocial utility and our corresponding results are largely unaffected, but we provide extensions in

[20]We relax this assumption in Appendix Section D.4.1 and show that allowing for non-exponential discounting does not affect our estimates of α, w and β much (as shown in Appendix Table D.1). Moreover, the implied discount factors for different time horizons are very similar across specifications, suggesting that exponential discounting is a reasonable first-order approximation in our setting.

[21]Appendix Section D.4.3 examines the role of noise in our risk data, showing that trimming the sample or winsorizing risky lottery choices leads to similar estimates of our parameters of interest.

the Appendix.[22]

5.2 Estimation

The experiment is carefully designed to provide the required variation to jointly identify the four parameters $\theta = (\alpha, \beta, \delta, w)$ in Equation (5). Univariate risk aversion, $1-\beta$, is identified from the risky choices in Part B. Conditional on $1-\beta$, the discount factor δ is separately identified from the univariate discounting stage in Part A of the experiment. The subjective exchange rate from stage ER provides identifying variation for the choice-dated prosocial utility parameter, α. We identify the pure altruism parameter, $1-w$, from choices involving tradeoffs between self-euros and charity-euros such as stage *MD – SELF*, *MD – CHARITY*, and *ER*.[23]

We estimate the structural parameters of our model using a minimum-distance estimator (Newey and McFadden, 1994). Let $m(\theta)$ denote the moments predicted by our structural model, and $\hat{m}$ the vector of observed moments. The minimum-distance estimator selects the parameters $\hat{\theta}$ that minimize the distance the squared distance between the observed and predicted moments. The estimates $\hat{\theta}$ are defined by:

$$\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \quad (m(\theta) - \hat{m})' W (m(\theta) - \hat{m}), \tag{6}$$

where W is a positive definite weighting matrix. We chose a minimum-distance estimator over a maximum likelihood estimator, because it is more robust to outliers. This challenge is particularly prevalent in the context of charitable giving (DellaVigna, 2018; DellaVigna et al., 2012).

As a vector of moments $\hat{m}$, we use the average normalized switching point in each of our remaining 33 price lists. We normalize individual switching points by applying a linear transformation that maps each price list onto the unit interval such that $\hat{m} \in [0,1]^{33}$. For the choice of the weighting matrix,

[22]Note that under narrow bracketing of monetary rewards, the assumption of additive separability will not affect our estimates of α and w. Appendix Section C.2 provides details on the results from choices under risk. Appendix Section D.4.4 provides an extension with background consumption.

[23]As the stage *ER* provides a source of identifying variation for both α and $1-w$, the parameter estimates will not be fully independent as is typical in non-linear specifications like ours. However, we provide evidence that any mechanical relationship between these parameters is small (as shown in Appendix Figure D.1).

we follow Altonji and Segal (1996) and use the diagonal of the inverse of the variance-covariance matrix of our empirical moments. We provide additional details about the implementation and reliability of our estimation approach in Appendix D.

5.3 Results

We estimate two models to learn about our parameters of interest. We first estimate a representative agent model that rules out any parameter heterogeneity. Then, we leverage the rich within-subject variation of our data. We estimate the utility function at the subject level and obtain estimated preferences $\hat{\theta}_i$ for each subject (Fisman et al., 2007; Augenblick and Rabin, 2018).

First, we consider the representative agent model. Figure 5 displays the point estimates and the corresponding 95% confidence intervals for the model parameters.

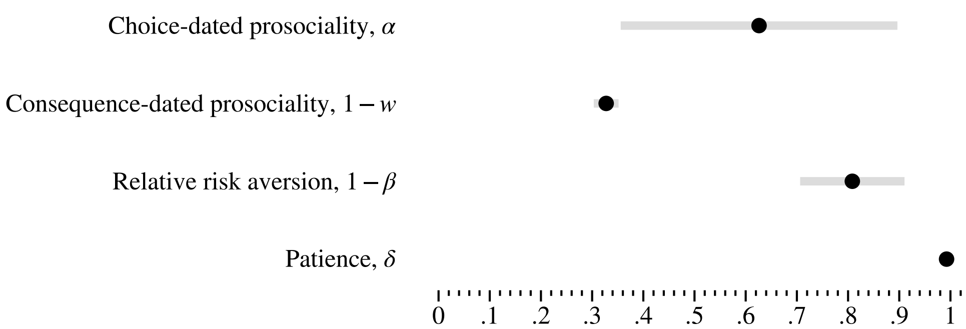

Figure 5: This figures displays the point estimates (black marker) and 95% confidence intervals (gray lines) of the representative agent parameter estimation (N = 200). α is the marginal choice-dated prosocial utility from giving. $1-w$ is the weight on utility from charity-euros in the stationary flow utility function. $1-\beta$ is the coefficient of univariate relative risk aversion. δ is the one-month discount factor.

Our estimated parameter values are, where applicable, in line with the existing literature. For example, we estimate a one-month discount factor of 0.992, which corresponds to a one-year discount factor of 0.906, similar to results observed by Andersen et al. (2018). We estimate a univariate relative risk aversion parameter of 0.802, and we find evidence for a consequence-dated prosocial utility component. Our point estimate of consequence-dated prosociality, $1-\hat{w} = 0.327$, implies that the consequence-dated prosocial flow utility from a delayed donation of 50 euros provides roughly half (i.e. $\frac{1-w}{w}$) of the flow utility of an identically-dated 50-euro payment to the subject. This magnitude is consistent with our reduced-form estimate of the subjective exchange rate. In addition, there is a choice-dated prosocial utility component. We estimate a value of $\hat{\alpha} = 0.642$ that implies that the immediate choice-dated prosocial utility from a donation of 50 euros in one month corresponds to 44% of the total discounted utility associated with a 50-euro payment to the subject in one month.

Next, we turn to the individual-level estimation to investigate the role of preference heterogeneity in our sample. We find considerable heterogeneity in preferences. Figure 6 visualizes the marginal distribution of each preference parameter. The median subject exhibits a consequence-dated prosociality parameter $1-\hat{w}$ of 0.353, which is in line with the estimate for a representative agent. At the same time, for about 20% of respondents we obtain parameter estimates that suggest almost no concern for the consequences of their decisions for others ($1-\hat{w} = 0$). Slightly fewer than 60% of our subjects have parameter estimates $\hat{\alpha} > 0$ that suggest the presence of choice-dated prosociality. Among this group, the degree of choice-dated motivation is widely dispersed with a median parameter estimate of 0.481.

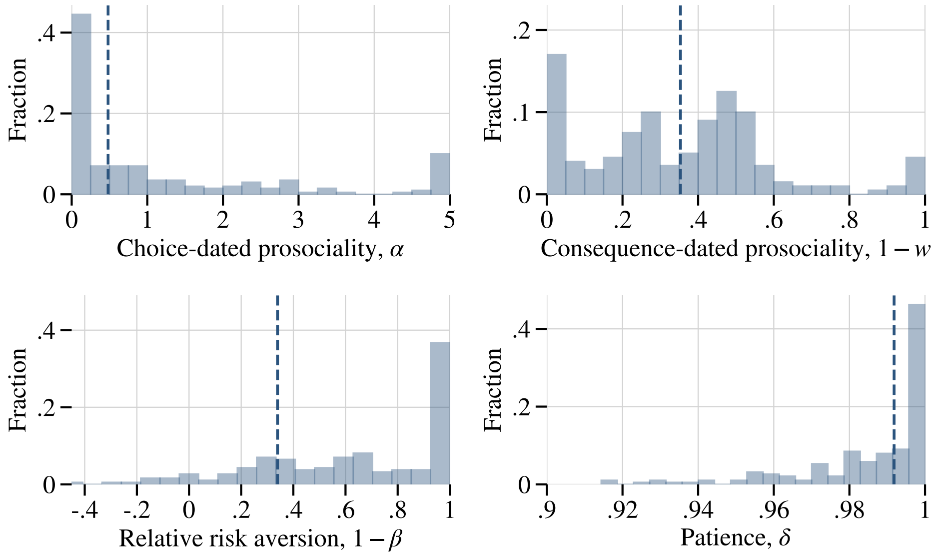

Figure 6: This figure plots the marginal distribution of the model parameters at the subject-level (N = 200). It shows the fraction of the sample that is contained in each bin. The dashed vertical line indicates the median of the distribution. The distribution of $1-\beta$ excludes fifteen subjects with a coefficient of relative risk aversion smaller than -0.50. The distribution of δ excludes twelve subjects with a one-month discount factor below 0.90.

Looking at the joint distribution between $\hat{\alpha}$ and $(1-\hat{w})$ we find a negative correlation of $\rho = -0.417$. This strong correlation suggests that the prosocial motivations underlying these differently-dated utility flows are substitutes rather than complements at the individual level. Put differently, choice-dated and consequence-dated motivations appear to characterize people with different types of prosocial motivations. Our data are compatible with the interpretation that, while some people donate out of pure altruism, others are driven by the feeling of warm glow.[24]

The declining subjective exchange rate between self-euro and charity-euro payments with the same delay is one of the core findings from our reduced form analysis. Our estimated model replicates this pattern, and we discuss the implications for the median individual parameter estimates in turn. First, consider a 50-euro donation in one month, which provides 1.32 utils from the discounted consequence-dated utility flow and 0.48 utils from the choice-dated utility. Second, consider a 50-euro donation executed in a year

[24]This negative correlation is not mechanical. Appendix Figure D.1 shows that if we fix choices and exogenously vary α, the model estimates of $1-w$ are largely unaffected.

from today. This provides 1.21 utils from the discounted consequence-dated utility flow and still 0.48 utils from the choice-dated utility. Going from a delay of a month to a full year, consequence-dated utility declines from 2.75 times the choice-dated utility to a factor of 2.52—a decrease by about 9%. As a consequence, the forward exchange rate implied by our parameter estimates decreases by 0.28 euros when payments are executed in a year from today rather than a month. This change is remarkably close to our observed decrease of 0.20 euros in our experiment.

6 Conclusion

We study the intertemporal dimension of prosocial behavior and propose a distinction between choice-dated and consequence-dated flows of prosocial utility. This conceptual approach generalizes differences between psychological motivations explored in the existing literature and delivers testable implications for intertemporal prosocial behavior. Empirically, we conduct a high-stakes donation experiment that provides a comprehensive characterization of the intertemporal multi-attribute utility function using reduced-form and structural approaches. We find that the majority of individuals exhibit both choice-dated and consequence-dated prosocial utility. Furthermore, both motives are quantitatively meaningful, and there is a strong negative correlation between their weights, implying that individuals are either primarily motivated by choice-dated or consequence-dated considerations.

We conclude with three comments on the limitations and potential promise of the approach taken in this paper. First, the proposed conceptual distinction between consequence-dated and choice-dated utility is deliberately chosen to bridge theoretical work on intertemporal choice with largely empirical work on specific prosocial motivations such as warm glow and pure altruism. At the same time, this taxonomy remains a reduced-form perspective on the underlying psychological drivers. It is thus complementary to work that sheds light on the sources of pure time preferences about the outcomes of others. For example, our approach and findings provide a motivation to further examine *why* people prefer helping others sooner rather than later. Second, we abstract from the implications of our approach for time-inconsistent behavior. This topic has received significant attention following work on present-biased preferences and is the focus of related work. Third, while the present paper introduces a toolkit for analyzing the time structure of prosocial utility flows and hints at the usefulness of this approach for understanding prosocial decision-making, it does so in a specific high-stakes donation context using a specific experimental paradigm that relies on the well-studied multiple price list methodology and monetary payments. One avenue for future work is to examine the implications of whether and how intertemporal prosocial motivations interact with these design choices, and how this matters for charitable giving in practice. In light of recent trends relating to the time structure of donations—such as donor-advised funds—, charities might be interested in better understanding the profile of existing and potential donors along the lines of our distinction between choice- and consequence-dated utility. Our paper showcases a methodology to examine the time structure of giving that can potentially be used as screening device for such type heterogeneity, allowing charities to better target their fundraising activities.

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Appendix

A Additional tables and figures

Table A.1: Summary statistics

	Observations	Mean	Std. dev.	Min	25th	Median	75th	Max
Age	244	25	5.5	18	22	23	26	61
Female	244	.57	.5	0	0	1	1	1
Household income	244	1,446	1,133	0	650	1,000	2,000	4,000
Savings	244	.54	.5	0	0	1	1	1
Education (years)	244	16	3.5	3	15	16	18	29
Student	244	.91	.29	0	1	1	1	1
Political orientation	244	2.3	1.3	0	1	2	3	6
Siblings	244	1.5	1.2	0	1	1	2	7
Raven score	244	6.1	1.7	0	5	6	7	10

Note: This table shows summary statistics for the full sample. “Household income” is the self-reported total monthly household income after taxes and transfers (in euros). “Savings” is a binary variable taking the value of 1 if the subject reported that she is able to save money each month. “Education (years)” are the subject’s total years of education starting from primary school. “Student” is a binary variable taking value of 1 if the subject is enrolled at a university degree program. “Political orientation” is measured on a scale from 1 (“rather left”) to 7 (“rather right”). “Siblings” are the total number of siblings. “Raven score” is the number of correctly solved Raven matrices out of ten.

Table A.2: Regression analysis of intertemporal choices without clustered standard errors

	Univariate discounting			Multivariate discounting			Exchange rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
charity-Euro	-0.005 (0.006)		0.001 (0.007)	-1.557 (0.064)		-1.079 (0.082)	
1 month							-0.042 (0.044)
3 months		-0.072 (0.005)	-0.070 (0.007)		0.219 (0.073)	0.315 (0.070)	-0.084 (0.039)
6 months		-0.138 (0.006)	-0.132 (0.008)		0.524 (0.085)	0.785 (0.096)	-0.137 (0.041)
12 months		-0.205 (0.008)	-0.199 (0.011)		1.083 (0.113)	1.682 (0.153)	-0.195 (0.049)
3 months × charity-Euro			-0.003 (0.010)			-0.192 (0.122)	
6 months × charity-Euro			-0.011 (0.012)			-0.523 (0.141)	
12 months × charity-Euro			-0.011 (0.015)			-1.199 (0.190)	
Constant	0.843 (0.004)	0.944 (0.004)	0.943 (0.005)	2.546 (0.051)	1.311 (0.048)	1.850 (0.043)	2.070 (0.034)
N	1952	1952	1952	1952	1952	1952	1220
R^2	0.386	0.620	0.621	0.396	0.245	0.471	0.921
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subjects	244	244	244	244	244	244	244

Note: This table shows pooled OLS regression estimates where the unit of observation are subject-choices. In columns 1–3, we include all choices from the two univariate discounting stages (*UD-SELF*, *UD-CHARITY*). The dependent variable is the net present value $y_{i,\tau,d}$ of the delayed payment, where i denotes the subject, τ the delay in months, and d is the numéraire of the payments (self-euros or charity-euros). Columns 4–6 include all choices from the two multivariate discounting stages (*MD-SELF*, *MD-CHARITY*). The dependent variable is the implied conversion factor $y_{i,\tau,d}$ that makes subjects indifferent between a payment of 50 euros today (self-euros or charity-euros) and a delayed payment of $50 \cdot y_{i,\tau,d}$ of type d (self-euros or charity-euros). In column 7, we include all choices from the exchange rate stage ER. The dependent variable is the implied (forward) exchange rate $y_{i,\tau}$ at different delays τ. "Charity-euro" is a binary indicator variable taking the value of 1 if the numéraire of the earlier payment are charity-euros. "τ month(s)" is a binary indicator variable taking the value of 1 if the later payment is received with a delay of τ month(s), where $\tau = 1$ month is the omitted category in columns 1–6 and "0 months" is the omitted category in column 7. All regressions include subject fixed effects. Robust standard errors are shown in parentheses.

Treffen Sie jetzt Ihre Entscheidung

Bitte geben Sie für jede Zeile in der folgenden Tabelle an, ob Sie **Option A** oder **Option B** wählen.

Option A			Option B
50,00 € heute **selbst erhalten.**	○	○	**0,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**10,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**21,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**31,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**42,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**52,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**63,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**73,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**84,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**94,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**105,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**115,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**126,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**136,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**147,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**157,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**168,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**178,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**189,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**199,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**210,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**220,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**231,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**241,50 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**252,00 €** in 6 Monaten **an Operation ASHA spenden.**
50,00 € heute **selbst erhalten.**	○	○	**262,50 €** in 6 Monaten **an Operation ASHA spenden.**

Automatische Ausfüllhilfe: Damit Sie weniger klicken müssen, haben wir eine Ausfüllhilfe aktiviert, die automatisch Auswahlfelder für Sie ausfüllt.

Weiter

Figure A.1: This is an example of the decision screen as seen by subjects in stage *MD – SELF* of the intertemporal choice part of the experiment. The original instructions in German are shown. In each row, subjects indicate whether they prefer option A or option B by selecting the appropriate circle in each row. Option A on the left-hand side offers 50 self-euros today. Option B on the right-hand side offers increasing amounts of charity-euros from zero to 262.50 euros. The amount will be wired to *Operation ASHA* in six months. All price lists in the intertemporal choice part of our experiment are presented in this format. We vary only (i) the amount offered in option B, (ii) the timing of payments (both for option A and option B), and (iii) whether payments are denoted in self-euros or charity-euros. The decision screens are otherwise identical.

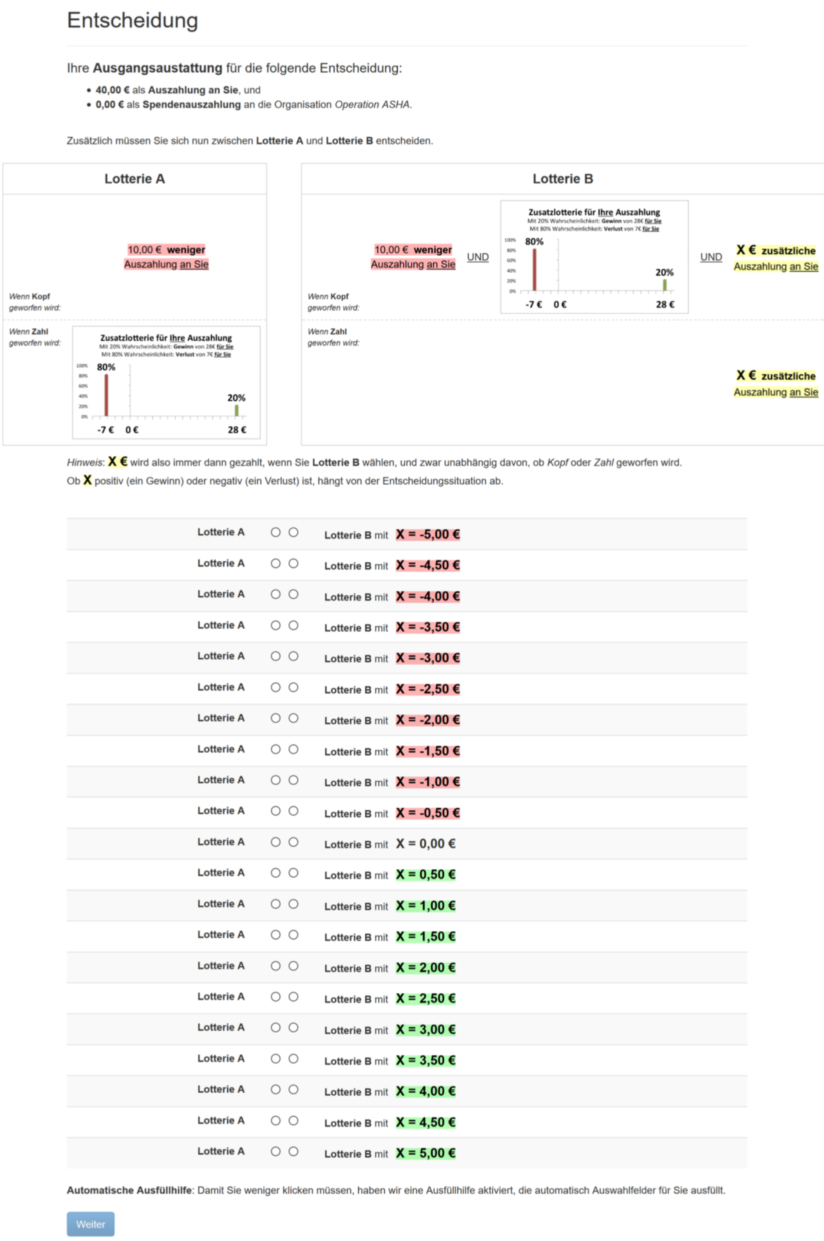
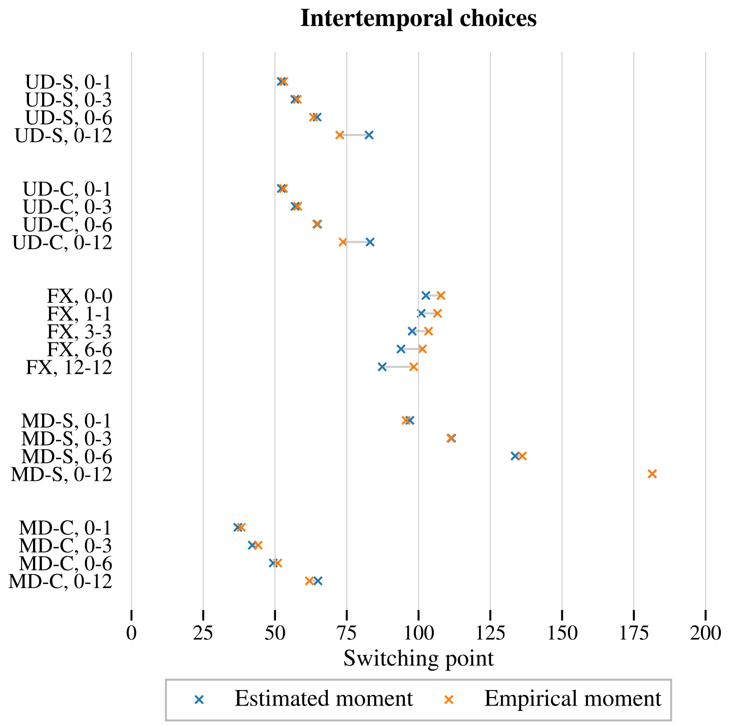


Figure A.2: This is an example of the decision screen as seen by subjects in stage *RA – SELF* of the risky choice part of the experiment. The original instructions in German are shown. At the top of the screen, subjects are informed about their initial endowment **e** of 40 self-euros and zero charity-euros. Next, subjects see two boxes that contain a visual representation of lottery A and lottery B. In each box, the upper part explains the consequences when the simulated coin toss yields head, whereas the lower part explains the consequences if it yields tails. In the lower part of the screen, subjects indicate whether they prefer lottery A or lottery B by selecting the appropriate circle in each row. The right-hand side shows the compensation amounts **m** that are to be added to lottery B. They range from -5.00 self-euros to 5.00 self-euros. All decisions in the risky choice part of our experiment are presented in this format. We vary only (i) the lotteries and (ii) the range of the compensation amounts. The decision screens are otherwise identical.



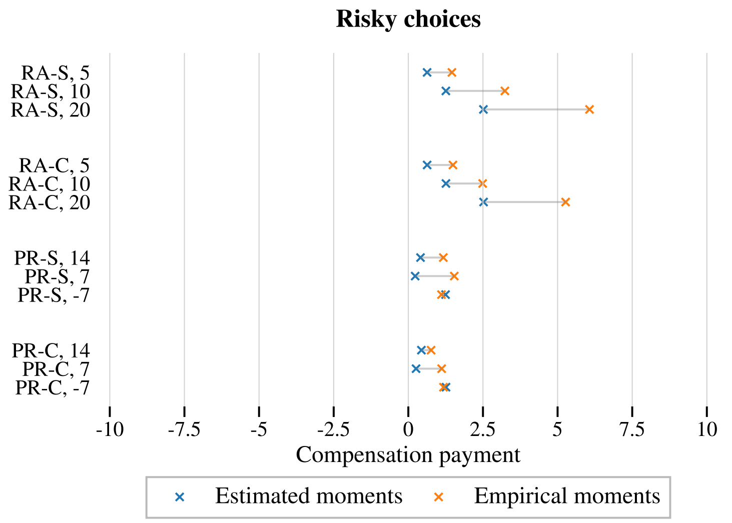


Figure A.3: This figure plots the empirical and the estimated moments for our estimation sample (N = 200). The moments are the average switching point in each of our 33 price lists. The upper panel shows moments for intertemporal choices, while the lower panel reports moments for risky choices from part B of the experiment. For intertemporal choices, labels on the vertical axis groups task by their stage (*UD-SELF*, *UD-CHARITY*, *ER*, *MD-SELF*, *MD-CHARITY*) and indicate the delay of the sooner and the later payment. For example, "6-6" means that both payments were made 6 months after the experiment. For risky choices, we indicate the size of the deduction R_2 (see Table B.2 for more details).

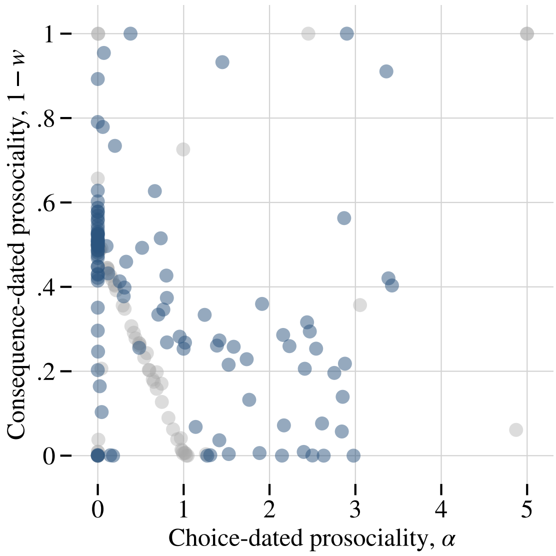


Figure A.4: This figure shows the joint distribution (N = 200) of the choice-dated prosociality parameter, α, and the consequence-dated prosociality parameter, $1-w$. The circles in dark gray indicate the subsample of subjects with a degree of risk aversion that is outside the range of the structural model, i.e. they have a coefficient of relative risk aversion greater than 0.90. The Spearman correlation is -0.417 in the full sample and -0.447 in the subsample.

B Experimental design

This section contains additional details about the experimental design outlined in Section 3.

B.1 Part A – Intertemporal choice

Table B.1: Overview of the multiple price lists for intertemporal choices

Stage	Recipient		Delays		Payment: t_0	Payment: t_1				Share choosing options
	t_0	t_1	t_0	t_1		Min	Max	Increment	Options	close to the midpoint
UD-S	self	self	0	1	50	50	56.25	0.21	31	2.9%
UD-S	self	self	0	3	50	50	68.75	0.62	31	10.7%
UD-S	self	self	0	6	50	50	87.50	1.25	31	7.4%
UD-S	self	self	0	12	50	50	125.00	2.50	31	3.7%
UD-C	charity	charity	0	1	50	50	56.25	0.21	31	4.9%
UD-C	charity	charity	0	3	50	50	68.75	0.62	31	10.7%
UD-C	charity	charity	0	6	50	50	87.50	1.25	31	5.3%
UD-C	charity	charity	0	12	50	50	125.00	2.50	31	4.1%
ER	self	charity	0	0	50	0	200.00	10.00	21	10.2%
ER	self	charity	1	1	50	0	200.00	10.00	21	10.7%
ER	self	charity	3	3	50	0	200.00	10.00	21	11.5%
ER	self	charity	6	6	50	0	200.00	10.00	21	14.3%
ER	self	charity	12	12	50	0	200.00	8.00	21	14.8%
MD-S	self	charity	0	1	50	0	168.75	6.75	26	3.7%
MD-S	self	charity	0	3	50	0	206.25	8.25	26	6.6%
MD-S	self	charity	0	6	50	0	262.50	10.50	26	3.7%
MD-S	self	charity	0	12	50	0	375.00	15.00	26	3.3%
MD-C	charity	self	0	1	50	0	56.25	2.25	26	6.1%
MD-C	charity	self	0	3	50	0	68.75	2.75	26	4.5%
MD-C	charity	self	0	6	50	0	87.50	3.50	26	3.7%
MD-C	charity	self	0	12	50	0	125.00	5.00	26	7.0%

Note: This table provides details about the Multiple Price Lists used to elicit discounting behavior in Part A ("Intertemporal choices") of the experiment. The earlier payment date is denoted by t_0, while the later payment date is denoted by t_1. Participants could choose between 50 euros to the t_0-recipient with a delay of t_0 months, or varying amounts paid to the t_1-recipient in t_1 months. Note that "immediate" payments arrived only with a delay of 3 days in the subjects' bank account. *Min* is the lowest value of the payment in t_1, while *Max* is the largest value that a subject could receive in t_1. *Increment* describes the step size of the multiple price list (in euros). *Option* lists the number of different options for t_1 payments. *Share choosing options close to the midpoint* is the share of respondents with an indifference point that differs from the midpoint of the multiple price list by at most 5% of the overall range of the price list.

B.2 Part B – Risk apportionment

We adopt the recently popularized experimental paradigm of risk apportionment, which allows for non-parametric testing conditions on the nature of the utility function. Second- and third-order risk aversion (i.e. prudence) are typically defined in terms of specific conditions on the (second and third) derivatives of the utility function under expected utility maximization. Eeckhoudt and Schlesinger (2006) provide an alternative definition based on observable choices in risk apportionment tasks. Risk apportioning has the desirable feature that the measurement remains valid even if expected utility theory fails (Ebert and van de Kuilen, 2015; Starmer, 2000). At the same time, data from risk apportionment choices allow us to calibrate specific utility specifications under additional parametric assumptions.

We measured univariate risk aversion individually for self-euros and for charity-euros (stages *RA – SELF* and *RA – CHARITY*, respectively), univariate prudence (stages *PR – SELF* and *PR – CHARITY*), and multivariate risk aversion (stage *X – RA*). The latter stage is crucial as it delivers a non-parametric estimate of the cross-derivative with respect to payments in self-euros and charity-euros, which determines whether additive non-separability of the utility function is a suitable assumption.

In every risk apportionment task, subjects receive some endowment $\mathbf{e} = (x, y)$ of attributes X and Y and then make a decision between two lotteries. Each of these lotteries has two equally likely outcomes. Assume further that there are two undesirable fixed amounts R_1 and R_2 with $R_i \preceq (0,0)$. Accordingly, R_1 is a fixed univariate "reduction" in either X or Y, but not in both dimensions at the same time.[1] A preference for risk apportionment is the desire to disaggregate these unavoidable fixed reductions in wealth, R_1 and R_2, across two equiprobable states of the world, as depicted in Figure B.1.

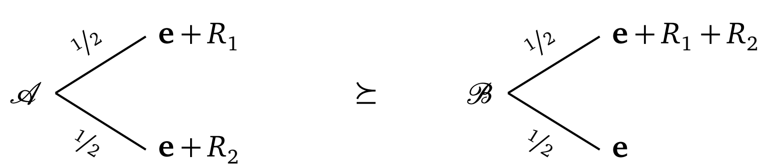


Figure B.1: Preference for risk apportionment (cf. Ebert and van de Kuilen (2015))

[1]The same holds for R_2, but R_1 and R_2 do not necessarily affect the same attribute.

The different stages in Part B vary depending on whether each attribute (X and Y) corresponds to self-euros or charity-euros. Concretely, we present subjects with choices between two lotteries as summarized in Figure B.1. For conceptual consistency and to avoid confusing subjects, we employ the same price list methodology as for intertemporal choices in Part A.[2] On each decision screen, subjects make binary choices between a fixed lottery $\mathscr{A}$ and a fixed lottery $\mathscr{B}$, where an additional, state-independent compensation payment m is added to lottery $\mathscr{B}$. This compensation payment m gradually increases across the rows of the choice list. The smallest amount for which the individual prefers lottery $\mathscr{B}$ indicates the minimal compensation demanded for heaving both undesirable reductions in wealth clustered in a single state. An example choice screen is depicted in Appendix Figure A.2.

Table B.2: Overview of risk apportionment choices

Stage	**Endowment**		**R_1**		**R_2**		**Expected value**	
	Self	Charity	Self	Charity	Self	Charity	Self	Charity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RA – SELF	25		-10		-5		17.5	
	50		-20		-10		35	
	100		-40		-20		70	
PR – SELF	40		-10		(14, 0.5; -14, 0.5)		35	
	40		-10		(7, 0.8; -28, 0.2)		35	
	40		-10		(-7, 0.8; 28, 0.2)		35	
RA – CHARITY		25		-10		-5		17.5
		50		-20		-10		35
		100		-40		-20		70
PR – CHARITY		40		-10		(14, 0.5; -14, 0.5)		35
		40		-10		(7, 0.8; -28, 0.2)		35
		40		-10		(-7, 0.8; 28, 0.2)		35
X – RA	25	25	-10			-10	20	20
	50	50	-20			-20	40	40
	100	100	-40			-40	80	80

Note: All values are displayed in euros. Columns labeled "Self" indicate payments to the subject and columns labeled "Charity" indicate payments to the charity. If R_1 or R_2 is a non-degenerate lottery, it is given as $(x_1, p_1;\ x_2, p_2)$, where x_i indicates the amount and p_i the probability of receiving it. Columns 8 and 9 show the expected payment to the subject and the expected payment to the charity, respectively.

Table B.2 shows all fifteen choice scenarios presented to subjects. Note that

[2] Concretely, our design extends the procedure suggested in Ebert and Wiesen (2014) to a multi-attribute setting.

for our measure of prudence, R_2 is a zero-mean lottery instead of a fixed reduction in wealth, i.e. R_2 only adds variance in this case. The grid of compensations offered in the choice lists varies with the endowments. Each choice list contains 21 rows across which the compensation increases at equal intervals. All grids are centered at zero.

In the analyses of our risk data, we create comparability between the compensation payments of different lotteries by dividing each by their expected value.

C Reduced-form analyses

C.1 Construction of confidence intervals

The procedure is best understood by considering the following auxiliary regression analysis of our results. Let $y_{i,j}$ denote an outcome of interest derived from subject i's selection of task j. We then estimate the saturated regression model separately for the stages UD, MD, and ER:

$$y_{i,j} = \alpha_i + \beta \text{Domain}_j + \sum_\tau \gamma_\tau \text{Delay}_{\tau(j)} + \sum_\tau \delta_\tau \text{Domain}_j \times \text{Delay}_{\tau(j)} + \varepsilon_{i,j}. \quad (7)$$

Here, α_i is a subject fixed effect, Domain_j is a binary variable taking the value of 1 if the earlier dated payment in task j is denoted in charity-euros, $\text{Delay}_{\tau(j)}$ is a binary variable taking the value of 1 if the later dated payment in task j has a delay of τ months, and $\varepsilon_{i,j}$ denotes the individual error term.

The confidence intervals developed by Morey (2008) and Cousineau (2005) for differences in means across tasks will be similar to the confidence intervals obtained for the corresponding linear combination of regression parameters. We report the estimates of Equation (7) in Table A.2 of the Appendix. Table C.1 presents analogous estimates with clustered standard errors.

C.2 Results from risk apportionment tasks

We can characterize the shape of the flow utility function up to the third derivative from the subjects' choices under risk.

Figure C.1 shows the cumulative distribution of the required compensation payments in the risk apportionment tasks. This non-parametric analysis yields two main findings, which we discuss in turn.

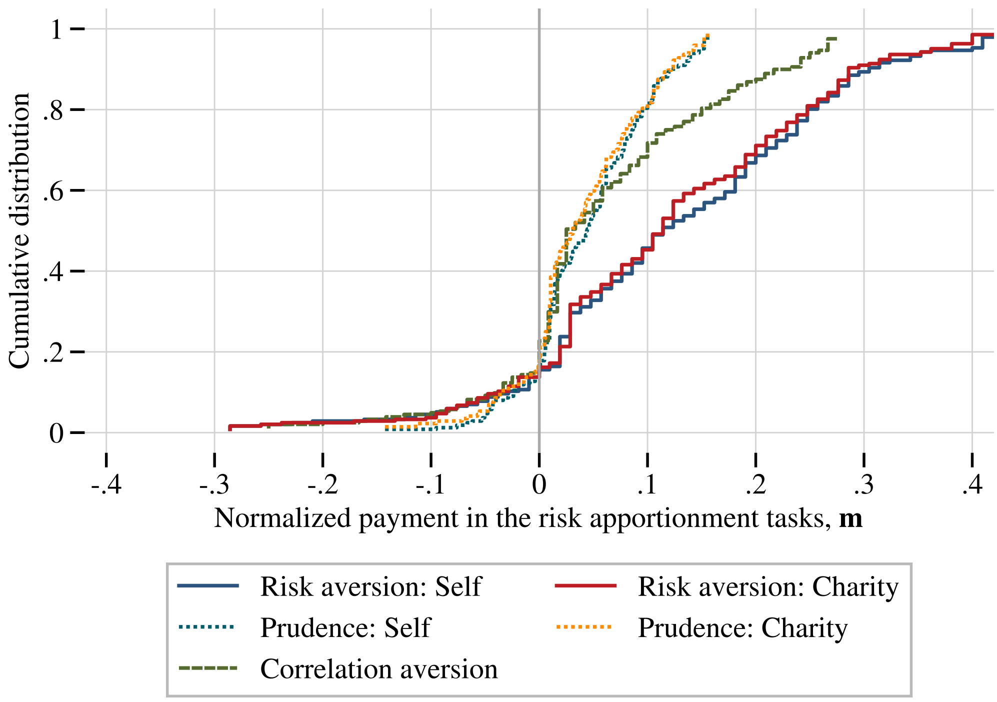


Figure C.1: This figure plots the cumulative distribution function of the normalized compensation payments *m* for each of the five stages of the risk apportionment tasks. For each risky choice, we first divide the indifference points by the expected value of the corresponding base lottery without compensation to render choices comparable (see Table B.2 for an overview of each stage). For each stage, we then obtain *m* by taking the average of the three normalized lottery choices. The figure then plots the cumulative distribution function of *m* for each stage (N = 244). "Risk aversion: Self" and "Risk aversion: Charity" show the distribution of second-order risk attitudes over self-euros and charity-euros. "Prudence: Self" and "Prudence: Charity" show the distribution of third-order risk attributes over self-euros and charity-euros. "Correlation aversion" shows the distribution of the multivariate risk aversion over self-euros and charity-euros.

More than 80% of subjects display second- and third-order risk aversion for self-euros and charity-euros. We can neither reject the null hypothesis that people are on average *equally* risk-averse in both domains (paired Wilcoxon signed-rank test, $p = 0.251$) nor that risk preferences in both domains are equally distributed (Kolmogorov–Smirnov test, $p = 0.786$).[3]

This finding underlies Result 1 in the main text and motivated our as-

[3]Figure C.2 plots the cumulative distribution of the *estimated* coefficients of relative risk aversion when separately fitting a CRRA utility function to the the risky lottery choices from the stages *RA-SELF* and *RA-CHARITY*, respectively. While this approach imposes a specific parametric form, it has the advantage of making the normalized monetary payments from Figure C.1 more comparable. Again, we cannot reject the null hypothesis that subjects are equally risk-averse in both domains ($p > 0.500$).

sumption that the single-attribute utility functions representing utility from self-euros and charity-euros only differ by a multiplicative constant.[4] We also observe a strong positive correlation ($\rho = 0.671$) between subjects' third-order risk aversion (prudence) in the self- and other domain.

Next, we classify more than 80% of subjects as *correlation averse*. Correlation aversion says that the cross-derivative with respect to payments in self-euros and charity-euros is negative. This means that payments to the self and donations are partial substitutes. Intuitively, the richer a person, the higher their marginal utility of donating another euro. This underscores the emerging consensus on a relationship between income, wealth, and charitable giving (Meer and Priday, 2020). The risk apportionment tasks deliver a non-parametric measure of the condition for correlation aversion, namely that the cross-derivative with respect to payments in self-euros and charity-euros is negative.

Summing up, we document the non-separability of multi-attribute utility and identical curvatures of the single-attribute utility functions. Our analysis of intertemporal choices builds on the result of equal curvatures. First, assuming that the univariate utility functions for self-euros and charity-euros have equal curvatures allows us to derive slightly more general conclusions than under the nested case of linear utility, as comparisons of discount factors across domains are no longer confounded by potential differences in curvature. Second, it motivates the assumption of equal curvatures in our structural model in Section 5.

In contrast, we will abstract from the non-separability of the utility function in our structural estimation. The primary reason is that under the common assumption of narrow bracketing of monetary rewards by subjects in laboratory experiments, the choice data that we use in our structural estimation involves only tradeoffs that are unaffected by the question of whether the multi attribute utility function is separable or not. As such, assuming non-separability is inconsequential.

[4]The most commonly used one- and two-parameter families of utility functions are pinned down (up to a linear transformation) by their second- and third-order risk aversion.

C.3 Additional tables and figures

Table C.1: Regression analysis of intertemporal choices with clustered standard errors

	Univariate discounting			Multivariate discounting			Exchange rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
charity-Euro	-0.005		0.001	-1.557		-1.079	
	(0.008)		(0.004)	(0.142)		(0.096)	
1 month							-0.042
							(0.036)
3 months		-0.072	-0.070		0.219	0.315	-0.084
		(0.004)	(0.005)		(0.017)	(0.035)	(0.039)
6 months		-0.138	-0.132		0.524	0.785	-0.137
		(0.006)	(0.008)		(0.031)	(0.063)	(0.045)
12 months		-0.205	-0.199		1.083	1.682	-0.195
		(0.009)	(0.011)		(0.058)	(0.121)	(0.054)
3 months × charity-Euro			-0.003			-0.192	
			(0.006)			(0.038)	
6 months × charity-Euro			-0.011			-0.523	
			(0.009)			(0.070)	
12 months × charity-Euro			-0.011			-1.199	
			(0.013)			(0.135)	
Constant	0.843	0.944	0.943	2.546	1.311	1.850	2.070
	(0.004)	(0.004)	(0.005)	(0.071)	(0.025)	(0.040)	(0.030)
N	1952	1952	1952	1952	1952	1952	1220
R^2	0.386	0.620	0.621	0.396	0.245	0.471	0.921
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subjects	244	244	244	244	244	244	244

Note: This table shows pooled OLS regression estimates where the unit of observation are subject-choices. In columns 1–3, we include all choices from the two univariate discounting stages (*UD-SELF*, *UD-CHARITY*). The dependent variable is the net present value $y_{i,\tau,d}$ of the delayed payment, where i denotes the subject, τ the delay in months, and d is the numéraire of the payments (self-euros or charity-euros). Columns 4–6 include all choices from the two multivariate discounting stages (*MD-SELF*, *MD-CHARITY*). The dependent variable is the implied conversion factor $y_{i,\tau,d}$ that makes subjects indifferent between a payment of 50 euros today (self-euros or charity-euros) and a delayed payment of $50 \cdot y_{i,\tau,d}$ of type d (self-euros or charity-euros). In column 7, we include all choices from the exchange rate stage ER. The dependent variable is the implied (forward) exchange rate $y_{i,\tau}$ at different delays τ. "Charity-euro" is a binary indicator variable taking the value of 1 if the numéraire of the earlier payment are charity-euros. "τ month(s)" is a binary indicator variable taking the value of 1 if the later payment is received with a delay of τ month(s), where $\tau = 1$ month is the omitted category in columns 1–6 and "0 months" is the omitted category in column 7. All regressions include subject fixed effects. Standard errors are clustered at the subject level and shown in parentheses.

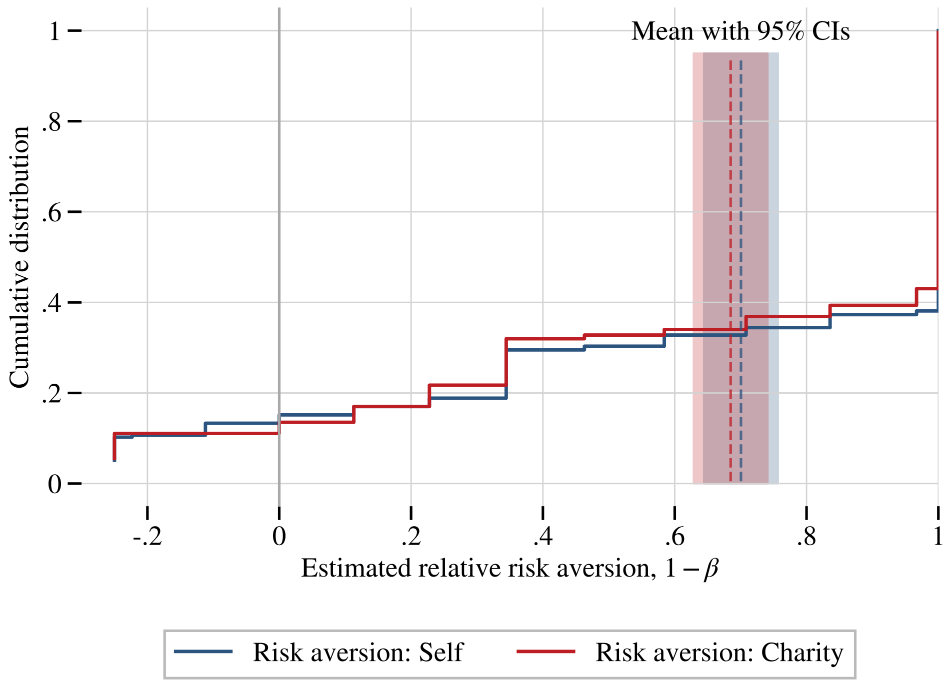


Figure C.2: This figure plots the cumulative distribution of the estimated coefficient of relative risk aversion for self-euros and charity-euros. For each individual, we fit a CRRA utility function of the form $u(x) = x^{\beta}$ to the choices from the stage *RA-SELF* (*RA-CHARITY*) to obtain a measure of risk aversion over self-euros (charity-euros). The vertical line indicates the sample mean. 95% confidence intervals are indicated as shaded regions. The average coefficient of risk aversion is 0.701 for self-euros and 0.685 for charity-euros.

D Structural estimation

D.1 Practical estimation

To calculate the minimum-distance estimator $\hat{\theta}$, we employ the L-BFGS-B algorithm, which is appropriate for constrained optimization (Byrd et al., 1995). We use a Python implementation of this estimation routine (Gabler, 2020). We impose the following box constraints: $\delta \in (0,1]$ (positive discounting), $\beta \in [0,5]$, $\alpha \in [0,5]$ (non-negative choice-dated utility) and $w \in [0,1]$ (altruism weight between 0 and 1). As local minima are a natural concern in any structural estimation, we repeatedly estimate our model using 25 randomly-chosen initial values from a uniform distribution over the parameter space. Moreover, we always include as initial values at least one parameter draw where $\alpha = 1 - w = 0$ to ensure that purely selfish preferences were in the consideration set of the estimator. As our final parameter estimate, $\hat{\theta}$, we choose the estimate with the minimum weighted distance among all 25 estimates. We obtain standard errors from an estimator of the asymptotic variance-covariance matrix of the estimator:

$$(\hat{G}'W\hat{G})^{-1}(\hat{G}'W\hat{\Lambda}W\hat{G})(\hat{G}'W\hat{G})^{-1}, \tag{8}$$

where $\hat{G} = N^{-1}\sum_{i=1}^{N}\nabla_{\theta}m_i(\hat{\theta})$ and $\hat{\Lambda} = Var[m(\hat{\theta})]$. The empirical and estimated moments are shown in Figure A.3.

D.2 Monte Carlo

We also conducted Monte Carlo experiments to increase our confidence in the estimation procedure. We simulate the choices of $N = 200$ agents with preferences θ_0 for randomly-chosen values of θ_0. For each θ_0, we start our estimation procedure at a perturbed initial value of $\theta_0 + \xi$. The minimum-distance estimator is able to back out θ_0 in our simulation experiments.

D.3 Present bias

Monetary payments to both subjects and Operation ASHA were received with a minimum delay of two to three days. The consequence-dated utility from either type of payment thus accrues in the future. In contrast, choice-dated prosocial utility is realized immediately. How does this affect the interpretation of our structural estimates in the presence of present-biased preferences? We will show below that this implies a small upward bias of the choice-dated utility parameter.

Direction of the bias. In Section 5, we estimate the parameters of the following parametric utility function[5]

$$V_t^{\text{Base}} = \alpha \mathbb{1}\left(\sum_{\tau=0}^{T} c_{t+\tau} > 0\right) + \sum_{\tau=0}^{T} D(\tau)\left(w s_{t+\tau}^{\gamma} + (1-w) c_{t+\tau}^{\gamma}\right) \tag{9}$$

and assume exponential discounting, $D(\tau) = \delta^{\tau}$, of the utility associated with payments that are implemented τ months after the subjects take their decisions.

To understand how present-biased preferences would affect the interpretation of the choice-dated utility parameter α, it is instructive to consider an alternative specification

$$V_t^{\text{PB}} = \tilde{\alpha} \mathbb{1}\left(\sum_{\tau=0}^{T} c_{t+\tau} > 0\right) + \sum_{\tau=0}^{T} \tilde{D}(\tau)\left(\tilde{w} s_{t+\tau}^{\tilde{\gamma}} + (1-\tilde{w}) c_{t+\tau}^{\tilde{\gamma}}\right) \tag{10}$$

with

$$\tilde{D}(\tau) = \left(\beta \tilde{\delta}^{2/30}\right) \tilde{\delta}^{\tau}. \tag{11}$$

Here, β captures the degree of present bias, and $\delta^{2/30}$ accounts for the additional delay of two days before bank transfers were received by the recipient. Dividing Equation (10) by $\beta \tilde{\delta}^{2/30}$ yields

$$\frac{V_t^{\text{PB}}}{\beta \tilde{\delta}^{2/30}} = \frac{\tilde{\alpha}}{\beta \tilde{\delta}^{2/30}} \mathbb{1}\left(\sum_{\tau=0}^{T} c_{t+\tau} > 0\right) + \sum_{\tau=0}^{T} \tilde{\delta}^{\tau}\left(\tilde{w} s_{t+\tau}^{\tilde{\gamma}} + (1-\tilde{w}) c_{t+\tau}^{\tilde{\gamma}}\right) \tag{12}$$

This show that there is a direct relationship between the choice-dated utility parameter $\tilde{\alpha}$ in Equation (10) and the choice-dated utility parameter α in

[5]To avoid confusion, note that in this section, we use γ instead of β to denote the curvature of the consequence-dated utility function. This substitution allows us follow the common norm that the degree of present bias is denoted by β.

equation 10:

$$\alpha = \frac{\tilde{\alpha}}{\beta \tilde{\delta}^{2/30}} \tag{13}$$

Thus, if subjects' true preferences were accurately represented by V^{PB}, and we use their choices to estimate the utility function V_t^{PB}, our estimate of α will overstate the quantitative importance of the choice-dated utility component.

Bounding the bias. How large is the potential upward bias in our estimation of α if subjects were present biased? To get a sense of the magnitude, estimates of $\tilde{\delta}$ and β are necessary. First, we draw on meta-analytic estimates of β from Imai et al. (2020), who collect 220 estimates from 22 studies. Their meta-analytic average of β is between 0.95 and 0.97 for studies using monetary rewards, and 0.88 for studies using a real-effort paradigm. Second, we use our own estimate of the one-month discount factor to calibrate δ at 0.992 (Figure 5). This suggests that our main specification would overstate the magnitude of the choice-dated utility by about 3.1% to 5.3% if we use the mean estimates from studies with monetary rewards (such as ours). If we instead use the average β from studies with real-effort tasks, then the upward bias would be about 13.7%.

Taken together, this suggests that our baseline structural estimates of the choice-dated utility parameter would not change much if subjects were $\beta - \delta$ discounters rather than exponential discounters.

D.4 Robustness

This section contains additional robustness exercises related to our structural estimation. We show that our baseline estimates of the structural parameters that capture the choice-dated and the consequence-dated prosocial utility from charitable contributions (see Equation (5) in Section 5) are robust to a series of alternative specifications. First, we show that the parameter estimates are quantitatively robust to allowing for non-exponential discounting. Second, we show that we obtain similar qualitative results if we allow for amount-dependent choice-dated prosocial utility. Third, we document that the quantitative importance of the choice-dated prosocial utility component is robust to potential noise in subjects' risky lottery choices. Fourth, we present an extension allowing for background consumption.

D.4.1 Non-exponential discounting

Our baseline specification in Equation (5) imposes the parametric assumption of exponential discounting, i.e. $D(\tau) = \delta^\tau$. Table D.1 presents estimates from two alternative specifications that allow for non-exponential discounting. Columns 1 and 2 present the baseline estimates. We then present analogous parameter estimates allowing for quasi-hyperbolic discounting in the form of $\beta - \delta$ discounting (columns 3 and 4). Specifically, we assume that $D(\tau) = \beta\delta^\tau$ for $\tau > 0$. Finally, we relax all parametric restrictions on $D(\tau)$ and allow the model to flexibly estimate discount factors for different time horizons directly.

We find that allowing for non-exponential discounting has virtually no effect on our estimates of the choice-dated and consequence-dated prosocial utility parameters. Moreover, the implied discount factors $D(\tau)$ are very similar across specifications, suggesting that exponential discounting is a reasonable first-order approximation in our setting. Taken together, this suggests that the assumption of exponential discounting in our baseline specification is not driving the results.

Table D.1: Structural model with non-exponential discounting

	A. Exponential		B. $\beta-\delta$		C. Unrestricted	
	Est. (1)	SE (2)	Est. (3)	SE (4)	Est. (5)	SE (6)
Choice-dated prosociality, α	0.642	0.141	0.675	0.149	0.681	0.151
Consequence-dated prosociality, $1-w$	0.327	0.012	0.320	0.013	0.319	0.013
Relative risk aversion	0.802	0.052	0.801	0.052	0.799	0.052
1-month exponential discounting, δ	0.992	0.002	0.993	0.002		
Present bias parameter, β			0.994	0.002		
Discount factors $D(\tau)$:						
$D(1)$					0.988	0.003
$D(3)$					0.971	0.007
$D(6)$					0.951	0.012
$D(12)$					0.925	0.019
Implied discount factors:						
$D(1)$	0.992		0.987		0.988	
$D(3)$	0.976		0.966		0.971	
$D(6)$	0.953		0.946		0.951	
$D(12)$	0.908		0.907		0.925	

Note: This table presents parameter estimates for alternative specifications of the structural model. Columns 1 and 2 present estimates of the baseline specification assuming exponential discounting with a 1-month discount factor of δ. Columns 3 and 4 present estimates where we instead allow for quasi-hyperbolic discounting with present-bias parameter β and a long-term 1-month discount factor of δ. Columns 5 and 6 present estimates where we estimate the discount factors $D(\tau)$ without imposing any parametric restrictions on $D(\tau)$. The models are otherwise identical in their functional form assumptions. Estimates are obtained from a minimum distance estimator as described in Appendix Section D.1.

D.4.2 Amount-dependent choice-dated prosocial utility

While it is conceivable that the size of a donation may affect the choice-dated utility from giving, our baseline specification assumed amount-independent choice-dated prosocial utility for reasons discussed in Section 5.

In this section, we relax the assumption that choice-dated prosocial utility is amount-independent. We separately re-estimate the parameters for three alternative functional relationships between the size of the donation and the corresponding choice-dated prosocial utility: (i) linear utility function, (ii) isoelastic utility function, and (iii) CARA utility function.

Table D.2 presents the results. First, note that the parameters unrelated to choice-dated prosocial utility are, reassuringly, relatively stable across specifications. Second, the estimates of the parameters related to the choice-dated prosocial utility—taken at face value—imply that the choice-dated prosocial utility is almost insensitive to the size of the donation, as shown in Panel B. However, these parameters are—with the exception of the intercept (α_0)—noisily estimated or close to the boundary of the parameter space, which makes the interpretation of these results more challenging. One interpretation is that the model is trying to fit a constant, amount-independent relationship. Indeed, Panel D shows that the implied prosocial utility from varying amounts of charity-euros (donated immediately) is rather insensitive to the size of the donation. However, an alternative interpretation is that the additional parameters (α_1, α_2) are not identified with the experimental variation that we have, thus limiting our ability to study and differentiate between alternative amount-dependent functional forms for the choice-dated prosocial utility component.

Panel C presents parameter estimates when we focus only on subjects with below-median estimated risk aversion. We obtain similar patterns, but the standard errors of the parameters related to the choice-dated utility decrease substantially. This suggests that the imprecise estimates of the parameters related to the functional form of the choice-dated prosocial utility in Panel A may be driven by subjects with relatively high risk aversion in the sample.

Table D.2: Structural model with amount-dependent choice-dated prosocial utility

	A. Constant		B. Linear utility		C. Isoelastic		D. CARA	
Functional form: Choice-dated utility	α_0		$\alpha_0 + \alpha_1 c$		$\alpha_0 + \alpha_1 c^{\alpha_2}$		$\alpha_0 + \alpha_1 e^{-\alpha_2 c}$	
	Est. (1)	SE (2)	Est. (3)	SE (4)	Est. (5)	SE (6)	Est. (7)	SE (8)
Panel A: *Estimates for the main sample*								
Relative risk aversion, $1-\beta$	0.802	0.052	0.787	0.053	0.815	0.061	0.883	0.062
1-month discount factor, δ	0.992	0.002	0.992	0.002	0.993	0.002	0.995	0.002
Consequence-dated prosociality, $1-w$	0.327	0.012	0.344	0.015	0.347	0.015	0.336	0.014
Intercept, α_0	0.642	0.141	0.614	0.143	5.607	341.5	0.470	0.120
Slope, α_1			-0.00024	0.00016	-4.999	341.6	0.374	10.664
Curvature, α_2					0.003	0.229	0.904	0.028
Panel B: *Implied choice-dated prosocial utility*								
1 charity-Euro	0.642		0.614		0.608		0.621	
10 charity-Euro	0.642		0.612		0.573		0.470	
100 charity-Euro	0.642		0.590		0.538		0.470	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel C: *Low risk aversion sample*								
Relative risk aversion, $1-\beta$	0.297	0.067	0.278	0.065	0.314	0.077	0.319	0.062
1-month discount factor, δ	0.975	0.003	0.976	0.003	0.977	0.003	0.978	0.003
Consequence-dated prosociality, $1-w$	0.268	0.011	0.290	0.014	0.293	0.014	0.286	0.013
Intercept, α_0	4.879	1.269	5.149	1.368	4.954	1.290	3.723	0.909
Slope, α_1			-0.009	0.005	-0.970	0.143	1.422	0.637
Curvature, α_2					0.554	0.293	0.021	0.001
Panel D: *Implied choice-dated prosocial utility*								
1 charity-Euro	4.879		5.140		4.857		5.115	
10 charity-Euro	4.879		5.059		4.607		4.876	
100 charity-Euro	4.879		4.249		3.710		3.897	

Note: This table presents parameter estimates for alternative specifications of the structural model. Column 1 ("Constant") presents estimates for the baseline model where a charitable contribution of $c > 0$ provides amount-independent prosocial utility of α_0, and zero otherwise. Column 3 ("Linear") presents estimates for a specification of the structural model where a charitable contribution of $c > 0$ provides prosocial utility of $\alpha_0 + \alpha_1 c$, and zero otherwise. Column 5 ("Isoelastic") presents estimates for a specification of the structural model where a charitable contribution of $c > 0$ provides prosocial utility of $\alpha_0 + \alpha_1 c^{\alpha_2}$, and zero otherwise. Column 7 ("CARA") presents estimates for a specification of the structural model where a charitable contribution of $c > 0$ provides prosocial utility of $\alpha_0 + \alpha_1 \exp(-\alpha_2 c)$, and zero otherwise. The models are otherwise identical to the baseline model (column 1) in their functional form assumptions. Panel A presents estimates for baseline sample. Panel B shows the implied choice-dated prosocial utility based on the above parameter estimates. Panel C shows estimates subjects with below median risk aversion. Panel D is analogous to Panel B but uses the estimates from Panel C. Estimates are obtained from a minimum distance estimator as described in Appendix Section D.1.

D.4.3 Accounting for noise in risky lottery choices

In this section, we examine the robustness of our results to handling subjects with very high revealed risk aversion in the stages *RA – SELF* and *RA – CHARITY* of our experimental design. In these stages, respondents can choose between a lottery where negative shocks are disaggregated across states (Option A) and a lottery where negative shocks are aggregated in one state in conjunction with a compensatory payment (Option B). We then elicit the switching point between Option A and Option B by varying the compensatory amount using the multiple price list methodology (see Section 3 for more details). A non-negligible share of respondents either always prefer Option A, or is only willing to switch for high compensatory amounts equivalent to 90% or more of the maximum amount possible, which implies a relative risk aversion greater than one.

As highlighted in Wakker (2008), the CRRA utility function in our baseline specification has difficulties matching such a behavior. We therefore excluded the 18% of subjects with an average normalized switching point greater than 0.9 in the stages *RA – SELF* and *RA – CHARITY* to avoid corner solutions from our baseline estimation.[6]

Columns 4 and 6 of Table D.3 present parameter estimates if we instead trim the sample by removing subjects with an average normalized switching point of 85% (or above) or 95% (or above). Columns 1–3 present estimates if we winsorize the data and replace outliers with 85%, 90% of 95% of the maximum compensatory amount that was possible in a given list.

Three patterns emerge. First, the estimates of time preference (δ) and the consequence-dated utility parameters $(1-w)$ are relatively unaffected by the precise choice of how we deal with very risk-average subjects—as one would expect. Second, the estimates of the coefficient of relative risk aversion $(1-\beta)$ is more sensitive, which is expected and the reason for trimming in our baseline specification (column 5). Note that the criterion function value increases if we include more highly risk-averse subjects or instead winsorize their risky lottery choices. Third, this change in the coefficient of relative aversion coincides with changes in the choice-dated prosocial utility param-

[6]Note that a high share of corner choices is not uncommon in laboratory studies which try to recover preference parameters from individual choices. For example, in Andreoni and Sprenger (2012), around 37% of subjects only choose corner allocations.

eter (α). The parameter estimate is always statistically significantly different from zero, which suggests that our qualitative conclusions from the structural exercise remain valid. However, we would expect α and β to be related as β also affects the scale of the implied utility from self-euros and charity-euros. It is therefore instructive to examine how the ratio of the choice-dated prosocial utility and the utility from a fixed payment to the self vary across specifications. Panel B shows that the relative value of the choice-dated utility compared to an immediate payment of 50 self-euros is very stable across specifications.

Taken together, these results suggest that the relative importance of the choice-dated prosocial utility component is robust to how we handle very risk-averse subjects in our structural estimation.

Table D.3: Structural model: Accounting for noise in the elicitation of risk attitudes

	Winsorized risk choices			Trimmed sample		
	85% (1)	90% (2)	95% (3)	85% (4)	90% (5)	95% (6)
Panel A: Parameters						
Choice-dated prosociality, α	0.3381	0.3066	0.2987	0.8762	0.6421	0.4851
	(0.0688)	(0.064)	(0.0638)	(0.1997)	(0.1432)	(0.1059)
Relative risk aversion, $1-\beta$	0.9616	0.9863	0.9942	0.7287	0.8022	0.8729
	(0.0486)	(0.0499)	(0.0512)	(0.0546)	(0.0528)	(0.0516)
Consequence-dated prosociality, $1-w$	0.3497	0.3530	0.3533	0.3147	0.3266	0.3362
	(0.0120)	(0.0123)	(0.0124)	(0.012)	(0.0124)	(0.0125)
1-month discount factor, δ	0.9984	0.9994	0.9998	0.9894	0.9922	0.9949
	(0.0020)	(0.0021)	(0.0022)	(0.0022)	(0.0021)	(0.0021)
Panel B: Utility comparisons						
Choice-dated prosocial utility relative to the utility of 50 self-euros today: α / (w 50^{β})	0.447	0.449	0.451	0.442	0.440	0.444
Criterion function value	2.1731	2.2914	2.4050	1.8231	1.8677	2.0550
Subjects	244	244	244	182	199	244

Note: This table presents parameter estimates for our baseline structural model. Estimates are obtained from a minimum distance estimator as described in Appendix Section D.1. Columns 1–3 winsorize risky lottery choices at 85%, 90%, and 95% of the maximum of the multiple price lists, respectively. Columns 4–6 trim the sample by excluding subjects that, on average, have a switching point that is greater than 85%, 90% and 95% of the maximum range of the multiple price list in the stages *RA – SELF* and *RA – CHARITY*, respectively. "Criterion function value" is the value of the criterion function at the estimated parameters.

D.4.4 Background consumption

The baseline structural estimates were obtained under the assumption of narrow bracketing, which allowed us to abstain from modelling background consumption outside the laboratory. In this section, we examine how accounting for background consumption in our structural estimation affects the parameters capturing the prosocial utility from giving.

We extend the baseline model in Equation (5) by introducing background consumption of self-euros, ω_s, and charity-euros, ω_c, in each period τ:

$$V_t^{BC} = \alpha \mathbb{1}\left(\sum_{\tau=0}^{12} c_{t+\tau} > 0\right) + \sum_{\tau=0}^{12} \delta^\tau \left(w(s_{t+\tau} + \omega_s)^\beta + (1-w)(c_{t+\tau} + \omega_c)^\beta\right) \tag{14}$$

Note that subjects receive choice-dated prosocial utility *only* if they cause an *additional* donation as a result of their choices in the experiment. The background consumption of charity-euros cannot act as a source of choice-dated utility. Note that a challenge for introducing background consumption in our setting is that our subjects are highly risk averse as revealed by their choices. Without background consumption, we already had to exclude the most risk averse subjects and still obtained a coefficient of risk aversion of 0.8. With background consumption, it will be even more difficult to rationalize subjects' choices with reasonable parameter estimates as requiring a high compensation for bundling risks in the risk apportionment task *despite* background consumption would imply an even higher curvature of the utility function.[7]

In a first step, we estimate the background consumption parameters together with the paramters governing the utility function in Equation (14) using the minimum distance estimator described in Appendix Section D.1. Column 1 of Panel A of Table D.4 presents the results. Column 2 then imposes the restriction that $\omega_c = 0$, whereas columns 3–7 exogenously fix ω_s and ω_c to a range of different values. As expected, the model requires a higher level of risk aversion to rationalize choices when increasing the background consumption parameters. At the same time, the choice-dated prosocial utility parameter α declines to zero.

[7] This point is also made by Andreoni and Sprenger (2012), who find that the estimated level of risk aversion increases in background consumption.

Panel B of Table D.4 presents analogous estimates when focusing on the subset of the 50% of respondents who are least risk averse (based on their choices). In this subsample, the parameter estimates are very stable across specifications. Moreover, the value of the choice-dated utility (α) relative to the consumption utility of $50 + \omega_s$ self-euros today is relatively stable.

Table D.4: Structural model with background consumption

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Baseline sample							
Choice-dated prosociality, α	0.5715	0.5892	0.1179	0.0017	0.0013	0.001	0.0008
	(0.1292)	(0.1347)	(0.0717)	(0.0114)	(0.0096)	(0.0084)	(0.0075)
Relative risk aversion, $1-\beta$	0.8949	0.8005	0.8332	0.9900	0.99	0.99	0.99
	(0.0584)	(0.0519)	(0.056)	(0.0631)	(0.0712)	(0.0793)	(0.0874)
Consequence-dated prosociality, $1-w$	0.3818	0.3171	0.3789	0.4213	0.4198	0.4184	0.4171
	(0.0163)	(0.0131)	(0.0166)	(0.0137)	(0.0138)	(0.014)	(0.0142)
1-month discount factor, δ	0.9974	0.9926	0.9961	0.9998	0.9998	0.9998	0.9998
	(0.0015)	(0.0019)	(0.0016)	(0.0012)	(0.0013)	(0.0014)	(0.0015)
ω_s	0.0001	0.0001	2	4	6	8	10
	(0.0007)	(0.0003)					
ω_c	14.6558	0	2	4	6	8	10
	(3.2361)						
Implied utility ratio: $\alpha/(w(50+\omega_s)^{\beta}$	0.6128	0.3953	0.0982	0.0028	0.0022	0.0017	0.0013

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel B: Low risk aversion sample							
Choice-dated prosociality, α	4.3164	4.4125	4.2554	4.2806	4.2161	4.0488	3.7878
	(1.3005)	(1.2578)	(1.2283)	(1.4382)	(1.6264)	(1.7659)	(1.8441)
Relative risk aversion, $1-\beta$	0.3219	0.308	0.3293	0.3127	0.3005	0.2939	0.2927
	(0.0793)	(0.0662)	(0.0662)	(0.0727)	(0.0799)	(0.0873)	(0.0945)
Consequence-dated prosociality, $1-w$	0.255	0.2524	0.2566	0.2574	0.2611	0.2662	0.272
	(0.0137)	(0.0116)	(0.0113)	(0.013)	(0.0146)	(0.016)	(0.0173)
1-month discount factor, δ	0.9793	0.9783	0.9797	0.981	0.9821	0.9831	0.984
	(0.0035)	(0.0027)	(0.0029)	(0.003)	(0.0031)	(0.0031)	(0.0031)
ω_s	2.1122	2.0978	2	4	6	8	10
	(1.2934)	(1.3089)					
ω_c	1.217	0	2	4	6	8	10
	(3.3423)						
Implied utility ratio: $\alpha/(w(50+\omega_s)^{\beta}$	0.3969	0.3828	0.4044	0.3716	0.3416	0.3138	0.2875

Note: This table presents parameter estimates from the structural model when allowing for background consumption of self-euros (ω_s) and charity-euros (ω_c). Each column presents estimates of the utility function described in Equation (14). Column 1 jointly estimates the preference parameters and the vector of background consumption. Column 2 introduces the restriction $\omega_c = 0$. Columns 3–7 present estimates when both ω_s and ω_c have been exogenously assigned. Panel A presents estimates from the sample of subjects used in our baseline estimation. Panel B restricts to subjects in the bottom half of the risk aversion distribution. Specifically, we restrict so subjects with a normalized switching point of 0.7 or lower in the stages *RA – SELF* and *RA – CHARITY*. The *implied utility ratio* indicates the value of the choice-dated prosocial utility of a donation relative to the consumption utility of $50+\omega_s$ self-euros consumed today.

D.4.5 Additional tables and figures

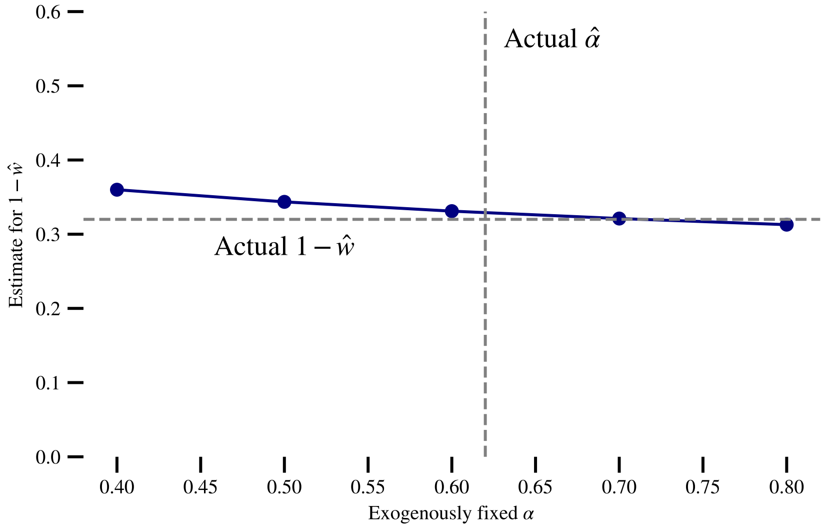


Figure D.1: This figure presents the results from a sensitivity analysis where we exogenously set the choice-dated prosocial utility parameter α to a range of values from 0.4 to 0.8, and re-estimate all other parameters of our baseline structural model. We then plot the relationship between α and our estimate of the consequence-dated prosocial utility parameter, $1-\hat{w}$. The baseline parameter estimates for α and $1-w$ are indicated by a horizontal and vertical line.

Table D.5: Structural model without using choices from multivariate discounting stage

	Excl. stage MD	
	Est. (1)	SE (2)
Choice-dated prosociality, α	0.193	0.064
Consequence-dated prosociality, $1-w$	0.422	0.014
Relative risk aversion, $1-\beta$	0.802	0.052
δ	0.992	0.002

Note: This table presents parameter estimates of our baseline structural model when excluding choices from the stages *MD-SELF* and *MD-CHARITY* from the estimation. The estimation procedure is otherwise identical to our baseline structural model.

E Theory appendix

E.1 Conceptual framework

We briefly discuss choice-dated prosocial utility and conditions that imply a declining forward exchange rate. Recall that t denotes the current period, τ indexes time relative to t, $s_{t+\tau}$ denotes a dated payment to the decision-maker to be received at $t+\tau$, and $c_{t+\tau}$ represents a donation to charity that was caused at time t and will be received by the charity in τ periods. Suppose that the decision-maker's preferences are given by

$$U_t^{\text{choice}} = \alpha(\mathbf{c}) + \sum_{\tau=0}^{\infty} D(\tau)v(s_{t+\tau}), \tag{15}$$

where $\alpha(\cdot)$ captures the choice-dated prosocial utility derived from the stream of future donations $\mathbf{c} = (c_{t+\tau})_\tau$ that has been *caused* in t. As we are mainly interested in the effect of delays, we replace α by a linear approximation

$$\alpha(\mathbf{c}) \approx a \sum_{\tau=0}^{\infty} D^c(\tau)c_{t+\tau}, \tag{16}$$

where $D^c(\tau)$ can be interpreted as an implicit "discount factor" that describes how choice-dated prosocial utility from causing a future charitable donation depreciates with the delay of the donation. We provide a sufficient condition for an asymptotically declining forward exchange rate:

Assumption 1. *The implicit discount factor $D^c(\tau)$ declines at a lower rate than the subjective discount factor $D(\tau)$, i.e. $\lim_{\tau\to\infty} D^c(\tau)/D(\tau) = \infty$.*

Intuitively, this implies that the choice-dated prosocial utility from the act of giving is less sensitive to the delay τ than the utility from payments to the self.[8] Thus, for large τ, the choice-dated prosocial utility will be insensitive to the delay τ *relative* to the sensitivity of utility from self-euros: the forward exchange rate will converge to zero.

We provide a simple example to illustrate why we would expect this condition to hold. Suppose that causing a delayed donation $c_{t+\tau}$ at time t provides an

[8] If we are willing to assume exponential discounting, i.e. $D^c(\tau) = \delta_c^\tau$ and $D(\tau) = \delta^\tau$, the assumption is equivalent to $\delta_c > \delta$.

immediate feeling of warm glow (Andreoni, 1989), $\bar{\alpha}$, independent of the size of the donation itself, in addition to other sources of choice-dated prosocial utility, i.e. suppose that the choice-dated prosocial utility generated by $c_{t+\tau}$ is:

$$\bar{\alpha}\mathbb{1}\left(c_{t+\tau} > 0\right) + v_{\tau}(c_{t+\tau}), \tag{17}$$

where $v_{\tau}(c_{t+\tau})$ is a family of positive function. Today, the decision-maker prefers a delayed donation $c_{t+\tau}$ in τ periods to an equally delayed amount $s_{t+\tau}$ of self-euros if

$$\bar{\alpha} + v_{\tau}(c_{t+\tau}) \geq D(\tau)u(x) \iff \underbrace{\frac{\bar{\alpha}}{D(\tau)v(x)}}_{\to\infty} + \underbrace{\frac{v_{\tau}(c_{t+\tau})}{D(\tau)v(x)}}_{\geq 0} \geq 1. \tag{18}$$

Thus, for large τ, the decision-maker will prefer the donation to contemporaneous self-euros, implying an asymptotically declining forward exchange rate. Note that we only need the existence of an (arbitrarily small) positive lower bound on the utility from the act of giving itself to obtain this result:

Proposition 1. *Suppose that the choice-dated prosocial utility from causing a dated donation g at time t that will be received by the charity at $t+\tau$ is bounded from below by $\bar{\alpha} > 0$. Then, the forward exchange rate converges to zero.*

Intuitively, the subjective discount factors imply that the present value of future self-euros becomes negligible for large τ and eventually falls below the lower bound on the immediate choice-dated prosocial utility (e.g. "warm glow"). In particular, we do not need any additional assumptions on the source of prosocial utilities.

E.2 Fungibility of money over time

In our experiment, we interpret payment dates as representing corresponding consumption dates. In this section, we show that even if subjects can borrow and invest self-euros at a fixed market interest rate, we should not expect a declining forward exchange rate.

To see this, recall that we elicit subjects' indifference points between receiving $s_{t+\tau} = 50$ euros for themselves in τ months and an alternative payment of $c^*_{t+\tau}$ to a charity in τ months. We observe that the forward exchange rate $\mathrm{F}_\tau = c^*_{t+\tau}/50$ declines in τ in our experiment. Assuming a discounted utility framework with a stationary flow utility function $u(s_{t+\tau}, c_{t+\tau})$ and discount factors $D(\tau)$, the indifference point $c^*_{t+\tau}$ is independent of τ, as can be seen below:

$$D(\tau)u(50,0) = D(\tau)u(0, c^*_{t+\tau}) \tag{19}$$

Now assume that subjects can borrow and invest at a market interest rate r. For the sake of the argument, assume that $D(\tau) = \delta^\tau$ and that $\delta < 1/(1+r) \equiv \delta_r$, i.e. the marginal intertemporal rate of substitution is lower than the marginal rate of transformation implied by the market interest rate. In this case, the subject should compare the utility from the net present value of the 50 self-euros to the discounted prosocial utility from a future donation:

$$\delta_r^\tau u(50,0) = \delta^\tau u(0, c^*_{t+\tau}) \tag{20}$$

This implies the following indifference condition:

$$\left(\frac{\delta_r}{\delta}\right)^\tau u(50,0) = u(0, c^*_{t+\tau}) \tag{21}$$

As τ increases, the left-hand side of Equation (21) increases (as $\delta < \delta_r$). To balance the equation, $c^*_{t+\tau}$ must increase as well. This would imply an increasing forward exchange rate F_τ, which is the opposite of what we find.

The above argument assumed that there is no source of choice-dated prosocial utility. If donations provide immediate choice-dated utility of α, we instead obtain the following indifference condition:

$$\delta_r^\tau u(50,0) = \alpha + \delta^\tau u(0, c^*_{t+\tau}) \implies \left(\frac{\delta_r}{\delta}\right)^\tau u(50,0) = \frac{\alpha}{\delta^\tau} + u(0, c^*_{t+\tau}) \tag{22}$$

As $\delta_r/\delta < 1/\delta$, the right-hand side of the above equation will grow faster than the left-hand side. To balance the equation, $c_{t+\tau}$ must decrease as τ rises. We would thus expect a declining forward exchange rate for sufficiently large τ. This demonstrates that the declining forward exchange rate in our experiment cannot be rationalized with a purely consequence-dated discounted utility framework and fungibility of payments to the self. However, fungibility of self-euros would still predict a declining exchange rate in the presence of choice-dated prosocial utility.

E.3 Consistency of intertemporal choices

This section examines internal consistency of subjects' intertemporal choices. We start by characterizing the optimal switching points for the multiple prices lists in the stages *UD-SELF*, *UD-CHARITY*, *MD-SELF*, *MD-CHARITY* and *ER* of our experiment (see Section 3 for an overview of the design). In a second step, we show that internal consistency of choices across these stages implies inequalities that we can test empirically. Finally, we show that these inequalities seem to hold in our data, suggesting that the observed discounting patterns can be rationalized with a utility function exhibiting a choice-dated prosocial utility component.

E.3.1 Switching points

Suppose that subjects' preferences can be represented by the following utility function featuring both choice-dated and consequence-dated prosocial utility from giving:

$$W_t = \alpha \mathbb{1}\left(\sum_{\tau=0}^{T} c_{t+\tau} > 0\right) + \sum_{\tau=0}^{T} \delta^{\tau} u(s_{t+\tau}, c_{t+\tau}) \tag{23}$$

where α captures the choice-dated prosocial utility from giving. The decisions in Part A of our experiment on intertemporal decision-making only involve tradeoffs between bundles of the type $(s_{t+\tau_1}, 0)$ and $(0, c_{t+\tau_2})$ for different τ_1, τ_2. To characterize indifference points between such bundles, only the marginals $u_c(c) \equiv u(0, c)$ and $u_s(s) \equiv u(s, 0)$ are of relevance.

UD. Let us first consider the stages *UD-SELF* and *UD-CHARITY*. In stage *UD-SELF*, we elicit the amount UD^s_τ of self-euros to be received in τ months that make subjects indifferent to receiving 50 self-euros today:

$$u_s(50) = \delta^{\tau} u_s(UD^s_\tau) \implies UD^s_\tau = u_s^{-1}\left(\frac{u_s(50)}{\delta^{\tau}}\right) \tag{24}$$

In stage *UD-SELF*, we elicit the amount UD^c_τ of charity-euros to be donated in τ months that make subjects indifferent to donating 50 charity-euros today:

$$\alpha + u_c(50) = \alpha + \delta^\tau u_c(UD^c_\tau) \implies UD^c_\tau = u_c^{-1}\left(\frac{u_c(50)}{\delta^\tau}\right) \tag{25}$$

ER. In stage *F*, we elicit the amount Fτ of charity-euros to be donated in τ months that make subjects indifferent to receiving 50 self-euros in τ months:

$$\delta^\tau u_s(50) = \alpha + \delta^\tau u_c(F_\tau) \implies F_\tau = u_c^{-1}\left(\frac{\delta^\tau u_s(50) - \alpha}{\delta^\tau}\right) \tag{26}$$

MD. In stage *MD-SELF*, we elicit the amount MD^s_τ of charity-euros to be donated in τ months that make subjects indifferent to receiving 50 self-euros today:

$$u_s(50) = \alpha + \delta^\tau u_c(MD^s_\tau) \implies MD^s_\tau = u_c^{-1}\left(\frac{u_s(50) - \alpha}{\delta^\tau}\right) \tag{27}$$

In stage *MD-CHARITY*, we elicit the amount MD^c_τ of self-euros to be received in τ months that make subjects indifferent to donating 50 charity-euros today:

$$\alpha + u_c(50) = \delta^\tau u_s(MD^c_\tau) \implies MD^c_\tau = u_s^{-1}\left(\frac{u_c(50) + \alpha}{\delta^\tau}\right) \tag{28}$$

E.3.2 Relationship across switching points

We next examine the relationship between predicted switching conditions in different types of tradeoffs using the above equations. For example, it seems intuitive that the switching points from the stage *MD-SELF* should be related to the switching points from the stages *UD-SELF* and *ER*. Such a relationship is also suggested by Figure 1, where it would imply that the diagonal arrows are equivalent (in some sense) to a combination of successive conversions using only horizontal and vertical arrows.

Below, we compare subjects direct conversion rate between self-euros (charity-euros) today and charity-euros (self-euros) in τ months from the stages *MD-SELF* (*MD-CHARITY*) with the implied conversion rate from the following two-step procedures:

1. Convert 50 self-euros (charity-euros) today to future self-euros (charity-euros) using the conversion rate implied by the stage *UD-SELF* (*UD-CHARITY*).

2. Exchange these future self-euros (charity-euros) to contemporaneous charity-euros (self-euros) by using the exchange rate implied by the choices in stage *ER*.

The final amount of charity-euros in τ months implied by this procedure is

$$UD_\tau^s \cdot \frac{F_\tau}{50} = \quad u_s^{-1}\left(\frac{u_s(50)}{\delta^\tau}\right)\left(u_c^{-1}\left(\frac{\delta^\tau u_s(50)-\alpha}{\delta^\tau}\right)/50\right) \tag{29}$$

To relate this to *MD-SELF*, we have to impose restrictions on the shape of u_s and u_c. Following the approach in our structural model, we assume that u_s and u_c exhibit constant relative risk aversion and share a constant coefficient of relative risk aversion, β. It then follows that

$$UD_\tau^s \cdot \frac{F_\tau}{50} = u_s^{-1}\left(\frac{u_s(50)}{\delta^\tau}\right)\frac{1}{50}u_c^{-1}\left(\frac{\delta^\tau u_s(50)-\alpha}{\delta^\tau}\right) \tag{30}$$

$$= \delta^{\tau/\beta}u_c^{-1}\left(\frac{\delta^\tau u_s(50)-\alpha}{\delta^\tau}\right) \tag{31}$$

$$= u_c^{-1}\left(\frac{\delta^\tau u_s(50)-\alpha}{\delta^{2\tau}}\right) \leq u_c^{-1}\left(\frac{u_s(50)-\alpha}{\delta}\right) = MD_\tau^s \tag{32}$$

Analogously, one can show that

$$UD_\tau^s \cdot \left(\frac{F_\tau}{50}\right)^{-1} \leq MD_\tau^c \tag{33}$$

E.3.3 Empirical test

We can now examine whether the above inequalities hold in our data. For each subject i, we obtain the hypothetical indifference point between self-euro s_t (charity-euro c_t) today and charity-euro $c_{t+\tau}$ (self-euro $s_{t+\tau}$) in τ months from the two-step outlined above. This is the *indirect* conversion factor. The *direct* conversion factor is the one obtained directly from the choices in the stages *MD-SELF* and *MD-CHARITY*. Figure E.1 displays the average ratio of the indirect and the direct conversion factors for different time horizons τ. Consistent with the inequalities in equations 32 and 33, the ratios are all weakly greater than one. For $\tau \geq 3$, the ratios are statistically significantly greater than. This suggests that the discounting patterns from the stages *UD*, *MD* and *ER* are mutually consistent.

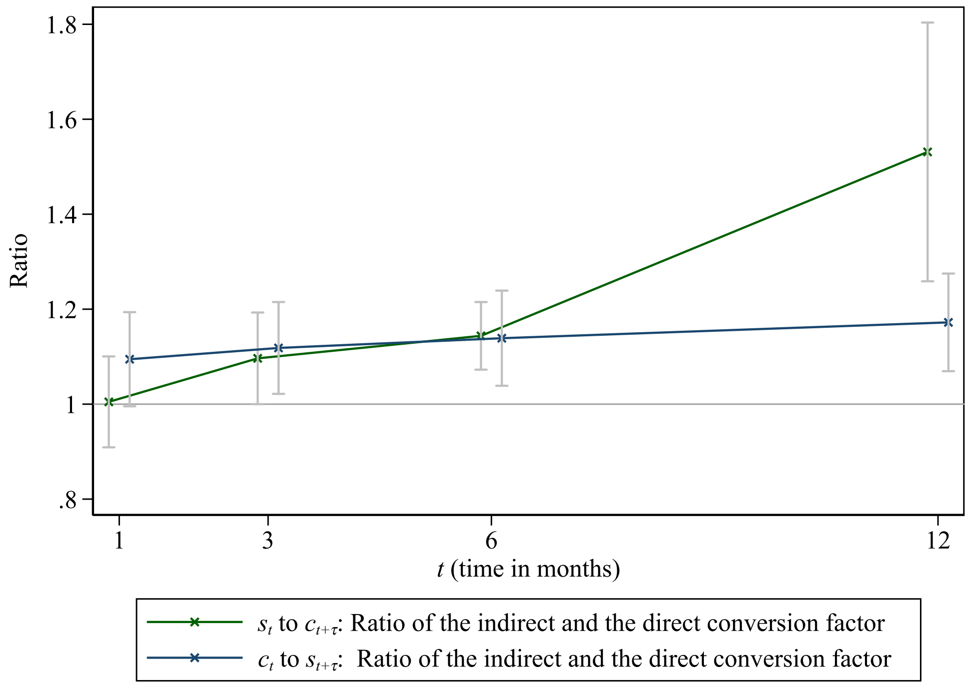


Figure E.1: This figure presents the ratio of the the *indirect* and the *direct* conversation factors. See Section E.3.3 for a description of how we obtain the conversion factors.

E.3.4 Additional remarks on consistency

One advantage of self-euros over charity-euros is that the former can still be converted to the latter, which provides some form of flexibility. For example, suppose that a subject faces a choice at time t between 1 self-euro at time t ("today") and 1 charity-euro at time $t+1$ ("tomorrow"). Rather than choosing the donation directly, the subject could take the self-euro and plan to donate it tomorrow with accrued interest r. Would that make them better off? Our perspective is that the choice-dated utility should accrue at the moment when the subject credibly commits to the donation. Thus, if the subject cannot credibly commit to donating the self-euro in the future, the choice-dated utility from planning to donate tomorrow will only realize tomorrow–and thus be subject to discounting.

This creates a tradeoff between the benefits derived from the accrued interest on the one hand, and the utility loss from having the choice-dated utility discounted. Below, we show that the latter effect will likely dominate when calibrating the model at our estimated parameter values. For this exercise, we assume the same functional form of the utility function as in our baseline structural model (see Equation (5)). The sum of the choice-dated and the consequence-dated prosocial utility from choosing the future donation is

$$\alpha + \delta(1-w) \tag{34}$$

In contrast, taking the self-euro today and waiting one period to donate $(1+r)$ would be associated with a total utility of

$$\delta(\alpha + \delta(1-w)(1+r)^{\beta}) \tag{35}$$

The subject will be prefer to take the self-euro today if $r \geq r^*$ with

$$r^* = \left(\frac{\alpha(1-\delta)}{(1-w)\delta} + 1\right)^{1/\beta} - 1 \tag{36}$$

At the estimated parameter values from Section 5, this would imply a 1-month interest rate of $r^* = 7.9\%$. This suggests that the option value of the self-euro is relatively low compared to the benefit of realizing the choice-dated prosocial utility today rather than tomorrow.

F Experimental Instructions

The original instructions used in the laboratory experiment are in German. We provide an English translation of the instructions below. The experiment has two parts. Each part consists of five different stages and each stage contains multiple price lists. To avoid repetitions, we only include the translation of one price list per stage. Within a stage, the instructions are constant across price lists except for changes in the monetary amounts or the number of months until a payment is made. See Section 3 of the paper for more details on how the price lists were constructed. The following sections contain the translations:

F.1 Introduction

Welcome and thank you for your interest in this study!

For your participation you will receive a fixed payment of 10.00 €, which will be paid to you by bank transfer after the study. In this study you will make decisions on the computer. Depending on how you decide you can earn additional money.

You are not allowed to talk to other participants during the study. Please turn off your mobile phone now, so that other participants will not be disturbed. Please only use the designated functions on the computer and make your entries using the keyboard and the mouse. If you have any questions, please raise your hand. Your question will be answered at your seat.

On the following screens you will see detailed information concerning the study. After reading this information you can confirm or refuse your participation.

To proceed click "Next".

[**end of screen**]

Information on participating in this study by the *BonnEconLab*

The following information has been sent to you via email along with the confirmation of your registration for this study. You will receive this information again now. Once you have read the subsequent declaration of consent you can confirm your participation by clicking on "I agree".

[followed by mandated exclusion restrictions for participation in this study]

[**end of screen**]

Information

In the follow part of this study, you will see important information, concerning tuberculosis and its possible treatment, that is relevant for your subsequent decisions. Please read all information carefully.

[**end of screen**]

Information about Tuberculosis

What is tuberculosis?

Tuberculosis – also called consumptiveness or White Death – is an infectious disease, which is caused by bacteria. Roughly one third of all humans are infected with the pathogen of tuberculosis. Active tuberculosis breaks out among 5 to 10% of all those infected. Tuberculosis is primarily airborne. This is also why a quick treatment is necessary.

What are the symptoms of tuberculosis?

Tuberculosis patients often suffer from generalized symptoms like fatigue, feeling of weakness, lack of appetite, and weight loss. At an advanced stage of lung tuberculosis, the patient coughs up blood, leading to the so-called rush of blood. Without treatment a person with tuberculosis dies with a probability of 43%.

How prevalent is tuberculosis?

In the year 2014, 6 million people have been recorded as falling ill with active tuberculosis. Almost 1.5 million people die of tuberculosis each year. This means more deaths are caused by tuberculosis than HIV, malaria, or any other infectious disease.

Is tuberculosis curable?

Today tuberculosis is curable. Treatment is administered by giving antibiotics several times each week over a period of 6 months. It is important that there is no interruption of treatment. In the years from 2000 to 2014 approximately 43 million human lives were saved due to the effective diagnosis and treatment of tuberculosis. The success rate of treatment for a new infection is often above 85%. The preceding numbers and information are provided by the World Health Organization (WHO), the United Nations' institution for the international public health, and are freely available. You can check this information on the web page of the WHO after this study.

Figure F.1: Typical appearance of a tuberculosis patient

[**end of screen**]

Your decision

In the course of this study you can choose between options that have different consequences. In particular, you can choose between options with the following consequences:

Additional Payment: If you choose this option, you will receive an additional payment.

Saving a Human Life: If you choose this option, you will not receive an additional payment. This option has another consequence: You save one human life.

After it has emerged which option will be implemented for you, it will be carried out exactly as described. On the next tab you will receive more information about the implementation of Saving a Human Life.

[**end of screen**]

Information about saving a human life

How will a human life be saved?

Depending on how you decide, a human life can be saved. A human life will be saved by arranging a donation of 350.00 € on your behalf to an organization that identifies and treats people suffering from tuberculosis. This donation will be executed for you by the BonnEconLab after the study. The entire donation amount will be used by the organization for the direct treatment of tuberculosis.

What does it mean to "save a life"?

In this context, to save a human life means to successfully cure one person of tuberculosis, who *otherwise* would have died from the disease. This means in particular: The donation amount is sufficient to identify and cure as many sick people such that there is at least one person among them, who would otherwise have died from tuberculosis in expectation. The calculation of the amount accommodates the fact that there are other ways (e.g., the national health care system) through which people can be cured. That means: **The amount of 350.00 € was calculated in such a way that the organization can save at least one additional human from death.**

On the next tab you will receive additional information about the possible saving of a human life and details about the organization that treats tuberculosis patients.

[**end of screen**]

Operation ASHA

Your decisions can save a human life. Depending on how you decide, an amount of 350.00 € will be transferred to the organization *Operation ASHA* after the study.

Operation ASHA is a charity organization that has specialized in the treatment of tuberculosis in disadvantaged communities since 2005. The work of *Operation ASHA* is based on the insight that the biggest obstacle for the treatment of tuberculosis is the interruption of the necessary 6-month-long regular intake of medication. For a successful treatment the patient has to come to a medical facility twice a week – more than 60 times in total – to take the medication. An interruption or termination of the treatment is fatal, because this strongly enhances the development of a drug-resistant form of tuberculosis. This form of tuberculosis is much more difficult to treat and almost always leads to death.

To overcome this problem, *Operation ASHA* developed a concept that guarantees the regular treatment through immediate spatial proximity to the patient. A possible non-adherence is additionally prevented by visiting the patient at home. By now *Operation ASHA* runs more than 360 treatment centers, almost all of which are located in the poorest regions of India. More than 60,000 sick individuals have been identified and treated this way.

Figure F.2: An employee of Operation ASHA provides medicine to a tuberculosis patient.

Operation ASHA is an internationally recognized organization, and its success has been covered by many news outlets including the New York Times, the BBC, and Deutsche Welle. MIT and University College London have already conducted research projects about the fight against tuberculosis in cooperation with *Operation ASHA*. The treatment method employed by *Operation ASHA* is described by the World Health Organization (WHO) as “highly efficient and cost-effective”.

[**end of screen**]

What determines the donation amount for saving a human life?

The donation amount ensures that at least one human life is saved in expectation.

The information used for the calculation of the donation amount exclusively consists of public statements by the World Health Organization (WHO), peer-reviewed research studies, statistical releases from the Indian government, and published figures from *Operation ASHA*. In the calculation all information was interpreted in a conservative way and more pessimistic estimates were used in case of doubt such that the donation amount of 350.00 € is, if anything, higher than the actual costs associated with saving a human life. Moreover, the calculation was based on the treatment success rate of *Operation ASHA* and the mortality rate of an alternative treatment by the national tuberculosis program in India. Furthermore, different detection rates for new cases of tuberculosis have been accounted for.

Based on a very high number of cases, one can illustrate the contribution of your donation as follows:

With your donation, *Operation ASHA* can treat five additional tuberculosis patients.

If these five sick individuals were not treated by *Operation ASHA*, one patient would die in expectation. If five people are treated by means of your donation, no patient dies in expectation. Based on these expected values, one human life will be saved with your donation. This relationship is depicted in the following diagram.

a) Without treatment by *Operation ASHA*, one of five individuals sick with tuberculosis will die in expectation.

b) With the donation five individuals sick with tuberculosis can be treated by *Operation ASHA*, and none of these individuals will die in expectation.

An agreement with *Operation ASHA* for the purpose of this study ensures that 100% of the donation amount will exclusively be used for the diagnosis and treatment of tuberculosis patients. That means that every euro of the donation amount will directly go toward saving human lives.

[**end of screen**]

Summary

Tuberculosis

The success rate of medical treatment for a new infection is very high. Nevertheless, 1.5 million people die from tuberculosis each year. The biggest obstacle for the cure of tuberculosis is a possible termination of the regular treatment with antibiotics. The concept of *Operation ASHA* is therefore based on having direct spatial proximity to its patients and being able to control and account for the regular intake of medication.

Your decision

In the course of this study you can choose between options that have different consequences. In particular, you can choose between options with the following consequences: You can choose the additional monetary payment. If you choose the other option, you will not receive an additional monetary payment, but you can save a human life. Concretely, by choosing the other option you will cause a donation. The donation of 350.00 € will be paid on your behalf, which is sufficient not only to cure one person, but to actually save that person from dying of tuberculosis.

How is the human life saved?

The donation amount of 350.00 € already accounts for the fact that a sick person could also have survived without treatment by *Operation ASHA*; or that he could instead have been treated by the national health care system. This is why the amount is sufficient for the diagnosis and complete treatment of several affected individuals.

Please note: **This is not a hypothetical game**. The option to be implemented for you will actually be carried out – exactly as described – by the *BonnEconLab*. You will receive the money in case you choose the additional monetary payment. In case you choose to save a human life, we will allow inspection of the confirmed bank transfer to the organization *Operation ASHA* upon request.

If you have individual questions, you can also direct these by email after the study to nachbesprechung@uni-bonn.de. You find this email address on the back of your seating card. You can take it home with you. Click on "Next", if you have carefully read the information on this page. Please note: You can only click on the button "Next" once you have spent at least five minutes on the seven tabs of this page.

[**end of screen**]

Information on the next part of this study

In the next part of this study, we will ask you to make a series of decisions in which you can choose between two monetary payments. The dates on which the two monetary payments are made can differ.

About this part of the study

This part of the study consists of five parts. In each part, you will make a decision in five different decision-making scenarios. At the beginning of each part, you will receive information that is relevant for this part. At the beginning of each decision-making scenario, you will also receive additional information for this particular decision-making scenario.

Payments in this part of the study

All monetary payments in this part of the study will be made by bank transfer. Each bank transfer will be made on the exact date that was indicated for the monetary payments. If, for example, a decision is about a monetary payment today, the corresponding monetary amount will be sent to you by a bank transfer today. If the decision involves a monetary payment in one month, a bank transfer with the corresponding amount will be made exactly one month from now.

In what follows, you will face a series of decision-making scenarios. One of these decision-making scenarios will be randomly selected by the computer at the end of this study. Your decision in *this* decision-making scenario will be implemented at the end of this study.

Remember:

- Every decision-making scenario can be relevant for your monetary payment.
- Your decisions in this part determine both **to whom** the monetary payment will go and **at which date** the monetary payment will be made.
- All monetary payments will be made by bank transfer.

[**end of screen**]

What does it mean that a donation will be made earlier or later?

If a donation is made earlier because of your decisions, help will be available earlier and hence people can be saved from death at an earlier point in time.

If a donation is made later, for example, in one year from now, then help will only be available later. Hence, people can only be saved from death at a later point in time. This means that the donation will be too late to help some patients that have tuberculosis in the present. In this case, patients who got sick at a later date will receive treatment instead.

The **size of the donation** is important, because more people can be helped with more money.

When making the following decisions, you should therefore take into account **when** the donation will be made and **how much** will be donated based on your decisions.

[**end of screen**]

F.2 Experiment Part A

F.2.1 UD-S

Information for the current part

In the following, you will see a series of decision-making scenarios in which you can choose between Option A and Option B.

- **Option A**: A **smaller** monetary payment **to you** at an **earlier** date.
- **Option B**: A **larger** monetary payment **to you** at a **later** date.

Thus, you can make a decision about a payment to yourself. You have the choice between a monetary payment that is smaller and made earlier; and a monetary payment that is larger, but made later.

Please note:

- Each of the following decisions could be the one that is actually implemented.
- **All** monetary payments will be made by **bank transfer**.

[**end of screen**]

Information for the decision-making scenario on the next page

[Box that repeats the relevant information for the current part of the study]

On the next page, you will see a list of choices between

- **Option A**: A smaller monetary payment to you today.
- **Option B**: A larger monetary payment to you in 12 months.

You can thus decide whether you are willing to wait to receive a larger monetary payment.

[**end of screen**]

You can now make your decision

Please indicate in each row of this table whether you choose **Option A** or **Option B**.

Option A	Option B
50.00 € for you today ◦	◦ 50.00 € for you in 12 months
50.00 € for you today ◦	◦ 52.50 € for you in 12 months
50.00 € for you today ◦	◦ 55.00 € for you in 12 months
. . . ◦	◦ . . .
50.00 € for you today ◦	◦ 120.00 € for you in 12 months
50.00 € for you today ◦	◦ 122.50 € for you in 12 months
50.00 € for you today ◦	◦ 125.00 € for you in 12 months

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.2.2 UD-C

Information for the current part

In the following, you will see a series of decision-making scenarios in which you can choose between Option A and Option B.

- **Option A**: A **smaller** monetary payment **to *Operation ASHA*** at an **earlier** date.

  You are making a smaller contribution to saving lives and the contribution is made earlier.

- **Option B**: A **larger** monetary payment **to *Operation ASHA*** at a **later** date.

  You are making a larger contribution to saving lives. However, the contribution is made later, so there is a delay.

Thus, you can choose whether you want to make a smaller donation at an earlier date to save fewer human lives, or whether you want to wait to make a larger donation at a later date to save more human lives.

Please note:

- Each of the following decisions could be the one that is actually implemented.
- **All** monetary payments will be made by **bank transfer**.

[**end of screen**]

Information for the decision-making scenario on the next page

[Box that repeats the relevant information for the current part of the study]

On the next page, you will see a list of choices between

- **Option A**: A smaller monetary payment to *Operation ASHA* today.
- **Option B**: A larger monetary payment to *Operation ASHA* in 12 months.

100% of the donation amount will be used to save human lives.

You can thus decide whether you prefer to save fewer human lives at an earlier date in the immediate future, or whether you want to help save more human lives in the future, but with a greater delay.

[**end of screen**]

You can now make your decision

Please indicate in each row of this table whether you choose **Option A** or **Option B**.

Option A	Option B
50.00 € for Operation ASHA today ∘	∘ 50.00 € for Operation ASHA in 12 months
50.00 € for Operation ASHA today ∘	∘ 52.50 € for Operation ASHA in 12 months
50.00 € for Operation ASHA today ∘	∘ 55.00 € for Operation ASHA in 12 months
. . . ∘	∘ . . .
50.00 € for Operation ASHA today ∘	∘ 120.00 € for Operation ASHA in 12 months
50.00 € for Operation ASHA today ∘	∘ 122.50 € for Operation ASHA in 12 months
50.00 € for Operation ASHA today ∘	∘ 125.00 € for Operation ASHA in 12 months

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.2.3 ER

Information for the current part

In the following, you will see a series of decision-making scenarios in which you can choose between Option A and Option B.

- **Option A**: Monetary payment **to you** at a **given** date.
- **Option B**: Monetary payment **to Operation ASHA** on the **same** date.

  You are making a contribution to saving human lives on the same date that you would have received your monetary payment if you had chosen **Option A**.

Thus, you can choose whether you prefer making a monetary payment to yourself on a given date, or whether you prefer making a donation to help save human lives on the same date.

Please note:

- Each of the following decisions could be the one that is actually implemented.
- **All** monetary payments will be made by **bank transfer**.

[**end of screen**]

Information for the decision-making scenario on the next page

[Box that repeats the relevant information for the current part of the study]

On the next page, you will see a list of choices between

- **Option A**: A monetary payment to *you* in 12 months.
- **Option B**: A monetary payment to *Operation ASHA* in 12 months.

100% of the donation amount will be used to save human lives.

You can thus decide whether you are willing to forego a monetary payment to yourself in 12 months in order to save human lives.

[**end of screen**]

You can now make your decision

Please indicate in each row of this table whether you choose **Option A** or **Option B**.

Option A	**Option B**
50.00 € for you in 12 months ◦	◦ 0.00 € for Operation ASHA in 12 months
50.00 € for you in 12 months ◦	◦ 10.00 € for Operation ASHA in 12 months
50.00 € for you in 12 months ◦	◦ 20.00 € for Operation ASHA in 12 months
. . . ◦	◦ . . .
50.00 € for you in 12 months ◦	◦ 180.00 € for Operation ASHA in 12 months
50.00 € for you in 12 months ◦	◦ 190.00 € for Operation ASHA in 12 months
50.00 € for you in 12 months ◦	◦ 200.00 € for Operation ASHA in 12 months

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.2.4 MD-S

Information for the current part

In the following, you will see a series of decision-making scenarios in which you can choose between Option A and Option B.

- **Option A**: A monetary payment **to you** at an **earlier** date.
- **Option B**: A monetary payment **to Operation ASHA** at a **later** date.

  You are making a contribution to saving lives. However, the contribution is made later, so there is a delay.

Thus, you can choose whether you prefer a monetary payment to yourself at an earlier date, or whether you prefer to wait to make a larger donation to help save human lives at a later date.

Please note:

- Each of the following decisions could be the one that is actually implemented.
- **All** monetary payments will be made by **bank transfer**.

[**end of screen**]

Information for the decision-making scenario on the next page

[Box that repeats the relevant information for the current part of the study]

On the next page, you will see a list of choices between

- **Option A**: A monetary payment to *you* today.
- **Option B**: A monetary payment to *Operation ASHA* in 12 months.

100% of the donation amount will be used to save human lives.

You can thus decide whether you are willing to forego a monetary payment to yourself at an earlier date to save human lives at a later date.

[**end of screen**]

You can now make your decision

Please indicate in each row of this table whether you choose **Option A** or **Option B**.

Option A	Option B
50.00 € for you today ∘	∘ 0.00 € for Operation ASHA in 12 months
50.00 € for you today ∘	∘ 15.00 € for Operation ASHA in 12 months
50.00 € for you today ∘	∘ 30.00 € for Operation ASHA in 12 months
...∘	∘ ...
50.00 € for you today ∘	∘ 345.00 € for Operation ASHA in 12 months
50.00 € for you today ∘	∘ 360.00 € for Operation ASHA in 12 months
50.00 € for you today ∘	∘ 375.00 € for Operation ASHA in 12 months

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.2.5 MD-C

Information for the current part

In the following, you will see a series of decision-making scenarios in which you can choose between Option A and Option B.

- **Option A**: A monetary payment **to Operation ASHA** at an **earlier** date.

  You are making a contribution to saving lives at an earlier date.

- **Option B**: A monetary payment **to you** at a **later** date.

Thus, you can choose whether you prefer a donation to help save human lives at an earlier date, or whether you prefer to wait to receive a monetary payment for yourself at a later date.

Please note:

- Each of the following decisions could be the one that is actually implemented.
- **All** monetary payments will be made by **bank transfer**.

[**end of screen**]

Information for the decision-making scenario on the next page

[Box that repeats the relevant information for the current part of the study]

On the next page, you will see a list of choices between

- **Option A**: A monetary payment to *Operation ASHA* today.
- **Option B**: A monetary payment to *you* in 12 months.

100% of the donation amount will be used to save human lives.

You can thus decide whether you are willing to forego saving human lives at an earlier date to receive a monetary payment at a later date.

[**end of screen**]

You can now make your decision

Please indicate in each row of this table whether you choose **Option A** or **Option B**.

Option A	Option B
50.00 € for Operation ASHA today ∘	∘ 0.00 € for you in 12 months
50.00 € for Operation ASHA today ∘	∘ 5.00 € for you in 12 months
50.00 € for Operation ASHA today ∘	∘ 10.00 € for you in 12 months
...∘	∘...
50.00 € for Operation ASHA today ∘	∘ 115.00 € for you in 12 months
50.00 € for Operation ASHA today ∘	∘ 120.00 € for you in 12 months
50.00 € for Operation ASHA today ∘	∘ 125.00 € for you in 12 months

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.3 Experiment Part B

Task description

In the following part of the study, we ask you make a series of decisions involving a choice between two lotteries, **Lottery A** and **Lottery B**. Both lotteries will be determined by a fair coin toss. That means that there is a 50% chance that it lands on heads, and a 50% chance that it lands on tails.

Before each lottery choice, you will receive information about the initial endowment in this decision. This initial endowment consists of two parts:

- A monetary payment **to you**
- A monetary payment **to Operation ASHA**. 100% of this amount will be used to save human lives.

After you have received information about the initial endowment, you can make your choice between **Lottery A** and **Lottery B**.

Please note:

- The lotteries will change the monetary payments to you and/or the organization. You will learn exactly how the initial endowments will change if, for example, you choose Lottery A and the coin toss lands on heads.
- **Thus, how the monetary payments to you and the organization change depends both on which lottery you choose and the result of the coin toss.** The coin toss will be carried out by the computer.

Payments in this part of the study

All monetary payments in this part of the study will be made by bank transfer. In the following decision-making scenarios, monetary payments are made either to you or to the organization *Operation ASHA*. If you are the recipient, a bank transfer to your account will be made today. If *Operation ASHA* is the recipient of the monetary payment, a bank transfer to the organization's account will be made today. As previously explained, 100% of the amount that is transferred to the organization's account will be used to save people from dying of tuberculosis.

In what follows, you will face a series of decision-making scenarios. One of these decision-making scenarios will be randomly selected by the computer at the end of this study. Your decision in *this* decision-making scenario will be implemented by a bank transfer at the end of this study. Your decisions in this part of the study thus determine *which* lottery is played at the end of this study.

Remember:

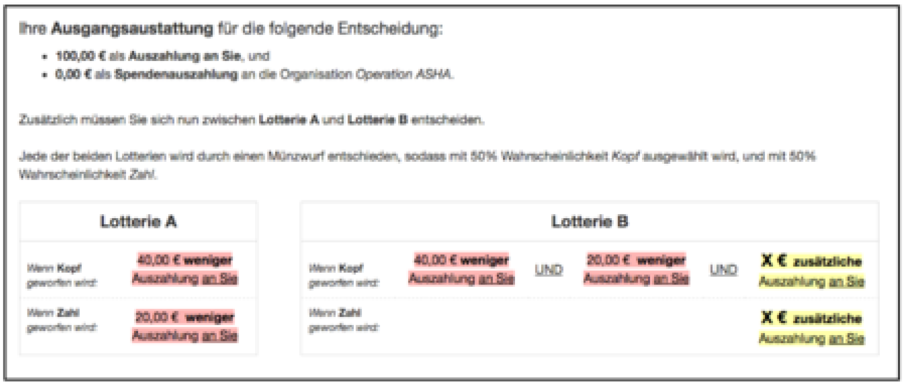
- Every decision-making scenario can be relevant for your monetary payment.
- Your decisions in this part determine both **to whom** the monetary payment will go and **at which date** the monetary payment will be made.
- All monetary payments will be made by bank transfer.

[**end of screen**]

Example

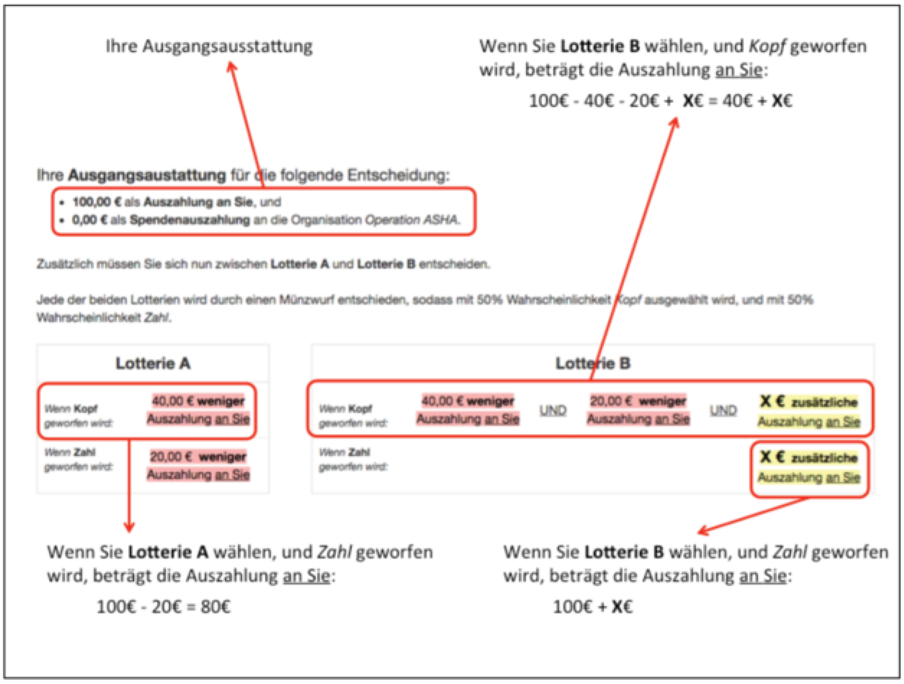
In the following decision-making scenarios, you can choose between **Lottery A** and **Lottery B**. On this page, we use an example to illustrate the choice between both lotteries.

In the following decision-making scenarios, you will see a page that looks like this:



On such a page, you will see information about the initial endowment, and how these endowments change depending on which lottery you choose and what the result of the coin toss is.

In the picture below, we explain the elements of this page in more detail:



In each decision-making scenario where you have to choose between **Lottery A** and **Lottery B**, we will show you an amount **X** €. The picture below illustrates what your decision would look like if $X = 10.00$ €. By selecting the left or right circle, you can choose between **Lottery A** and **Lottery B**.

To proceed click "Next".

[**end of screen**]

Exercise 1

On this and the following page, you can check whether you have correctly understood all the necessary information for this part of the study. For the first exercise, take a look at the following initial endowment:

> The initial endowment for the following scenario:
>
> - 25.00 € for you, and
> - a donation of 25.00 € to the organization Operation ASHA.
>
> In addition, you also have to choose between **Lottery A** and **Lottery B**.

Imagine that, given the initial endowment above, you had to make a decision between the following two lotteries:

- Lottery A:
  - If the coin toss is heads: the donation amount is reduced by 10.00 €.
  - If the coin toss is tails: the monetary payment to you is reduced by 10.00 €.
- Lottery B:
  - If the coin toss is heads: both the donation amount and the monetary payment to you are reduced by 10.00 €. You receive an additional **X** € as well.
  - If the coin toss is tails: you receive an additional **X** €.
  - $X = 2.00$ €

To test whether you have understood how your choice between Lottery A and Lottery B as well as how the outcome of the coin toss affects the monetary payments, please provide answers to the following questions:

- If I choose **Lottery A** and the coin toss is *heads*, the monetary amount that I will receive, including the initial endowment, is: [blank field] (in €)
- If I choose **Lottery B** and the coin toss is *heads*, the monetary amount that I will receive, including the initial endowment, is: [blank field] (in €)
- If I choose **Lottery B** and the coin toss is *heads*, the size of the donation, including the initial endowment, is: [blank field] (in €)
- If I choose **Lottery B** and the coin toss is *tails*, the monetary amount that I will receive, including the initial endowment, is: [blank field] (in €)

[**end of screen**]

Exercise 2

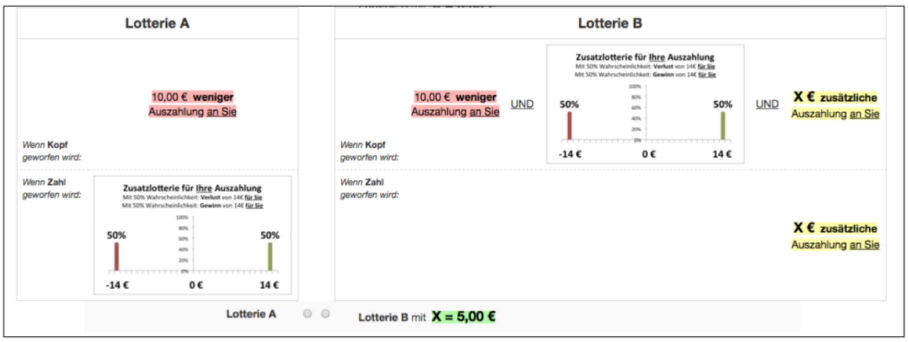
For the first exercise, take a look at the following initial endowment:

> The initial endowment for the following scenario:
>
> - 40.00 € for you, and
> - a donation of 0.00 € to the organization Operation ASHA.
>
> In addition, you also have to choose between **Lottery A** and **Lottery B**.

Some decisions involve a so-called **additional lottery**. Every additional lottery has a possible positive outcome (the monetary payment increases) and a possible negative outcome (the monetary payment decreases). The outcome of the **additional lottery** will also be randomly determined by the computer.

Note: Pay attention to the probabilities in the **additional lottery**.

Imagine that, given the initial endowment above, you had to make a decision between the following two lotteries:



- Lottery A:
  - If the coin toss is heads: the donation amount is reduced by 10.00 €.
  - If the coin toss is tails: There is an additional lottery for **your** monetary payment.
    - With a probability of 50%: You lose 14 €.
    - With a probability of 50%: You win 14 €.

- Lottery B:
  - If the coin toss is heads: the donation amount is reduced by 10.00 € AND you will receive an additional **X** € AND have an additional lottery for **your** monetary payment:
    * With a probability of 50%: You lose 14 €.
    * With a probability of 50%: You win 14 €.
  - If the coin toss is tails: you receive an additional **X** €.
  - $X = 5.00$ €

The additional lottery thus has a possible negative outcome of -14.00 € and a possible positive outcome of +14.00 €. Both outcomes are equally likely, that is, they both have a probability of 50%.

To test whether you have understood how your choice between Lottery A and Lottery B as well as how the outcome of the coin toss affects the monetary payments, please provide answers to the following questions:

- If I choose **Lottery A** and the coin toss is tails, then the outcome of the additional lottery is +14 €, and I will receive a monetary payment, including the initial endowment, of: [blank field] (in €)
- If I choose **Lottery B** and the coin toss is heads, then the outcome of the additional lottery is -14 €, and I will receive a monetary payment, including the initial endowment, of: [blank field] (in €)

[**end of screen**]

Your task begins on the next page

On the next page you will see the first decision-making scenario. From now on, the decisions you make are no longer an exercise, meaning that any of your following decisions and all related consequences could be implemented.

Remember:

- Every decision-making scenario can be relevant for your monetary payment.
- Your decisions in this part determine both **to whom** the monetary payment will go and **at which date** the monetary payment will be made.
- All monetary payments will be made by bank transfer.

To proceed click "Next".

F.3.1 RA–Self

The initial endowment for this decision is:

- 25.00 € for you, and
- a donation of 0.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

Both lotteries will be decided by a coin toss, which means that there is a 50% chance of heads and a 50% chance of tails.

[Description of the lotteries]

On the next page you will see a list where each row represents a different decision-making scenario between Lottery A and Lottery B. Each row indicates the value of **X** in that particular decision-making scenario. To proceed click "Next".

[end of screen]

Decision

The initial endowment for this decision is:

- 25.00 € for you, and
- a donation of 0.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

[Description of the lotteries]

Note: **X** € will be paid to you whenever you choose **Lottery B**, independently of whether the coin toss is heads or tails. Whether **X** is positive (a gain) or negative (a loss) depends on the decision-making scenario.

Lottery A ○	○ **Lottery B** with **X = -5.00** €
Lottery A ○	○ **Lottery B** with **X = -4.50** €
Lottery A ○	○ **Lottery B** with **X = -4.00** €
... ○	○ ...
Lottery A ○	○ **Lottery B** with **X = 4.00** €
Lottery A ○	○ **Lottery B** with **X = 4.50** €
Lottery A ○	○ **Lottery B** with **X = 5.00** €

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.3.2 RA–Charity

The initial endowment for this decision is:

- 0.00 € for you, and
- a donation of 25.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

Both lotteries will be decided by a coin toss, which means that there is a 50% chance of heads and a 50% chance of tails.

[Description of the lotteries]

On the next page you will see a list where each row represents a different decision-making scenario between Lottery A and Lottery B. Each row indicates the value of **X** in that particular decision-making scenario. To proceed click "Next".

[end of screen]

Decision

The initial endowment for this decision is:

- 0.00 € for you, and
- a donation of 25.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

[Description of the lotteries]

Note: **X** € will be paid to you whenever you choose **Lottery B**, independently of whether the coin toss is heads or tails. Whether **X** is positive (a gain) or negative (a loss) depends on the decision-making scenario.

Lottery A ○	○ **Lottery B** with **X = -5.00** €
Lottery A ○	○ **Lottery B** with **X = -4.50** €
Lottery A ○	○ **Lottery B** with **X = -4.00** €
... ○	○ ...
Lottery A ○	○ **Lottery B** with **X = 4.00** €
Lottery A ○	○ **Lottery B** with **X = 4.50** €
Lottery A ○	○ **Lottery B** with **X = 5.00** €

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.3.3 X–RA

The initial endowment for this decision is:

- 25.00 € for you, and
- a donation of 25.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

Both lotteries will be decided by a coin toss, which means that there is a 50% chance of heads and a 50% chance of tails.

[Description of the lotteries]

On the next page you will see a list where each row represents a different decision-making scenario between Lottery A and Lottery B. Each row indicates the value of **X** in that particular decision-making scenario. To proceed click "Next".

[end of screen]

Decision

The initial endowment for this decision is:

- 25.00 € for you, and
- a donation of 25.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

[Description of the lotteries]

Note: **X** € will be paid to you whenever you choose **Lottery B**, independently of whether the coin toss is heads or tails. Whether **X** is positive (a gain) or negative (a loss) depends on the decision-making scenario.

Lottery A ○ ○ **Lottery B** with **X = -5.00** €
Lottery A ○ ○ **Lottery B** with **X = -4.50** €
Lottery A ○ ○ **Lottery B** with **X = -4.00** €
. . . ○ ○ . . .
Lottery A ○ ○ **Lottery B** with **X = 4.00** €
Lottery A ○ ○ **Lottery B** with **X = 4.50** €
Lottery A ○ ○ **Lottery B** with **X = 5.00** €

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.3.4 PR–Self

The initial endowment for this decision is:

- 40.00 € for you, and
- a donation of 0.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

Both lotteries will be decided by a coin toss, which means that there is a 50% chance of heads and a 50% chance of tails.

[Description of the lotteries]

This decision entails the possibility of an **additional lottery**. For example, if you choose Lottery A and the coin toss is tails, the additional lottery will be played. The outcome of the additional lottery will be determined by the computer.

On the next page you will see a list where each row represents a different decision-making scenario between Lottery A and Lottery B. Each row indicates the value of **X** in that particular decision-making scenario. To proceed click "Next".

[end of screen]

Decision

The initial endowment for this decision is:

- 40.00 € for you, and
- a donation of 0.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

[Description of the lotteries]

Note: **X** € will be paid to you whenever you choose **Lottery B**, independently of whether the coin toss is heads or tails. Whether **X** is positive (a gain) or negative (a loss) depends on the decision-making scenario.

Lottery A ○ ○ **Lottery B** with **X = -5.00** €
Lottery A ○ ○ **Lottery B** with **X = -4.50** €
Lottery A ○ ○ **Lottery B** with **X = -4.00** €
... ○ ○ ...
Lottery A ○ ○ **Lottery B** with **X = 4.00** €
Lottery A ○ ○ **Lottery B** with **X = 4.50** €
Lottery A ○ ○ **Lottery B** with **X = 5.00** €

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]

F.3.5 PR–Charity

The initial endowment for this decision is:

- 0.00 € for you, and
- a donation of 40.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

Both lotteries will be decided by a coin toss, which means that there is a 50% chance of heads and a 50% chance of tails.

[Description of the lotteries]

This decision entails the possibility of an **additional lottery**. For example, if you choose Lottery A and the coin toss is tails, the additional lottery will be played. The outcome of the additional lottery will be determined by the computer.

On the next page you will see a list where each row represents a different decision-making scenario between Lottery A and Lottery B. Each row indicates the value of **X** in that particular decision-making scenario. To proceed click "Next".

[end of screen]

Decision

The initial endowment for this decision is:

- 0.00 € for you, and
- a donation of 40.00 € to the organization Operation ASHA.

In addition, you also have to choose between **Lottery A** and **Lottery B**.

[Description of the lotteries]

Note: **X** € will be paid to you whenever you choose **Lottery B**, independently of whether the coin toss is heads or tails. Whether **X** is positive (a gain) or negative (a loss) depends on the decision-making scenario.

Lottery A ○	○ **Lottery B** with **X = -5.00** €
Lottery A ○	○ **Lottery B** with **X = -4.50** €
Lottery A ○	○ **Lottery B** with **X = -4.00** €
. . . ○	○ . . .
Lottery A ○	○ **Lottery B** with **X = 4.00** €
Lottery A ○	○ **Lottery B** with **X = 4.50** €
Lottery A ○	○ **Lottery B** with **X = 5.00** €

Automatic completion: We have activated a fill-in aid that automatically fills out the remaining rows so you don't have to click as much.

[**end of screen**]