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TIME-INCONSISTENT CHARITABLE GIVING

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ABSTRACT

We motivate this paper by presenting a puzzle. When we asked one group of subjects to give $5 to charity today, about 30% agree. When we asked a similar group the same question, but indicate their gift will be transacted in one week rather than today, giving increases by 50%. This suggests a classic time-inconsistency in charitable giving. It is a puzzle because classic discounting and models of temptation cannot capture major patterns in the data, though clearly the difference must have something to do with delay, but what? We conduct two new experiments to resolve the puzzle. Our explanation relies on the rich dynamics of social image signaling of pro-social behavior.

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1 Introduction

We begin this paper by demonstrating a puzzle we call *time-inconsistent charitable giving*. In the first week of a two-week experiment, subjects were asked to give $5 to a worthy charity. Half are asked to decide now to give now, and half are asked to decide now to give the money in a week. When the transaction is one week later than the decision, giving increases by 50 percent. Subjects appear to be expressing a new kind of time inconsistent charitable giving.

We show that a simple model in which individuals derive utility from the giving *transaction* cannot explain the puzzle. Moreover, models of temptation cannot explain the direction or magnitude of the effect. For temptation to underlie the time-inconsistency, individuals would have to be tempted to *not* give (Saito, 2015; Dreber et al., 2016). We see far too few cases of this for it to be a driver of the effect. When we offer commitment—the gold-standard test for sophistication in present bias (Augenblick et al., 2015)—the people who would be expected to choose commitment instead have a strong preference for flexibility. This puzzle seems to call for a new direction in understanding intertemporal charitable giving.

We propose a dynamic model of giving based on social motivations. This model belongs in a loosely knit class of models focusing on the social structures and incentives that surround the act of giving. The effects they study come under names such as prestige, self-image, social-image, social pressure, audience effects, the power of asking, avoiding the ask, and moral wiggle-room (see, Harbaugh 1998; Benabou and Tirole, 2006; Dana et al., 2006; Ariely et al., 2009; Andreoni and Bernheim, 2009; Andreoni and Rao, 2011; DellaVigna et al., 2012; Andreoni et al., 2017).[1] All of these models can be seen as providing deeper underpinnings to notions of warm-glow giving (Andreoni, 1989). We develop such a dynamic model here and find that it captures the important patterns of behavior observed in two additional experiments.

There are several key observations that lead to our model. First, giving is largely a

[1] See related papers by Dana et al., (2007); Haisley and Weber (2010); Exley (2015); Exley and Naecker (2017); and Kessler (2017).

social activity. There are no natural or objective indicators that tell a donor how much to give, how often to give, and to which of the seemingly limitless supply of worthy causes to give. As a result, the giving decision is mediated through social settings, social comparisons, and related social payoffs to giving (Becker, 1974; Piliavin and Charng, 1990; Andreoni and Scholz, 1998). Second, these social payoffs to giving can be thought of as byproducts of making a *decision* about giving. The moment one decides to give, the social benefits from saying yes can flow immediately, while avoiding the immediate sting from a refusal to give. A third key observation is that, all else equal, adding new members to the set of social observers, or audience, will to have a greater effect on the utility of the the person being observed. Moreover, the effect will depend on whether the new audience is added to the early period, the later period or both.

How does delay between the decision to give and the transaction of that gift increase the likelihood of giving? We demonstrate that this effect can be primarily understood through the formal logic of social interactions. Spreading a single giving decision into two distinct social interactions is like giving a person a larger audience, even if the audience is the same people, and even if the audience is simply themselves (as with self-signaling).

In recent years, an experimental literature has emerged around the temporal nature of altruistic decisions. These have focused on the effects of time pressure (Rand et al., 2012; Kessler et al., 2016; Recalde et al., 2018), narrow bracketing (Adena and Huck, 2017), and present-biased discounting (Kovarik, 2009; Breman, 2011; Dreber et al., 2016). Our paper is distinct from this as we are the first to consider social interactions as the source of time inconsistent giving behavior. Understanding what is the source of such apparent time inconsistency is crucially important for understanding the welfare effects of dynamic fundraising appeals, commitment devices for donors, the use of anonymity, pledges, and the public announcements of future gifts. In fact, in a companion paper (Andreoni and Serra-Garcia, 2018) we show that pledges can be used as screening devices to identify donors' preferences for giving.[2]

The remainder of this paper is organized as follows. Next, we present Experiment 1.

[2]Consistent with our findings, Fosgaard and Soetevent (2018) and Meyer and Tripodi (2018) find pledges are often reneged upon in two recent experiments.

In Section 3 we outline the main testable implications of temptation models and image models in the context of dynamic charitable giving. Section 4 presents the findings from a second experiment that examines commitment demand in charitable giving. Section 5 provides a direct test of dynamic image concerns by exogenously varying announcements regarding dynamic giving decisions. Section 6 concludes.

2 The Motivating Experiment: Give More Later

We begin the discussion of our motivating experiment by providing a basic inter-temporal model of giving. We then turn to the experimental evidence on the time-inconsistent charitable giving puzzle that violates the basic model.

2.1 A Benchmark Model of Giving

We start with a simple model of utility from transacting a gift, such as warm-glow giving (Andreoni, 1989, 1990; Ribar and Wilhelm, 2002; Ottoni-Wilhelm et al., 2017). In the simplest model, households endowed with m dollars (that is, experimental payments) must allocate these to either consumption x of private goods, or a gift g to charity. Throughout, we assume that utility is separable on x and g. The utility of private consumption is $u(x)$, where $x = m - g$ if a gift is transacted, and $x = m$ if not. Similarly, let $v(g)$ be the utility of making a gift and $v(0)$ of not. To simplify notation, we let $g = 1$ represent both the size of the gift and be an indicator that a gift was made. Since m is the same for all subjects, absorb this into the utility function and normalize utility from payments as $u(0) = 1$ and $u(-1) = 0$. Likewise, normalize the utility from giving as $v(1) = v$ and $v(0) = 0$. Then the *transaction utility* from giving now is $v(1) + u(-1) = v$, and for not giving now is $v(0) + u(0) = 1$. Notice that all of the heterogeneity across individuals is now concentrated on the single variable v.

When the giving decision and the giving transaction occur at the same point in time, the individual decides to give if

$$v > 1. \tag{1}$$

What happens if the giving transaction is delayed by a week? Assume that utility from experimental payments are discounted at a rate δ_x while future charitable gifts are discounted at a rate δ_g. An individual who is asked to give later will have utility of giving of $\delta_g v(1) + \delta_x u(-1) = \delta_v v$, and utility of not giving of $\delta_v v(0) + \delta_x u(0) = \delta_x$. Suppose, as is standard, that $\delta_x = \delta_g$. Then the give later decision depends on the benchmark condition (1), and is unaffected by the delay in carrying out the decision. That is, in this benchmark case, charitable giving is *time-consistent*.

2.2 Experimental Design

We designed a simple longitudinal experiment. Subjects came to the laboratory for an experiment designed to last two visits exactly one week apart, to the hour, irrespective of their decisions. We compare two treatments. In both treatments subjects see identical presentations about a charity called GiveDirectly, and then are asked if they would give $5 of their participation fee to the charity. All decisions are made in the first week, and no new decisions are made in second week.

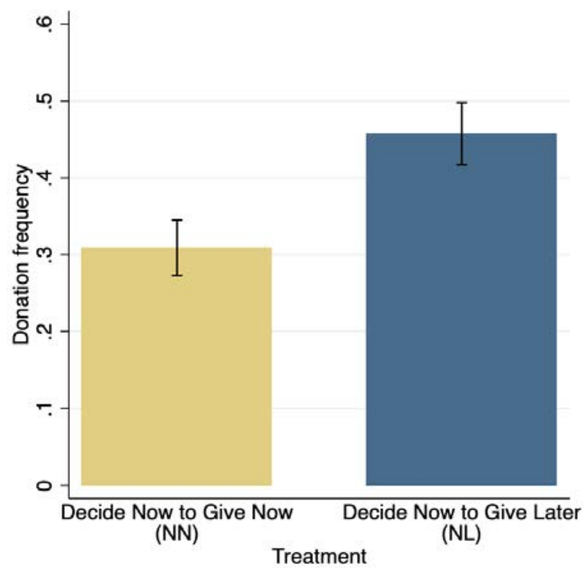
In the first treatment, subjects decide now about donations made today and coming from today's participation fee. We refer to this as the Decide Now to Give Now (NN) treatment. In the second treatment, called the Decide Now to Give Later (NL) treatment, subjects make an identical decision in week 1, but the donation is transacted a week later and is paid from the participation fee from the next week. We observed 179 subjects in the NN treatment and 173 in the NL treatment.[3]

[3]To reduce attrition, the first four out of eight sessions of the NN and NL treatments paid a higher show-up payment in Week 2 of the study, paying $6 in Week 1 and $20 in Week 2. The second set of four sessions paid the same show-up of $15 in both weeks. We observe no significant differences in attrition ($\chi^2 = 0.197$, $p = 0.658$) and donation behavior ($\chi^2 = 0.184$, $p = 0.668$ in NN, and $\chi^2 = 0.206$, $p = 0.650$, in NL) between these sessions and hence pool them in the analysis.

In NN, 14 subjects (7.8%) failed to complete the study, and in NL the number was 20 (11.5%). The difference in completion rates is not significant across treatments, and subjects do not differ in their

2.3 Results

The results of this experiment are shown in Figure 1. The one-week delay in transacting a charitable gift raises giving from 31% in the Decide Now to Give Now treatment to 45% in the Decide-Now-to-Give-Later treatment—a 50% increase in giving. When deciding today about a donation transacted today, people are significantly less likely to give than when deciding today about a gift to be transacted just one week later ($p \leq 0.01$).[4]



Note: Error bars denote ± 1 S.E.

Figure 1: Giving Decisions in the NN and NL Treatments

The behavior shown in Figure 1 clearly demonstrates the time-inconsistent charitable giving. Given that our benchmark model would predict no effect, this is a puzzle. Clearly the solution to this puzzle must revolve around the gap in time, but be about something other than discounting. But what? Next we begin to explore possible explanations for this puzzle in the current literature, and offer our own new model.

observable characteristics. We focus on the analysis of individuals who completed the study, though findings remain unchanged including all subjects. Further details of the design and the instructions for this experiment are found in Appendix B.

[4]In Appendix C, we show the results by gender. Giving by women increases from 30% to 50% with delay, that by men increases from 32% to 39%.

3 Models of Time-Inconsistent Charitable Giving

To resolve the puzzle of time-inconsistent charitable giving, we must design a setting that will draw clear distinctions among the various approaches to this puzzle. We consider a within-subjects setting in which subjects are asked to make the same giving decision at two different times, $t = 1$ or $t = 2$, that are one week apart (to the hour). The question asked each week is a request to give \$5 to the charity GiveDirectly at time $t = 2$. Thus saying yes in $t = 2$ is to give now, while saying yes in $t = 1$ is to give later. Notice too that all transactions will take place in $t = 2$, while decisions will be made both before or concurrent to the transaction. By fixing the date of the transaction and altering the date of the decision, this setting allows a rich set of alternative models.

After the second decision is made one of the two decisions is randomly selected to be carried out in $t = 2$. The degree of randomness, however, is selected by the subject in $t = 1$ in a manner similar to Augenblick et al. (2015). Let p be the probability that the $t = 1$ decision is selected. We restrict p to three values: $p \in \{0.1, 0.5, 0.9\}$. We call p the level of commitment and for clarity will often refer to $p = 0.1$ as *flexibility* (F), $p = 0.5$ as *indifference* (I), and $p = 0.9$ as *commitment* (C), and instead write $p \in \{F, I, C\}$. The choice of p will play a key role in our experiment as the level of commitment chosen will help reveal a subject's true preference for giving.

We next discuss several alternative models used to explain time-inconsistent choice, plus introduce a new adaptation of a model that can also speak to time-inconsistent charitable giving.

3.1 Temptation

Two recent papers study temptation in the domain of prosocial behavior. Dreber et al. (2016) use a dual-self model assuming *temptation to give*, in which an individual's short-run self prefers to behave altruistically, while the long-run self does not. Saito (2015) (see also Noor and Ren, 2011) assumes a *temptation to keep*, where the short-run self is tempted by private consumption, while the long-run self prefers charitable giving. To simplify our discussion of these two approaches, assume two discount rates, δ_g on utility from giving, and δ_x on utility from money kept for one's self. Much like in Jackson and Yariv (2015), this will necessitate time inconsistency. When $\delta_g > \delta_x$, we say people are tempted to give. When $\delta_x > \delta_g$, by contrast, we say the person is tempted to keep. What type of temptation is consistent with the time-inconsistent charitable giving observed above?

A person will decide *not* to give now if $v < 1$, but will decide now to give later if $\delta_g v > \delta_x$, that is, if $v > \delta_x/\delta_g$. For the same person to satisfy both of these conditions requires that $\delta_x/\delta_g < 1$, that is, the donors are tempted to keep.

As is often done in these models, long-run players can be assumed to be naïve about their time inconsistency and act as though they will execute their long run plans. They can alternatively be assumed to be sophisticated, meaning players understand that temptation will take over and choose commitment to the long run plan that maximizes current discounted utility. Focusing on those tempted to keep, in our setting sophisticates will choose $p = C$ while naïve players will be indifferent to p.

Naturally, we expect our sample to also include those who care so little for the charity that $g_1 = g_2 = 0$, or who care so much for the charity that $g_1 = g_2 = 1$, regardless of the opportunity to commit. By this model we expect both of these groups to be indifferent to p.

3.2 Image Concerns in Experiment 1

Before applying image concerns to probabilistic commitment, we demonstrate how a model of image concerns can generate the time-inconsistent charitable giving puzzle from Experiment 1, as a consequence of the time delay but regardless of discounting.

Begin with our benchmark model where the only heterogeneity is in v, the utility one gets from the act of giving. We will also refer to v as a person's "type." We assume that v is drawn from a continuous distribution $f(v)$ on the interval $v \in [0, \bar{v}]$, where $\bar{v} > 1$.

Imagine an *audience* observes an individual's actions but not their v's, and forms a belief about each individual's type. Image concerns are also known as audience effects as they require that someone, perhaps just the experimenter, the other subjects in the study, or even just one's self can be the audience.

Definition: Audience. An audience is $n \geq 1$ individuals who make the same observations on a subject, and thus form the same expectation the subject's "type," which we call μ. The audience can be characterized by their number and belief. For audience j write this as $\mathcal{A}_j = \{n_j : \mu_j\}$ meaning n_j individuals all hold the belief μ_j about a particular individual

The individual gains more image utility the higher the audience believes v to be. Of course, the individual never observes the audience's belief, so we assume each person forms an accurate expectation of the audience's belief about the subject's own true type. Imagine first that the only audience is the experimenter.

How can image concerns explain the time-inconsistent charitable giving puzzle seen in Experiment 1? Recall, the individual's strategy in Experiment 1 is simply $g = 0$ or $g = 1$. We assume the potential donor will form an expectation of the audience's belief about the donor's type v based on their observation of g, which we call $\mu(g)$, where $\mu(1) \geq \mu(0)$. Next, we assume there is an increasing and concave function $M(\mu)$ that translates beliefs into utility. In the unique Perfect Bayesian Equilibrium of this signaling game, there will exist a critical value of v, say $v^* \leq 1$, such that $g = 0$ if $v < v^*$ and $g = 1$ if $v \geq v^*$. Here we also add the assumptions that utility from giving (v) flows at the time of the decision to give, the utility cost of transacting the gift is incurred at the time of the payment, while image utility flows at the time the audience is engaged.

The question to pose is, how does the solution from the NN treatment, v_N^*, compare to the solution for the NL treatment, v_L^* ?

First consider NN. Then v_N^* solves these conditions:

$$
\begin{aligned}
v_N^* + M(\mu_N(1)) =& 1 + M(\mu_N(0)), \\
\mu_N(0) =& \frac{1}{F(v_N^*)} \int_0^{v_N^*} v f(v) dv, \\
\mu_N(1) =& \frac{1}{1 - F(v_N^*)} \int_{v_N^*}^{\bar{v}} v f(v) dv.
\end{aligned} \tag{2}
$$

Now consider NL. This treatment resembles NN in that the decision is reported to the experimenter in $t = 1$, but it differs in that the gift is transacted with the experimenter a week later at $t = 2$. Moreover, since the donation is featured in both meetings of the experiment, there is potential for social image utility in both periods. Let v_L^* solve the equations below, which determine the Perfect Bayesian Nash equilibrium in NL:

$$
\begin{aligned}
v_L^* + M(\mu_L(1)) + \delta\beta M(\mu_L(1)) =& \delta + M(\mu_L(0)) + \delta\beta M(\mu_L(0)), \\
\mu_L(0) =& \frac{1}{F(v_L^*)} \int_0^{v_L^*} v f(v) dv, \\
\mu_L(1) =& \frac{1}{1 - F(v_L^*)} \int_{v_L^*}^{\bar{v}} v f(v) dv.
\end{aligned} \tag{3}
$$

The one week discount factor is $0 \leq \delta \leq 1$, β is a depreciation factor applied to the $t = 1$ image utility in $t = 2$, in particular $0 \leq \beta \leq 1$.

Compare equations (2) and (3). Begin by simplifying to eliminate discounting, $\delta = 1$, and to fully depreciate image, $\beta = 0$. In this case it is obvious that (2) and (3) are indeed identical, implying $v_N^* = v_L^*$. Next, allow $\delta < 1$ but keep $\beta = 0$, such that social image utility only flows when the decision to give is made. Then (2) and (3) become

$$
\begin{aligned}
v_N^* + M(\mu_N(1)) =& 1 + M(\mu_N(0)), \\
v_L^* + M(\mu_L(1)) =& \delta + M(\mu_L(0)).
\end{aligned}
$$

Here we get the usual effect of discounting to encourage more giving later, with $v_L^* < v_N^*$. Instead, let $\beta > 0$, but keep $\delta = 1$. Since $M(\mu_L(1)) > M(\mu_L(0))$, increasing β raises the left hand side of (3) more than the right, implying a reduction in v_L^* to maintain the equality. Thus, even without discounting, as long as image utility is also consumed (in some fraction) at $t = 2$, then we predict time-inconsistent charitable giving in this model. In this way we can predict time-inconsistent charitable giving in our motivating experiments that is caused by the delay of time, but not necessarily by discounting.

Notice that this simple model of social image predicts time inconsistent *choices*, but unlike the other models, does not base the prediction on time inconsistent *preferences*. When the decision maker has full awareness of the audience effects, she will be perfectly happy with a fully contingent plan to decide now to give later and also to say no in one week to a request to "give now." Stated differently, preferences do not change, are not naïve, and are conformable to time-inconsistent charitable giving.[5]

3.3 Image Concerns in Probabilistic Commitment

Next, we examine individual behavior when individuals also choose their level of commitment, p. Assume in $t = 1$ the audience (the experimenter) observes the decision to give later, g_1, and $p \in \{C, I, F\}$. From this, the audience forms an expected value of v, and the subject forms a (rational) expectation of this value. Call this $\mu_1(g_1, p)$. In $t = 2$, the individual decides about giving now, g_2, and the subject and the audience updates their beliefs regarding v, which we call $\mu_2(g_1, p, g_2)$. Finally, for ease of presentation and to accentuate the role of social image, we will assume that the one week discount factor is $\delta = 1$ while allowing future image utility to be depreciated with β. All derivations reported in Appendix A will include $\delta < 1$, with identical qualitative findings.

Given an increasing and concave function M, an individual's expected utility is:[6]

$$U(g_1, p, g_2) = (v - 1)(pg_1 + (1 - p)g_2) + M(\mu(g_1, p)) + \beta M(\mu(g_1, p, g_2))$$

[5] See also Andreoni et al., (2018) for a similar finding in the context of fair allocations to two apparently equally deserving others.

[6] If we allow $\delta < 1$, we would instead write this as $U(g_1, p, g_2) = (v - \delta)(pg_1 + (1 - p)g_2) + M(\mu(g_1, p)) + \beta\delta M(\mu(g_1, p, g_2))$.

Next, we formally define the two types of possible signaling. These definitions are based on the assumption that each individual has only one audience (of size n).

Definition: Social-Signaling. A person is engaged in social-signaling if they believe that an *audience of others* is seeing the person's strategy unfold. Based on information the audience holds at any time, the audience forms (or updates) beliefs about the expected value of the person's utility parameter v. Call the person's expectation about the audience's belief μ. A person who cares for social-signaling maximizes a utility function that is increasing in μ.

Definition: Self-Signaling. A person is engaged in self-signaling if they behave as if they are unsure of their own v value, and, importantly, act like their own audience in a social-signaling model.

An important distinction between self- and social-signaling is that the self has the advantage of knowing their own full strategy for $t = 1$ and $t = 2$, while the audience for social-signaling can only condition their beliefs on actions they observe.

Finally, we must define the image function $M(\mu)$:

Definition: Image Function $M(n : \mu)$. If a player has a single audience $\mathcal{A} = \{n : \mu\}$, the function $M(n : \mu)$ maps the audience to a real number M. The function $M(n : \mu)$ has these qualities:

a) *Continuous*: $M(n : \mu)$ is continuous and differentiable w.r.t. μ.

b) *Increasing and concave in μ*: $\partial M/\partial\mu \geq 0$, and $\partial^2 M/\partial\mu^2 \leq 0$.

c) *Magnification by Audience*: Having a larger audience will magnify the effect of any existing audience. Thus, if $M(n_1 : \mu) > 0$, for any $n_2 > n_1 \geq 1$, $M(n_2 : \mu) \geq M(n_1 : \mu)$. In particular, there will be a function $\omega(n)$ such that $M(n : \mu) = \omega(n)M(1 : \mu)$.

d) *Decreasing Marginal Magnification*: $\omega(n)$ has the features $n \geq \omega(n) \geq 1$, $1 \geq \omega'(n) \geq 0$ and $\omega''(n) \leq 0$.

e) *Cardinal*: M is a cardinal measure.

3.4 Probabilistic Commitment Predictions: Experimenter as Audience

In the probabilistic commitment experiment, Experiment 2, only the experimenter, or the subject him or herself, could act as an audience. Since we are most interested in social image, we first formulate predictions for an audience of 1 who observes the $t = 1$ strategy $s' = (g_1, p)$ in $t = 1$, then updates beliefs when the full strategy $s = (g_1, p, g_2)$ is revealed in $t = 2$.

The key to the predictions are the following four lemmas. Formal proofs of each of these are in Appendix A.

Lemma 1: Assume the population is engaged in social-signaling, but not self-signaling. Further assume that some people in this population prefer to give in only one period. These people will prefer to give in $t = 1$ rather than $t = 2$.

This lemma is very intuitive. A person who has chosen a strategy of $s = (0, 1 - p, 1)$ could also have accomplished the same level of consumption and giving by having chosen $s = (1, p, 0)$. The question for this donor is which path for revealing of the full strategy will generate the most social utility. The first strategy will yield $M(0, 1-p) + \beta M(0, 1-p, 1)$ while the otherwise equivalent second strategy will yield $M(1, p) + \beta M(1, p, 0)$. For the strategy $s' = (0, 1 - p)$ the maximum probability of giving is p, while for $s' = (1, p)$ the minimum probability of giving is p. Thus we should anticipate $M(1, p) > M(0, 1-p)$. As long as $M(1, p, 0) = M(0, 1 - p, 1)$, then choosing the unfolding of the full strategy that sends the strongest signal of one's full intentions in $t = 1$ should dominate.

Lemma 2: Assume the population is engaged in social-signaling, but not self-signaling. Then, if in $t = 1$ the audience observes a person choosing $g_1 = 0$ for any p, the audience can conclude that this person also intends to choose $g_2 = 0$ in $t = 2$.

The second lemma follows almost immediately from the first. If this lemma were not true, it would violate Lemma 1. It holds the critical implication that $g_1 = 0$ is sufficient for $g_2 = 0$ as well.

Next let's consider that some people in this population may prefer to give in both periods. Since there is not a choice of $p = 1$, it will not be until $t = 2$ that these people reveal their full strategies. We add an extra assumption, which we will relax later:

Assumption 1 (No Counter-Signaling): $E(v|1, p, 1)$ is the same for all p.

This assumption implies that a person interested in social image will want to send the strongest signal of v in period $t = 1$ in order to get the highest social image.[7] This means choosing $s' = (1, C)$ since $E(v|1, C) \geq E(v|1, I) \geq E(v|1, F)$.

Lemma 3: If $E(v|1, p, 1)$ is the same for all p and if the individuals cares about social image and wishes to choose $g_1 = g_2 = 1$, the individual will chose strategy $s' = (1, C)$ in $t = 1$.

Again, Lemma 3 naturally flows from social image concerns. It also has a very useful implication for those not choosing $s' = (1, C)$, which we state in Lemma 4:

Lemma 4: If $E(v|1, p, 1)$ is the same for all p, if the individual cares about social image, and if in $t = 1$ the audience sees the strategy $s' = (1, p)$ for any $p \neq C$, then the audience will believe that $g_2 = 0$.

We can now state a proposition for our probabilistic commitment game with social image concerns.

Proposition 1: Assume all individuals care equally about social image, and that $E(v|1, p, 1)$ is the same for all p. Then there exists a Bayesian Perfect equilibrium of the probabilistic commitment game, which is characterized by numbers v^{F0}, v^{I0}, v^{C0}, and v^{C1}, such that $0 \leq v^{F0} \leq v^{I0} \leq v^{C0} \leq v^{C1} \leq 1$ and

$a)$ all individuals with $v < v^{F0}$ choose $s = (0, p, 0)$, for any p;

$b)$ all individuals with $v^{F0} \leq v \leq v^{I0}$ choose $s = (1, F, 0)$;

$c)$ all individuals with $v^{I0} \leq v \leq v^{C0}$ choose $s = (1, I, 0)$;

[7]See Feltovich, Harbaugh, and To (2002) for introducing the concept of counter-signaling. We will return to this later in the paper.

d) all individuals with $v^{C0} \leq v \leq v^{C1}$ choose $s = (1, C, 0)$;

e) all individuals with $v^{C1} \leq v \leq \bar{v}$ choose $s = (1, C, 1)$.

The formal proof of this is in Appendix A, but given the structure provided thus far, it is rather easy to construct image functions M and probability distribution functions of $f(v)$ that would be consistent with an equilibrium. For instance, suppose that in $t = 1$ the whole population of subjects can be apportioned to one of the four pools above (note in $t = 1$, both types in (d) and (e) are in the same pool choosing $(1, C)$). Assuming a form for $f(v)$ then one can identify the five values of v needed to form the edges of the pools. Then to find the image utility M for each pool we note that in equilibrium there will be one type who is indifferent between joining two adjacent pools. For instance there will be a type v^{F0} who is indifferent to joining the pool that does not give and the pool that gives only with probability $p = F$. For this type, $(1+\beta)M(0, p, 0) = 0.1(v^{F0}-1)+(1+\beta)M(1, 0.1, 0)$. If we assume a value for $M(0, p, 0)$ we can build the value of $M(1, 0.1, 1)$ for $p = 0.1$. Next we know that there will be someone with $v = v^{I0}$ who is just indifferent to pooling with those with lower and those with higher v's. For this person $0.1(v^{I0} - 1) + (1 + \beta)M(1, F, 0) = 0.5(v^{I0} - 1) + (1 + \beta)M(1, I, 0)$. Continuing in this manner, for any assumption of $f(v)$ and β, we construct the M function that will satisfy equilibrium.

Notice that the last of the 4 pools in $t = 1$, at $s' = (1, C)$, will split into two pools in $t = 2$. There will be the "always-give" types with $v \geq 1$ who will give in both periods regardless of the social image. It follows naturally that a pool of those with v's near to but below 1 will mimic the true always-give types in order to gather additional social image utility.

3.4.1 About Self-signaling

If individuals in the experiment do not see the experimenter as an audience but instead see only themselves as the audience, then they are solely self-signaling. The main difference between this and the prior case of social signaling is that self-signaling individuals can observe their full strategy in $t = 1$. Since, for instance, $s = (1, 0.9, 0)$ and $s = (0, 0.1, 1)$ both produce a probability of giving of 0.9, they yield the same self-image. To differentiate from commitment probabilities, call probability of giving q. Every three-part strategy reduces to a probability q that they give. Because $q = 0$ when $g_1 = g_2 = 0$ and $q = 1$ when $g_1 = g_2 = 1$, there are five values of q they can choose from $q \in \{0, 0.1, 0.5, 0.9, 1\}$.[8]

3.4.2 About Counter-signaling

By counter-signaling we mean that there exists another equilibrium in which the most generous person in the group—the person with $v = \bar{v}$—can find a way to further signal that she is, in fact, the person with the highest v in the community. The new equilibrium must be so costly to imitate that only those with v at or near $\bar{v}$ could benefit from the strategy. Suppose Assumption 1, that $E(v|1, p, 1)$ is the same for all p, no longer holds. In our game we have two natural "wasteful" signals. Given our lemmas above, choosing a strategy $s = (1, C, 1)$ should always be better than any other way to give $g_1 = g_2 = 1$. But suppose the person at $\bar{v}$ instead chose the strategy $(1, F, 1)$. This changes the donor's $t = 1$ image by an amount $\Delta_1 = M(\mu(1, F)) - M(\mu(1, C)) < 0$. In $t = 2$, the complete strategy is revealed to be $s = (1, F, 1)$. If the audience rewards this with an increase in social image utility of $\Delta_2 = M(\mu(\bar{v})) - M(\mu(1, C, 1)) > 0$ in $t = 2$, then, if $\Delta_2 > \Delta_1$, it is easily shown that there is a probability distribution function $f(v)$ and image function M, that could support this type of equilibria with one or even two new pools formed. We can get equilibria with pools of people choosing the counter-signaling strategies of $s = (1, I, 1)$, of $(1, F, 1)$, or of both $(1, I, 1)$ and $(1, F, 1)$. In each case the individuals in these counter-signaling pools are from the highest v types. An important aspect of counter-signaling is that it is only useful if g_2 is seen by the audience. This will come into play in Experiment 3.[9]

[8]See Appendix A for further detail and formal proofs.

[9]See Appendix A for formal proofs.

3.5 Kreps Demand For Flexibility

Kreps (1979) shows that, given the future is uncertain, individuals should demand flexibility. Notice that this consideration could not have played a role in our motivating experiment, as commitment demand was not part of the decision. Moreover, both the decision to give now and to give later were made at the same time in Experiment 1, and so there was an equal degree of uncertainty in both decisions. In the framework described at the outset of this section, however, Kreps' intuitions could play some role, and they will be considered in our analysis.

Table 1 summarizes the predictions derived thus far.

Table 1: Models and Testable Predictions Regarding Probabilistic Commitment

	(1)	(2)	(3)
	(Apparently) Time Inconsistent Givers		Always Givers
Model	Give More Later	Commitment	& Commitment
Benchmark	No	-	**Indifferent**
Temptation to Give			
Sophisticated	No	-	**Indifferent**
Naïve	No	-	**Indifferent**
Temptation to Keep			
Sophisticated:	**Yes**	Yes	**Yes/Indifferent**
Naïve:	**Yes**	Indifferent	**Indifferent**
Kreps:	No	**No**	No
Image Concerns:	**Yes**	**No**	**Indifferent**
Data	**Yes**	**No**	**Indifferent**

Note: Bold indicates coincidence between test and evidence.

4 Probabilistic Commitment: Experiment 2

Experiment 2 is a direct application of the theoretical setting discussed above. Hence our description of the experiment here focuses primarily on implementation.

4.1 Experimental Design

This within-subjects experiment consisted of a single treatment. As in Experiment 1, subjects participated in a two-week (to the hour) study. In contrast to Experiment 1, each individual made two giving decisions. Both decisions were about giving $5 to a deserving charity in week 2. The week 1 decision we write as g_1, and the week 2 decision is g_2. Both choices were made knowing that of the two decisions one would be randomly chosen to carry out. The odds of g_1 being chosen were selected by the subject in week 1, immediately after the choice of g_1. This probability p is constrained to be $p \in \{0.1, 0.5, 0.9\}$. All these stages were known to subjects before making any decisions. Instructions are shown in Appendix B.

A total of 183 subjects participated in week 1, and 163 returned for week 2. This attrition was unrelated to decisions to give and commitment choices in week 1 (χ^2-test, p=0.537). We focus the analysis on 163 subjects.[10]

4.2 Results

First we examine within-subject behavior in Experiment 2. We find that 25.2% of the subjects always give, while 38.0% never give. The remainder, 36.8%, make different decisions over time. Of these, 62% (or 22.7% of subjects in the sample) choose to give later, but not give now. The remainder, 38% (14% of the sample) choose to give now, but not later. Those choosing to give later, but not give now are significantly more numerous than the opposite (McNemar's test, $p = 0.07$), in line with the results of Experiment 1.

Table 2 summarizes the commitment choices of subjects and their give-now decisions, according to their decision to give later. Column (4) shows that, among subjects who

[10]Details on attrition and behavior are shown in Appendix C.

decide to give later, $g_1 = 1$, flexibility is most frequently preferred, by 22.1% of the subjects, while commitment and indifference are both chosen by 12.9% of subjects. This distribution is significantly different from chance (χ^2-test, p=0.056).

Table 2: Distribution of Subjects' Choices in the Probabilistic Commitment Experiment

(1) g_1	(2) Percent of Subjects	(3) Commitment Choice	(4) Percent of Subjects	(5) g_2	(6) Percent of Subjects
$g_1 = 0$	52.1%	C	25.8%	0	18.4%
				1	7.4%
		I	14.1%	0	12.3%
				1	1.8%
		F	12.3%	0	7.4%
				1	4.9%
$g_1 = 1$	47.9%	C	12.9%	0	4.3%
				1	8.6%
		I	12.9%	0	3.7%
				1	9.2%
		F	22.1%	0	14.7%
				1	7.4%

Note: $n = 163$ subjects.

Focusing on individuals who give later, but do not give now, $(g_1, g_2) = (1, 0)$, we observe an even stronger preference for flexibility. The choice pattern $(g_1, p, g_2) = (1, F, 0)$ is observed for 14.7% of subjects. By contrast, 4.3% of subjects who only give later choose to commit, and 3.7% choose indifference. Again, the preference towards flexibility is statistically significant (χ^2-test, p <0.01). As shown in Table 3, the preference towards flexibility is significantly stronger among individuals choosing to give more later, than among individuals showing other dynamic giving paths. This yields Finding 1.

Finding 1 (Give more later and Commitment): Individuals who choose to give more later exhibit a preference for flexibility.

The preference for flexibility is no longer observed among individuals who always give. Instead, these subjects appear to choose levels of commitment with equal likelihood.

Table 3: Dynamic giving decisions and commitment demand

	(1)	(2)	(3)
		Commitment Choice	
	Commitment ($p = 0.9$)	Indifference ($p = 0.5$)	Flexibility ($p = 0.1$)
Give More Later	-0.318*	-0.156	0.475***
(give later, not give now)	(0.182)	(0.162)	(0.118)
Always Give	-0.153*	0.024	0.130*
(give later and give now)	(0.083)	(0.114)	(0.075)
Give less later	0.040	-0.226*	0.187
(not give later, give now)	(0.091)	(0.121)	(0.134)
Observations		163	

Note: This table presents the marginal effects (calculated at the means of all variables) from a multinomial probit regression relating patterns of dynamic choice to commitment choice. Give later, not give now is a dummy variable that takes value one if the subject gives in week 1 and not in week 2. Give later and give now is a dummy variable that takes value one if the subject gives in week 1 and week 2. Not give later, give now is a dummy variable that takes value one if the subject does not give in week 1 and but gives in week 2. The omitted category is choosing not to give in week 1 and week 2. Individual characteristics such as gender, ethnicity, whether the subject is a native English speaker, and their score in the Cognitive Reflection Test are included as covariates. Robust standard errors, clustered at the session level, are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Strategy $(g_1, p, g_2) = (1, C, 1)$ is preferred by 8.6% of subjects, $(1, I, 1)$ is preferred 9.2%, and $(1, F, 1)$ is preferred by 7.4%. This distribution of choices is not significantly different from chance (χ^2-test, p=0.843). This yields Finding 2.

Finding 2 (Always give and Commitment): Individuals who always give exhibit an equal likelihood of choosing each of the possible levels of commitment.

Looking back to Table 1, the three main variables of interest for explaining the time-inconsistent charitable giving puzzle all point to the model of image concerns. However, not all of the data is perfectly in line with the model. The model of image concerns predicts that we would never observe a strategy that chooses $g_1 = 0$ and $g_2 = 1$. Yet, Table 2 shows us that about 14% of subjects are in this category. The strategy $(0, C, 1)$, that was chosen by 7.4% of subjects, could be consistent with one who is tempted to give and is sophisticated, thus choosing commitment, or self-signaling. Likewise, the strategy $(1, C, 0)$, chosen by 4.3% of the subjects, could be consistent with a sophisticated time-inconsistent subject who is tempted to *not* give. Only the later strategy will produce the time-inconsistent charitable giving puzzle, but its influence on the total effect is negated by the $(0, C, 1)$ subjects, meaning that models of self control in general will not be able to explain the time-inconsistent charitable-giving effect.

Strategies that choose F are suggested by Kreps as a demand for flexibly in the face of an ambiguous future. First, only 36.4% of our subjects choose flexibility. Of those who do, Kreps suggests that if $E(v) > 1$ for $t = 2$, the most likely strategy would be $(1, F, 1)$. Likewise if $E(v) < 1$, the most likely strategy choice should be $(0, F, 0)$. In fact $(1, F, 1)$ represents only 7.4% of choices and is out numbered by $(1, F, 0)$ at 14.7%.[11] This leads to our next finding.

Finding 3 (Temptation and Uncertainty): Evidence in support of both models of temptation and of demand for flexibility are present in the experiment. However, the predictions of temptation have a net effect opposite to that of the time-inconsistent-charitable-giving effect, and demand for flexibility is too small to be of use in predicting the relatively higher giving when deciding now to give later.

This analysis thus far clearly indicates behavior like that modeled by temptation to give, temptation to keep, and flexibility are not strong enough to explain the time-inconsistent charitable giving puzzle. By contrast, the data is broadly consistent with the set of predictions from the model of image concerns.

Next, we go beyond the time-inconsistent charitable giving puzzle to explore whether there are other aspects of subjects' behavior that are consistent with predictions from the model of dynamic image concerns. We do this by controlling the size the audience and the information we allow the audience to know.

[11] See Appendix D where we further examine whether subjects self-reported resolving uncertainty between the week 1 and week 2 sessions of the experiment.

5 Manipulating Social Image: Experiment 3

To directly test image concerns, Experiment 3 repeats Experiment 2, but adds three treatments that each manipulate the audience and the information they use to form social image. All three new treatments add the other subjects in the experimental session as the audience. This is typically between 20 and 23 other individuals. We then vary the part of the strategy we announce to this audience. Treatment Announce 3 (A3) tells the new audience all three elements of each other player's strategy. In $t = 1$ subjects in a given session are told g_1 and p of all subjects present, and then in $t = 2$ are also told g_2. Announce 2 (A2) tells the subjects in a session only the two $t = 1$ choices of g_1 and p. Finally, Announce 1 (A1) reveals one element, g_1 in $t = 1$, and nothing else.

5.1 Several Audiences

Notice that announcing giving decisions to other subjects will create two audiences, the experimenter and the other subjects in the session. Next we discuss how our model of image concerns must be adjusted to account for this.

5.1.1 Image Function for Several Audiences

Begin with two audiences, $\mathcal{A}_a = \{n_a : \mu_a\}$ and $\mathcal{A}_b = \{n_b : \mu_b\}$. Intuitively, the aggregation function should have the basic qualities of the image function of a single audience noted above. Let $N(n_a : \mu_a, n_b : \mu_b)$ be the aggregation function for these two audiences. We can note in the definition of M, image utility can be written as $w(n)M(\mu)$. Recall that μ is the expected value of the individual's belief about the audiences beliefs about the individual's v. Following this, we can form the individual's expectation, μ_{ab}, as the weighted average of each audience's expected belief:

$$\mu_{ab} = \frac{n_a}{n_a + n_b}\mu_a + \frac{n_b}{n_a + n_b}\mu_b. \tag{4}$$

Then it is natural to define $N(n_a : \mu_a, n_b : \mu_b)$ as

$$N(n_a : \mu_a, n_b : \mu_b) = \omega(n_a + n_b)M(\mu_{ab}), \tag{5}$$

where $M(\mu_{ab})$ has all of the qualities of the image function of a single audience defined above. The generalization to three or more audiences is straightforward.

In our experiment, n_a will be about 20, while n_b will be 1. Given the concavity of $\omega(n)$ and the concavity of M, the existence of the larger audience will have the effect of greatly dulling the impact of the smaller audience, while the opposite effect will not be true. Inside M, the smaller audience will be weighed approximately by 1/21 while the large audience will be weighted 20/21, making the smaller audience nearly inconsequential to the predictions. Thus, when the two audiences differ, we will provide an analysis for the larger audience for the starkest predictions, knowing the true effects may be tilted slightly in the direction of the baseline.

5.1.2 Equilibrium Conditions

Earlier we described how to construct the critical values of v that serve to define the different pools in equilibrium. While the full derivation of these is in Appendix A, we rewrite them here in a form that is most useful for understanding the predictions of the announce conditions.

$$v^{F0} = 1 - (1+\beta)w(n)(M(\mu_F) - M(\mu_0))/0.1 \tag{6}$$

$$v^{I0} = 1 - (1+\beta)w(n)(M(\mu_I) - M(\mu_F))/0.4 \tag{7}$$

$$v^{C0} = 1 - w(n)(M(\mu_C) + \beta(M(\mu_{C0}) - (1+\beta)M(\mu_I)))/0.4 \tag{8}$$

$$v^{C1} = 1 - \beta(M(\mu_{C1}) - M(\mu_{C0}))/0.1 \tag{9}$$

where $\mu_0 = E(v|0 \leq v \leq v^{F0}), \mu_F = E(v|v^{F0} \leq v < v^{I0}), \mu_I = E(v|v^{I0} \leq v < v^{C0}), \mu_C = E(v|v^{C0} \leq v \leq \bar{v}), \mu_{C0} = E(v|v^{C0} \leq v < v^{C1})$, and $\mu_{C1} = E(v|v \geq v^{C1})$.

5.2 Predictions for the Announcement Conditions

We discuss predictions on the announcement conditions going from least to most restrictions on the two audiences.

5.2.1 Predictions for Announce 3 (A3)

We begin with Announce 3 under the assumption of only social signaling. Announce 3 simply expands the audience from 1 to n members. As is easily seen, this applies pressure for v^{F0}, v^{I0}, v^{C0}, and v^{C1} to all move lower. This means that, relative to the baseline, the average values for g_1 and g_2 will all be increasing, meaning that $E(g)$ will be as well.

Next, suppose some people are not engaging in social-signaling in the baseline, but only self-signaling. Then the self-signaling person would be indifferent to $s = (1, p, 0)$ and $s = (0, 1 - p, 1)$. Other than combining these two strategies into 1, the predictions of self-signaling and social signaling will be largely the same. Since the announcements in treatment A3 are clearly adding social-signaling, our predictions for A3 as compared to the baseline are largely the same, but that we should expect the incidence of $s = (0, 1 - p, 1)$ in A3 to decline relative to the baseline.

We can also say something about counter-signaling. Since we predict a greater number of people choosing $g_1 = g_2 = 1$, the utility of that pool may be diluted, which in turn may give those at the very top of the distribution of v's an opportunity to further separate themselves through counter-signaling in A3 relative to the baseline. Thus we may expect the number of $s = (1, I, 1)$ and $s = (1, F, 1)$ to rise relative to the baseline.

5.2.2 Predictions for Announce 2 (A2)

Announce 2 is identical to Announce 3 except no information on g_2 is provided. The main effect of this is that unless $v \geq 1$, there is no reason for anyone to join a pool of $g_1 = g_2 = 1$ givers. This means we can simply define $v_{C1} = 1$ in equations (6) to (9) above.

As can be seen, we predict v^{F0}, v^{I0}, and v^{C0} all lower relative to the baseline, meaning a rise in g_1. We then also predict a reduction in g_2. Note also, as with A3, we should see a reduction in self-signaling strategies of the sort $s = (0, p, 1)$, and we should also see an elimination of counter-signaling.

When we combine this audience with the experimenter as audience, then we will get a slight softening of this prediction toward the baseline predictions, but, we conjecture, the general effects should be in the directions just described.

5.2.3 Predictions for Announce 1 (A1)

Given that the audience in A1 will only see whether $g_1 = 1$ or 0, all subjects will sort into just two pools. The first is for $g_1 = 0$ and the second for $g_1 = 1$. Furthermore, without any signaling value from p or from giving in $t = 2$, any subject with $v < 1$ will have an incentive to attach to any $g_1 = 1$ the minimum level of commitment, $p = 0.1$. However, those for whom $v \geq 1$ will still have an incentive to give in $t = 2$. For these people, choice of p is irrelevant as it pertains to the new audience.

In the equilibrium we find the value of v^{A1} to solve

$$\omega(n)M(\mu_0) - (v^{A1} - 1)0.1 - \omega(n)M(\mu_{A1}) = 0 \tag{10}$$

Imagine for a minute that $v^{A1} = v^{F0}$ in A3. Then the first two terms of (10) would be the same as in A3, but clearly $\mu_{A1} > \mu_{F0}$ even if $v^{A1} = v^{F0}$. This means that if we start at $v^{A1} = v^{F0}$, then the value of the expression in (10) will be less than zero in value. How must we adjust v^{A1} to return equilibrium?

Differentiating the left hand side of (10) with respect to v^{A1} we find an ambiguous result:

$$\begin{aligned}
&\frac{\partial}{\partial v^{A1}}\omega(n)M(\mu_0) - (v^{A1} - 1)0.1 - \omega(n)M(\mu_{A1}) \\
&\quad = \omega(n)M'(\mu_0)(v^{A1} - \mu_0)\frac{f(v^{A1})}{F(v^{A1})} \\
&\quad - \omega(n)M'(\mu_{A1})(\mu_{A1} - v^{A1})\frac{f(v^{A1})}{1 - F(v^{A1})} \\
&\quad - 0.1.
\end{aligned}$$

Since $\mu_0 < \mu_{A1}$, by concavity $M'(\mu_0) > M'(\mu_{A1})$. And since $\mu_0 < v_{A1} < \mu_{A1}$ it follows that $(v^{A1} - \mu_0) > (\mu_{A1} - v^{A1})$. This makes the net value of the first two terms positive. However, for the full derivative to be positive the net value of the first two terms must exceed -0.1. While, intuitively, this seems likely, the actual result is unclear. As a result, we cannot compare the effect of A1 on $g_1 = 0$ to the baseline or to the other conditions. However, we can expect strong reductions in p and g_2 (both conditional on $g_1 = 1$).

Table 4 summarizes the predictions regarding how the Announce treatments will differ from the baseline, without announcements, or Announce 3.

Table 4: Testable Predictions From Image Concerns Model in the Announcement Treatments

	Directions of Change Relative to Baseline or Announce 3 (A3) when noted		
	Announce 3	Announce 2	Announce 1
Outcome	(1)	(2)	(3)
Predictions			
g_1	$+$	$+$	?
g_2	$+$	$-$	$-$
$E(g)$	$+$	?	$-$
Self-signaling $(0, p, 1)$	$-$	$-$	$-$
Counter-signaling $(1, I, 1)$ & $(1, F, 1)$	$+$	$<$ A3	$<$A3
Data			
g_1	$+$ (***)	$+$ (***)	$-$ (n.s.)
g_2	$-$ (n.s.)	$-$ (n.s.)	$-$ (***)
$E(g)$	$+$ (n.s.)	$+$ (n.s.)	$-$ (**)
Self-signaling $(0, p, 1)$	$-$ (n.s.)	$-$ (*)	$-$ (*)
Counter-signaling $(1, I, 1)$ & $(1, F, 1)$	$+$ (n.s.)	$-$ (n.s.)	$-$ (***)

Note: All changes are relative to the Baseline treatment (in which the only audience is the experimenter). "+" denotes an increase. "'−" denotes a decrease. The question mark "?" denotes an ambiguous prediction. Under data, we present the sign of the effects and in parenthesis their statistical significance. n.s. denotes not significant, ***, **, * denotes significant at the 1%, 5% and 10% level, respectively.

5.3 Experimental Design

As is clear by now, Experiment 3 extends Experiment 2 with three additional treatments designed to test the predictions of the social image model. These treatments manipulate the information about participants' decisions by announcing subsets of their strategies to the other participants in the experimental session (between 20 and 23 other subjects).[12] In Announce 1, we announce g_1 to all participants in Week 1. In Announce 2, we announce (g_1, p). Announce 3 reveals the full strategy (g_2, p, g_2). The announcement plans were known to all subjects before decisions were made. These sessions were otherwise identical to Experiment 2.

A total of 263 new subjects participated in this experiment. Of these, 244 completed both weeks of the experiment.[13] There were 64, 65, and 59 in Announce 1, 2 and 3, respectively. In addition, 56 participated in a replication of Experiment 2, which is the Baseline treatment in Experiment 3. Since behavior in the new sessions of the Baseline treatment was not significantly different from behavior in Experiment 2,[14] all subjects in Experiment 2 are included in the analysis of Experiment 3 and form part of the Baseline treatment. Detailed instructions of this experiment are shown in Appendix B.

In the empirical analysis, we first examine, g_1 and g_2, which are our primary outcome variables. We acknowledge, however, that g_2 may have been impacted by the information provided at the end of the first week's session regarding g_1 or the announcement of the strategies chosen by others (see, e.g., Frey and Meier, 2004; Shang and Croson, 2009). We additionally examine as secondary outcome variables, the expected gift, $E(g) = pg_1 + (1-p)g_2$, and the effects of announcements on self-signaling, $(0, p, 1)$, as well as counter-signaling, choosing $(1, F, 1)$ and $(1, I, 1)$. In Appendix C, we investigate the treatment effects on commitment choice, p, for all subjects and on the subjects who give in $t = 1$, pg_1.

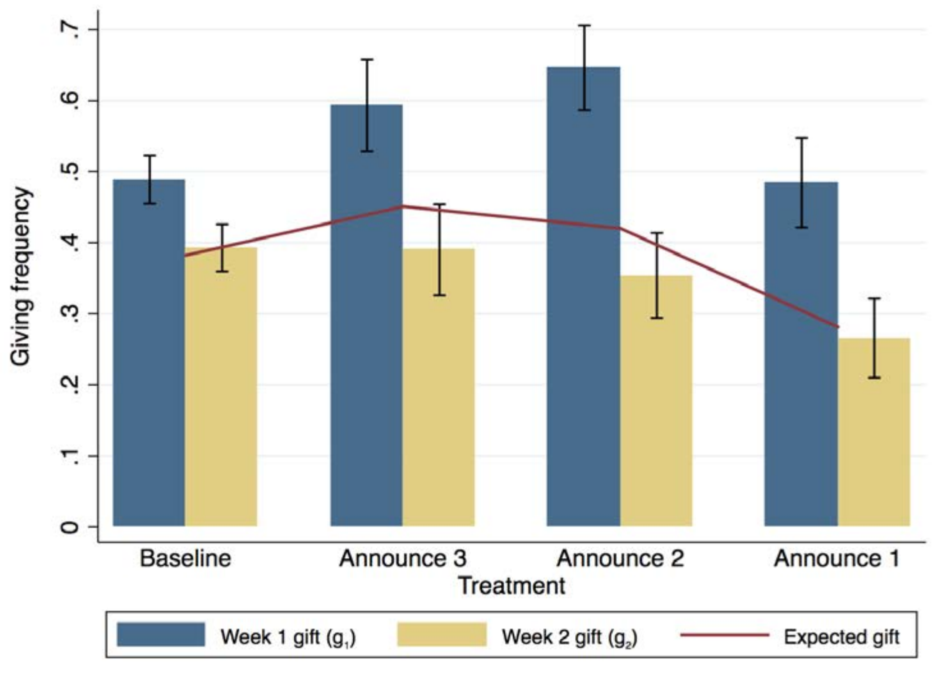
[12] Details are shown in Appendix C.

[13] There are no significant differences in participation the Week 2 session by treatment (χ^2-test, $p = 0.129$), or by giving decisions and commitment choices within each treatment (χ^2-test, $p > 0.1$ in all treatments). Detailed results are shown in Appendix C.

[14] Donation decisions and commitment decisions in week 1, as well as donation decisions in week 2 did not differ (χ^2-test, $p > 0.1$ in all cases).

5.4 Results

Figure 2 shows the results from the three new announcement treatments along with the Baseline treatment. Here we see clear evidence of a continued time-inconsistent charitable giving. In fact, when described relative to give now, the effect appears stronger in the treatments with announcements: give later shows a 24% increase over give now in the Baseline treatment, while there is a 71% increase across the combination of all announcements treatments.



Note: Error bars denote ± 1 S.E.

Figure 2: Giving by Announcements Treatment

Table 5 displays the estimated treatment effects of the announcements treatments on the outcome variables discussed in the predictions. We begin on the first row of Table 5 which shows the effects for Announce 3. Four of the five coefficients have the predicted sign, and two of these are significant.

The second row of Table 5 shows the results for Announce 2. All four treatment effects we have predictions for have the correct sign, two of which meet standard levels

Table 5: Treatment Effects in the Announcements Experiment

	(1) Probit g_1	(2) Probit g_2	(3) Linear reg. E(g)	(4) Probit $(0, p, 1)$	(5) Probit $(1, I, 1)$ & $(1, F, 1)$
Announce 3	0.105***	-0.002	0.079	-0.084*	0.054
	(0.036)	(0.105)	(0.084)	(0.049)	(0.040)
Announce 2	0.151***	-0.042	0.041	-0.085*	0.014
	(0.045)	(0.087)	(0.067)	(0.050)	(0.037)
Announce 1	0.003	-0.134***	-0.092**	-0.064	-0.055*
	(0.050)	(0.045)	(0.033)	(0.051)	(0.029)
Constant			0.525***		
			(0.079)		
Observations	407	407	407	407	407
R-squared			0.044		

Note: Probit marginal effects (calculated at the means of all variables), and OLS coefficients. The variables Announce 1, Announce 2 and Announce 3 are dummy variables that take value one if the individual was a participant in that treatment, and zero otherwise. The omitted category is the Baseline treatment. Individual characteristics such as gender, ethnicity, whether the subject is a native English speaker, and their score in the Cognitive Reflection Test are included as covariates. Robust standard errors, clustered at the session level, are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

of significance. When we examine the choice to counter-signal, by choosing $(1, I, 1)$ or $(1, F, 1)$, we find a directional drop in this behavior in Announce 2 relative to Announce 3 (χ^2-test, $p = 0.396$).

Finally, row three of Table 5 shows the treatment effects for Announce 1. Again all four coefficients we have predictions for have the expected sign, three of which are significant. We find that counter-signaling decreases significantly in Announce 1 relative to Announce 3 (χ^2-test, $p < 0.01$).

Overall, of the 13 treatment effects with clear theoretical predictions discussed in Table 4, 12 were measured with the correct sign, and seven of those have significant coefficients. We must, however, acknowledge that multiple hypotheses are tested. If we use a Bonferroni correction, on our primary outcome variables, g_1 and g_2, results remain nevertheless unchanged. This leads to our last finding:

Finding 4 (Image concerns and audience effects): Exogenously varying the information about intertemporal giving decisions known to others strengthens the time-inconsistent charitable giving puzzle, and these audience effects are broadly consistent with the dynamic model of image concerns.

6 Summary and Conclusion

We introduced this paper with a puzzle. In a between-subjects experiment we found strong evidence of time-inconsistent charitable giving. Giving increased nearly 50 percent simply by adding a week's delay between the *decision* to give and the *transaction* of that gift. The puzzle was validated in two additional within-subjects experiments showing the week long delay increases giving by 24% to 82%.

The natural place to look for a resolution of this puzzle is to models of temptation or present bias, or perhaps to models of an uncertain future. We show that neither of these ideas can explain more than a small segment of our data, underscoring the puzzle. The large effect of a one week delay cannot be explained by the primary models, yet the gap in time between deciding and paying for a charitable gift must be at the root of the explanation.

We present a model of social-signaling that provides a rich set of hypotheses beyond the predictions from standard discounting, and the model is successful at explaining important patterns in behavior that discounting models cannot. The contribution is thus both theoretical and empirical.

The simplest way to think about our model is that the single act of making a charitable contribution creates a number of opportunities for the donor to collect utility. The first is the standard notion of the joy-of-giving. The second good is the social utility that comes from the fact that people are concerned with the opinions others hold of them as a result of witnessing their contribution decisions. This social-image utility can begin flowing at the moment the audience observes the decision to give. Moreover, this utility is more like an depreciable asset that can be consumed for a number of periods whenever a social interaction brings attention to the gift. It is this effect that makes incentives for deciding now and giving later preferable to deciding now and giving now. The model is one of time-consistent social-image preferences.

Why do we believe this result is important? We present a very simple environment, with a relatively minor manipulation, yet find a large and significant change in behavior that appears to violate time-consistency, a common notion of economic rationality. We note that charitable giving is unlike other goods—there are no physical or physiological indicators of when you are "hungry" for more giving, or when your last gift has "worn out." Instead, definitions of an appropriate amount and frequency of gifts is mediated through social interactions. Any person wishing to do their "fair share" will only know what this is by comparison with others who are in similar circumstances. We find a surprisingly strong and consistent set of responses to subtle changes in social information and audience size that appear not only to explain our finding of time-inconsistent charitable giving, but to give life to the a rich and powerful set of fundamental human motivations related to social image.

What makes this all the more important is that we are only beginning to understand the power and reach of these incentives, and how the charitable sector, and others, are using these to their advantage by controlling the giving information and, at times, the audience. Perhaps most importantly, how does this sensitivity to image concerns affect our understanding of the welfare effects of charitable giving, and the incidence of fundraising polices built around manipulating social image. This issue takes special urgency now when public policy has helped lead us to a world where government is devolving many communally provided goods to the charitable sector, adding additional tax incentives for those with highest income and wealth, such as the use of Donor Advised Funds as means of washing capital gains out of asset portfolios (see Andreoni, 2018).

Finally, beyond charitable giving, there may be other behaviors that could be better understood by considering audience effects. With so much of our daily activities being shared on the Internet, in particular over social media, the volume and velocity of social information reaches new heights daily. As we saw in our experiment, some information can be counter productive. It will be important to model and measure how the kind of information shared will influence both those sharing and receiving social information.

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Appendix A: Theoretical Framework

A.1. Probabilistic Commitment

We assume that every population consists of some subjects with v close to zero who will choose $g_1 = g_2 = 0$. Set the image utility experienced by these people to $M_0 \leq 0$. Others will be so charitable as to have $v > 1$ and so will always choose $g_1 = g_2 = 1$. To explain time-inconsistent charitable giving in our game of probabilistic commitment, it must be that some people prefer to give in only one of the periods, and in particular must favor giving in $t = 1$.

It is possible that some people will be engaged in self-signaling as well as social-signaling if they see the experimenter as an audience. Here we will assume that everyone is engaged in social-signaling with an audience of $n = 1$, that is, the experimenter. We must acknowledge, however, that some subjects may not see the experimenter as an audience and will be engaged only in self-signaling. For this part if the discussion, we will set these people aside. When, in Experiment 3, we manipulate the audience and surely add significant social-signaling incentives, we will revisit this possibility that in Experiment 2, a small number of subjects are only engaged in self-signaling.

A.2. Definitions of Signaling Preferences

Definition: Social-Signaling. A person is engaged in social-signaling if they believe that an *audience of others* is seeing the person's strategy unfold. Based on information the audience holds at any time, the audience forms (or updates) beliefs about the expected value of the person's utility parameter v. Call the person's excpectation about the audience's belief μ. A person who cares for social-signaling maximizes a utility function that is increasing in μ.

Definition: Self-Signaling. A person is engaged in self-signaling if they behave as if they are unsure of their own v value, and, importantly, act like their own audience in a social-signaling model.

An important distinction between self- and social-signaling is that the self has the advantage of knowing their own full strategy for $t = 1$ and $t = 2$, while the audience for social-signaling can only condition their beliefs on actions they observe.

Definition: Self-and-Social Signaling. A person could have have both self- and social-signaling motives.

Having both motives will mean finding a way to aggegrate social image utility across at least two audiences.

A.3. Analysis of only Social Image Types

Lemma 1: Assume the population is engaged in social-signaling, but not self-signaling. Further assume that some people in this population prefer to give in only one period. These people will prefer to give in $t = 1$ rather than $t = 2$.

Proof: By assumption, the person can choose either $s = (1, p, 0)$ or $s = (0, 1 - p, 1)$ as both stragies will result in the same potential flows of earnings. However, the audience in $t = 1$ must form their first estimate of the donor's v based only on the portion of their strategies revealed in $t = 1$, that is $s' = (g_1, p)$. Suppose first that $s' = (1, p)$. Then the audience's *minimal* belief is that v is at least high enough to give $g = 1$ with probability p. Suppose instead that $s' = (0, 1 - p)$. Now the audience's *maximal* belief is that v is high enough to give $g = 1$ with probability p. Since $E(v|1, p) \geq E(v|0, 1 - p)$, the strategy $(1, p, 0) \succ (0, 1 - p, 1)$.$\|$

Lemma 1 already largely established Lemma 2.

Lemma 2: Assume the population is engaged in social-signaling, but not self-signaling. Then, if in $t = 1$ the audience observes a person choosing $g_1 = 0$ for any p, the audience can conclude that this person also intends to choose $g_2 = 0$ in $t = 2$.

Proof: Suppose not. Then this person chooses $s = (0, p, 1)$. This contradicts Lemma 1.$\|$

Next let's consider that some people in this population may prefer to give both periods. Since there is not a choice of $p = 1$, it will not be until $t = 2$ that these people reveal their full strategies. We add an extra assumption, which we will relax later:

Assumption 1 (No Counter-Signaling): The $E(v|1, p, 1)$ is the same for all p.

This assumptions implies that a person interested in social image will want to send the strongest signal of v in period $t = 1$ in order to get the highest social image. This means choosing $s' = (1, C)$ since $E(v|1, C) \geq E(v|1, I) \geq E(v|1, F)$.

Lemma 3: If $E(v|1, p, 1)$ is the same for all p and if the individuals cares about social image and wishes to choose $g_1 = g_2 = 1$, the individual will chose strategy $s' = (1, C)$ in $t = 1$.

Proof: Since social image utility will be the same in $t = 2$ regardless of p, and the objective is to choose $g_1 = g_2 = 1$ and p to maximize utility, then this is the same as choosing p to maximize social image at $t = 1$. This is achieved by choosing $s' = (1, C)$ in $t - 1$ and $g_2 = 1$ in $t = 2$.

This lends itself naturally to the next lemma:

Lemma 4: If $E(v|1, p, 1)$ is the same for all p, if the individual cares about social image, and if in $t = 1$ the audience sees the strategy $s' = (1, p)$ for any $p \neq C$, then the audience will believe that $g_2 = 0$.

Proof: Suppose not. Then, this will contradict Lemma 3.

We can now state a proposition for our probabilistic commitment game with social image concerns.

Proposition 1: Assume all individuals care equally about social image, and that the $E(v|1, p, 1)$ is the same for all p. Then there exists a Bayesian Perfect equilibrium of the probabilistic commitment game, which is characterized by numbers v^{F0}, v^{I0}, v^{C0}, and v^{C1}, such that $0 \leq v^{F0} \leq v^{I0} \leq v^{C0} \leq v^{C1} \leq 1$ and

a) all individuals with $v < v^{F0}$ choose $s = (0, p, 0)$, for any p;

b) all individuals with $v^{F0} \leq v \leq v^{I0}$ choose $s = (1, F, 0)$;

c) all individuals with $v^{I0} \leq v \leq v^{C0}$ choose $s = (1, I, 0)$;

d) all individuals with $v^{C0} \leq v \leq v^{C1}$ choose $s = (1, C, 0)$;

e) all individuals with $v^{C1} \leq v \leq \bar{v}$ choose $s = (1, C, 1)$.

Proof: Notice that in $t = 1$ there will be at most 4 pools consisting of those choosing the strategy $s' = (g_1, p)$ of $(0, p)$, $(1, F)$, $(1, I)$, and $(1, C)$. Lemma 3 shows that those wishing to give in both $t = 1$ and $t = 2$ would choose $(1, C)$ in $t = 1$. Then in $t = 2$ the pool at $(1, C)$ would be split into two pools by a $v^{C1} < 1$ such that those with $v^{C0} \leq v < v^{C1}$ choose $g_2 = 0$ and those with $v^{C1} \leq v \leq \bar{v}$ choose $g_2 = 1$. We assume that for certain distributions of v and definitions of the image function $M()$, this will indeed be an equilibrium, and then prove the proposition by construction.

Let $f(v)$, $0 \leq v \leq \bar{v}$, be the probability distribution function for v, with density function $F(v) = \int_0^v f(v)dv$. We assume $f(v)$ is continuous, and twice differentiable. Then define the function $a(x, y)$ as the average (that is, expected value) of v conditional on $x \leq v \leq y$:

$$a(x, y) = \frac{1}{F(y) - F(x)} \int_x^y v f(v) dv$$

Then, define the expected value of v within each pool as

$$\begin{aligned}
\mu_0 &= a(0, v^{F0}), \\
\mu_F &= a(v^{F0}, v^{I0}), \\
\mu_I &= a(v^{I0}, v^{C0}), \\
\mu_C &= a(v^{C0}, \bar{v}), \\
\mu_{C0} &= a(v^{C0}, v^{C1}), \text{and} \\
\mu_{C1} &= a(v^{C1}, \bar{v}).
\end{aligned}$$

Next, define the utility of a donor in a given pool at time $t = 1$. We will use $M()$ to indicate the image utility in $t = 1$ and $\delta\beta M()$ as the discounted image utility for $t = 2$, where $0 < \delta\beta \leq 1$. We use δ to represent the one week discount rate, and $0 < \beta \leq 1$ to represent the idea that social image earned in period 1 may only partly carry over to the period 2 decision.

$$U(v|0,p,0) = M(\mu_0) + \delta\beta M(\mu_0) \tag{11}$$

$$U(v|1,F,0) = 0.1(v-\delta) + M(\mu_F) + \delta\beta M(\mu_F) \tag{12}$$

$$U(v|1,I,0) = 0.5(v-\delta) + M(\mu_I) + \delta\beta M(\mu_I) \tag{13}$$

$$U(v|1,C,0) = 0.9(v-\delta) + M(\mu_C) + \delta\beta M(\mu_{C0}) \tag{14}$$

$$U(v|1,C,1) = v - \delta + M(\mu_C) + \delta\beta M(\mu_{C1}). \tag{15}$$

Then in equilibrium, the critical values v^{F0}, v^{I0}, v^{C0}, and v^{C1} solve these four equations:

$$U(v^{F0}|0,p,0) - U(v^{F0}|1,F,0) = 0 \tag{16}$$

$$U(v^{I0}|1,F,0) - U(v^{I0}|1,I,0) = 0 \tag{17}$$

$$U(v^{C0}|1,I,0) - U(v^{C0}|1,C,0) = 0 \tag{18}$$

$$U(v^{C1}|1,C,0) - U(v^{C1}|1,C,1) = 0 \tag{19}$$

By the assumption that M is increasing, continuous, and concave, this system will have a unique solution where $0 \leq v^{F0} \leq v^{I0} \leq v^{C0} \leq v^{C1} \leq 1$. The final inequality follows from the assumption that all those with $v \geq 1$ will choose $g_1 = g_2 = 1$ as long as $M \geq 0$ and by continuity there will form a pool of "always give" types that includes some points $v < 1$ in the neighborhood of $v = 1$. $\|$

A.3.1. Generalization to Counter-signaling

If we weaken the assumption of no counter-signaling, we can potentially get one or even two new types of equilibria that include counter-signaling. By counter-signaling we mean that the highest type person choosing $g_1 = g_2 = 1$ does not employ the strongest signal of $p = C$ in $t = 1$ but instead sends a weaker signal choosing, say $s' = (1, I)$ rather than $(1, C)$, thus pooling with lower type in $t = 1$, such that in $t = 2$ this person can reveal themselves to be (among) the highest types. They can do this if the utility lost in the lower quality signal sent in $t = 1$ can be made up for by those with high enough v such that the social image $M(1, I, 1) > M(1, C, 1)$. In particular, if upon seeing the full strategy of $s = (1, I, 1)$ the social image for this strategy increases just enough such that $U(v|1, I, 1) \geq U(v|1, C, 1)$ if and only if $v = \bar{v}$, and for all others the inequality is reversed. Then we can establish a new equilibrium where the most generous type can further separate from those of lower v. This is shown in Corollary 1 below.

If there is a sufficiently long right tail of the distribution of types, $f(v)$, then it is possible for there to be two counter-signals: $(1, F)$ by the highest group, and $(1, I)$ by the second highest group. This is shown in Corollary 2.

Of course, if there is no social information about g_2, then counter-signaling will not be possible, excluding these strategies as equilibria. This will return when discussing Experiment 3.

Corollary 1: Assume the no-counter-signaling assumption fails, and in particular assume $M(\mu_I) + \beta M(\bar{v}) > M(\mu_C) + \beta M(\mu_{C1})$, but $M(\mu_F) + \beta M(\bar{v}) < M(\mu_C) + \beta M(\mu_{C1})$. Then, there exists a probability distribution function $f(v)$, $0 \leq v \leq \bar{v}$, and a neighborhood of $\bar{v}$, $N_\epsilon(\bar{v})$, such that all j with $v_j \in N_\epsilon(\bar{v})$ choose the strategy $s = (1, I, 1)$. In equilibrium the image function $M(\mu)$ assures us that the individual i with $v_i = \bar{v} - \epsilon^*$ is indifferent to counter-signaling or choosing $s = (1, C, 1)$.

Proof: If these assumptions hold, then a person with $v_i = \bar{v}$ can deviate from the strategy $s = (1, C, 1)$ to the counter-signaling strategy whereby the person pretends to be a lower v type by choosing $s' = (1, I)$ in $t = 1$ such that in $t = 2$ the complete strategy $s = (1, I, 1)$ can be revealed. Since, by Lemma 2 the audience is anticipating that any strategy $s' = (1, I)$ must be completed in $t = 2$ with $s = (1, I, 0)$, the audience must ask who is most likely to profit from this deviation. If the answer is that only individuals at or very near $v_i = \bar{v}$, then this counter-signaling strategy can become an equilibrium. Given continuity, there will be a neighborhood of $\bar{v}$ where all i with v_i in this neighborhood will form a small pool that sends the counter-signal in period 1 and further separates themselves from the other "always give" types.

In particular, let $\mu(\epsilon) = a(\bar{v} - \epsilon, \bar{v})$ be the expected value of v given $v \in N_\epsilon(\bar{v})$. Then, for the equilibrium to exist, we need to find a value of ϵ, say ϵ^*, such that the no-counter-signaling conditions, appropriately modified, hold for $v_i \in N^*_\epsilon(\bar{v})$ but not for those with $v \notin N^*_\epsilon(\bar{v})$. Specifically, $M(\mu_I) + \beta M(\mu\epsilon^*) > M(\mu_C) + \beta M(\mu_{C1})$, but $M(\mu_F) + \beta M(\mu(v^*) < M(\mu_C) + \beta M(\mu_{C1})$. ‖

Corollary 2: Assume $M(\mu_F) + \beta M(\bar{v}) > M(\mu_C) + \beta M(\mu_{C1})$. Then there exist a neighborhood of $\bar{v}$, $N_\epsilon(\bar{v})$, such that all i with $v_i \in N_\epsilon(\bar{v})$ choose the strategy $s = (1, F, 1)$. And, letting $\bar{v}'$ be the lowest element of $N_\epsilon(\bar{v})$, then there exists another neighborhood of $\bar{v}'$ such that all $v_j \in N_\gamma(\bar{v}')$ such that $v_j < \bar{v}'$ the strategy $s = (1, I, 1)$ will be optimal.

Proof: Here we simply follow the logic of Corollary 1, applying the method twice, under the assumption that the distribution of v will actually support the equilibrium. ‖

A.3.2. Analysis of only Self-Signaling types

Assuming people are only self-image signalers is equivalent to assuming that $t = 1$ and $t = 2$ are combined to a single decision. In particular, to a self-signaler the strategies $s = (1, p, 0)$ and $(0, 1 - p, 1)$ are the same. This then reduces the self-signal to choosing a probability with which to give, say q, where now q has five possible values, $q = 0, 0.1, 0.5, 0.9$, or 1. The strategy $q = 0$ results from $s = (0, p, 0)$ and $q = 1$ from $s = (1, p, 1)$. Contrary to the above, now $(1, p, 0)$ and $(0, 1 - p, 1)$ both produce p.

With a model of pure self-signaling the solution is obvious:

Proposition 2: If subject care only about self-signaling there will exist an equilibrium will be characterized by four numbers, $v_{0.1} \leq v_{0.5} \leq v_{0.9} \leq v_1 \leq 1$, such that

a) If $v_i < v_{0.1}$ then i will give with probability $q = 0$.

b) If $v_{0.1} < v_i \leq v_{0.5}$ then i will give with probability $q = 0.1$

c) If $v_{0.5} < v_i \leq v_{0.9}$ then i will give with probability $q = 0.5$

d) If $v_{0.9} < v_i \leq v_1$ then i will give with probability $q = 0.9$

e) If $v_1 < v_i$ then i will give with probability $q = 1$

Proof: This is a subclass of the case considered in Proposition 1. The same tools can be applied to construct this proof.

Appendix B: Instructions and Decision Screens

B.1. Summary of Session Structure

All experiments invited subjects to participate in a 2-week experiment. We refer to Week 1 and Week 2 sessions in what follows. Participation in the two session was always required and independent of decisions made in Week 1.

The structure of the Week 1 session was as follows. First there was a Welcome Sheet, shown below. The Welcome Sheet for the first set of sessions in the NN and NL treatments, which had a show-up fee of $6 in the first week, and $20 in the second week, was the same except for the show-up fees. After subjects read the Welcome Sheet, a GiveDirectly Pitch was done. The slides of GiveDirectly were shown on a screen in front of the room, visible to all subjects. The experimenter read the slides. After reading the slides, the instructions were read out loud. For each Experiment, we present the instructions and decision screens shown in Week 1 below. The text in square brackets that follows was not read aloud. All treatment differences are indicated in brackets below.

In Week 2 of Experiment 1, subjects did not receive any additional written instructions. In all treatments, they were first reminded of their donation decision in Week 1 on their computer screens, and then asked to complete several survey questions on their computer. Once everyone had completed the survey, the subjects were called individual to receive their payment for participation (minus their donation, if they decided to donate in Week 1 in the NL treatment).

In Week 2 of Experiment 2 and 3, subjects made their Week 2 donation decision (g_2). At the beginning of the session, subjects were reminded of their Week 1 decisions (g_1 and p). In the treatment Announce 3 sessions, they were reminded that their Week 2 donation would also be announced, following the same procedures as the announcements in Week 1. Once all subjects had made their decisions and completed several survey questions, a volunteer was randomly selected to roll a dice in front of the room, to determine for each subject whether their Week 1 or Week 2 decisions would be implemented, according to their choice of g_1, g_2 and p.

[WELCOME SHEET]

Welcome

Thank you for participating in this experiment. During the experiment you and the other participants are asked to answer a series of questions. Please do not communicate with other participants. If you have any questions please raise your hand and an experimenter will approach you and answer your question in private.

This experiment consists of two parts.

- Part 1: Today we will ask you to answer a series of questionnaires.
- Part 2: A follow up survey that you will be asked to fill out a week from today.

Payment

You receive for the participation in this experiment $30. Please note that in order to obtain you all payments you need to answer both parts of the experiment.

- Today you receive $15 for showing up to the experiment and answering the first part of the experiment. You can collect the $15 from the experimenter after the session is finished.
- The remaining $15 you will receive at the end of the next week's session.

B.2. Experiment 1

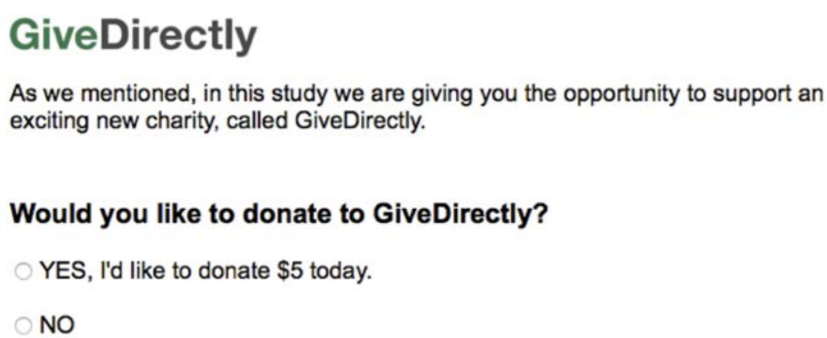
[At the end of the GiveDirectly pitch:]

- [Treatment NN]: We would like to ask you whether you would like to donate $5 of your show up fee for today's session to GiveDirectly. You will be asked to answer this question on your screens in a minute. If you answer "YES, I'd like to donate $5 today," $5 of your show up fee today will be donated. If you say "NO," no donation will be made. Your decisions are final today.

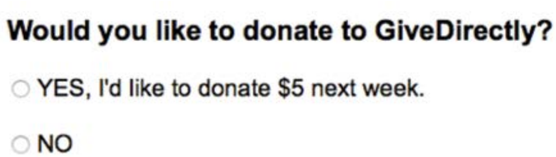
- [Treatment NL]: We would like to ask you whether you would like to donate $5 of your show up fee for next week's session to GiveDirectly. You will be asked to answer this question on your screens in a minute. If you answer "YES, I'd like to donate $5 next week," $5 of your show up fee next week will be donated. If you say NO, no donation will be made. Your decisions are final today.

Decision Screens

NN:



NL:



B.3. Experiments 2 and 3

The instructions of Experiment 3 are shown below. In brackets the additional variations in Treatments Announce 1, Announce 2 and Announce 3 are shown. The instructions for Experiment 2 did not explicitly discuss the indifference option, which was offered on the computer screens only. This discussion was added explicitly in Experiment 2, including the Baseline treatment of Experiment 3, which replicates Experiment 2. The results demonstrate no differences in decisions. The former set of instructions is available upon request.

Your Donation Decision

In this study we will ask you to make two donation decisions, but only one of these two will end up being the decision that counts. One donation decision will be made today. Call this your week-1 donation decision. Your second donation decision will be made next week, when you return to the lab to complete this study. Call this your week-2 donation decision.

Here is how it works.

Week-1 donation decision

Today we will ask you whether you would like to donate $5 of your show up fee for next week's session to GiveDirectly. You will be asked to answer this question on your screens in a minute. If you answer "YES, I'd like to donate $5 next week," $5 of your show up fee next week will be donated. If you say NO, no donation will be made.

Week-2 donation decision

Next week, when you return to the lab to complete this study, you will have the opportunity to renew or revise your donation decision. In particular, next week you will be asked again whether you would like to donate $5 of your show up fee for next week's session to Give Directly. If you answer "YES, I'd like to donate $5 today,"

$5 of your show up fee next week will be donated. If you say NO, no donation will be made.

IMPORTANT: Only one of your decisions, either your week-1 or your week-2 donation decision, will be implemented. That is, only one decision will be the decision-that-counts. We will not use both! The most you will ever donate in this study is $5. The least you can donate is $0.

How will we decide whether your week-1 donation decision or your week-2 donation decision is the decision-that-counts?

Next week, after you make your week-2 donation decision, we will ask someone in the room to roll a 10-sided die to determine which decision is the decision-that-counts. All 10 numbers on the die are equally likely. Based on your decision, there will be a 1 in 10 chance or a 9 in 10 chance that the decision-that-counts is your week-1 decision.

Today you will have three options to choose from:

A. Your **week-1 donation decision** will count with a **1 in 10 chance**, and so your week-2 donation decision will count with a 9 in 10 chance.

B. Your **week-1 donation decision** will count with a **9 in 10 chance**, and so your week-2 donation decision will count with a 1 in 10 chance.

C. Your choice between Option A or Option B is determined using a coin flip.

If you chose Option A today, the following will occur. A volunteer will roll a 10-sided die and:

- Your **week-1** donation decision will be the decision-that-counts if number "1" is the outcome of the die roll.
- Your **week-2** donation decision will be the decision-that-counts if numbers "2", "3", "4", "5", "6", "7", "8", "9" or "10" are the outcome of the die roll.

If you choose Option B today, the following will occur. A volunteer will roll a 10-sided die and:

- Your **week-1** donation decision will be the decision-that-counts if numbers "2", "3", "4", "5", "6", "7", "8", "9" or "10" are the outcome of the die roll.
- Your **week-2** donation decision will be the decision-that-counts if number "1" is the outcome of the die roll.

If you chose Option C today, a volunteer will flip a coin to determine whether your payment will be determined according to Option A or Option B.

- If the outcome of the coin flip is "heads", Option A will be the option assigned to you.
- If the outcome of the coin flip is "tails", Option B will be the option assigned to you.

[Announce 1:

Announcing Decisions

At the end of the session today, after everyone's decisions have been recorded, we will announce your week-1 donation decision to all of the participants in the room today. We will do this two ways.

First, we will use the screen at the front of this room to display the decision of each participant. The screen display may look something like this:

Seat Number	Week-1 Donation Decision
1	Yes, donate $5 next week
2	No
3	Yes, donate $5 next week

. . . and so forth

Next, we will call out seat numbers sequentially, starting at a randomly determined seat number. When we call your seat number, for example seat number 25, please stand up and say “I am at seat 25”. Then, please read the decision you made today listed on the screen, by saying “I chose yes, donate $5 next week”, or “I chose no”. Please remember to stay standing until we are ready to call the next seat number.

As you can see, this means that the other participants in this session will learn your week-1 donation decision.

[Announce 2:

Announcing Decisions

At the end of the session today, after everyone’s decisions have been recorded, we will announce your week-1 donation decision and your choice between Options A, B and C to all of the participants in the room today. We will do this two ways.

First, we will use the screen at the front of this room to display the decision of each participant. The screen display may look something like this:

Seat Number	Week-1 Donation Decision	Option A, B or C?
1	Yes, donate $5 next week	Option A
2	No	Option B
3	Yes, donate $5 next week	Option C

. . . and so forth

Next, we will call out seat numbers sequentially, starting at a randomly determined seat number. When we call your seat number, for example seat number 25, please stand up and say “I am at seat 25”. Then, please read the decision you made today listed on the screen, by saying “I chose yes, donate $5 next week”, or “I chose no”, and thereafter adding “And I chose Option A”, “And I chose Option B” or “And I chose Option C”. Please remember to stay standing until we are ready to call the next seat number.

As you can see, this means that the other participants in this session will learn your week-1 donation decision, and your choice between Option A, B or C.]

[Announce 3:

Announcing Decisions

At the end of the session today, after everyone’s decisions have been recorded, we will announce your week-1 donation decision and your choice between Options A, B and C to all of the participants in the room today. We will do this two ways.

First, we will use the screen at the front of this room to display the decision of each participant. The screen display may look something like this:

Seat Number	Week-1 Donation Decision	Option A, B or C?
1	Yes, donate $5 next week	Option A
2	No	Option B
3	Yes, donate $5 next week	Option C

. . . and so forth

Next, we will call out seat numbers sequentially, starting at a randomly determined seat number. When we call your seat number, for example seat number 25, please stand up and say "I am at seat 25". Then, please read the decision you made today listed on the screen, by saying "I chose yes, donate $5 next week", or "I chose no", and thereafter adding "And I chose Option A", "And I chose Option B" or "And I chose Option C". Please remember to stay standing until we are ready to call the next seat number.

As you can see, this means that the other participants in this session will learn your week-1 donation decision, and your choice between Option A, B or C.

When you return to the lab next week, after everyone's decisions have been recorded, we will announce your week-2 decisions, following the same procedures as described above. We will also remind everyone in the room of your decisions in week 1.]]

In summary:

- Today you make a decision about donating $5 out of your show-up fee for next week's session to Give Directly. This decision will be carried out next week with a 1 in 10 or a 9 in 10 chance.

- Next week you will be asked again to make a decision about donating $5 out of your show up fee for next week's session to Give Directly. This decision will be carried out next week with a 9 in 10 or a 1 in 10 chance.

- Only one of these two decisions will be carried out.
- You make both donation decisions before you know which decision will be carried out.
- You decide today whether you would like Option A (your week-1 donation decision to count with a 1 in 10 chance and so your week-2 donation decision will count with a 9 in 10 chance), Option B (your week 1 donation decision to count with a 9 in 10 chance and so your week-2 donation decision will count with a 1 in 10 chance) or Option C (you would like to flip a coin between these two options).
- After you have made your week-2 donation decision, a die will be rolled to determine whether your week-1 or your week-2 donation decision is the decision that counts. If you chose to flip a coin, a coin will be flipped beforehand.
- [Announce: At the end of the session today, [1: your week-1 donation decision [2, 3: and your choice between Options A, B and C]] will be announced to the rest of the participants in the room.
- [Announce: At the end of the session next week, [1, 2: there will be no announcements. [3: your week-2 donation decision will also be announced to the rest of the participants in the room, together with your week-1 decision and your choice between Options A, B and C.]]

Next you will be asked about your donation decision on the screens.

Remember: Your donation decision today could be the decision-that-counts so treat this decision as if it were the decision that will count.

Decision Screens

Week 1 decision:

GiveDirectly

As we mentioned, in this study we are giving you the opportunity to support an exciting new charity, called GiveDirectly.

Would you like to donate to GiveDirectly?

○ YES, I'd like to donate $5 next week.

○ NO

Commitment decision (on screen following week 1 decision):

As we mentioned, we will also ask you next week about your donation decision. Here you can choose whether you would like your donation decision today to be the decision-that-counts with a 1 in 10 chance or a 9 in 10 chance. You can also say that it doesn't matter to you which option is chosen, in which case we will flip a coin to decide for you.

Please select below what option you would prefer:

○ **A:** I definitely want
my donation decision **today** to count with a **1 in 10 chance**
(and so my donation decision **next week** to count with a **9 in 10 chance**.)

○ **B:** I definitely want
my donation decision **today** to count with a **9 in 10 chance**
(and so my donation decision **next week** to count with a **1 in 10 chance**).

○ **C:** I truly don't care which option A or B above is chosen.
Please flip a coin to decide.

Appendix C: Additional Analyses

C.1. Analysis of show-up rates

Table C.1 examines the determinants of the decision to show-up in Week 2, in the NN and NL treatments. We do not find that the treatment, or the decision to give within each treatment, or any individual characteristic is related to show-up in Week 2. Table C.2 provides the same analysis for the Commitment and Announcement Experiments.

C.1. Analysis of Show-up Rates (Experiment 1)

	No-show rate in Week 2	Give (g=1) If no-show	If show-up	*p-value*	N
NN Treatment	7.8%	28.6%	30.9%	*0.856*	179
NL Treatment	11.6%	45.0%	45.8%	*0.949*	173
NL vs. NN show-up rate (p-value χ^2-test)	*0.235*				

C.2. Analysis of Show-up Rates (Experiments 2 and 3)

	Experiment 2	Experiment 3 (Announcements)			
	Probabilistic Commitment	Baseline	Announce 1	Announce 2	Announce 3
No-show rate	10.9%	6.7%	5.9%	3.0%	13.2%
χ^2-test p-value (Announcements)		0.129			
Week 1 Decision	If show-up	If show-up	If show-up	If show-up	If show-up
No + c=0.9	26%	27%	8%	22%	10%
No + c=0.5	14%	16%	22%	8%	24%
No + c=0.1	12%	5%	22%	6%	7%
Yes + c=0.9	13%	13%	23%	15%	15%
Yes + c=0.5	13%	16%	17%	22%	22%
Yes + c=0.1	22%	23%	8%	28%	22%
	If no-show	If no-show	If no-show	If no-show	If no-show
No + c=0.9	35%	50%	0%	50%	22%
No + c=0.5	10%	25%	0%	0%	0%
No + c=0.1	0%	25%	0%	0%	0%
Yes + c=0.9	20%	0%	50%	0%	11%
Yes + c=0.5	10%	0%	50%	0%	44%
Yes + c=0.1	25%	0%	0%	50%	22%
χ^2-test p-value	0.537	0.401	0.352	0.841	0.372

C.2. Gender Differences in Experiment 1

Table C.3. disaggregates the results of Experiment 1 by gender. In the NN and NL treatments the number of male participants is 124 and the number of female participants is 194.

Table C.3. Results by Gender

	Men	Women
NN and NL Treatments		
Decide Now to Give Now (NN): Share of giving	0.323	0.300
	(0.058)	(0.046)
Decide Now to Give Later (NL): Share of giving	0.390	0.500
	(0.064)	(0.051)
NN vs. NL: χ^2-test (p-val)	0.754	0.183

Notes: This table presents the behavior of male and female participants in the NN and NL treatments. The table presents the frequency of each behavior unless otherwise noted. Standard errors are displayed in parentheses for giving rates.

C.3. Session sizes in Experiment 3

The session size in treatments Announce 1, Announce 2 and Announce 3 was as follows. In treatment Announce 1 the size of the Week 1 sessions was 22, 22 and 24, across three sessions. In Announce 2, the size of the sessions was 21, 22 and 24. In Announce 3, the size of the sessions was 21, 23 and 24.

C.4. Treatment Effects in Experiment 3

Table C.4. displays the effects of the treatments on commitment choices in Announce 1, Announce 2 and Announce 3 in Experiment 3, relative to the Baseline treatment.

C.4. Additional Treatment Effects in Experiment 3

	(1)	(2)
	Linear regressions	
	p	$p * g_1$
Announce 3	-0.032	0.074*
	(0.027)	(0.036)
Announce 2	-0.005	0.075*
	(0.035)	(0.040)
Announce 1	-0.027	-0.017
	(0.044)	(0.027)
Constant	0.528***	0.307***
	(0.073)	(0.068)
Observations	407	407
R-squared	0.005	0.048

D. Uncertainty and Flexibility: Additional Results

In this section we examine additional survey evidence regarding the role of uncertainty in Experiment 2. At the end of the Week 2 session, after all donation decisions had been made, we asked individuals to indicate their level of agreement with the following statements: "Over the last week... (a) I thought about GiveDirectly" (GD thought); (b) I read or did research about GiveDirectly" (GD read); (c) I learned about other charities like GiveDirectly" (Thought others); (d) I thought about whether my financial situation allows me to donate to GiveDirectly" (Thought budget). Answers were provided on a 5-point Likert scale, ranging from strongly disagree to strongly agree. Based on these statements we construct an index, that we label as Resolving Uncertainty index, that measures the extent to which the individual thought and did research about her donation decision. We also elicited the extent to which the search for information about GiveDirectly changed the subject's opinion, through the statement "Over the last week I became more favorable about GiveDirectly." (GD more favorable). We present average responses to each variable in Table D.1. Based on these statements we construct an index, labeled Resolving Uncertainty index, that measures the extent to which the individual thought and did research about her donation decision. A higher value of the index indicates more research and thought was given to the donation decision. We also elicited the extent to which the search for information about GiveDirectly changed the subject's opinion, through the statement "Over the last week I became more favorable about GiveDirectly."

In Table D.2. we examine the relationship between these measures and donation behavior. Naturally, since these measures were elicited after donation decisions have been made, the results should be interpreted with caution. Column (1) of Table D.2. displays the results of a linear regression on the (standardized) Resolving Uncertainty index and giving and commitment decisions. The results indicate that individuals who demanded flexibility report a higher likelihood doing more thinking and research between Week 1 and Week 2, relative to those individuals who are indifferent between commitment and

Table D.1. Self-reported behaviors between Week 1 and Week 2 sessions (Experiment 2)

	GD thought	GD read	Thought others	Thought budget	GD more favorable
Always give					
Flexibility	3.6	2.8	2.9	4.3	3.0
Indifference	3.3	2.1	2.2	2.9	3.1
Commitment	3.4	2.1	2.6	3.1	3.0
Never give					
Flexibility	3.3	2.5	2.8	3.7	2.8
Indifference	3.0	1.9	1.9	3.4	2.3
Commitment	3.5	2.3	2.4	4.3	2.8
Give more later					
Flexibility	3.1	2.3	2.8	3.6	3.0
Indifference	4.0	2.0	2.0	4.0	2.3
Commitment	3.4	2.0	2.1	2.7	2.6
Give less later					
Flexibility	4.4	3.4	3.0	4.4	3.6
Indifference	3.3	2.0	2.3	3.0	2.3
Commitment	3.3	2.7	2.3	4.2	3.1

flexibility. However, those subjects who choose to give more later ($g_1 = 1$ and $g_2 = 0$) and demand flexibility are *less* likely to do research and think about the charity, which speaks against the concern that this type of time-inconsistent individuals demanded flexibility due to uncertainty.

Column (2) of Table D.2. explores the relationship between changes in opinion with regards to GiveDirectly, time inconsistency and demand for flexibility. The results indicate that subjects who chose (No, Yes) and demanded flexibility express becoming significantly more favorable towards GiveDirectly in the week between the first and second session of the experiment. The behavior of these subjects is consistent with Kreps (1979), since they were initially uncertain and cautious, but changed their donation decision, potentially due to their change in opinion about GiveDirectly. By contrast, the behavior of subjects who chose to give more later ($g_1 = 1$ and $g_2 = 0$) and demanded flexibility is again inconsistent with Kreps (1979). These subjects change their decision towards not giving in Week 2, but they do not report becoming *less* favorable towards the charity, since the coefficient for this group is not significant and positive (0.803).

Table D.2. Flexibility and Uncertainty

	(1) Resolving Uncertainty Index	(2) Became more favorable towards charity
Flexibility	0.961*	-0.073
	(0.438)	(0.458)
Give more later X Flexibility	-1.053*	0.803
	(0.531)	(0.571)
Never give X Flexibility	-0.336	0.511
	(0.536)	(0.684)
Give less later X Flexibility	0.444	1.487**
	(0.433)	(0.515)
Commitment	0.192	-0.073
	(0.286)	(0.423)
Give more later X Commitment	-0.732	0.334
	(0.526)	(0.683)
Never give X Commitment	0.564	0.565
	(0.528)	(0.693)
Give less later X Commitment	0.386	0.894
	(0.531)	(0.507)
Give more later	0.462	-0.803
	(0.311)	(0.464)
Never give	-0.137	-0.784
	(0.513)	(0.598)
Give less later	0.042	-0.803*
	(0.473)	(0.420)
Constant	-0.375	0.240
	(0.332)	(0.388)
Observations	163	163
R-squared	0.133	0.094

Note: This table presents the estimate coefficients from an ordinary least squares regression relating choices in the Commitment treatment and self-reported measures of behavior between the Week 1 and Week 2 session. The Resolving Uncertainty index is the sum of the answers to the following statements: Over the last week... (a) I thought about GiveDirectly; (b) I read or did research about GiveDirectly; (c) I learned about other charities like GiveDirectly; (d) I thought about whether my financial situation allows me to donate to GiveDirectly. A value of 1 corresponds to strongly disagree and 5 corresponds to strongly agree. The variable Became more favorable towards charity takes values 1 to 5, reflecting disagreement/agreement with the statement "Over the past week I became more favorable about GiveDirectly". Both dependent variables are standardized. All explanatory variables are dummy variables that take value one if the subject chose the described behavior. Robust standard errors, clustered at the session level, are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1