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Blood Donations and Incentives: Evidence from a Field Experiment*

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Abstract

There is a longstanding concern that material rewards might undermine pro-social motivations, thereby leading to a decrease in blood donations. This paper provides an empirical test of how material rewards affect blood donations in a three-month large-scale field experiment and a fifteen-month follow-up period, involving more than 10,000 previous donors. We examine the efficacy of a lottery ticket as a reward vis-à-vis a standard invitation, an appeal, and a free cholesterol test. The offer of a lottery ticket, on average, increases the probability to donate blood during the experiment by 5.6 percentage points over a baseline donation rate of 46 percent. We find that this effect is driven by less motivated donors. Moreover, no reduction in donations is observed after the experiment.

Keywords: blood donations, field experiment, material rewards, motivation crowding effect, pro-social behavior

JEL classification: C93, D64, H41, I18

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I. Introduction

In medical emergencies, blood transfusions are often the only way to save individuals' lives (Higgins, 1994). A sufficient supply of donated blood is thus a matter of life and death. Whole blood cannot yet be produced artificially, and some components of blood can only be stored for a short period of time. Moreover, the amount an individual can donate is limited. As such, in order to meet the need for blood, a wide and healthy base of donors, who are willing to give blood when required, is needed. Historically, many blood donation services have relied on voluntary, non-remunerated donations and thus on the pro-social motivations of their donors (Slonim et al., 2014).[1] Despite the inherent free-rider problem of this policy, the arrangement seems to have worked satisfactorily most of the time. However, it also faces serious challenges. New techniques in surgeries and oncological therapies require larger amounts of blood (Davey, 2004). There is also a general tightening of eligibility criteria, such as stepped-up travel restrictions and restrictions on past blood recipients. Finally, there are widespread seasonal shortages experienced by hospitals (Gilcher and McCombs, 2005).

In this paper, we present evidence on whether rewards can be used to overcome blood shortages in an environment that relies primarily on the pro-social motivations of voluntary donors. Most economic models, including those incorporating pro-social preferences explicitly (for example, Andreoni, 1990) predict that selective incentives will increase blood donations.[2] Yet, there remains a deep-rooted skepticism pertaining to the use of incentives in blood donations, even on a temporary basis. This skepticism is based on the conjecture that using incentives may

[1] While whole-blood donations are generally unpaid in developed countries (World Health Organization, 2017), there are some countries where plasma donations, which can be offered frequently, are paid. Indeed, Trimmel, Lattacher and Janda (2005) find that, using survey measures, whole-blood donors are broadly more pro-socially motivated than plasma donors. Intriguingly, no difference was found in the survey when comparing whole-blood donors with plasma donors who would be willing to continue donating plasma if no longer paid. Similar differences were found when comparing whole-blood donors with the general population (Fernández Montoya et al., 1996). See Piliavin (1990) for additional references.

[2] We use the term incentive to describe an external intervention affecting the relative attractiveness of alternative options with no specific reference to the substance of the incentive. Instead, when we refer to rewards, we consider specific incentives, i.e. quid pro quo offers in a voluntary exchange.

undermine the motivation to donate blood.[3,4]

Research in psychology and economics has proposed that incentives can lead to less pro-social behavior. If rewards are perceived as controlling, incentives may undermine pro-social motivations. This is often referred to in the literature as the motivation crowding effect (Deci and Ryan, 1985; Frey, 1997; Lepper and Greene, 1978). There is ample evidence from various contexts in support of this mechanism (see the reviews by Frey and Jegen 2001; Gneezy et al. 2011; Kamenica 2012) and it has repeatedly been discussed in the context of blood donation policy (see, e.g., Archard 2002; Lacetera et al. 2013; Stutzer and Goette 2010). However, the specific evidence is less clear. In a comprehensive review of the literature on the use of incentives to stimulate blood donation, Chell et al. (2018) conclude that many issues remain unresolved. One of the reasons they emphasize is that the research is "confounded by current operating context" (p. 251).[5]

Our natural field experiment allows us to study the effects of material rewards in a controlled context that is particularly attractive to pit the theoretical predictions of a standard economics model against a model of motivation crowding.[6] In our study, we randomized the offer of rewards to roughly 10,000 blood donors who were previously not offered any kind of reward in exchange for their blood. We can thus learn about the impact of incentives on individuals who chose to donate blood in the absence of compensation. Our data include donation records of these individuals before, during, and after the experiment. The experimental design not only allows us to evaluate how the motivation to donate blood changes i) when incentives are applied, but also ii) for the period after being exposed to incentives. The data on donation behavior before the experiment provides us with a natural measure of how motivated individuals are to donate

[3]This conjecture is associated with Titmuss (1971), who famously argued, "From our study of the private market in blood in the United States, we have concluded that the commercialization of blood donor relationships represses the expression of altruism, erodes the sense of community, [...]" (p. 245).

[4]A second concern is that using incentives may attract at-risk donors. This concern holds great relevance to new donors (Eastlund, 1998; Sanchez et al., 2001; Van der Poel et al., 2002). As our experiment studies the behavioral reactions of previous donors, we focus on the effects of incentives on contributions and refer to the working paper (Goette and Stutzer 2008) for an analysis of the selection issue.

[5]Other reviews and narrative summaries are offered in Bagot et al. (2016), Goette et al. (2010), Lacetera et al. (2013), and Niza et al. (2013).

[6]The criticism of lab experiments by Levitt and List (2007) makes the conditions of our field experiment particularly desirable, as the participants did not know they were involved in a study.

blood in the absence of incentives.

In our key experimental condition, individuals were offered a lottery ticket in return for donating blood over a pre-specified time window. This information was presented on a postcard which came with the standard invitation letter that individuals were used to receive.

A lottery ticket was chosen as a reward as it is nearly as fungible as a monetary payment. We complemented the lottery ticket treatment with three control conditions. In the first condition, individuals were offered a free cholesterol test, which was also communicated to them via a postcard. The cost of the cholesterol test to the SRC was roughly the same as that of the lottery ticket. This condition thus controls for being offered a reward of similar costs, but not fungibility. Moreover, we chose the health domain so that the reward was in the same dimension, in the sense that donors contribute to other people's health. In the second condition, individuals received the standard invitation and an additional postcard, asking them to donate during the same time period as in the two reward conditions. This condition controls for possible effects of the perceived urgency of donating blood (Bruhin et al., 2015; Sun et al., 2016). The third control condition consisted of only the standard invitation letter to establish the baseline donation rate. Importantly, our subjects were not aware that a study was being conducted. The invitation letters were mailed privately to the donors, and donations occurred in the anonymity of a medical center or hospital, so that public image concerns are largely excluded in our experiment (see Lacetera and Macis, 2010, for a demonstration of the relevance of public-image concerns in blood donations). Thus, our experiment can be viewed as a test of psychological crowding theories related to intrinsic motivation or self-signaling (Bénabou and Tirole, 2006).

In a previous paper, we had already shown that the free cholesterol test has no systematic effect on donations during the experiment (Goette et al., 2009).[7] However, the earlier paper focused on the disconnect between attitudes and behavior in the evaluation of free cholesterol testing as a means to encourage donors to donate blood more often. The present study examines the impact of fungible rewards, and the potential interaction between intrinsic and extrinsic

[7] In addition, the earlier paper also reports evidence from a separate experiment testing the effectiveness of the cholesterol test in recruiting "novice" donors who had never given blood before.

motivators in donation behavior. In particular, we examine the impact of the lottery ticket and test whether it affects behavior differently from the other three conditions. In addition, we study the long-term effects of offering material rewards on the probability of donating blood.

The overall picture that emerges from our experiment is that material rewards have no general negative effects, both during the experiment and in the long-term. On the contrary, when looking at the overall experimental outcomes, we find that offering a lottery ticket increases donations by 5.6 percentage points over a baseline donation rate of 46 percent. In contrast, we find no economically and statistically significant effect of the free cholesterol test (as reported in Goette et al., 2009), and the simple appeal to donate on behavior during the experiment.

We also show that the treatment effects vary between subsamples in interesting ways. Our treatment effects are entirely driven by individuals who previously had a low motivation to donate blood. Even though this group has a low baseline donation rate of about 30 percent, offering a lottery ticket increases the probability of donating blood by around 8 percentage points. In contrast, there is essentially no incentive effect on donors who had previously shown a high motivation to donate blood. This pattern suggests that heterogeneity in the motivation for blood donation modulates the impact of incentives.

When we examine different splits of the sample, such as by age, gender, or regularity of the invitation schedule chosen, we find no significant differences in the responses to the treatments between these subsamples. This reinforces our interpretation that differences in the motivation to donate blood are the driving force behind the different responses.

In addition, our design allows us to examine whether the material rewards changed pro-social motivations in the long run by following the donors up to 15 months after the conclusion of the experiment. After the experiment, donations generated from people who were incentivized during the experiment are no lower than those generated from people who received the rewards unexpectedly, and the precision of our estimates allows us to reject even small negative effects.

The findings from our study contribute to the understanding of which operating contexts offer a fruitful ground for applying incentives, and highlight other areas where results across studies are more discordant (Chell et al., 2018). Perhaps surprisingly, the results are consistent with previous evidence pertaining to the use of monetary or near-monetary rewards such as stored-value cards. Lacetera et al. (2012) and Lacetera et al. (2014) show that such rewards reliably lead to higher turnout in blood drives of the American Red Cross (ARC). Importantly, the individuals in these two studies are used to receiving some form of reward.[8] The results from our study population, on which material rewards had not been used before, are very similar.

By contrast, there are large differences in how other forms of rewards affect blood donations. As pointed out, the offer of a free cholesterol test does not have a positive effect on donation rates, both overall and in any of the subpopulations that we examined. This sharply contrasts with the findings in Leipnitz et al. (2018), which uses a difference-in-differences strategy to assess the effectiveness of offering blood screening on donations. They find large positive effects from offering a blood check as a reward.

Furthermore, we find that merely appealing to previous donors to give blood has some positive effect for individuals with a relatively low baseline motivation. Another recent study by Sun et al. (2016) finds strong positive effects of a similar message that was delivered by a text message (rather than postal mail as in our case).

The remainder of this paper is structured as follows. Section II describes the empirical setup of our study, explains the details of the treatments, and offers some descriptive statistics. Section III discusses the behavioral predictions for the different treatments. The section also elaborates on how the standard model, augmented by a dynamic mechanism to allow for habit formation or guilt, can produce long-run responses to temporary incentives. Section IV presents the results of the donation behavior during and after the experimental intervention. Section V offers concluding remarks.

II. The Empirical Setup

We conducted a large-scale field experiment spanning three months during the summer of 2006 in four blood donation centers in the canton of Zurich, Switzerland. The study was conducted

[8]Lacetera et al. (2014) state that "[b]ecause about 40% of ARC drives offer a promotional item, and most flyers show at least one drive with a promotion, the reward offers should not be perceived as unusal" (p. 1111).

in close collaboration with the Zurich Blood Donation Service of the Swiss Red Cross (Stiftung Zürcher Blutspendedienst, henceforth SRC). The subjects participating in the field experiment were individuals registered in the database of the blood donation service.

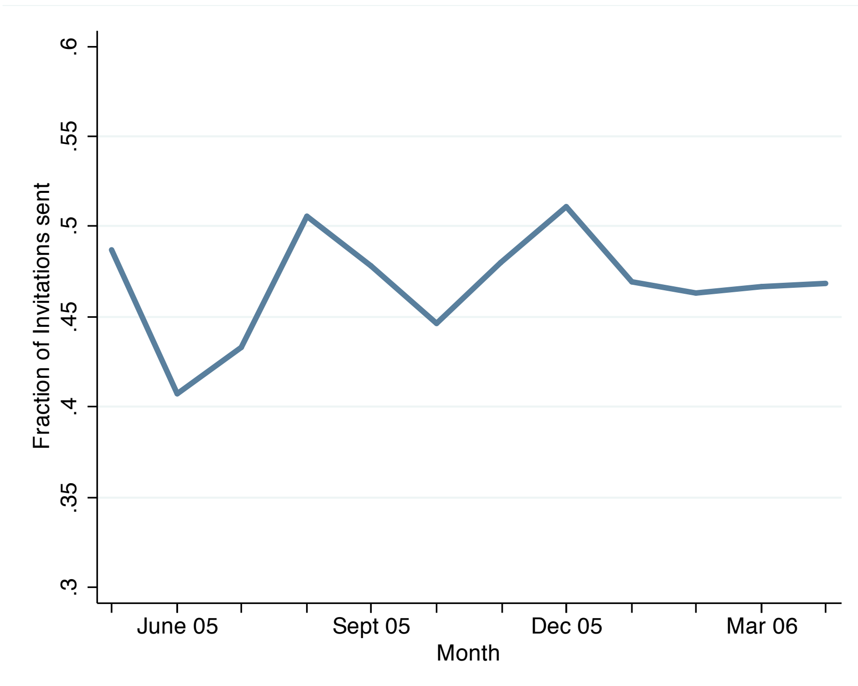
If an individual has previously donated blood in one of the four donation services, he or she is registered in the database of the SRC. The individual is subsequently invited to donate blood again at one of the four donation centers (the center is determined by proximity to the town the individual lives in). The donors are mailed a standard invitation giving a specific date, approximately three weeks prior to the appointment, in order to avoid congestion at the donation center. The SRC starts inviting eligible individuals four months after their last invitation (or longer, if the donors so indicate) and sends these invitations in no particular order. If an individual fails to respond to seven consecutive invitations, the SRC stops sending invitations to them.

Figure 1 graphs the frequency with which the invited blood donors responded to the invitation in the 12 months before the experiment began in May 2006. It shows that the fraction of individuals donating blood subsequent to receiving an invitation is quite volatile, and between 40 and 50 percent in most months.[9] Figure 2 shows the overall donation rate during the experiment. It is 47 percent and thus slightly higher than the average donation rate during the corresponding months one year earlier. The figure also reveals important persistent differences in the motivation to donate blood across donors. Restricted to donors who have received at least four invitations prior to the experiment, we display the fraction of individuals responding to the invitation during the experiment as a function of the number of previous invitations they responded to. The figure shows that of those who followed none of the 4 previous invitations, only about 15 percent donated during the experiment. This fraction increases monotonically to over 80 percent for those who had followed all four previous invitations. This is strongly indicative of heterogeneity between donors, and the figure suggests that the number of previous invitations responded to is a strong predictor of the overall willingness to donate blood during

[9] A few donations are also collected from spontaneous donors. We omit those from the statistics as they are subsequently not part of the experiment.

the experiment. It is important to note that in each group, there is ample room to adjust donations upward or downward. Thus, mechanical "ceiling effects" are unlikely to play a role in our experiment.

Figure 1: Propensity to Donate Blood Following an Invitation Prior to the Field Experiment

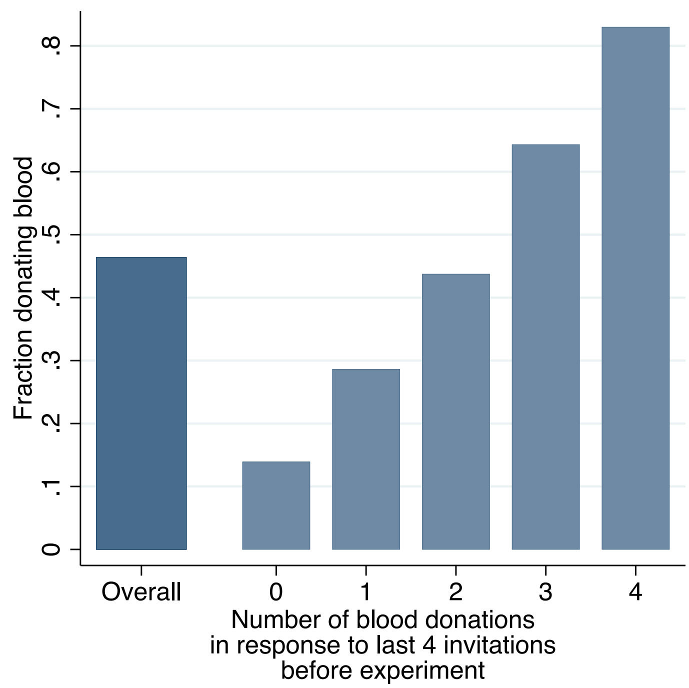


Source: Own calculations based on data from the SRC.

A. Treatments

We implemented four experimental groups. One group served as the control to identify the effects of the control variables and these individuals were invited as usual. The remaining three groups received the standard invitation letter with an additional feature: for each of the three treatments, a postcard was included. The face side of the post card read "This summer, you can make a difference." The reverse side bore a general message as well as one specific to the treatment applied. In all treatments, it was explained that the blood donation service found it difficult to meet demand during the summer, and that this might possibly lead to significant

Figure 2: Propensity to Donate Blood During the Field Experiment



Note: The sample is restricted to the 9,731 donors who have received at least four previous invitations to donate blood.

shortages. In the appeal treatment, the card then stated

> "In order to prevent this, we are particularly relying on your voluntary donation during the summer months. We therefore especially invite you with this call to donate blood.
>
> Many thanks!
>
> Zurich Blood Donation Service SRC"

In the second treatment, in addition to the information provided in the appeal treatment, a free cholesterol test was offered. Specifically, the following sentence was added to the card:

> "In appreciation of your donation, this summer we offer you the opportunity to check your cholesterol level free of charge at the blood donation center."

In the third treatment, the subjects were offered a lottery ticket. The text on the card was supplemented with the following:

> "In appreciation of your donation, this summer you will receive a lottery ticket from the Swiss State Lottery."

The retail value of the cholesterol check was CHF 15 (approx. 12 Euros), while that of the lottery ticket was CHF 5 (approx. 4 Euros). The lottery ticket was low-yield, but with a higher probability of winning (the probability of winning CHF 10 or more was approximately 30 percent).

It was a requirement of the centers' board that all blood donors showing up at a donation center be treated equally. For this reason, we had to implement the second treatments (the cholesterol test) and the third one (the lottery ticket) in different donation centers. As the board was most interested in the effectiveness of the cholesterol test as a retention reward, this particular reward was offered in three centers. The lottery ticket was offered in only one center (the second largest). The equal treatment implies that, upon showing up at the donation center, *all* blood donors were offered, depending on the center, a lottery ticket or a cholesterol test irrespective of whether this was advertised to them in the invitation. Notice also that the baseline and appeal conditions were implemented in each of the centers. The sequence of the treatments was randomized over days; i.e., only one treatment was mailed out per day due to administrative considerations. Thus, the treatment was randomized only within weeks and within donation centers. This constraint has important implications for the randomization of our treatments. It requires us to control for donation center, week, and weekday in the empirical analysis below, and has implications for the correction of standard errors.

B. Descriptive Statistics

In total, our baseline sample comprises 11,320 blood donors who were mailed an invitation during the experiment. Table 1 displays information on the basic demographics, as well as the past donation frequency of the blood donors who were invited during the experiment. The first line in the table shows that the mean age in the sample is about 44 years and approximately 40 percent of the donors are female.

The second line in the table restricts attention to the blood donors who have received at least four previous invitations. This subsample will be used to study heterogeneous treatment effects between frequent and infrequent donors. As can be seen, there are only minor differences between the donors in the base sample and the ones in the subsample: the main difference is that donors in the latter sample are about one year older than the average. Table 1 also shows the frequency with which individuals have donated in response to the last four invitations (or the last four or fewer invitations in the base sample). The average frequency of donations in response to four invitations is 1.97. The standard deviation of 1.55 suggests that there is strong heterogeneity between donors in the probability with which they respond to an invitation. Looking further into heterogeneity in the subsample (not reported in the table), we find that 27 percent have not responded to any of the four previous invitations. About 15 percent have responded once, twice or thrice, respectively, to the past four invitations, and nearly 25 percent have donated each time they were invited to. The subset of donors with at least four previous invitations is our preferred sample, as it allows us to control for heterogeneity in baseline motivation in a parsimonious way.

Turning to the distribution of treatments, Table A2 in the Appendix gives an overview of the number of invitations sent out per treatment overall and by center. A free cholesterol test was offered to about one third of the invited donors. About one tenth received an invitation offering a lottery ticket. As the latter reward was only offered in one of the four donation centers, the lottery ticket experimental group is smaller.

The bottom part of Table 1 provides a randomization check for the observable characteristics. The table shows that there are small differences across treatments with respect to age and previous donations, possibly due to the coarse randomization procedure. In order to examine this observation in more detail, we perform balancing checks for the observable characteristics. As the treatment was randomized within centers and between days, we control for center-specific week effects in these randomization checks. Moreover, the opening hours of the centers differ by

Table 1: Descriptive Statistics

	Age	Gender (female = 1)	Donations following last four invitations	Signed up for fixed interval of inv. (=1)	N
Overall sample					
Full sample	43.52	0.41	–	0.33	11,141
	(14.14)	(0.49)	–	(0.47)	
Sample with at least four previous invitations	44.77	0.39	1.97	0.35	9,731
	(13.87)	(0.49)	(1.55)	(0.48)	
By treatment					
Baseline	44.98	0.40	1.98	0.37	2,973
	(13.73)	(0.49)	(1.54)	(0.48)	
Appeal	45.66	0.40	2.11	0.35	2,224
	(13.84)	(0.49)	(1.54)	(0.48)	
Cholesterol test	44.12	0.38	1.90	0.26	3,544
	(13.96)	(0.49)	(1.56)	(0.44)	
Lottery ticket	44.47	0.38	1.83	0.63	990
	(13.92)	(0.49)	(1.53)	(0.48)	
Balance checks					
Test for full sample (p-value)	0.04	0.59	0.03	0.58	
Overall p-value for all four characteristics	0.19				
Test for sample with at least four previous invitations (p-value)	0.06	0.86	0.07	0.86	
Overall p-value for all four characteristics	0.42				

Notes: Numbers in parentheses are standard deviations. Descriptive statistics by treatment condition are calculated based on the sample with at least four previous invitations. The p-values for balance checks are obtained from seemingly unrelated regression (SUR) model for the four characteristics.

weekday. We therefore also control for center × weekday effects. The randomization check is implemented by estimating a set of seemingly unrelated regressions taking into account the correlation in the residuals across equations when calculating the covariance matrix. The p-values from these regressions are also shown in Table 1. We detect that there are small and marginally statistically significant imbalances with respect to age and previous donations. However, the overall F-test of balance across all four equations, also taking into account cross-correlations in the four characteristics, shows no statistically significant evidence of imbalance. This holds, in particular, for the sample restricted to individuals with four previous invitations for donations. In addition, Table A1 in the Appendix provides the descriptive statistics by treatment across the centers. It reveals that while there are some differences between centers, randomization was also successful within each center.

III. Behavioral Predictions

This section examines the predictions of different theories regarding the response of blood donations to incentives. The predictions concern (i) how individuals respond to material rewards and other kind of incentives in general, (ii) how differential donor motivation moderates the response to incentives during the experiment, and (iii) how the predictions of behavior subsequent to the experiment differ. In the first subsection, we examine different versions of the standard model in economics and explain their predictions concerning the use of incentives to encourage blood donation. Inspired by research in psychology, we also consider alternative theories of "motivational crowding" (Frey, 1997), which suggest that the use of monetary incentives can backfire in a sense to be made precise. In the second subsection, we describe the empirical strategy.

A. Theory

The Baseline Model: We begin by discussing a stripped-down economic model of blood donations. To fix ideas, suppose that the utility from donating blood is given by

$$u_i(d_i) = (v_i - c)d_i \tag{1}$$

where $d_i = 1$ indicates that individual i donates blood and $d_i = 0$ indicates that she does not. The parameter v_i is the individual's benefit from donating blood as derived from altruism or warm-glow (see, e.g., Andreoni, 1990, 2007; Wildman and Hollingsworth, 2009). v_i may differ between individuals reflecting heterogeneity in pro-social motivations. The parameter c is the cost of donating blood as reflected in the time costs and other possible utility costs associated with donating blood. The cost c is random with cumulative distribution function $F_c()$ with support $[0, \bar{c}]$ reflecting that not each day may be equally convenient to donate blood.

In the absence of incentives, the fraction of individuals donating blood is the fraction of individuals for which $c < v_i$. This is given by the fraction $q = \int_0^{\bar{v}} F_c(z)dG(z)$, where $G()$ is the distribution function of v_i. The model naturally predicts an increase in donations as positive incentives are used. Denote the utility from the incentive by m. Then, individuals will donate blood if $c < v_i + m$, and the fraction of individuals donating blood will change by $\Delta q = \int_0^{\bar{v}} (F_c(z+m) - F_c(z))\, dG(z) \geq 0$. The model, as such is silent on what constitutes an incentive. It could be anything that has consumption value for the individual. In our experiment, we offer two types of potential incentives: a lottery ticket and a cholesterol test. As such, it is not clear which of the two is expected to have a stronger impact on behavior, as the utility of the two rewards to the individuals would need to be known.

The model can also be used to derive conditions under which highly motivated donors (deriving a high benefit v from donating blood) respond differently to incentives in a systematic way from donors who are less motivated. As the model makes clear, differences in response to the same incentive are related to the distribution of opportunity costs as well as the benefits from donating blood. Consider the case of a negative correlation between costs and benefits. For example, there are two types of individuals with benefits v and $v' > v$ and the density of the cost function is higher at $f_c(v)$ than at $f_c(v')$. It follows that the change in the probability to donate blood will be higher for individuals of type v, as $F_c(v+m) - F_c(v) = \int_0^m f_c(v+z)dz \geq \int_0^m f_c(v'+z)dz = F_c(v'+m) - F_c(v')$. The reverse holds for the case of a positive correlation between costs and benefits.

Importantly, the standard model also makes the prediction that incentives only affect behavior while they are in place. Once the incentives are removed, donations will return to their baseline level.

Intertemporal Utility Spillovers: This last property, however, need not hold in the presence of intertemporal spillovers on utility. For instance, suppose that the utility from donating blood in period t takes the form

$$u(d_t, d_{t-1}) = \begin{cases} d_t(v - c_t) & \text{if } d_{t-1} = 0 \\ d_t(\alpha v - c_t) & \text{if } d_{t-1} = 1 \end{cases} \tag{2}$$

ignoring possible differences in v across individuals, and assuming an infinitely-lived individual with discount factor $\delta < 1$ between periods. In contrast to equation (1), equation (2) illustrates a case in which past behavior has a direct effect on the utility of donating blood today: if the individual has donated in period $t-1$, the benefit from donating today is αv, while the benefit from donating is v if she has not donated in period $t-1$. Several specifications are possible. Consider first the case where $\alpha < 1$. This corresponds to the case of "guilt-driven" preferences, i.e. the intuition that individuals feel more strongly that they should donate the more time has elapsed since their last donation. This implies that it feels less urgent to donate in the current period if the individual has donated in the last period, with $\alpha < 1$ indicating the "discounted" motivation due to the previous donation.

Consider now the effect of incentives on behavior. As we show in the appendix, if $d_{t-1} = 0$, the individual will find it optimal to donate if

$$c \leq v + m + \delta \left[E(V^1) - E(V^0) \right]$$

where $E(V^1)$ and $E(V^0)$ are the discounted expected lifetime utility starting with $d_t = 1, 0$, respectively, in period $t + 1$. Thus, as before, the individual will be more likely to donate when there is an added incentive to the blood donation. However this donation is going to have an effect on the decision to donate in the next period. In period $t + 1$, the individual has $d_t = 1$ and will donate if

$$c \leq \alpha v + \delta \left[E(V^1) - E(V^0) \right]$$

Thus, if the individual has donated after being exposed to incentives in the last period, she is *less* likely to donate this period since it now feels less urgent to donate blood. In other words, $\alpha < 1$ may lead to a behavior that looks like "intertemporal substitution" in blood donations, leading to a temporary depression in blood donations subsequent to the use of incentives. From a policy perspective, this reaction makes the use of incentives less attractive as it depresses future blood donations.

Now consider the case where $\alpha > 1$. In this case, having donated last period raises the benefit from donating this period. This can be thought of as habit formation in the sense of Stigler and Becker (1977). The temporary use of incentives has a positive effect in the medium run. As the incentives induce more donations, more individuals will have utility $\alpha v > v$ over the next period, and thus will be more likely to donate blood. In this case, the temporary use of incentives may have medium-term benefits.[10] Figure 3 provides a quantitative illustration of the likely magnitude of such effects, calibrated to the baseline donation rate in our sample in each panel. We use a simple example of our model, where for simplicity we choose the costs c to follow a uniform distribution. Panel A displays the results for $\alpha = 2$. The panel shows the

[10] In the context of exercising, Charness and Gneezy (2009) have found that a temporary incentive can have effects on behavior beyond the period during which the incentive is offered.

donation rate at its steady-state value in period $t-1$, and then increased by 10 percentage points in response to a temporary incentive. As we explained, the behavior gradually tends back to its steady-state value from above. One period after the incentive has been removed, donations are still 2.5 percentage points above their steady-state value before slowly converging back to this level. Summing over all five periods after the intervention in t, habit-forming preferences increase blood donations by 3.1 percentage points, rendering the intervention 30 percent more productive in the long-run. In contrast, Panel B of Figure 3 displays the calibrations for the case of guilt-driven preferences with $\alpha = 0.5$, i.e. a case in which donating in the next period feels only half as urgent than if the individual had not donated the period before. As the figure shows, there is a sharp drop by more than 4 percentage points below the steady state in the period after the incentives have been used. Donation rates then oscillate and tend towards the steady state value, leading to a long run loss of 3.1 percentage points in the post-incentives period. In other words, the long-run efficiency of incentives is reduced by roughly 30 percent.

Crowding-Out of Intrinsic Motivation: Research in psychology has shown that when external rewards are given for an activity an individual intrinsically enjoys, this may undermine her intrinsic motivation (Deci and Ryan, 1985; Lepper and Greene, 1978). In terms of our model, this implies that an individual's utility in the absence of incentives is

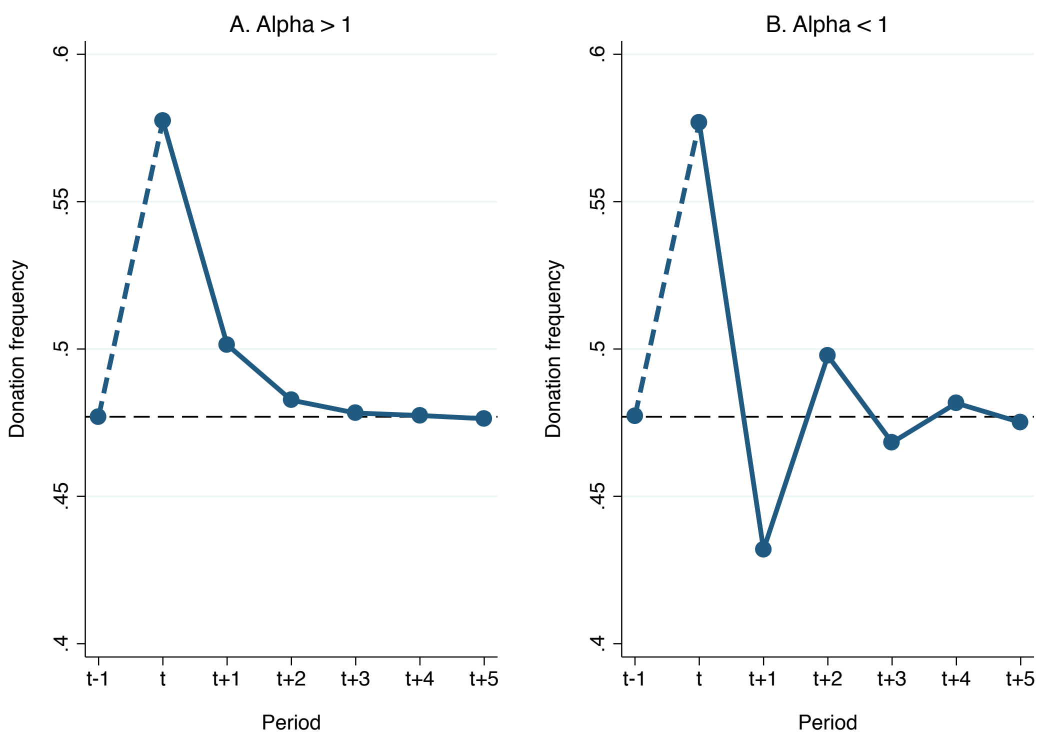
$$u_i(d_t, 0) = (\nu_i h(0) - c)d_t \tag{3}$$

If incentives are introduced, this changes the intrinsic valuation of the activity according to the function $h()$:

$$u_i(d_t, m_t) = (\nu_i h(m_t) + m_t - c)d_t \tag{4}$$

The use of incentives decreases the intrinsic benefit of donating blood, captured by a decreasing

Figure 3: Simulated Donation Patterns with Intertemporal Spillovers in Utility



Notes: Calculations are based on the model details in the appendix. Panel A displays the response to incentives with positive habit formation, where $\alpha = 2$. Panel B displays the case of diminishing utility after a donation, where $\alpha = 0.5$. In both cases, the benefit of donating blood v is calibrated such that it corresponds to the baseline donation rate of 47 percent. The incentive $m = 0.1$ in period t increases donation rates by 10 percentage points. $\delta = 0.99$.

function $h(m)$.[11] As a consequence, the positive relative price effect might be reversed.[12] Overall, the model with intrinsic motivation makes no clear prediction as to how behavior responds when incentives are provided. The sum of intrinsic and extrinsic benefits only increases, and hence the probability to donate blood, if

$$h(0) - h(m_t) < m_t/\nu_i, \tag{5}$$

[11]The evidence in several papers suggests that $h(m)$ may not be differentiable, but rather drops discontinuously as rewards are used (Deci et al., 1999; Gneezy and Rustichini, 2000)

[12]A similar exposition is offered in Frey and Oberholzer-Gee (1997).

is not clear a priori.[13] The model also implies the assertion in the psychological reasoning that those with a particularly high intrinsic benefit from the activity experience the largest drop in motivation, as the drop in the motivation $h(m) - h(0)$ is scaled by ν_i. A higher ν_i thus implies a larger drop in intrinsic motivation. So the theory predicts that highly motivated individuals respond less to incentives than less motivated ones, or even negatively, as equation (5) is more difficult to satisfy for a high ν_i.

Motivation crowing theory makes the prediction that once incentives have been used, intrinsic motivation is reduced or destroyed and will not recover. Thus while individuals choose whether or not to donate blood according to (3) before period t, they will choose whether or not to donate blood after the use of incentives according to

$$u_i(d_s, 0) = (\nu_i h(m_s) - c)d_s \tag{6}$$

with the intrinsic motivation diminished for all future periods $s > t$. Abstracting from other forces, motivation crowing theory unambiguously predicts that donations decrease subsequent to the use of incentives. Importantly, the theory predicts that only *contingent* incentives are expected to crowd out intrinsic motivation (Deci et al., 1999). This is particularly relevant to our setting as all individuals who donated blood received a reward. The emphasis on contingent incentives implies that those people for whom the reward was not announced are understood not to experience an impact on their intrinsic motivation. Therefore, they continue to be the relevant control group.

Summary: The behavioral consequences of incentives are separately modeled here, taking into

[13]This simple model of motivation crowding also captures the essence of richer models based on image concerns. The self-signaling interpretation of the models by Bénabou and Tirole (2006) and Bénabou and Tirole (2011) emphasizes that an individual wishes to see him- or herself as someone who likes contributing to a pro-social activity and who is not mercenary (that is, as someone who has a low marginal utility of money). Thus, in choosing an action, an individual also takes into account what this action signals about his or her character. In this setting, it is possible for incentives to reduce the level of an activity. The reason being that a positive response to such incentives may communicate an individual's positive marginal utility of money and thereby convey a selfish signal to his or her future selves. There are other recent models in economics with a similar flavor whereby behavioral reactions are derived from *public* image motivation (Ariely et al., 2009; Ellingsen and Johannesson, 2008). We do not refer to these models as donations in donation centers can be considered largely private.

account intertemporal spillovers and the possibility of motivation crowding effects. The two forces might potentially affect behavior simultaneously. Due to the natural setting, the theories have to be assessed based on the observed net effects on donation behavior. Ideally, the theories captured in our simple models would make distinct predictions that allow us to discriminate between them when confronted with the empirical evidence. The differences turn out to be rather subtle when the predictions from both models are combined.

Six combinations can be meaningfully discussed between three cases of intertemporal utility spillovers, i.e. $\alpha < 1$ (guilt), $\alpha = 1$ (no intertemporal effects) and $\alpha > 1$ (habit formation), split between whether motivation crowding is effective or not. For each of them, there are predictions of the behavioral consequences during and after the intervention. During the experiment, utility spillovers obviously do not matter and a positive incentive effect is expected when there is no motivation crowding while the effect turns out to be ambiguous if motivation crowding is relevant. After the intervention, predictions for the six cases are as follows: For $\alpha = 1$, donations are at the baseline level with no motivation crowding but below baseline with motivation crowding. If $\alpha < 1$, there is a negative intertemporal spillover effect. With no motivation crowding, the negative effect vanishes over time. With motivation crowding, the negative effect also gets smaller over time but remains negative. In the case of $\alpha > 1$, there is a positive intertemporal spillover effect that decays over time. Combined with motivation crowding, it is ambiguous to determine whether the donation level is above or below the baseline level immediately after the intervention. However, any positive effect is decreasing and turns into a negative effect over time. An overview of the predictions is presented in Table 2.

In addition to the listed predictions for the overall effects before and after the intervention, there are differential predictions for more or less motivated donors. During as well as after the provision of incentives, relatively worse outcomes are expected for the more motivated donors if motivation crowding plays a role. However, this same prediction is also consistent with the costs and benefits of donating blood being negatively correlated. A negative correlation might not be expected a priori though as pro-social behavior is often observed to be positively correlated with the level of education and thus with the opportunity costs of time. While this argument

Table 2: Summary of the Behavioral Predictions

			Intertemporal utility spillovers		
			$\alpha < 1$ (Guilt)	$\alpha = 1$	$\alpha > 1$ (Habit formation)
Motivation crowding out	No	During experiment	Homogenous increase of donations across donors		
		After experiment	Decreasing negative effects	No effect	Decreasing positive effects
	Yes	During experiment	Ambiguous effect on the level of blood donations Relatively less effective for highly motivated donors		
		After experiment	Decreasing negative effects with remaining negative level effect	Negative level effect	Decreasing positive effects (or increasing negative effects) turning into a negative level effect

suggests a positive rather than a negative correlation, we cannot assess whether the respective relationship also holds in our context. The unobserved heterogeneity in costs and benefits from donating blood thus impedes the interpretation of differential consequences of groups of donors solely in terms of motivation crowding theory. Of course, we still learn about the behavioral reactions of different groups.

B. *Empirical Strategy*

For the outcome during the experiment, we model the probability of donating blood as

$$\Pr(d_i = 1) = \Pr(T'_{ct}\gamma + x'_i\beta + \delta_c(t) + \omega_c(t) + \epsilon_i > 0) \tag{7}$$

where T_{ct} is a vector of binary variables, indicating the treatment that was mailed out by center c on date t. We naturally choose the condition referring to the mailings of the standard invitation letters as our control condition. The vector γ contains the associated coefficients, indicating how the different treatments affect the index function that determines the probability to donate blood. The vector x_i contains individual-level control variables with coefficients β. In our core specification, x_i also contains our measure of past donation intensity, which indicates the number of times the individual showed up to donate blood out of the four previous invitations . For this measure to be comparable across individuals, an individual needs to have received at least four invitations prior to the experiment. We thus restrict the sample to individuals who fulfill this criteria. We also estimate a set of center-specific weekday effects $\delta_c(t)$, since the different centers have different opening hours. Finally, we estimate center-specific week fixed effects $\omega_c(t)$. With these center fixed effects in place, the treatment effects are thus identified from within-center variation in treatment conditions within a week. This safeguards against identifying effects based on differences across centers, since not all the treatments were implemented in every center. We assume that ϵ_i follows a logistic distribution and estimate a logit model by maximum likelihood. For the most part, we calculate the marginal effects $\frac{\partial \Pr(d_i=1)}{\partial z_i}$ and report those rather than the coefficient estimates of the index function. As we explained in the previous subsection, the experiment is randomized at the day × center level. We therefore follow the recommendation to cluster the standard errors at the level of randomization (Abadie et al., 2017).

In order to examine how the response to the experiment depends on the individual's prior frequency of donation, we estimate equation (7) separately for two groups of individuals: those having donated zero, one or two times in response to the last four invitations, and those having donated three or four times in response to the last four invitations.

We analyse the effects of the treatments on blood donations after the experiment was concluded by estimating an equation of the form

$$d_i^k = T_{ct}'\gamma^k + x_i'\beta^k + \delta_c^k(t) + \omega_c^k(t) + \epsilon_i^k \tag{8}$$

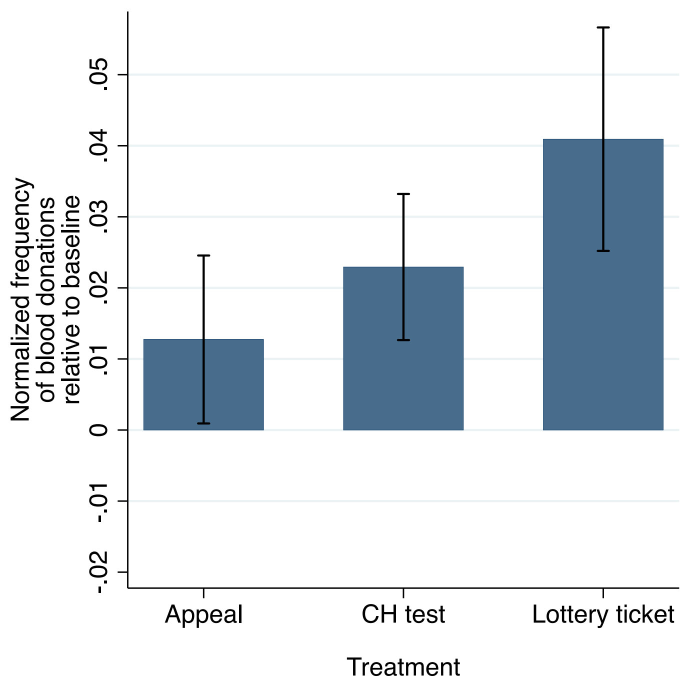
where d_i^k indicates the number of blood donations in the k months after the experiment had concluded. Unlike the experimental period, we are not able to condition on who received an invitation for the post-experimental period, so we simply count the number of times that the individual donated blood. We estimate equation (8) for five time horizons of $k = 3, 6, 9, 12$ and 15 months after the experiment. We estimate the equations by OLS and again cluster at the level of the randomization (date of the original invitation to the experiment at the particular center). As a robustness check, we repeated the analysis using poisson regressions, and reached the same conclusions. The results are available upon request.

IV. Results

A. Response During the Experiment

Overall Treatment Effects: Figure 4 offers a first descriptive presentation of the outcomes in the different experimental conditions. It shows the differences in donation rates between an intervention treatment and the baseline treatment in which the standard invitation was sent out. In our analysis, the outcome variable is normalized by donation center × donor type mean values and the standard errors are displayed as vertical lines around the differences in donation rates. The figure reveals a moderate increase of 1.3 percentage points in the donation rate when the appeal alone is sent out to donors, with the standard error indicating that the difference to the baseline invitation is likely not statistically significant. Turning to the two rewards used in the experiment, the results show an increase of 2.3 percentage points in the donation rate when a free cholesterol test is offered to donors. For the lottery ticket, the descriptive evidence suggests that it raises donation rates quite substantially by approximately 4 percentage points, and that the effect is likely statistically significant.

Figure 4: Descriptive Evidence of the Overall Treatment Effects



Notes: The outcome variable is normalized by donation center × donor type mean values. Treatment effects are calculated relative to the outcomes with standard invitation. The vertical lines indicate the standard errors of the differences. The sample is restricted to the 9,731 donors who have received at least four previous invitations to donate blood. "Appeal" indicates that a special card was added to the invitation, calling subjects up to donate. "CH test" means that together with the card, subjects were offered a free cholesterol (CH) test if they showed up."Lottery ticket" refers to cards on which a lottery ticket was offered to donors.

As the experiment is only randomized within centers across days, the averages across periods may overstate the precision with which the differences across treatments are measured. In order to provide a formal statistical test, we estimate equation (7) in three versions. In the first column of Table 3, we only include the controls ensuring randomization (but do not take into account donor type). We add demographic controls in the second column, and finally constrain the sample to the individuals who have received at least four previous invitations in the third column. The first and the second estimation are thus for the full sample, while the third estimation is restricted to donors with a known donor history. As in the figure above, the reference condition is the standard invitation. Differences in the number of observations across estimations arise due to the dropping of observations if information on the control variables is missing or due to perfect prediction in the logit models.

The results in the table show that the statistical precision is increased once we condition on previous donations and the center-level controls required by the level of randomization. Our preferred specification is presented in the third column of Table 3, with all the controls in place. While the point estimates are similar across all specifications, the third column offers the best statistical power.

Turning to the key treatment of interest, we find that the lottery ticket significantly increases blood donations. The point estimate is comparable across the specifications, and statistically significant at the 5 percent level in our preferred specification, i.e. the third column. The effect size of 5.6 percentage points is considerable given that the baseline donation rate is approximately 50 percent. However, the lottery ticket reward was combined with an appeal to donate. We can control for this by comparing the effect of the lottery ticket to the appeal treatment as both treatments contained the same message. As can be seen in the table, the appeal treatment is not statistically significant in any of the specifications. In column (3), its point estimate is near 1 percentage point and with the added precision of the controls, we are able to reject the hypothesis that the lottery ticket and the appeal have the same effect ($p = 0.05$, see the bottom panel of the table). The cholesterol test always has a small positive point estimate going up to 1.7 percentage points. However, in this specification, it is neither statistically significant, nor statistically distinguishable from the effect of the lottery ticket.

Table 3: Overall Treatment Effects on Blood Donations
Dependent variable: Solicitation resulted in blood donation (=1)
Marginal effects from logit models

Appeal	0.031	0.026	0.008
	(0.022)	(0.022)	(0.015)
Cholesterol test	0.008	0.012	0.017
	(0.022)	(0.021)	(0.017)
Lottery ticket	0.041*	0.048**	0.056**
	(0.025)	(0.022)	(0.024)
Control variables			
Gender (female = 1)		–0.039***	–0.025*
		(0.012)	(0.015)
No. prev. inv. followed			
1 out of 4			0.251***
			(0.019)
2 out of 4			0.376***
			(0.016)
3 out of 4			0.499***
			(0.012)
4 out of 4			0.639***
			(0.010)
Mean donation rate in invitation-only group	0.447	0.447	0.459
Differences between treatments			
Lottery ticket vs. ... (p-values)			
Appeal	0.705	0.357	0.049
Cholesterol test	0.294	0.201	0.159
Other controls?	No	Yes	Yes
Received at least 4 previous invitations	No	No	Yes
Pseudo-R^2	0.019	0.101	0.262
N	11,319	11,319	9,723

Notes: All specifications include a full set of dummy variables for donation center × week and donation center × weekday. Other controls include a full set of dummy variables indicating the periodicity of invitations as required by the donors. Baseline treatment is the standard invitation. "Appeal" indicates that a special card was added to the invitation, calling subjects up to donate. "Cholesterol test" means that together with the card, subjects were offered a free cholesterol test if they showed up. "Lottery ticket" refers to cards on which a lottery ticket was offered to donors.

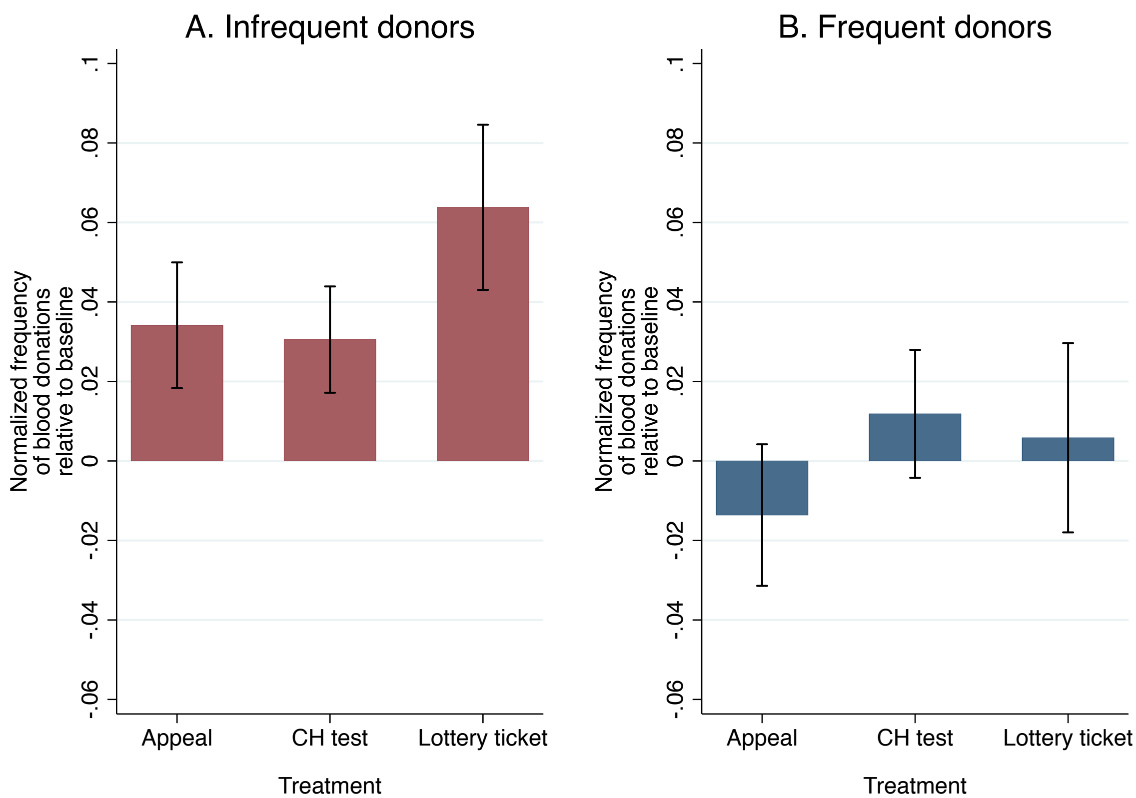
Overall, the only treatment that significantly increases blood donations is the lottery ticket. Thus far, this result is consistent with either model described above, the standard model in economics and the alternative on motivation crowding.

Differential Treatment Effects by Donor Motivation: In order to discriminate between different theories, we explore the respective predictions in greater detail. In particular, the theory of motivation crowding predicts that highly motivated donors are negatively affected by the use of incentives to a larger extent. We use our measure of previous donations in response to the last four invitations as an indicator of donor motivation. We group donors into frequent and infrequent donors, depending on whether they responded to at least three of the previous four invitations. The treatment effects, based on the same normalizations as in Figure 2, are displayed for the two groups in Figure 5. The figure suggests a clear qualitative difference in how frequent and infrequent donors respond to the experiment. Frequent donors seem to be more or less unmoved by any of the treatments. If anything, the appeal appears to reduce turnout among frequent donors.

In contrast, the treatment effects displayed in panel A of the figure suggests more sensitivity to the experimental treatments by infrequent donors. They seem somewhat more likely to donate even when receiving the appeal alone. The point estimates of the treatment effects of the appeal and the cholesterol test are both around 3 percentage points. Interestingly, the lottery ticket evokes an even larger response and donation rates increase by around 6 percentage points. Given that the mean donation rate for the less motivated donors is only about 26 percent, this represents a large increase in relative terms.

We provide a formal statistical test in Table 4. The test confirms the visual inspection from the graph, and provides marginal effects together with the correct standard errors. Turning first to the infrequent donors, the results show a strong increase in the donation rate in response to the lottery ticket: with all the controls in place, we estimate that donation rates increase by approximately 8 percentage points for this first group of donors. The estimations also reveal that the cholesterol test has a comparatively small effect of around 2 percentage points on blood donations, whereby the hypothesis of no effect cannot be statistically rejected (see also Goette

Figure 5: Treatment Effects by Frequency of Prior Donations



Note: See Figure 4.

et al., 2009). A statistical test also reveals that the lottery ticket works significantly better than the cholesterol test, and also somewhat better than an appeal alone, even though the appeal has a positive effect of nearly 4 percentage points on donations.

Compare this to the results we find for frequent donors in the third and fourth columns of Table 4. As the figure indicates, there is no significant response to either of the reward treatments, i.e. free cholesterol test or lottery ticket. All the point estimates are small, and, for the lottery ticket, negative, albeit not statistically significant. If anything, the appeal alone seems to marginally decrease the chance of donating blood. While we reject the hypothesis of no effect of the treatments on infrequent donors ($p \leq 0.01$ in both specifications), we cannot

Table 4: Treatment Effects for Frequent and Infrequent Donors
Dependent variable: Solicitation resulted in blood donation (=1)
Marginal effects from logit models

	Infrequent donors		Frequent donors	
Appeal	0.039**	0.037**	–0.032*	–0.036**
	(0.020)	(0.014)	(0.016)	(0.017)
Cholesterol test	0.026	0.023	0.000	0.002
	(0.019)	(0.015)	(0.018)	(0.018)
Lottery ticket	0.077***	0.082***	–0.035	–0.013
	(0.027)	(0.023)	(0.037)	(0.034)
Control variables				
Gender (female =1)		–0.015		–0.021
		(0.013)		(0.017)
No. prev. inv. followed				
1 out of 4		0.201***		
		(0.021)		
2 out of 4		0.331***		
		(0.023)		
4 out of 4				–0.153***
				(0.013)
Mean donation rate in invitation-only group	0.245	0.245	0.761	0.761
Differences between treatments				
Lottery ticket vs. ... (p-values)				
Appeal	0.084	0.028	0.467	0.252
Cholesterol test	0.058	0.015	0.180	0.336
Different response to treatments?	$p < 0.008^a$	$p < 0.003^b$		
Other controls?	No	Yes	No	Yes
Pseudo-R^2	0.026	0.114	0.030	0.092
N	5,647	5,647	4,079	4,072

Notes: See Table 3. [a] $\chi^2(3)$-test for equality of treatment effects in the first and the third column. [b] $\chi^2(3)$-test for equality of treatment effects in the second and fourth column.

reject non-response to any treatment at conventional significance levels for frequent donors ($p \approx 0.08$ in the third and fourth column). Importantly, we can also test whether the responses to the treatments in the two subgroups of donors are identical by comparing the estimated coefficients. We clearly reject that they are the same ($p < 0.01$ in either case). Thus, intrinsic donor motivation, measured by previous donation rates, modulates the response to the experiment.

Treatment Effects for Alternative Sample Splits: In order to interpret the latter results as donor motivation moderating the response to the experiment, we need to rule out that other factors, that may be correlated with the frequency of donation, explain the heterogeneity in the response to the experiment. Donation frequency may be correlated with age, gender and whether or not the individual has signed up for scheduled invitations. We address concerns that each of these factors could, in fact, moderate the response to the experiment rather than the intensity of past donations.

We approach the issue empirically by estimating equation (7) with all the control variables included for three alternative splits of the sample. Table 5 presents the results. We begin by examining whether men and women respond differently to the rewards. Since women react somewhat less often to invitations, the difference being around 3 percentage points according to Table 3, it could be that women respond more strongly to rewards. The first two columns of Table 5 display the result that no such general tendency is observed.[14] While the point estimates for the treatment effects in the women sample seem larger for the appeal and the cholesterol test, there is almost no difference for the lottery ticket. However, the large standard errors of the treatment effects prevent us from drawing strong conclusions. A formal test of the equality of the treatment coefficients for men and women cannot be rejected. Next, we examine whether age moderates the differences in the response to the treatment. Age is positively correlated with the response behavior to invitations, and it is possible that young donors show a stronger response to the appeal and the rewards than elder donors, as marginal costs might hinder many to donate. The third and fourth column of Table 5 display the results for the two age groups obtained by

[14] Mellström and Johannesson (2008) find gender differences in the response to incentives for blood donations in a setting in which image motivation is relevant. In other research on motivational crowding, no systematic gender differences are observed (Deci et al., 1999).

a split at the median age of 45. It shows that the point estimates of the treatment effects are indeed larger for the young than for the old donors. However, a statistical test again cannot reject the null of no difference in treatment effects between the two groups. Finally, we split the sample by whether or not an individual has signed up to receive invitations by some periodicity. Individuals who have signed up for regular invitations tend to donate somewhat more often, though not much (as they can, for instance, also sign up to receive only one invitation per year). Perhaps the heterogeneity in the response comes from one set of donors being rather rigid about blood donations (those who sign up for scheduled invitations) and the other set being more flexible. The fifth and the sixth column of Table 5 present the results. Again, there is no statistically discernible difference in the response to the four treatments, which is indicated by the high p-value of a formal test of the null of no treatment differences between the two groups.

To summarize, none of the alternative explanations for why previous response intensity moderates the reaction to the experiment can be supported with the data.

Theoretical Interpretation of the Findings: Having set these alternative explanation aside, we conclude that it is individual differences in the motivation to donate blood that create the differential response to the experiment. However, which model do the results from this subsection support? Motivational crowding predicts that individuals with high intrinsic motivation experience the strongest drop in this motivation if extrinsic incentives are used. On the one hand, this is consistent with the result that infrequent donors respond strongly and positively to the extrinsic incentive (the lottery ticket), while there is a net zero effect on the highly motivated donors. Thereby the latter net effect can be understood as the result of some of their intrinsic motivation being destroyed and simultaneously being countered by the incentive effect of the lottery ticket. On the other hand, the results are also consistent with a standard model in economics and a situation in which the distribution of marginal costs has more density at the motivation levels of the marginal infrequent than the marginal frequent donors.

Table 5: Treatment Effects in Different Subsamples
Dependent variable: Solicitation resulted in blood donation (=1)
Marginal effects from logit models

	Gender		Age		Fixed interval inv.	
	Female	Male	Young	Old	No	Yes
Appeal	0.022	–0.005	0.015	–0.004	0.003	0.011
	(0.029)	(0.025)	(0.023)	(0.025)	(0.025)	(0.031)
Cholesterol test	0.026	0.003	0.037	–0.009	0.032	–0.026
	(0.029)	(0.025)	(0.023)	(0.025)	(0.023)	(0.034)
Lottery ticket	0.049	0.060	0.063	0.034	0.041	0.053
	(0.052)	(0.043)	(0.042)	(0.042)	(0.060)	(0.041)
Control variables						
Gender (female = 1)			–0.020	–0.027	–0.047***	–0.015
			(0.016)	(0.018)	(0.018)	(0.022)
No. prev. inv. followed						
1 out of 4	0.250***	0.250***	0.239***	0.198***	0.261***	0.237***
	(0.032)	(0.024)	(0.027)	(0.023)	(0.025)	(0.058)
2 out of 4	0.375***	0.372***	0.381***	0.296***	0.388***	0.354***
	(0.027)	(0.019)	(0.025)	(0.017)	(0.020)	(0.120)
3 out of 4	??	0.372?***				**
	(0.022)	(0.015)	(0.021)	(0.016)	(0.018)	(0.187)
4 out of 4	0.638***	0.643***	0.656***	0.596***	0.667***	0.587**
	(0.017)	(0.013)	(0.016)	(0.015)	(0.014)	(0.227)
Mean donation rate in invitation-only group	0.390	0.506	0.309	0.598	0.443	0.519
Diff. response to treatm.?	$p = 0.86$		$p = 0.53$		$p = 0.44$	
Pseudo-R^2	0.251	0.270	0.219	0.223	0.279	0.244
N	3,792	5,931	4,782	4,940	6,296	3,433

Notes: See Table 3. The age cutoff is 45. The specifications for gender, age and individuals signed up for a fixed interval of invitations include controls for the required periodicity of invitations.

The models only make distinctive predictions for donations after the incentives are removed. Motivational crowding theory predicts that motivation is destroyed long-term and implies lower donation rates after the use of incentives. The standard model may also predict post-intervention effects if preferences for blood donation are habit-forming, or guilt-driven, as we explained in the previous section. However, these responses (a decreasing positive response in the case of habit formation, and a decreasing negative effect in the case of guilt) are qualitatively in sharp contrast with the predictions of the motivation crowding model which suggest negative treatment effects in the longer term, independent of the intertemporal utility spillovers. We turn to an empirical test of these implications in the next subsection.

B. Response After the Experiment

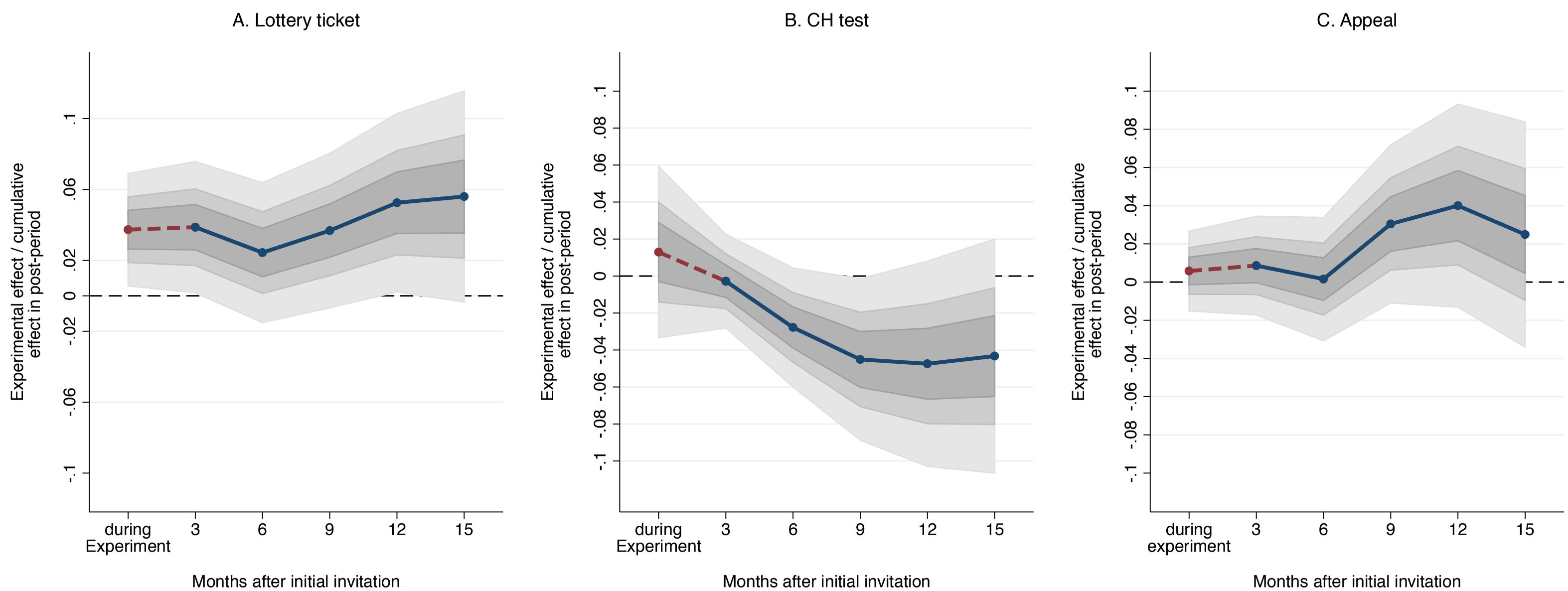
Average Effects: In order to examine the response to the treatments after the experiment, we estimate linear regressions for the number of donations three, six, nine, twelve and fifteen months after the experiment, as specified in equation (8). The estimated coefficients are presented in Table A3. In order to gain a more intuitive impression of the cumulative changes in the number of donations for a given time window, we have also plotted the estimates in Figure 6 for each of the treatments separately. The first observation in each of the panels is the estimated change in the probability to donate, for comparability also estimated using OLS, based on the specification in the third column in Table 3. Around the point estimates, we display the 50, 75 and 95 percent confidence intervals of the estimates.

Our main interest is to examine whether the use of incentives decreased blood donations subsequent to the experiment, and whether this effect is temporary (due to intertemporal utility spillovers) or permanent (as in the motivational-crowding model). Looking at the overall results, there is no evidence that blood donations decrease subsequent to the offering of rewards. In particular, in the case of the lottery ticket (panel A in Figure 6), the point estimates are positive. The 95% confidence interval shows that we can reject even small decreases in donations following the first-time use of incentives. If anything, the graph is mildly suggestive of habit-forming preferences as modeled and illustrated in Figure 3, with a positive effect slowly vanishing. However, apart from being able to reject small negative effects, we do not have enough precision to take a strong stance on whether preferences for blood donations are habit forming. Panels B and C in Figure 6 display the changes in donations subsequent to the intervention involving a free cholesterol test or an appeal. There are no statistically significant effects observed, with the null effect within the 95-percent confidence interval, for both of them. Taken together, the overall evaluation of the blood donations up to 15 months after the experiment shows no statistically significant effects, but with positive point estimates for the lottery ticket and rather small negative ones for the cholesterol test. The evidence thus does not support the worrisome predictions of the motivation crowding model for blood donations.

Differential Treatment Effects by Donor Motivation: As before, we split the sample by the motivation to donate blood as measured based on behavior prior to the experiment, and estimate equation (8) for the two groups of donors. The results are reported in Tables A4 and A5 and displayed in Figures 7, 8 and 9. Formal tests comparing the two sets of estimates fail to reject the null that they are identical for any of the time windows. Thus, we find no statistically significant differences in the behavior of the individuals after the intervention from the different treatments, in contrast to what we find during the experiment.

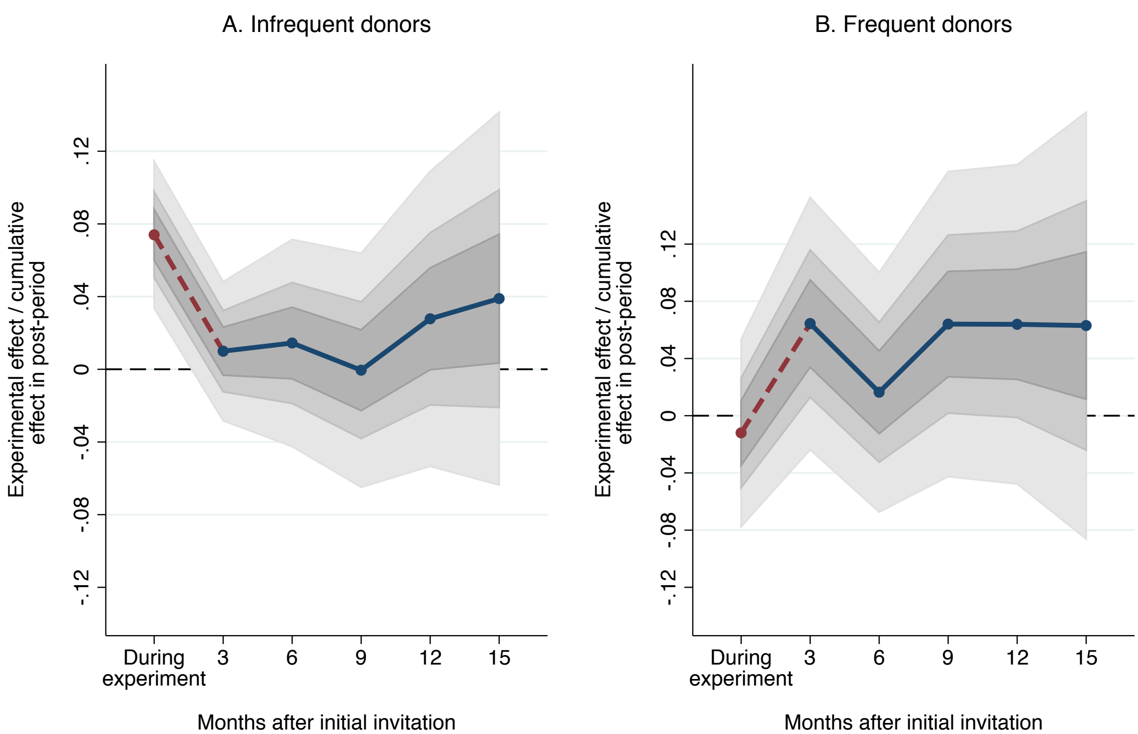
Theoretical Interpretation of the Findings: Overall, the evidence favors the standard model in economics. While we find that previous donor motivation moderates the response to the experiment, as predicted by the motivation crowding model, this result is also consistent with a standard model of preference heterogeneity. Furthermore, the behavioral pattern in donations subsequent to the experiment offers no systematic evidence for the predictions of the motivation crowding model. Our best interpretation is that the qualitative features resemble most those of a model with habit formation.

Figure 6: Long-run Effects of the Experimental Interventions



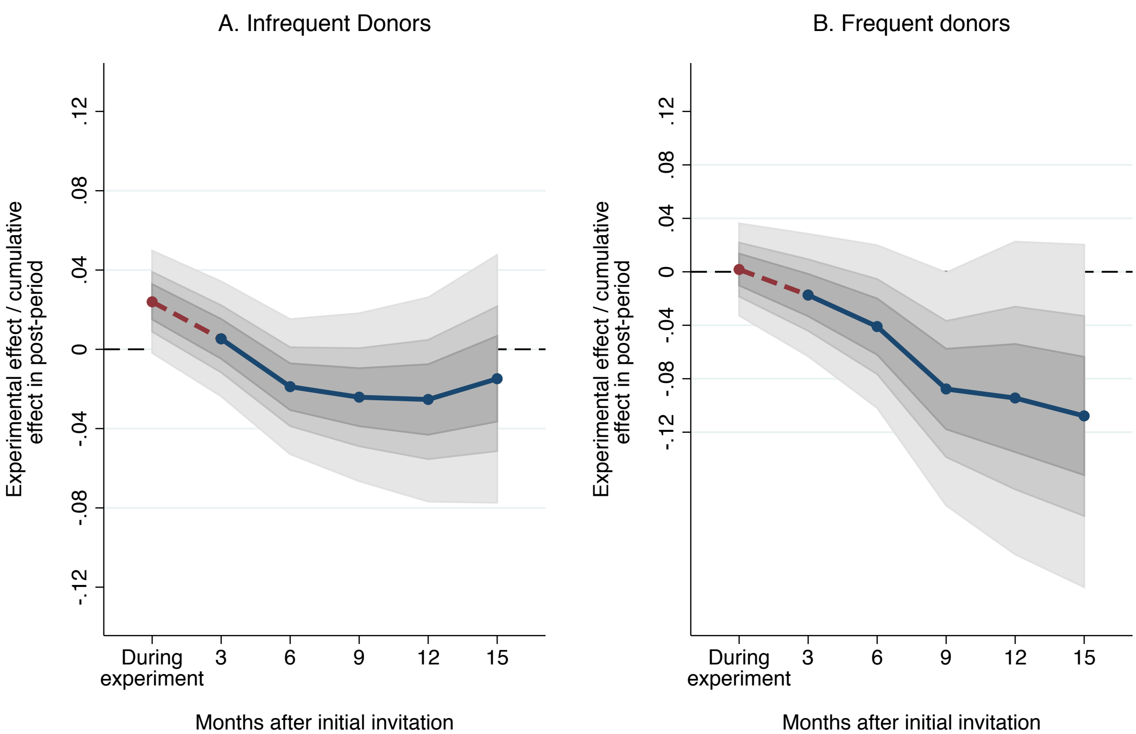
Notes: The three panels display the impact on the cumulative number of donations (relative to the main control treatment) estimated by OLS. The numbers are calculated based on the regressions in Table A3 in the Appendix for the number of blood donations following k months after the experiment. The shaded regions display the 50, 75 and 95 percent confidence intervals in decreasing shading, respectively. The sample includes only donors who have received at least four previous invitations to donate blood.

Figure 7: Long-run Effects of the Lottery Ticket by Frequency of Prior Donations



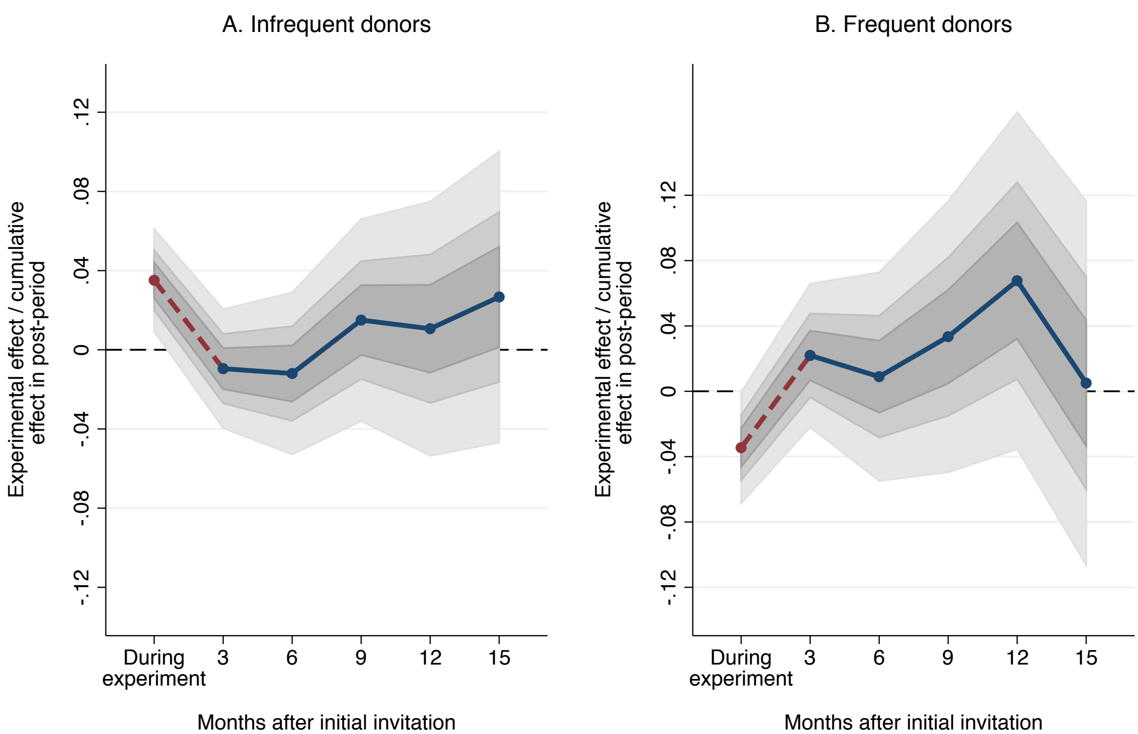
Notes: See Figure 6. The cumulative effects on donations and their confidence intervals are calculated based on the estimates in Tables A4 and A5 in the Appendix.

Figure 8: Long-run Effects of the Cholesterol Test by Frequency of Prior Donations



Notes: See Figure 6. The cumulative effects on donations and their confidence intervals are calculated based on the estimates in Tables A4 and A5 in the Appendix.

Figure 9: Long-run Effects of the Appeal by Frequency of Prior Donations



Notes: See Figure 6. The cumulative effects on donations and their confidence intervals are calculated based on the estimates in Tables A4 and A5 in the Appendix.

V. Concluding Remarks

Whether material rewards are an effective means to increase pro-social behavior is highly controversial. Our study offers evidence from a large-scale field experiment in the context of blood donation, which is often considered prototypical of an intrinsically motivated voluntary behavior. Before we put our study into perspective and briefly discuss its implications and limitations in the context of blood donations, we attempt to precisely summarize our analysis in relation to the general academic debate.

A. Summary of the Experiment

Do private incentives in the form of material rewards offer an (extrinsic) motivation to donate blood or do they crowd out intrinsic motivation to do so, as predicted by theories of intrinsic motivation (Deci and Ryan, 1985; Frey, 1997; Gneezy et al., 2011)? To address this question, in the key experimental condition of our study, individuals were offered a lottery ticket if they donate during the summer months (often plagued by a shortage of blood). Compared to individuals in the control condition who only received the standard invitation to donate (without any mention of the shortage), we find that the lottery ticket significantly increased blood donations. Individuals in the lottery ticket condition have a 5.6 percentage points higher probability of donating over a baseline probability of 46 percent in the control condition.

The announcement of the lottery was combined with the message that blood supply was expected to run low. For this reason, an additional control for the effect of the pure information about a possible shortage was implemented (similar to Sun et al., 2016). In this condition, the standard invitation was combined with a message about the special need during summer presented in the exact same way as in the main reward treatment. As offering a tangible material reward might also be seen as a form of costly signaling, we control for this interpretation in another condition in which individuals were offered a free (non-transferable) cholesterol test. We find that neither an appeal nor the offer of a cholesterol test raises the propensity to donate.[15]

While our main findings are consistent with the standard model in economics, they are also consistent with motivational crowding (with the relative price effect mitigating the impact from motivational crowing out). Crucially, our setup allowed us to probe deeper into the underlying behavioral mechanisms for three reasons. First, donors were previously not offered rewards in return for their blood donation. Thus, using incentives on this population has the largest possible effect on intrinsic motivation. Second, the rewards were announced to the donors privately, and

[15]The result that specific material rewards are ineffective in raising donation rates is not uncommon. For instance, the offer of a free t-shirt was ineffective in Reich et al. (2006). However, the ineffectiveness of a reward in the heath domain, i.e. in the same domain as the pro-social activity, might come as a surprise. Indeed, in related research, offering a comprehensive blood check turned out effective in motivating blood donations (Leipnitz et al., 2018).

blood donations took place in the relative anonymity of a medical center. This makes it unlikely that the use of incentives creates an image concern as in Bénabou and Tirole (2006) and Ariely et al. (2009). Third, in our experiment, all donors were treated the same way at the donation center. That is, even donors who received the control (or appeal) invitation received a lottery ticket. However, to them, the lottery ticket was an unexpected gift rather than an incentive. This allows us to examine how the *contingency* of the lottery ticket affects subsequent motivation, exactly as in the experiments in social psychology (Deci et al., 1999).

Theories of intrinsic motivation make two clear predictions with respect to crowding out: first, they predict that highly motivated donors experience stronger crowding out effects than donors with lower baseline motivation. Second, they predict that intrinsic motivation will remain lower subsequent to the use of incentives. Our data allow tests of both predictions. We use the responsiveness to invitations prior to the experiment as our measure of intrinsic motivation. Individuals who rarely responded (low baseline motivation) reacted very strongly to the treatments. Offering a lottery ticket increased their probability to donate blood by 8 percentage points over a baseline probability of 30 percent. There is also a significantly positive, but smaller, response to the appeal condition, whereas the free cholesterol test is ineffective. In both cases, the lottery ticket condition has a significantly stronger effect on the probability to donate blood than the appeal and free cholesterol test conditions.

In contrast, individuals with a high baseline motivation did not respond to either the lottery ticket or the cholesterol test as a reward. If anything, they respond negatively to being sent an appeal, compared to the control condition of a standard invitation.

We also followed the donation frequency of our experimental population up to 15 months after the experiment. For this period, the SRC returned to their previous regime of not offering any rewards for blood donations. We do not find any materially significant evidence of crowding out of intrinsic motivation through material rewards. The precision of our estimates is sufficient to reject even small negative effects. Our setup allows us to follow almost identical identification strategy as the lab experiments (no experience with incentives for blood donations, all individuals receive reward after donating, but only one group was offered the incentive as a contingency).

We do not find a pattern indicating a lower motivation after having been offered a contingent reward. The results also do not suggest any obvious pattern of intertemporal substitution that would follow from a standard economic model, and offer only weak and statistically insignificant hint at habit formation. This latter interpretation, however, should be taken with a grain of salt. The ideal setting to test for intertemporal substitution is one in which an incentive is applied to one group, while the other group is not treated in any way. While it is true that the control group received no incentive during the experiment, the donors did receive a gift after the donation, which may have had an effect on their subsequent motivation. While we doubt that this effect would be large, the lack of a "control of the control" that is completely untouched does not allow us to draw strong conclusions with regard to intertemporal substitution or habit formation.

B. Implications and Limitations

Overall, our results suggest that selective incentives and pro-social motivations may coexist even in domains that heavily rely on people's intrinsic motivation *and* in which usually rewards are not offered for voluntary contributions. Thus, in light of the recurring seasonal shortages and a steady tightening of donor criteria, material rewards may prove useful to motivate past donors to donate more blood. This finding complements previous evidence that material rewards are effective in increasing donations in the short-term in the context where rewards have become common (Lacetera et al., 2012, 2014). Our results should not, however, be construed as evidence that instituting a permanent regime of monetary incentives would have positive effects on the level of blood donations. Money may not be perceived the same way as the lottery tickets in our experiment. Moreover, there was essentially no public image concern, as in Bénabou and Tirole (2006), so an important channel by which incentives may become ineffective for the specific population of donors was shut out. Furthermore, a switch to a regime offering rewards on a permanent basis may also be interpreted by donors as evidence that the donation service is not altruistic, and may trigger effects along the line described in Ellingsen and Johannesson (2008).

However, while our evidence suggests that incentives can be used as a stop-gap measure when shortages occur, further research is needed to address how permanently switching to reward schemes affects the pro-social motivation of blood donors. Neither our results nor that of others (e.g. Lacetera et al., 2014) should be taken as evidence that a policy shift from an all-volunteer system would be desirable. Such a shift may well induce changes in the composition of the individuals willing to donate.

Furthermore, the fact that incentives are not harmful does not imply that they are the most effective policy choice. Other mechanisms to stimulate blood donations in situations of shortages may be more cost effective. For instance, Bruhin et al. (2015) show that a phone call, aimed at overcoming shortages in particular blood types, is a highly effective tool to increase turnout. They show that the phone call increases turnout by 10 percentage points uniformly in the population of donors. The comparison is particularly interesting, as the recipients of the phone call were individuals registered with the same blood donation service as in our study. The much larger overall effect compared to our lottery ticket is striking, and suggests that the phone call taps into different motivations. Further research is needed to delve into the types of policy interventions which are relatively more effective in the context of blood donations. This may help to develop a common framework to also understand problems of recruitment (see, e.g., Iajya et al., 2013; Stutzer et al., 2011), retention of first time donors (see, e.g., Bagot et al., 2016), as well as the retention of long-term donors (see, e.g., Chell et al., 2018).

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A Appendix

A. An Illustrative Model of Blood Donations

Suppose that an individual's period utility is given by

$$u(d_t, d_{t-1}) = \begin{cases} d_t(v - c_t) & \text{if } d_{t-1} = 0 \\ d_t(\alpha v - c_t) & \text{if } d_{t-1} = 1 \end{cases}$$

where $d_t \in \{0, 1\}$ indicates whether the individual donates blood ($d_t = 1$) or not. As before, v is the utility from donating blood, and c_t is the cost of donating blood in this period with distribution function $F_c(x)$. The parameter $\alpha \neq 1$ captures the way in which a donation in the last period affects the utility from donating blood in this period. If $\alpha > 1$, this can be interpreted as habit formation: donating is more pleasant if one does it regularly. The model also allows for the possibility that donating is less pleasant or feels less urgent if one has done it recently ($\alpha < 1$), for example because people feel guilt in reaction to the time that has elapsed since their last donation.

Consider an individual who did not donate in $t - 1$. Her lifetime utility is given by

$$V_t^0 = \delta E(V^0) + \max_{d_t} \left((v - c_t) + \delta(E(V^1) - E(V^0))d_t\right) \tag{9}$$

where we impose stationarity right from the beginning. Conversely, for an individual who donated in $t - 1$, her lifetime utility is

$$V_t^1 = \delta E(V^0) + \max_{d_t} \left((\alpha v - c_t) + \delta(E(V^1) - E(V^0))d_t\right) \tag{10}$$

Applying the expectation operation to (9), we obtain

$$E(V^0) = \delta E(V^0) + p^0 \left((v - c^0) + \delta(E(V^1) - E(V^0))\right) \tag{11}$$

where $p^0 = \Pr(c_t \leq v + \delta(E(V^1) - E(V^0))$ and $c^0 = E(c_t | c_t \leq v + \delta(E(V^1) - E(V^0))$. To keep this example simple, assume that c_t is uniform on $[0,1]$. In this case, $c^0 = 0.5(v + \delta\Delta V)$ and $p^0 = 2c^0 = (v + \delta\Delta V)$, where $\Delta V \equiv E(V^1) - E(V^0)$. Thus,

$$E(V^0) = \delta E(V^0) + 0.5(v + \delta\Delta V)^2 \tag{12}$$

Similarly, we take the expectation of (10) to obtain

$$E(V^1) = \delta E(V^0) + p^1 \left((\alpha v - c^1) + \delta(E(V^1) - E(V^0))\right)$$

where $c^1 = \alpha v + \delta\Delta V$ and $p^1 = 2c^1$. Thus,

$$E(V^1) = \delta E(V^0) + 0.5(\alpha v + \delta\Delta V)^2 \tag{13}$$

Subtracting (12) from (13), we obtain

$$\begin{aligned} \Delta V &= 0.5v^2(\alpha^2 - 1) + (\alpha - 1)\delta v\Delta V \qquad (14) \\ \Leftrightarrow \Delta V &= 0.5v^2 \frac{\alpha^2 - 1}{1 - \delta v(\alpha - 1)} \end{aligned}$$

Notice that as $1 > \alpha > 0$, $\Delta V < 0$ since the reduction in the utility α reduces the utility from donating blood this period. As $\alpha > 1$, $\Delta V > 0$, reflecting the higher utility if the individual starts from a situation of having donated in the period before.

The preceding calculations are based on the case where the probability of donating blood is strictly less than one, a necessary condition to this is $\delta(\alpha - 1) < 1$. However, if α is large enough, this condition may not be satisfied as the individual will donate blood in any case. Formally, this can be seen by plugging the solution for ΔV into the definition of p^0

$$p^0 = v + \delta\Delta V = v + 0.5v^2 \frac{\alpha^2 - 1}{1 - \delta v(\alpha - 1)} = v\frac{1 - \delta v(1-\alpha) + 0.5\delta(\alpha^2 - 1)v}{1 - \delta v(\alpha - 1)}$$

$$= v\frac{1 - \delta v(\alpha - 1)(1 - 0.5(\alpha + 1))}{1 - \delta v(\alpha - 1)} = v\frac{1 + 0.5\delta v(\alpha - 1)^2}{1 - \delta v(\alpha - 1)}$$

This probability is less than one if $v\left(1 + 0.5\delta v(\alpha - 1)^2\right) < 1 - \delta v(\alpha - 1)$, a necessary condition to which is $1 - \delta v(\alpha - 1) > 0 \Leftrightarrow \delta v(\alpha - 1) < 1$.

We use this model to calibrate a numerical simulation of the use of incentives, displayed in Figure 3. We calculate Δ, p^0, p^1 in the absence of incentives using parameter values $\delta = 0.99$ and values of 2 and 0.5 for α, respectively. The steady state donation rate q in this model is given by

$$q = qp^1 + (1 - q)p^0 \tag{15}$$

where the right-hand side of equation (15) is the composition of the population in the last period, and the left-hand side is the fraction of individuals who will be donating this period. Solving for q yields

$$q = \frac{p^0}{1 - p^1 + p^0}$$

For each of the two cases $\alpha = 0.5, 2$, we choose v such that q matches the average donation rate in our sample (0.477). We then shock individuals in one period with a one-time incentive of $m = 0.1$ in utility terms, equivalent to a 10 percentage point increase in the donation rate. We subsequently calculate how the donation choices tend back to the steady state. While the model could be solved analytically, we approximated the solution by simulating it numerically using $N = 1,000,000$ individuals.

B. Tables

Table A1: Descriptive Statistics (by center and treatment)

	Age	Gender (female = 1)	Donations following last four invitations	Signed up for fixed interval of inv. (=1)	N
By center and treatment:					
1					
Baseline	44.25	0.39	1.92	0.31	1,647
	(13.96)	(0.49)	(1.55)	(0.46)	
Appeal	45.12	0.38	2.03	0.30	1,211
	(14.29)	(0.49)	(1.60)	(0.46)	
Cholesterol test	43.45	0.39	1.84	0.28	2,524
	(14.07)	(0.49)	(1.59)	(0.45)	
Overall p-value	0.2686				
2					
Baseline	48.07	0.34	2.12	0.16	361
	(12.97)	(0.48)	(1.42)	(0.37)	
Appeal	48.62	0.37	2.33	0.09	323
	(13.03)	(0.48)	(1.28)	(0.29)	
Cholesterol test	48.68	0.31	2.24	0.15	555
	(12.95)	(0.46)	(1.34)	(0.36)	
Overall p-value	0.0751				

Notes: Numbers in parentheses are standard deviations. Descriptive statistics by center and treatment condition are calculated based on the sample with at least four previous invitations. The overall p-values for balance checks are obtained from seemingly unrelated regression (SUR) model for the four characteristics.

Table A1: Descriptive Statistics (by center and treatment) - continued

	Age	Gender (female = 1)	Donations following last four invitations	Signed up for fixed interval of inv. (=1)	N
By center and treatment:					
3					
Baseline	45.84	0.41	2.07	0.65	650
	(13.58)	(0.49)	(1.56)	(0.48)	
Appeal	45.60	0.44	2.21	0.69	487
	(13.48)	(0.50)	(1.52)	(0.46)	
Lottery ticket	44.47	0.38	1.83	0.63	989
	(13.92)	(0.49)	(1.53)	(0.48)	
Overall p-value	0.6252				
4					
Baseline	43.50	0.50	1.95	0.35	315
	(13.07)	(0.50)	(1.55)	(0.48)	
Appeal	44.31	0.40	2.04	0.28	203
	(12.61)	(0.49)	(1.60)	(0.45)	
Cholesterol test	42.29	0.41	1.84	0.27	467
	(13.36)	(0.49)	(1.62)	(0.45)	
Overall p-value	0.8670				

Notes: Numbers in parentheses are standard deviations. Descriptive statistics by center and treatment condition are calculated based on the sample with at least four previous invitations. The overall p-values for balance checks are obtained from seemingly unrelated regression (SUR) model for the four characteristics.

Table A2: The Distribution of Treatments
(Number of Subjects)

	Donation center				
Treatment	1	2	3	4	Total
Baseline	1,987	512	393	790	3,682
Appeal	1,378	373	601	261	2,613
Cholesterol test	2,911	615	579		4,105
Lottery ticket				1,160	1,160
Total	6,185	1,392	2,521	1,222	11,320

Notes: The sample refers to the full sample in Table 2.

Table A3: Long-run Effects of the Experiment
Number of donations within different periods after the intervention
OLS estimates

	1 to 3 months	1 to 6 months	1 to 9 months	1 to 12 months	1 to 15 months
Appeal	0.009	0.002	0.030	0.040	0.025
	(0.013)	(0.016)	(0.021)	(0.027)	(0.030)
CH Test	–0.003	–0.028*	–0.045**	–0.047*	–0.043
	(0.013)	(0.016)	(0.022)	(0.028)	(0.032)
Lottery Ticket	0.039**	0.024	0.037*	0.053**	0.056*
	(0.019)	(0.020)	(0.022)	(0.026)	(0.030)
Age	0.007***	0.013***	0.024***	0.035***	0.050***
	(0.002)	(0.003)	(0.005)	(0.006)	(0.007)
Age squared	–0.000**	–0.000**	–0.000***	–0.000***	–0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender (female = 1)	–0.018*	–0.048***	–0.092***	–0.141***	–0.187***
	(0.010)	(0.013)	(0.016)	(0.022)	(0.028)
No. prev. inv. followed					
1 out of 4	0.137***	0.299***	0.451***	0.595***	0.710***
	(0.016)	(0.025)	(0.033)	(0.041)	(0.051)
2 out of 4	0.230***	0.520***	0.832***	1.102***	1.344***
	(0.017)	(0.023)	(0.033)	(0.041)	(0.050)
3 out of 4	0.330***	0.768***	1.176***	1.599***	1.978***
	(0.018)	(0.027)	(0.037)	(0.047)	(0.056)
4 out of 4	0.470***	1.044***	1.557***	2.091***	2.588***
	(0.018)	(0.027)	(0.036)	(0.048)	(0.058)
Mean donations in invitation-only group	0.332	0.726	1.085	1.453	1.774
R^2	0.246	0.393	0.451	0.488	0.507
N	9,593	9,593	9,593	9,593	9,593

Notes: See Table 3. All specifications include controls for the required periodicity of invitations.

Table A4: Long-run Effects of the Experiment for Infrequent Donors
Number of donations within different periods after the intervention
OLS estimates

	1 to 3 months	1 to 6 months	1 to 9 months	1 to 12 months	1 to 15 months
Appeal	–0.010	–0.012	0.015	0.011	0.027
	(0.015)	(0.021)	(0.026)	(0.033)	(0.037)
CH Test	0.006	–0.019	–0.024	–0.025	–0.014
	(0.015)	(0.017)	(0.022)	(0.026)	(0.032)
Lottery Ticket	0.010	0.015	0.000	0.028	0.041
	(0.019)	(0.029)	(0.032)	(0.041)	(0.052)
Age	0.005*	0.006	0.011*	0.015**	0.023***
	(0.003)	(0.004)	(0.006)	(0.007)	(0.008)
Age squared	–0.000	–0.000	–0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender (female = 1)	–0.004	–0.028*	–0.049**	–0.083***	–0.114***
	(0.010)	(0.015)	(0.020)	(0.025)	(0.028)
No. prev. inv. followed					
1 out of 4	0.134***	0.282***	0.417***	0.546***	0.654***
	(0.015)	(0.023)	(0.030)	(0.037)	(0.045)
2 out of 4	0.231***	0.504***	0.802***	1.061***	1.299***
	(0.016)	(0.022)	(0.031)	(0.038)	(0.045)
Mean donations in invitation-only group	0.178	0.381	0.568	0.755	0.906
R^2	0.116	0.215	0.278	0.298	0.307
Obs	5,564	5,564	5,564	5,564	5,564

Note: See Table A3.

Table A5: Long-run Effects of the Experiment for Frequent Donors
Number of donations within different periods after the intervention
OLS estimates

	1 to 3 months	1 to 6 months	1 to 9 months	1 to 12 months	1 to 15 months
Appeal	0.022	0.009	0.033	0.068	0.005
	(0.022)	(0.032)	(0.042)	(0.052)	(0.057)
CH Test	–0.017	–0.041	–0.088**	–0.094	–0.108*
	(0.023)	(0.031)	(0.044)	(0.059)	(0.065)
Lottery Ticket	0.064	0.016	0.064	0.064	0.063
	(0.045)	(0.042)	(0.054)	(0.057)	(0.076)
Age	0.005	0.019***	0.041***	0.067***	0.096***
	(0.005)	(0.006)	(0.009)	(0.011)	(0.013)
Age squared	–0.000	–0.000**	–0.000***	–0.001***	–0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender (female = 1)	–0.037*	–0.073***	–0.144***	–0.219***	–0.286***
	(0.019)	(0.025)	(0.030)	(0.040)	(0.052)
No. prev. inv. followed 3 out of 4	–0.111***	–0.230***	–0.312***	–0.405***	–0.499***
	(0.016)	(0.022)	(0.029)	(0.036)	(0.043)
Mean donations in invitation-only group	0.354	1.177	1.762	2.367	2.911
R^2	0.216	0.194	0.222	0.232	0.247
Obs	4,029	4,029	4,029	4,029	4,029

Note: See Table A3.