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REWARDING ALTRUISM? A NATURAL FIELD EXPERIMENT

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ABSTRACT

We present evidence from a natural field experiment involving nearly 100,000 individuals on the effects of offering economic incentives for blood donations. Subjects who were offered economic rewards to donate blood were more likely to donate, and more so the higher the value of the rewards. They were also more likely to attract others to donate, spatially alter the location of their donations towards the drives offering rewards, and modify their temporal donation schedule leading to a short-term reduction in donations immediately after the reward offer was removed. Although offering economic incentives, combining all of these effects, positively and significantly increased donations, ignoring individuals who took additional actions beyond donating to get others to donate would have led to an under-estimate of the total effect, whereas ignoring the spatial effect would have led to an over-estimate of the total effect. We also find that individuals who received a reward by surprise were less likely to donate after the intervention than subjects who received no reward, suggesting that for some individuals a surprise reward adversely affected their intrinsic motivations. We discuss the implications of these findings for understanding pro-social behavior.

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1. Introduction

A vast debate exists as to whether offering economic incentives increases motivation for individuals to provide public goods and perform pro-social activities, or instead inhibits them from performing such activities. Answering this question is important to understand how to foster contributions to public goods that involve a large part of social life but for which supply often falls below societal needs.[1] Standard economic theory predicts that the addition of an economic incentive will add to any intrinsic utility individuals receive to perform pro-social activities. However, research in psychology and behavioral economics suggest that offering economic incentives can backfire by crowding out the intrinsic motives involved in performing pro-social activities or by negatively affecting an individual's social or self-image (Bénabou and Tirole, 2006; Deci, 1975). The available evidence offers mixed results; some studies find that incentives enhance pro-social activities while others document negative responses.[2]

This paper presents a comprehensive study on the impact of offering economic incentives on a pro-social activity that has high social relevance, no substitutes and experiences frequent shortages: donating blood.[3] We find that individuals who were offered economic rewards to donate blood were not only more likely to donate, and more so the higher the value of the rewards, but were also more likely to attract others to donate, spatially alter the location of their donations towards the intervention drives offering rewards, and modify their temporal donation schedule leading to a short-term reduction in donations immediately after the reward offer was removed. Although the total effect of offering economic incentives, combining all of these effects, positively and significantly increased donations, ignoring individuals who took additional actions beyond donating to get others to donate would have led to an under-estimate of the total effect, whereas ignoring the spatial effect would have led to an over-estimate of the total effect. We also find that individuals who received a reward by surprise were less likely to donate after the intervention than subjects who received no reward, suggesting that for some individuals a surprise reward adversely affected their intrinsic motivations.

Our evidence comes from a natural field experiment involving 98,278 individuals and 72 blood drives conducted with the American Red Cross Blood Service in Northern Ohio (ARC) from September 2009 to August 2010. Among over 7,000 annual ARC blood drives, we randomly selected 72 drives to study which had similar and typical characteristics, such as their historical average turnout. We then randomly selected 36 of the 72 drives to provide rewards of $5, $10 or $15 in the form of gift cards from various stores. While all

[1] In the US, for example, charitable giving totals more than $260 billion, or around 1.9% of personal income (Andreoni, 2007), and the estimated value of volunteer time is over $240 billion (Independent Sector, 2006). The number of non-profit organizations registered with the IRS grew by about 60% from 1995 to 2005 (List, 2011).

[2] Gneezy, Meier and Rey-Biel (forthcoming), Kamenica (2011), and Meier (2007) offer reviews of this literature.

[3] Blood transfusions are required in case of trauma, surgeries, the treatment of premature babies, and several types of cancer and blood-related diseases. Population ageing and new surgical procedures such as organ transplantations are substantially increasing the demand for blood. However, only about 5% of eligible individuals donate blood in developed countries, and even fewer do so in developing countries. The availability of blood at any given time is often below the target of three days of demand at each location and for each blood type. It is also estimated that, worldwide, there is a shortage of about 22 million units of blood per year (DiRado, 2004; Hemobiotech, 2008; Oakley, 1996).

potential donors included in the ARC's contact lists were informed about the drives using standard ARC procedures, in 27 of 36 reward drives (called "Advertised reward" drives) we informed 50% of the subjects of the presence and dollar amount of the gift cards. The remaining 50% of the subjects at the Advertised reward drives were not informed of the gift card offer and represent an almost ideal control for the informed individuals because they would have the same demographics and blood drive conditions (e.g., location and hours of operation). However, the informed subjects at the Advertised reward drives might be motivated to do more than donate and may attract others to donate – a form of pro-social behavior itself. To assess the presence of this indirect effect, in the remaining 9 reward drives (called "Surprise reward" drives) no subject was informed of the rewards; thus any difference in behavior of the uninformed individuals at the Advertised and Surprise reward drives will be an indicator of these indirect efforts. Finally, no rewards were offered in the remaining 36 drives (called "No reward" drives). Donations at No reward drives provide a comparison to those at the Surprise reward drives to validate our identifying assumption that subjects at the Surprise reward drives were in fact unaware of the rewards. Moreover, the post-intervention behavior of donors at the No reward drives (who were neither aware of nor received a reward) is used as control for comparison with the behavior of the individuals who donated at an Advertised reward drive and were informed of the reward, and with those who donated at a Surprise reward drive and hence were not informed of the reward.

In addition, the ARC provided us with information on the subjects' demographics (gender, age, blood type), and previous donation experience (if any), which allowed us to test for heterogeneous treatment effects. Moreover, we observed the donation behavior of the subjects not only at the intervention locations, but also at any other ARC drive to assess whether the observed effects at the intervention locations were genuine or instead represented spatial substitution.

We also followed the donation behavior of the subjects for nine months after the intervention period to gauge the overall impact of the rewards. The presence of an incentive, while possibly increasing the propensity to donate at a given time, might reduce donations in the future because of inter-temporal substitution or decreased intrinsic motivation (Deci and Flaste, 1996). By following subjects for nine months after the intervention, we can separate inter-temporal substitution (a shift in the timing of a single donation) from changes in motivation or over-justification that would result in a more permanent long-term reduction in donations. Alternatively, rewards might elicit reciprocity in the form of more donations in the future (Falk, 2007), especially if the gift was unexpected. In addition, if a temporary reward offer encourages subjects to make a donation, the donation experience provides subjects with an opportunity to update their beliefs on the costs and benefits of this activity (e.g. physiological or time involved), especially for new and infrequent donors. The provision of incentives at a given time might also not carry any consequences for future donations.

We find that the likelihood of donating at Advertised reward drives for those informed of the incentives was 1.02%, versus 0.65% for those uninformed of the rewards at the same drives, and 0.53% of those

contacted for Surprise reward drives. The positive effect increased in the dollar amount of the rewards. In absolute terms, most of the increase in donations was among subjects with a prior donation history at the intervention sites, with the average percentage donating in this group increasing from 15% when uninformed to 20% when informed. However, in relative terms the response was stronger for those who had never donated at an intervention site in the past, especially for the $15 reward. Although the response to incentives did not vary by gender or blood type, incentives had a stronger effect on subjects who were older, had longer donation history, and had donated in the recent past.

We also find that a higher percentage of subjects who had not been informed of the presence of a reward at Advertised reward drives donated than the subjects informed about a Surprise reward drive, and this gap widened with higher values of the reward. We interpret this as evidence of an additional, indirect effect of incentives, whereby those informed of the rewards through official ARC channels motivate others to donate. A survey conducted at a subsample of treatment drives, as well as the analysis of the subset of individuals who donated at the intervention drives but were not contacted by the ARC (including first-time donors), offer findings consistent with this interpretation. These additional indirect effects suggest that our analysis showing higher donations among the informed than uninformed donors at the Advertised reward drives may underestimate the direct effect on those informed of incentives on their donations. We thus determine the direct effect of the incentives at the intervention drives by comparing the donations of individuals contacted for Surprise reward drives, where no donor-to-donor communication could occur, with those contacted for Advertised reward drives. On average, the likelihood of donating blood was 6.7 percentage points higher in the case of individuals with past history (19.9% among those informed compared to 13.2% of those uninformed at the Surprise drives), and 0.17 percentage points higher for those without past history (0.25% among informed subjects and 0.08% among the uninformed). The effects were increasing with the dollar amount of the reward, with the $5 dollar rewards increasing the number of donations by 3.5 percentage points, the $10 rewards increasing donations by 6.9 percentage points, and the $15 reward increasing donations by 9.5 percentage points, respectively, for the individuals with past history at the sites, and by 0.06, 0.14 and 0.37 percentage points, respectively, for those with no previous history at the sites.

We further examine whether the increase in donations at the intervention sites was a genuine increase in donations or the result of spatial or inter-temporal displacement. Spatial displacement indeed occurred for donors with a prior donation history at the intervention sites, especially in response to the highest dollar value reward; on average, 26% of the increase in donations was due to a decline in donations during the intervention time at sites other than the intervention locations, and 40% when $15 rewards were offered.

We also find that inter-temporal substitution occurred; difference-in-difference individual fixed-effect regressions show that among subjects who donated during the intervention, those informed of the rewards were on average 12% less likely to donate three months after than before the intervention than those contacted for the No reward drives. Like the spatial displacement, the inter-temporal displacement was

largest among subjects informed of the $15, reaching 20% fewer subjects who donated three month after than before the intervention. However, the inter-temporal decline was limited to the three months following the intervention, indicating that donors adjusted their donation schedule (i.e., substituted inter-temporally) rather than experienced any long-term loss in motivation to donate blood. Unexpectedly given the extensive support for reciprocal preferences in lab experiments, we find that subjects who received a reward at a Surprise drive were less likely to donate after the intervention for the full nine months we followed subjects after the intervention. This long-term reduction in donations is consistent with the surprise gift undermining intrinsic motivation to donate blood. We explore several explanations for this behavior.

To our knowledge, this is the largest and most comprehensive experiment on the impact of extrinsic incentives for blood donations, and among the largest on the impact of material rewards on pro-social behavior in general. Goette and Stutzer's (2008) natural field experiment in Switzerland with over 10,000 previous blood donors found that offering lottery tickets increased blood donations, whereas a free cholesterol test had no effect. Mellstrom and Johannesson's (2008) experiment in Sweden with 262 college students who had never donated blood found that offering cash rewards to take a health test to determine their eligibility to donate blood had no effect on male subjects and a negative effect on females' propensity to take the test. Our previous study (Lacetera, Macis and Slonim, forthcoming) using observational and experimental data at the drive level found that material rewards had a positive effect on turnout and units collected at blood drives offering rewards, no effect on the share of donors eligible to donate, and a reduction in donations at neighboring drives not offering rewards. All of these studies considered only the short-term (one-shot) impact of incentives and did not look at alternative actions that individuals might take beyond donating blood themselves.[4]

This study is the first to provide a comprehensive view of the short and long-term effects of economic incentives on blood donations using individual-level data. More specifically, this is the first study to assess, in one setting, how the size of the incentives affects donations, whether any observed changes in donations are genuine or displace donations elsewhere, whether any observed change in donations is genuine or the result of inter-temporal substitution, whether there are any other long-term effects (e.g., inter-temporal crowding, reciprocity), whether incentives cause any actions beyond donating (e.g. getting others to donate), and whether incentive effects are homogeneous or heterogeneous in the population.

The paper is organized as follows. Section 2 describes the ARC's operations and gives details on the Northern Ohio Unit where the experiment was run. Section 3 describes the experimental design and the data. Section 4 presents the findings and Section 5 concludes.

[4] A literature has developed also on the provision of incentives for organ donation. See for example Becker and Elias (2007), Kessler and Roth (forthcoming), and Roth (2007). Some papers have considered the impact of different incentives systems on activities that, while remunerated financially, are also thought to include intrinsic utility (e.g., Ashraf, Bandiera and Jack, 2011; Hall, Propper and Van Reenen, 2008; Miller et al., 2011).

2. Institutional Background: The American Red Cross in Northern Ohio

The Northern Ohio Blood Service Unit of the American Red Cross (ARC) runs over 7,000 blood drives per year.[5] Blood drives are run in partnership with a "host" organization that works with an ARC representative to collect blood. The host organizations (e.g., schools, churches, community centres, private firms and hospitals) provide space at a specific location and date, and the ARC provides the administrative and collection staff and physical equipment for the blood collection.

Several thousand individuals are typically informed about each blood drive. In most counties in Northern Ohio the ARC sends out a flyer on the 23rd or 24th of a month indicating all the drives that will occur in the county in the following month.[6] Figure 1 provides an example of a flyer (identifying information has been blacked out for privacy considerations). The flyers include information on each drive's location and hours of operation, whether an incentive is offered and, if an incentive is offered, the specific type of incentive. About 40% of the blood drives offer a promotion item – provided by either the ARC or the drive's host – and there is essentially never more than one item at a drive. Common items include T-shirts, coupons, jackets, coolers, blankets and gift cards from various merchants. The ARC mails each county flyer to everyone who has previously donated in that county who is "active" and "eligible." An active donor is someone who has donated at least once over the past two years and an eligible donor is someone who the ARC knows is not currently disqualified. Donors can be disqualified either because the donation may endanger the donor or because the donation would be unusable; examples include individuals with anaemia, low blood pressure or low iron, and recent behavior that increases the risk of potential blood problems that tests cannot detect. Donors are also not permitted to donate for 56 days after making a whole blood donation.

3. Experimental design and data

3.1 Design

We ran our experiment over four periods: September 2009, December 2009, March 2010, and July-August 2010. The four periods gave us the opportunity to collect more independent observations and control for possible seasonal effects. We established a set of six criteria that all potential drives would have to meet to be in our study, such that the drives would be similar to each other, avoid atypical drive characteristics, and avoid potentially confounding concerns for our analyses. Once we established a set of potential drives to include, we randomized among them which ones to include, then randomized among the selected drives which ones would be in each condition.

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[5] The ARC operates 36 regional blood centers within the US and Puerto Rico. Northern Ohio covers 10,206 square miles and includes major cities such as Cleveland and Akron. In 2010, about 4.1 million people lived in Northern Ohio, median income was about $47,000 (overall US: $50,221); the unemployment rate was 9.9% (US: 9.6%); and there were 83% Caucasian and 11.4% African Americans (US: 72.4% and 12.6%).

[6] Monthly flyers are sent in 17 of the 21 counties where the ARC-Northern Ohio operates. People in the remaining 4 counties are sent postcards about specific drives. We only considered counties where information is through flyers.

The six criteria a drive had to meet for inclusion are as follows. First, we excluded "closed" drives (i.e., drives restricted to a narrow set of donors such as high school students) because they limit who can donate and thus limit broader potential effects of an incentive offer. Closed drives represent about 20% of all drives. Second, we required host locations to have run at least three drives in the year prior to the first intervention period (henceforth, the reference year) so that we would have substantial data on behavior prior to our intervention for better control measures.[7] Less than 22% of host locations had two or fewer drives in the reference year. Third, we restricted the host location's average turnout during the reference year to be within one standard deviation of the overall mean turnout in Northern Ohio drives (11.9 to 57.5 donors) to avoid unusually large or small drives that could be sensitive to idiosyncratic issues (e.g., during holiday weekends). About 70% of all donations in the reference year were made at drives within one standard deviation of the mean. Fourth, we required that no more than 50% of the drives at the host location during the reference year offered an incentive. By removing these uncommon locations where incentives were the norm, we avoid situations in which our intervention control drive locations that offer no rewards could be unusual for *not* offering incentives at a location that historically offered them. Fifth, we ensured that the ARC did not introduce any additional incentives at our intervention drives because we did not want any other incentive offer in addition to ours since it was rare for the ARC to offer more than one reward at a drive. We also only used drives in which no incentive was offered at the same location in the drive immediately prior to the intervention drive so that the sequence of rewards between treatment and control drives would hold constant the preceding drive at the level of no rewards. Last, all drive locations in the experiment had to be at least five miles apart from each other to avoid possible contaminations across the experimental drives.

Among all drives meeting the above criteria, we randomly chose 18 per period in 9 pairs such that the drives within a pair were held in the same county while each pair was in a different county. Within each pair we randomly assigned one drive to have a reward (henceforth, Reward drives) and the other to have no reward (henceforth, No reward drives); this resulted in a total of 36 Reward and 36 No reward drives. The Reward and No reward drives were not only similar in meeting the above criteria, but also had the identical population of potential donors who were contacted since the drives in a pair were advertised on the same county flyer.[8] Since no incentive was offered at the No reward drives, from the potential donor's perspective these drives are identical to any other ARC drive that did not offer a reward.

At the Reward drives, donors could choose either one, two or three $5 gift cards for our $5, $10 and $15 treatments, respectively. Anyone presenting to donate would receive the gift cards regardless of whether they donated. Having three dollar values lets us estimate the shape of the supply curve whereas offering only one value might not reflect how other values would affect performance; Gneezy and Rustichini (2000) found that

[7] The reference year is from 5/18/2008 through 5/18/2009. Because the ARC allocates incentives to drives months in advance, it was important that we pre-selected our intervention drives as much in advance as possible to ensure that no incentives would be allocated at those sites in the drives immediately prior to our intervention drives.

[8] In a few cases, the No reward and Reward drives, while being in the same county, were advertised on separate flyers.

the value of the reward offered to lab subjects for performance on an IQ test had a non-monotonic effect on performance with a small reward resulting in a negative effect and a large reward resulting in a positive effect. We randomly allocated the dollar value treatments equally across the 36 Reward drives so that there were 12 Reward drives per dollar value, and an equal balance of dollar values across the four time periods. The gift card selection included merchants that sell food, gasoline and general merchandise (e.g., Wal-Mart, Target, BP, Buehler's, and Giant Eagle).

We chose to offer gifts cards as rewards for several reasons. First, unlike offering a specific item (e.g., T-shirts), the broad range of items the gift cards let donors purchase gives us confidence that the monetary value to the donors will be the same; we can also assume that rewards of differing amounts, if offered in the form of gift cards, will be ranked in the same way ($15>$10>$5) by all subjects, whereas offering specific items could introduce heterogeneity. Second, we let donors choose gift cards from multiple merchants to increase the "liquidity" of the reward. Third, the cards excluded any reference to the ARC or blood donations to minimize any symbolic or signaling value. Fourth, gift cards are common promotion items offered by the ARC and the three dollar values we offered are within the normal range of perceived values of the items that the ARC offers, therefore the gift cards should not be perceived as "unusual". An unusual gift item may signal, for instance, that there is a greater need for blood or that the ARC might be running an experiment, thus potentially compromising the validity of the study.[9] Finally, offering gift cards lets us track usage; if the cards were not used, then that would suggest that their dollar values are not a good proxy for the value of the gift to the donor.[10]

All active and eligible donors included in the ARC's contact lists were informed about the blood drives through the ARC's normal communication channels. We randomized the 36 Reward drives into two conditions: 27 "Advertised reward" drives and nine "Surprise reward" drives. Seven of the 27 Advertised reward drives occurred in each of the first three periods and the other six occurred in the last period. In the Advertised reward drives, a random sample of approximately half of the subjects in each drive was informed that a reward would be given, the types of gift cards offered, and the total dollar amount of the reward.[11]

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[9] More generally, it may be argued that the presence of rewards is perceived as a signal of scarcity of blood. Thus the reaction would be to the information about scarcity, rather than to the rewards per se. Note however that the subjects received information about a whole set of drives in the monthly fliers (see Figure 1), with some offering and some not offering rewards. Therefore it is unlikely that they derive any specific information on scarcity from a single drive on the flier.

[10] Offering cash may have further guaranteed the same monetary value to the donors; however the FDA prohibits that blood collected from donors paid in cash be labeled as blood coming from volunteer donors, therefore the policy of the ARC is to not offer cash. This might raise the question of whether gift cards may elicit a different response than cash. Some research has shown that small in-kind rewards might be more effective than direct cash because they are not interpreted as part of a market transaction. However, cash was found to be as strong a motivator (if not stronger) than in-kind gifts for non-negligible dollar values (Heyman and Ariely, 2004). Furthermore, in experiments where subjects are asked to choose among in-kind and cash prizes, most subjects choose cash even if they stated a preference for the in-kind gift (Kube, Marechal and Puppe, forthcoming).

[11] While we do not know the full name of the contacted individuals, we have information on the unique ID number for each subject and to the first letter of their last names. Based on this letter, at the Advertised reward drives we randomly

However, we could eventually use only 26 of the 27 Advertised treatment drives in the analysis because, at one drive, unforeseen contingencies did not allow the host to apply the experimental protocol. In the remaining nine Surprise reward drives (two in each of the first three periods, and three in the last period), no subject was informed of the presence of an incentive. Recall that all presenting donors at a Reward drive, regardless of their awareness of the reward, would be offered the reward.

This design, shown in Table 1a, allows us to examine the direct effect on the change in the likelihood to donate for subjects informed of the reward offer, and indirect effects in which informed subjects may motivate uninformed individuals to donate. The uninformed-of-reward subjects at the Advertised reward drives provide a natural control group for the informed subjects (Row 1 vs. Row 2); the random assignment of subjects to be uniformed or informed ensures that the characteristics and donation opportunities (e.g., date, location, weather conditions and host personnel involved) of the two groups will be the same. However, we anticipated that (officially) uninformed of reward subjects could learn about the rewards from the informed subjects through word-of-mouth or other social networking activities. To address this possibility, we included the Surprise reward drives in the design so that we can quantify these indirect effects. Since no subject invited to a Surprise drive was informed of rewards, the donation behavior of this group provides a benchmark for the donations of the uninformed subjects at the Advertised drives; the difference in the likelihood to donate between these two groups gives us one measure of the possible informed subjects' indirect efforts to motivate others (Row 2 vs. Row 3). We also designed the experiment to estimate any effects of incentives on uninformed subject's behavior if drive hosts or ARC personnel communicated with subjects through informal channels about the rewards. Although we did not anticipate any informal communications since ARC personnel were requested to follow our protocols, the design let us test for any informal ARC or host communications by comparing donations at Surprise reward drives with donations at the No Reward drives (Rows 3 vs. Row 4 of Table 1a).

In addition to examining the effects during the intervention, we designed the study to examine longer term effects in order to provide a more comprehensive understanding of the effects of offering incentives. We accomplish this by comparing the difference in long term donation behavior between subjects who were informed of rewards at the Advertised reward drives and subjects at the No reward drives (Row 1 vs. Row 4). Thus, we included the No reward drives to not only verify no informal activity by the ARC and hosts, but more importantly, their primary purpose will be as the control group in the analyses of long term effects.

There are two potential reasons why future donations may be lower after than before a reward was offered. First, a donation during the intervention might replace a future donation. In this case, the immediate positive response to the incentive would be due to short-term inter-temporal substitution, and thus any

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assigned either the subjects whose last name initial was between A-K, or those whose initial was L-Z, to receive a version of the flyer with information also on the presence of rewards. The "cutoff" was set between K and L because roughly half of last names in the US begin with a letter between A and K.

positive short term effect would over-estimate the total effect. Second, Deci and Flaste (1996) argue that the presence of incentives could alter donors' perception of their motivation for donating. In this case, a donor's intrinsic motivation to donate will fall after receiving an incentive. This lower utility and related decline in donations, in contrast to inter-temporal substitution, would persist over a longer period of time, and would indicate that any positive short-term effects could substantially over-estimate the total effect. By observing subject's donation behavior for nine months after the intervention, we can thus distinguish between a short-term inter-temporal substitution effect and a longer-term reduction in utility to donate.

The impact of rewards on future donations can also be positive. First, economic incentives may nudge subjects to develop a donation habit. Evidence consistent with incentives temporarily offered stimulating longer term habits has been found in the case of physical exercise (Charness and Gneezy, 2009; Royer, Stehr and Sydnor, 2011). Meer (2010) and Rosen and Sims (2010) also show habit formation in charitable giving. Second, someone who donates when an incentive is offered will learn more about the donation experience, and potentially positively update their expectations about the time involved (e.g., the bleed time is usually under 10 minutes and the whole process is usually under one hour) and the lack of physical discomfort during and after the procedure (e.g., not as painful or tiring as expected). The Surprise drives also let us examine reciprocal preferences and potential sorting among donors who donated when they were and were not aware of the reward. For instance, Falk (2007) found that people are more likely to make a monetary donation when they receive an unexpected gift item. We also anticipated that subjects who donate when they know a reward has been offered (the informed-of-rewards subjects who donate at the Advertised drives) may have a different reaction to receiving rewards than subjects who were unaware (the subjects who donate at the Surprise drives). When uninformed of the rewards, some subjects may present to donate who would have avoided donating if they had known about the reward; providing rewards to these subjects thus might negatively affect their willingness to donate in the future. For instance, Lazear, Malmendier and Weber (forthcoming) found significant sorting among laboratory subjects to avoid making decisions in games that elicit social preferences.

A few other features of the design are worth mentioning. First, the ARC guaranteed that identical, standard procedures were used for all 71 drives in the experiment. Second, subjects were never informed that a study was being conducted and since gift cards and other items of similar value are often offered by the ARC, it is reasonable to assume that subjects were never aware they were participating in a study and, thus, being observed. Last, the random assignment of rewards to drives and who was informed about them were the only changes to the ARC's operations; no other aspect (e.g. personnel, location, supplies, and communications) was changed. Our design is therefore a natural field experiment (Harrison and List, 2004).

Design Checks. Before turning to the data and results, we make three points to verify the validity of the design. First, we conducted an anonymous survey at the Reward drives during the last two intervention

periods (March and July-August 2010), to assess whether the information regarding the rewards was communicated as designed. The survey asked presenting donors whether they knew about the presence of gift cards before coming to the blood drive, and if so, how they knew about them. The survey response rate was 94% and we collected 640 surveys. Among those who were sent fliers with the rewards information, 52% indicated knowing about them, and primarily through the fliers.[12] In contrast, only 4% (6/159) of the respondents at the Surprise reward drives indicated knowing about the rewards. This stark contrast confirms that the official communication of rewards to inform subjects was effective, and the lack of awareness of subjects at the Surprise drives is consistent with our understanding that ARC representatives and drive hosts would not informally communicate with anyone about the rewards. Among the respondents who were on the uninformed-of-reward list at the Advertised reward drives, 17% indicated knowing about the rewards, and a large share of these reported that they knew through family and friends.

Second, to further investigate whether the same standard recruitment procedures were used for the drives with and without rewards, we compared donations at No reward drives (where no incentives were present, and so incentives could not have motivated any informal actions by ARC representatives or drive hosts) with donations at Surprise reward drives where ARC representatives were aware of the incentives, but no subjects were formally informed of them. We could not detect any differences in donations at the Surprise and No reward drives (see Table A1 in the Appendix), further validating this aspect of our experimental design.

Third, we examined whether gift cards were actually taken and used; if donors either refused to accept the cards or did not use them, then we would have lost some control by offering an item that the subjects did not value. However, we found, perhaps even a little surprising, that 98% of the cards offered were taken and more than 90% of the sum of all the cards' value was spent within the first four weeks after being given out. Thus, we are confident that the subjects perceived the rewards as providing economic value.

3.2 Data

The ARC provided us with drive-level and individual-level data. The drive-level data includes the number of presenting donors, units of blood collected, and number of deferred donors at all our intervention drives for the year prior to, during, and at least nine months after the intervention. The individual-level data includes information on everyone contacted during the intervention (i.e., the subjects) plus anyone who donated at an intervention drive but had not been contacted, which includes new and lapsed donors (i.e., eligible but inactive). The individual data includes the total number of past donations, donation history (date and location) for the four years prior to our first intervention until nine months after our final intervention, and

[12] There could be many reasons that only 52% of informed respondents indicated knew about the rewards. For instance, they may have forgotten or not wanted to admit that they knew about them. Alternatively, some donors may not have noticed the reward offer, and this possibility suggests that our results may under-estimate the effect of incentives to the extent that the subjects intended to be informed of the rewards, *ceteris paribus*, were in fact not all informed.

demographics including gender, age and blood type. The individual donation information includes only successful donations since regulations prevent the ARC from disclosing information when a deferral occurs. Although deferral information would have been interesting to examine, the drive-level experimental data here and our past work (Lacetera et al., forthcoming) using historical drive-level data indicate that incentive offers did not affect deferrals, thus individual-level deferral information may not have been especially informative. To protect subject's privacy the individual data we received were de-identified.

The individual-level donation data allow us to distinguish between subjects who have and have not donated in the past at an intervention site. This heterogeneity is important because individuals who have previously donated at a drive are more likely to live closer to its location, know how to get to it and be familiar with the ARC staff and drive hosts. Therefore, we anticipated that subjects will be more likely to donate at an intervention site, *ceteris paribus*, if they had previously donated at that drive. This was indeed the case; subjects with previous history at a site are over one hundred times more likely to donate at the site than subjects who had never donated at the site. To control for this base rate heterogeneity, we generally present analyses for these two types of subjects separately which crucially helps us identify and quantify the effects of incentives with dramatically greater precision. The individual-level characteristics in the data also let us examine whether the potential effects of rewards were heterogeneous along a number of dimensions including gender, age, blood type, and the number and frequency of past donations.

Table 1b shows the number of individuals contacted for each condition. Overall, 98,278 unique subjects were contacted for at least one intervention drive. About 50% of these subjects were contacted in exactly one intervention period, about 30% were contacted in two periods and 20% were contacted in three or four periods. As a result, there were 176,327 individual-period observations of contacted subjects. Once we limit the sample to the individuals who were eligible to donate at the intervention drives, we are left with 79,680 unique individuals and 128,690 individual-period observations. Table 2 shows statistics on the characteristics of the drives in the three experimental conditions (i.e., No reward, Advertised reward, Surprise reward) during the reference year prior to our intervention and at the intervention drives. Given the random assignment of drives, the characteristics across the three treatment conditions are statistically identical (we cannot reject the hypothesis of no differences in means using t-tests for any pair-wise comparisons).

Table 3 describes the characteristics of the individuals contacted for each treatment: informed of the reward at Advertised reward drives, not informed at Advertised reward drives, and invited to Surprise reward drives). Across the three conditions, subjects were observationally nearly identical overall (Columns 1-3), conditional on having previously donated at the intervention site (Columns 4-6) and on never having donated at the intervention site (Columns 7-9). Identifying subjects based on whether they have or have not donated at a specific location naturally led to substantial heterogeneity since individuals who donate at more locations

will be more likely to have donated at a given location,[13] and the subject characteristics reflect this heterogeneity; subjects with a past history (Columns 4-6) on average had donated at approximately 3.0 different locations whereas subjects without a past donation history at the sites (Columns 7-9) had donated on average at about 1.9 different locations. Consistent with identifying subjects who had donated at more locations, those with past history at an intervention site also had made more total donations, donated more recently and were older than those who had not donated at the intervention sites. This heterogeneity further stresses the importance to perform our analyses separately for subjects with and without past donation experience at the intervention sites. Our sample includes 4,745 and 123,945 individual-period observations with and without past donations at the intervention sites, respectively.

4. Results

We first report on the short-term impact of the rewards. We initially estimated the impact of offering rewards on donations at the intervention drives. We next analyzed how offering rewards affected donations at non-intervention drives to measure any potential spatial substitution. We then compared the change in donation behavior of the subjects after versus before the intervention periods to assess the long-term effects of the rewards. We conclude this section with an attempt to quantify the overall monetary cost spent on the rewards for each additional unit of blood collected due to the reward offers, and to compare it to the benefits.

4.1 Short-term responses

4.1.1 The effect of the incentives at the Advertised reward drives

Estimating direct effects: We first compare the donation behavior of subjects informed and uninformed of the rewards who were contacted for Advertised reward drives (henceforth "informed" and "uninformed" subjects). Uninformed subjects are a natural control group for the informed subjects not only because of the random assignment to be informed or uniformed, but also since they share the identical drive conditions.

Figure 2 shows the impact of the reward offer on the subjects contacted for Advertised reward drives and separately for subjects with and without history at the sites for which they were contacted. Overall, 0.65% of uninformed subjects donated while 1.02% of informed subjects donated. Donations increased with the value of the reward and were especially large for the $15 drives where the percent of subjects who donated was

[13] To better understand this point, consider a simple example of a county with two intervention drive locations, X and Y, and two types of people, A and B, that each make up half of the population. Suppose type A people have donated at both locations and half of type B people have only donated at X and the other half have only donated at Y. In this case, although there would be an equal number of type A and B overall (Columns 1-3), all type As and half of the type Bs have past history at an intervention drive (Columns 4-6) whereas no type As and half of type Bs have never donated at an intervention drive (Columns 7-9). Thus, the subjects who have donated at more locations (type As) will make up more of the population among those who have past history (they will make up 2/3 of this population) than among those who have never donated at an intervention site (they will make up 0 percent of this population).

nearly twice as large among the informed (1.63%) than uninformed (0.90%) subjects. Figures 2B and 2C highlight the degree of heterogeneity between individuals with and without past history, respectively. Subjects who had donated previously at a site were dramatically more likely to donate; 15% of uninformed subjects with a previous history donated whereas just 0.10% of uninformed subjects with no previous history donated. Further, the response to incentives was stronger in absolute terms for those with previous history (from 15% to 20%) than without history (from 0.10% to 0.25%), but the response was much stronger in relative terms for those without previous history (150%) than with previous history (33%). To test for significance, we estimate versions of the following regression model:

$$\textbf{Prob(DONATED}_{ijt}\textbf{=1) = f(INFO\_REWARD, } X_{ijt}\textbf{, } \eta_j\textbf{,} \varepsilon_{jt}\textbf{).} \qquad \textbf{(1)}$$

The outcome variable $DONATED_{ijt}$ is a dummy for whether a subject *i* donated at intervention drive *j* on date *t* (during one of the intervention periods). The term η_j represents drive-level fixed effects, and X_{ijr} represents individual-level controls. In the models we estimate, the coefficient on the dummy variable *INFO_REWARD* (equal to 1 if subject *i* was informed of a reward, and 0 otherwise) represents the difference in the probability of donating for subjects who were informed of an incentive relative to those who were not informed of the incentive at the same drive, *ceteris paribus*. We also use this model to estimate the effect of the three dollar values by replacing *INFO_REWARD* with *$5–INFO_REWARD*, *$10-INFO_REWARD*, and *$15-INFO_REWARD*. We include controls for gender (dummy for female), age (dummies for 25-49 and 50+), O-Neg blood type, total donations to date (dummies for 2-9 and 10+) and most recent donation (within the last 6 months or in the last 6 to 12 months). Throughout the paper, we present estimates from linear probability models because they allow us to conveniently include drive-level fixed effects; the estimates (and standard errors) shown in the tables have been multiplied by 100 to reflect the percentage change.[14]

Table 4 presents the results.[15] Column 1 shows that, overall, informed-of-reward subjects were 0.33 percentage points more likely to donate than the uninformed subjects, an increase of just over 50%. Columns 2 and 3 show that the likelihood to donate increased with the dollar value of the reward. Individuals with past history at the Advertised reward drives were about 170 times more likely to donate at these drives than subjects with no past history at these drives. Given this dramatic heterogeneity, we henceforth present estimates separately for subjects with and without previous donation history at the drives.

Column 4 shows that offering rewards increased the donations by 4.5 percentage points for informed subjects who donated in the past at the Advertised reward sites (baseline 15.3%), with stronger effects for higher dollar values. Column 5, without controls for drive fixed effects, shows that a $5, $10, and $15 reward

[14] The Appendix reports results from Logit estimates of our main models (Table A2). These estimates are very similar to the linear probability models.

[15] In addition to the effect of rewards, Table 4 shows that on average women were less likely to donate while the oldest subjects, subjects who had donated more than 10 times and subjects who had donated in the last six months were more likely to donate at the intervention drives. We discuss whether the incentive offer had any heterogeneous effects below.

offer increased the donations by 1.3, 4.9 and 7.3 percentage points, respectively, compared to donations by the uninformed subjects across all Advertised reward drives, representing an 8%, 32% and 47% increase compared to the baseline of all uninformed subjects. The *p*-values for the significance of the increased donations with the higher dollar values are shown at the bottom of the tables;[16] the $10 and $15 reward offers attracted significantly more informed subjects to donate than the $5 offer. Column 6 includes drive-level fixed effects so that the subjects informed of an $X reward are now compared to the subjects at the same drive (X = 5, 10 and 15). Adding drive fixed effects allows us to control for idiosyncratic differences between the drives such as location and hours of operation. Including the drive fixed effects, the most notable difference is that we obtain much more similar estimates for the coefficients on three dollar amounts. This result does not necessarily imply that the direct effect of the reward offer on donations is the same regardless of the value of the reward; if information about the reward offer was conveyed from informed to uninformed subjects, and if this informal donor-to-donor communication was more prevalent for more valuable rewards, then uninformed subjects could also show a similar response to a reward offer as informed ones, which would compress the differences in the estimated likelihood of donating, and more so the higher the value of the reward. Figure 2b shows that indeed the uninformed subjects with a past history contacted for drives that offered higher rewards were more likely to donate (below we will explore donor-to-donor communications more formally).

Columns 7-9 investigate the effects for subjects with no previous donation history at the advertised drives. The estimates show that while the absolute magnitude of the effects were smaller, they were statistically significant and large relative to the baseline donations of the uninformed subjects; being informed of a reward led to an average 0.16 percentage points increase on the likelihood to donate (Column 7) compared to 0.09% for the uninformed subjects. Columns 8 and 9 further show that the effect was driven by the $10 and especially $15 reward offers. The response to the $15 reward offer was particularly large; it increased the likelihood to donate by 0.35 percentage points, almost 300% over the likelihood that the uninformed subjects donated. For subjects with no history, the $10 offer marginally significantly increased the likelihood to donate compared to the $5 offer and the $15 offer significantly increased the likelihood to donate compared to either the $5 or $10 offer.

Estimating indirect effects: Figure 2b showed that donations across different reward values was increasing with the reward value among individuals who were uninformed of the rewards, which is consistent with these subjects learning about the reward offer from informed subjects. The survey evidence described in Section 3 is also consistent with this potential donor-to-donor communication. The survey results indicate that significantly more donors at the Advertised reward drives who were not formally informed of the reward

[16] We report one-tailed tests for the difference in the dollar reward amounts (e.g., $15 offer vs. $5 offer) since we assume any potential negative effects on motivation from being offered a reward are constant whereas the benefits are increasing as the reward value increases, consistent with Gneezy and Rustichini's (2000) evidence.

offer reported knowing about the reward (17%) than donors at the Surprise drive (4%) where no one was formally informed. Further, among the donors indicating they knew about the rewards, the uninformed donors at the Advertised drive were more likely to indicate learning about the reward offer from friends, family or co-workers (16.5%) than the informed donors (7.4%). This evidence suggests that offering rewards may have not only a direct effect of motivating individuals to donate, but also an indirect effect of motivating individuals to get others to donate.

We formally test this indirect effect in two ways. First, we compare the behavior of the uninformed subjects at the Advertised drives (where half the subjects were informed) and at the Surprise drives (where no subject was informed). Any difference in donations may be attributed to (informed) donor-to-(uninformed) donor communication since at both drives the ARC representatives and drive hosts were aware of the rewards, therefore only the presence of informed subjects systematically differs. Second, we compared the number of donations that occurred among individuals who were not contacted officially by the ARC for any drive at the Advertised reward drives (where half the donors were informed of the rewards) and at all other intervention drives (where no subjects were informed); if subjects informed of the reward were motivating others to donate, then other individuals beyond our subject population would learn about the rewards and thus result in higher donations at the Advertised than non advertised drives.

Figures 3a and 3b and Table 5 present evidence on potential donor-to-donor communication by comparing the behavior of the uninformed-of-reward subjects contacted about Advertised reward drives with the behavior of those contacted for the Surprise reward drives. For subjects with past history at the drives, the percentage who donated was higher among those who were uninformed of rewards at Advertised than Surprise drives, and this difference increases with the dollar value of the reward. Further, the donations of the individuals contacted for Surprise reward drives did not vary with the dollar value of the reward, suggesting not only that the higher percentage of donations among the uninformed at the advertised drives was driven by informal communications, but also provides further corroboration of our experimental design in which ARC representatives and drive hosts did not informally communicate with anyone about the rewards. For those without a past history at the drives, the donations of the uninformed at Advertised reward sites and at Surprise reward sites were very similar to each other and essentially flat across the dollar values.

In Table 5 we report estimates of versions of the following model to assess the magnitude and significance of potential donor-to-donor communications:

$$Prob(DONATED_{ijt}=1) = f(ADV\_UNINFORMED_{ijk}, X_{ijt}, \varepsilon_{jt}), \qquad (2)$$

where the dummy *ADV_UNINFORMED* equals 1 if a subject was contacted for an Advertised reward drive but was uninformed about the reward, and equals 0 if the subject was contacted for a Surprise reward drive. As before, we also estimate models where we create dummies for the different dollar levels of the rewards, and use linear probability models and the same basic specifications as for Equation (1). Drive-level fixed

effects cannot be used here since all subjects at a drive were in the same treatment. Instead, period fixed effects are included in the regressions and we cluster the standard errors at the drive level.[17]

For subjects with prior history at the drive, those uninformed of the rewards at the Advertised reward drives were 2.4 percentage points more likely to donate than the subjects at the Surprise drives. This difference is driven in large part by the difference in donations at the $15 drives, although the estimate is only marginally statistically significant ($p<.06$).[18] This estimated 4.4 percentage point increase is similar in magnitude to the difference between the OLS and drive fixed effect estimates for the $15 reward in Table 4 (7.3 - 4.7 in Columns 5 and 6). Therefore, it appears that informal donor-to-donor communications increases the likelihood that an officially uninformed subject will donate when individuals are informed of a $15 offer. For subjects with no past donations at the drives, no substantial effects are detected, which is consistent with the raw data shown in Figure 3b.

Table 6 presents further evidence that informed individuals motivated others to donate. Here we examine the 328 individuals who donated at the intervention sites and who were not contacted through any formal ARC channel about the drives where they donated, not even about the *presence* of that drive. Among these individuals, 108 were first-time donors (i.e., there is no previous record of them donating anywhere). The remaining 220 donors had donated at some point in the past (henceforth "lapsed" donors). If there were no informal communications about the rewards, we would expect these individuals' donations to be distributed across the drives proportionally to the number of intervention drives for each condition, thus 50.6% (36/71) at No reward drives, 36.7% (26/71) at Advertised reward drives, and 12.7% (9/71) at Surprise reward drives. However, Table 6 shows a "shift" in the actual distribution of these donors toward Advertised reward drives; 46.3%, 43.5% and 47.7% of overall, first-time and lapsed donors donated at the Advertised drives relative to the 36.7% of all drives being Advertised, and the differences are statistically significant at the 1%, 7%and 1% level, respectively (from binomial tests of proportions). We also find that the average number of not-contacted donors per drive was higher at the Advertised reward drives (5.8) than the No reward and Surprise reward drives (3.9). Thus, almost 2 extra non-contacted individuals donated per Advertised reward drive when the ARC officially communicated the reward to only half the subjects.

The total direct effect of incentives: To the extent that informal communication between subjects informed and uninformed of rewards motivated uninformed subjects to donate, the estimates in Table 4 understate the total direct effect of offering rewards. Thus we now compare the donations of subjects who were informed of rewards with those invited to the Surprise reward drives. We estimate versions of the following model:

[17] The Tables report both robust standard errors (in parentheses) and drive-level clustered standard errors [in brackets].
[18] The estimate is significant at the 11.5% level if we consider a 2-tailed test, but is significant within the conventional 10% level if we consider a one-tailed test. The one-tail test is appropriate here because we are testing the hypothesis of an *additional positive* effect with respect to a null of zero effect.

$$Prob(DONATED_{ijt}=1) = f(ADV\_INFORMED_{ijk}, X_{ijt}, \varepsilon_{jt}), \quad (3)$$

which is identical to model (2) except that the sample here replaces the uninformed-of-reward subjects with those informed of the rewards (*ADV_INFORMED*=1), whereas subjects contacted for the Surprise reward drives remain the reference group (*ADV_INFORMED*=0).

Table 7 presents the results. It shows that subjects with and without past donations at the intervention sites who were informed of the rewards were more likely to donate than those uninformed of the rewards. Across all three rewards values the likelihood to donate was 6.7 percentage points higher for subjects with past history (a relative increase of over 50% compared to a baseline of 13.2%), and 0.17 percentage points higher for those without past history (a relative increase of over 200% compared to a baseline of 0.08%). The effects were increasing in the dollar value of the reward; the $5, $10 and $15 rewards increased the probability of donating by 3.5, 6.9, and 9.5 percentage points, respectively, for subjects with a past history at the sites, and by 0.06 (marginally significant), 0.14 (marginally significant) and 0.37 percentage points for subjects with no previous history at the sites. The higher reward offers had a roughly linear effect among subjects with a past donation history at the sites (about 0.65 percentage points per dollar). However, among subjects without past history, the $15 reward had a strikingly large increase of over 400% (0.37/.08).

Heterogeneous effects: We also explore whether the reward offer differentially affected subjects by adding an interaction term for each subject characteristic and *INFO_REWARD* to model (3), i.e., comparing subjects informed of rewards at the Advertised reward drives with all subjects at the Surprise reward drives.[19] To avoid higher-order interactions, we estimated each interaction separately, thus the heterogeneous effects for each characteristic are evaluated at the mean value of the other characteristics. Table 8 reports the results.

There were no significant gender differences in the response to rewards. The likelihood to donate among men and women with a past history were 7.9 and 5.5 percentage points higher when informed of the rewards (Column 1), and men and women with no past history were 0.18 and 0.15 percentage points more likely to donate if informed of the rewards. These results differ from Mellstrom and Johannesson's (MJ 2008) and Lacetera and Macis' (LM 2010) results that find negative responses to rewards by women. However, there are many differences in methodologies and populations that may explain the differences; MJ 2008 examined a decision to take a health test among non-donor students (who knew they were taking part in a study), and LM 2010 examined stated preferences. Our results are based on actual donation behavior among existing donors who were unaware of participating in a study.

We also do not detect significant differences in the response to incentives across age, blood type or total past donations among subjects with previous history at the intervention sites (Columns 2-4).

[19] Appendix Table A3 shows estimates comparing subjects informed and uninformed of the rewards at the Advertised reward drives; the results are very similar, qualitatively and quantitatively, to those reported in Table 8. Appendix Table A4 shows estimates where we interact the subject characteristics with the different monetary values of the rewards.

Among subjects with no past history (Columns 7 and 9), we find significant heterogeneity; subjects who were older, had donated more often and more recently, were significantly more likely to donate when a reward was offered. The age effect is somewhat surprising, if older subjects have less flexibility (so higher opportunity cost of time) and greater wealth (so lower marginal utility for the rewards). One potential explanation is that older donors may be more secure (or less concerned) with rewards undermining either their self or social image or undermining their intrinsic motivations. Since the age affect only occurs among subjects with no past donations at the intervention sites, age may also reflect greater mobility and, to the extent the oldest subjects may be retired, may also reflect greater free time. On the other hand, we are not surprised that subjects who have donated more often in the past and more recently were more likely to donate when a reward is offered since they may pay more attention to drive information and since their intrinsic motives were less affected by receiving a reward.[20]

4.1.2 The effect of the incentives at non-intervention drives: testing for spatial displacement

The positive direct effect of reward offers on donations at the intervention drives may over-estimate the total increase in donations if the offer caused subjects to change the location of their donations from another drive to an intervention drive where rewards were offered.[21] Although this spatial displacement would be further evidence of incentives affecting subject's behavior, it is important to quantify spatial displacement in order to measure the genuine total effect of the reward offer.

To measure displacement, we now estimate the effect of our intervention on donations at ARC drives in Northern Ohio other than the intervention drives during the intervention period. If reward offers at the intervention drives attracted subjects who would have donated somewhere else in the same time period, then we should have observed a decrease in the likelihood to donate at other drives by subjects who were informed of the rewards. For this analysis, we assume that any unobserved blood donations at other locations outside of the ARC's operations were unlikely to affect the displacement estimates in any meaningful way since other blood banks played a minor role in Northern Ohio (under 15% of the total units collected) and donors are unlikely to donate with multiple blood collection organizations.[22] In this section we also report

[20] Appendix Table A4 shows that this effect was mostly driven by the $15 reward.

[21] Lacetera, Macis and Slonim (forthcoming), examining drive-level outcomes of the incentives that the ARC offered between 2006 and 2008, found a significant decrease in donations at spatially and temporally neighboring drives that did not offer incentives.

[22] It is also possible that displacement could occur outside Northern Ohio, but this is likely to reflect subjects moving rather an effect of the incentives. Displacement may also occur with plasma or platelet donations, however these blood products represent only a small percent of blood product donations and donors tend to be almost exclusively a whole blood donor only or a platelet donor only. Finally, subjects could more radically displace some other form of pro-social behavior in response to a blood donation reward offer, but this also seems unlikely to affect displacement estimates given the unobvious relationship between blood donations and other pro-social activities. An empirical analysis of displacement to all possibly relevant activities is beyond the scope of this paper, but studying displacement in the blood donation context may be as ideal a context as any given no close substitutes for blood donations (as opposed to, e.g., cash donations to a particular charity).

estimates of the total effect of the reward offer at *all* ARC drives (including the intervention drives) during the intervention months. By assessing the effect of the reward offer on the likelihood to donate *at any* location during the intervention period we can determine the overall (short-term) effect of the offer.

To examine displacement effects, we compare the behavior of subjects informed of the rewards at the Advertised drives with all subjects at the Surprise drives. We again estimate versions of model (3) but now use the outcome variables are "donated somewhere else" and "donated anywhere." We again analyze subjects with and without a past donation history at the sites separately. Because the likelihood to donate somewhere else depends on the number and characteristics of the alternative options, these regressions add controls for the heterogeneity in the number of other drives included on the flyer that offered rewards when the intervention drive was advertised,[23] whether a blood drive was available during the intervention month at any site where the subject had donated in the past, and if that drive occurred, whether it offered a reward during the intervention month. The coefficient of interest in these regressions is again *INFO_REWARD* (equal to 1 if subject *i* was informed of the reward at the Advertised drive and to 0 if *i* was contacted for a Surprise drive).

Table 9 presents the estimated coefficient on *INFO_REWARD* from twelve regressions. For comparison, Columns 1 and 4 show the estimates on "donated at the intervention drive" from Table 7 with the additional control variables for the number and characteristics of the alternative drives during the intervention period. Row 1 shows the estimates from regressions aggregating across the three reward values and Rows 2-4 present the estimates with separate dummies for each reward value. In all these regressions we include period fixed effects and cluster standard errors at the drive level. Columns 1 and 4 show that the extra control variables directionally increase the estimated effect of reward offers on donations by about 0.7 and 0.02 percentage points for subjects with and without past donation history, respectively, at the intervention drives (compared to those presented in Table 7), though they do not change the qualitative interpretation of any of the results described above.

For subjects with a past donation history at the intervention sites, being informed of the rewards increased the likelihood of donating at an intervention site by 7.4 percentage points but decreased the likelihood that they donated at another site by 1.9 percentage points. The displacement effect thus reduced the total effect of the rewards by roughly 25% (1.9/7.4). The displacement effect was only marginally significant on average, but was significant for the $15 reward offer ($p<.05$). In this case, displacement reduced the local effect (10.2 percentage points) by roughly 40% for an overall effect of 6.1 percentage point net increase in donations. Thus, donors substituted among drives and the displacement was especially large when the incentive was large. Moreover, in contrast to the local effect, the overall effect on the likelihood to

[23] We could control for either the number of drives offering incentives or the total number of drives on the flyer, but we could not include both since the correlation was nearly 80% between these two variables. The results do not change meaningfully with either control, and since the model fit and precision of most of the estimates are better when we control for the number of drives offering rewards, we present these estimates.

donate when a $10 or $15 reward was offered no longer differs. Thus, offering higher rewards increased the likelihood of donating at the intervention drives, but this larger increase appears to be the result also of attracting subjects to relocate their donation location rather than to generate a genuine new donation.

For subjects without a past donation history at the intervention sites, we do not find evidence for displacement effects;[24] on average, subjects without a past history were actually directionally more likely to donate at alternative locations, though the effect is estimated with substantial noise and none of the displacement estimates are close to significant. Given the directionally greater donations elsewhere, the coefficients on donated anywhere for subjects with past history is thus greater than the estimated coefficients for donations at the intervention drives only; for instance, over all rewards subjects were 0.33 percentage points more likely to donate anywhere (compared to only 0.19 percentage points more likely to donate at the intervention drives). However, since the overwhelming majority (over 99%) of their donations occurred at locations other than the intervention drives, there is much greater noise (unrelated to the experimental conditions) in these estimates. Thus, even though the overall effect is now 0.33 percentage points, it does not reach the level of significance as the standard errors increased from the intervention location estimate of 0.04 (reported in Column 4) to 0.22 (reported in Column 6) for the standard error on the overall estimates. Even with the higher standard errors, however, we find that offering the $15 rewards increased the donations anywhere significantly ($p<.05$).

In sum, we find a positive, significant direct effect of offering rewards on donations that increased with the dollar value of the rewards, but for subjects with a past donation history at the sites there was significant displacement such that the higher dollar value reward offers caused donors to change locations in response to the higher rewards, and thus the local effects over-estimated the total effects.

4.2 The long-term impact of the rewards

In Section 4.1 we assessed the overall short-term effect of offering incentives on donations during the intervention. However, the short-term impact is not sufficient to have a full view because some effects may have occurred after the intervention. For instance, a temporary reward offer may cause inter-temporal substitution or undermine motivations later. On the other hand, attracting people to donate when incentives are offered may help them develop a habit to donate, alter their expected donation costs or elicit reciprocity.

[24] The higher displacement among subjects with than without past history is not surprising. First, in our past work, Lacetera et al. (forthcoming), the drive level analysis showed that displacement occurred but only within two miles of reward drives, thus most donors without past history are likely to live too far from the intervention drive locations to relocate donations. More importantly, Table 3 showed that subjects without past history donated at less locations in the past (1.9) and were more likely to have only donated at one location (55%) than donors with past history (3.0 and 29% respectively), thus donors with past history have a history of more flexibility in the locations they will donate at, and thus should be more prone to displacement effects.

Our empirical strategy involves comparing an individual's donation behavior before and after the intervention. We have donation data for 20, 17, 14 and 9 months after the 1st, 2nd, 3rd and 4th intervention periods, respectively. However, we limit the follow-up period to nine months after the intervention since that lets us use data from all four periods and since the longer the time horizon the noisier the data (e.g., increased likelihood of subjects moving outside the region). We compare subject donations in the *N* weeks preceding an intervention ("pre") to donations in the *N* weeks after the intervention ("post"), with N = 13, 26 and 39.[25] We analyze behavior over different time horizons to check if the effects, if any, are temporary or persistent.

We examine two outcomes: whether a subject donated and the total number of donations. The latter outcome is only used for the 26 and 39 week intervals because a subject who donated at an intervention drive could only donate at most once within the 13 weeks pre- and post-intervention due to the eligibility restrictions.

We present results for the subjects who donated at one of the intervention drives during the intervention periods.[26] We compare subject behavior between those receiving and not receiving the reward, and we further distinguish between the subjects who were and were not informed in advance of the reward offer. Thus, subjects are divided into three categories: (a) those who donated at a No reward drive and were not contacted for any Advertised reward drive during the intervention period; these subjects were unaware of the intervention reward being offered and did not receive any reward; (b) those who donated at an Advertised reward drive and were informed in advance of the reward through the ARC's formal channels; these subjects were the most likely subjects to be aware of the reward offer and received the reward when they donated; and (c) those who donated at a Surprise reward drive and were not contacted for any Advertised reward drive; these subjects were unaware of the intervention reward being offered but received a reward as a surprise gift when they donated.[27] Tables 10 and 11 compare group (b) to (a) and (c) to (a), respectively. To make these comparisons, we estimate versions of the following model:

$$Y_{it} = \alpha + \beta POST + \delta_2 POST*TR\_COND + \lambda X_{it} + \eta_i + \varepsilon_{it}, \qquad (4)$$

where Y_{it} is the outcome for subject *i* in period *t* (where *t* = pre or post intervention). The regressions include individual fixed effects (η_i). *POST* is a dummy for the period after the intervention that captures any seasonal changes or trends in donations; the coefficient on POST will measure the change in donations for the No reward control group (a). *TR_COND* indicates the treatment condition for subject *i* where *i* could be in

[25] We use weeks since most drives at each location occur on the same day of the week and since most individuals donate at the same location over time. The number of weeks of eligibility is identical in the pre and post periods; subjects who donated at an intervention drive could not have donated eight weeks prior to or after the intervention.

[26] We also explored the long term effects of the rewards on subjects who did not donate at the intervention sites and find no significant changes in their post intervention donation behavior compared to their pre intervention behavior.

[27] In principle, this group could include also the individuals who donated at Advertised reward drives and were not informed of the presence of rewards. However, since at least some of these individuals could have known about the incentives in advance (as from the findings in section 4.1.2), we excluded them from this analysis.

condition (b) (Table 10) or condition (c) (Table 11), or in the omitted No reward condition (a) (both Tables). Since we estimate individual fixed effects and each subject was only in one condition, the regressions omit the main effect for the variable *TR_COND*. The critical parameter estimate reported in the tables is the interaction *POST*TR_COND* that measures the change in donation likelihood (or number of donations) post vs. pre-intervention for subjects in the treatment (b or c) versus the No reward control condition (a).

No reward vs. Advertised reward: For subjects with past history at an intervention site, Panel A of Table 10 shows a significant decrease in donations 13 weeks after than before a donation at an intervention drive for those who donated at the Advertised as compared to those who donated at No reward drives. The average reduction was 12 percentage points from a baseline donation rate of 50%, and a slight increase in the post-intervention donation probability for those who donated at the No reward drives. The overall negative effect was increasing in the value of the reward, and particularly strong (and statistically significant) for the $15 reward. There was no significant systematic effect for longer periods of time, however. Panel A also shows that for subjects with no past history at the sites there was no significant difference in donations after versus before the donation at the intervention drive. Panel B indicates that for both subjects with and without past history there was essentially no significant change in the number of donations in the 26 and 39 weeks after than before the intervention date for subjects who donated at the Advertised than No reward drives.

These findings are consistent with subjects with past history substituting the timing of donations to obtain the rewards rather than causing a permanent negative effect on motivation. First, while individuals are, *ceteris paribus*, more likely to incur the same rescheduling costs regardless of the dollar value of the rewards, the benefits of rescheduling are greater the higher the reward value. Second, and more importantly, since the negative effect disappears after 13 weeks it is unlikely to reflect a permanent change in motivation.

No reward vs. Surprise reward: Table 11 presents the estimates of the post-intervention effects on subjects who received the reward as a surprise gift. The estimates in Panel A of Table 11 show a significant decline in post-intervention donations for the subjects who received a surprise reward relative to their pre-intervention behavior compared to the change in behavior among subjects who donated at No reward drives. The overall decline remained significant for the full 39 weeks that we observed donations. Compared to the trend towards lower donations in the No reward group for the 26 and 39 week post intervention periods, -7.1 and -6.1 percentage points, respectively, the additional decline for subjects who donated at the Surprise drives was even larger, -10.7 and -8.6 percentage points, respectively. Panel B also shows that there is a significantly larger decline in the total number of donations among subjects who donated at the Advertised than No reward drives 39 weeks after than before the intervention, and the magnitude is quite substantial; while subjects who donated at the No reward drives donated on average 0.13 less units of blood after than before the intervention, subjects who donated at the Surprise reward drives donated an additional 0.35 units less, so

the decline was roughly three times larger for the subjects at the Surprise drive, and represents approximately a 15% additional drop in donations from the pre-donation level of 2.15 units. These negative significant effects, however, are detected only for subjects who had a previous history at the intervention sites; for subjects with no history at the interventions, we detect no significant difference in donations after than before the intervention period between subjects who donated at the Surprise and No reward drives.

The first conclusion from Table 11 is that there is no evidence of reciprocity; if subjects who received a gift by surprise wanted to reciprocate, they would have responded by donating more, not less, in the future. While this result is at odds with many laboratory experiments examining reciprocity, it is consistent with the lack of support for reciprocity behavior reported in some recent field evidence in labor markets and charitable fund raising (e.g., Gneezy and List, 2006).

There are at least two possible mechanisms that could explain the fall in donations after the surprise gift. First, some subjects might have been repulsed by the presence of the rewards, and the post-intervention decline in donations might reflect this repugnance. However, as reported above, regardless of whether subjects were informed in advance of the rewards and regardless of the dollar value, almost all subjects took the gift cards and spent almost the full amount within a short period of time. If they were opposed to receiving a gift for making a donation, they could have refused to take them or not use them. Thus we favor a second explanation: for a subset of subjects, the (unexpected) presence of the rewards led to a subsequent reduction in intrinsic motivation. This undermining of motivation is consistent with the prolonged reduction in donations throughout the post intervention time. It is also consistent with a potential sorting in which the subjects who would lose motivation if a reward was offered could avoid the intervention drives offering rewards, but could not avoid them when the rewards were a surprise; Lazear et al. (forthcoming) found similar sorting in which subjects sacrificed money to avoid playing a game in which they could have been perceived to behave antisocially.

4.3 Cost-Benefit Analysis

We now use our results to quantify the cost of rewards per each extra unit of blood collected when a reward was offered. Since we find no evidence that offering rewards significantly affected donations in the longer term (with the exception of Surprise reward drives, which we do not consider here because giving reward by surprise is not a practice of the ARC – Northern Ohio Blood Services), we only include the extra units collected during the intervention period. We also only consider parameter estimates that are statistically significant, and assign a value of zero to the others.

The analysis, reported in Table 12, uses the information from Table 9. Columns 1 and 4 in Table 9 show that 13.2% and 0.08% of contacted subjects with and without prior history at the intervention sites, respectively, donated when uninformed of the rewards. This result is reported in the first row of Table 12 that

assumes 100 individuals are contacted. The third row in Table 12 reports the additional units of blood collected when the reward was offered (Columns 3 and 6 in Table 9). Since the ARC has to give the reward to all donors presenting, regardless of whether they donated, we need to convert the estimates on units collected to donors presenting in order to determine the number and costs of the rewards that have to be given to donors. Our past work (Lacetera et al., forthcoming) found that the blood units collected were 13% less than the number of presenting donors due to deferrals, regardless of the presence or cost of the reward. Table 12 thus shows the donors presenting to be the units collected times 1.149 (=1.00/0.87); Rows 2, 4 and 5 show the estimated number of donors who presented when no incentives were offered, the extra donors presenting when incentives were offered and the total number of donors presenting when incentives were offered, respectively. Row 6 indicates the total cost of the rewards per 100 contacted individuals, i.e. the product of donors presenting and dollar value of the gift cards, and Row 7 reports the additional cost per extra unit of blood collected. For individuals with past history at the intervention location, offering the $10 reward was more cost effective than offering the $15 reward. It was more cost effective since the $15 reward attracted more individuals to donate at the intervention drive that had to be given the reward, which was more expensive, and since the number of extra units collected was not different between the two reward amounts for donations everywhere that adjusts for the larger displacement when the $15 rewards were offered. The $15 offer to subjects with no past donation history at the intervention sites was the most cost effective; its advantage derives from attracting the greatest number of extra donors (0.45 per hundred) relative to those who would have donated without the reward (0.08 per hundred).[28]

Estimating the benefit from collecting one extra unit of blood is more difficult. One approach is to estimate a lower bound based on the amount that is paid for each unit of blood. The Medicare hospital outpatient payment rate for a unit of whole blood for transfusion was set in 2010 at $206.25 (Centers for Medicare and Medicaid Services, 2010).[29] This suggests that the $10 and $15 rewards for people with previous history and the $15 rewards for people without history are highly cost effective. Another approach is to calculate the value of the potential uses of the additional blood collected. For example, about 7 units of blood are needed for brain surgery, hip replacement and for cancer treatment on average per patient in a week, as well as for certain organ transplants (Canadian Blood Service, 2011). To fully capture the benefits, we would need to further determine the expected impact of these procedures on the life expectancy and quality of the patients multiplied by the dollar value of those extra (quality-adjusted) years of life to the

[28] These estimates ignore the marginal costs of the ARC operations to collect each additional unit. We assume these are relatively small given the scale of the ARC's operations and that the marginal costs for the equipment and storage are assumed to be very low.

[29] Personal communications with medical professionals suggest that the amount that hospitals bill to patients and insurers when performing transfusions can reach about $1,000 per blood unit.

recipient as well as to the rest of society.[30] Although there may be potentially large variation in these expected benefits, it seems reasonable to assume that the benefits will far outweigh the extra costs we have estimated.

5. Summary and discussion

Titmuss' (1971) claim that offering material rewards for blood donations might backfire and lower donations has motivated many studies on the impact of explicit rewards on several intrinsically motivated activities. In particular, concerns have been raised that explicit incentives for pro-social activities can be counter-productive and lower supply of these tasks. The evidence has been mixed, and no study has offered a comprehensive picture within the same field setting of whether and how incentives might affect pro-social behavior including the shape of the supply curve, heterogeneity in individual responses, spatial and temporal responses and indirect responses that motivate others. Our natural field experiment on the effect of material rewards on blood donation fills this gap.

The first-order, robust finding of this study is that providing material rewards led to a large and significant increase in the propensity to donate, and in a very standard way: the effect was increasing in the amount of the incentives. In addition to this direct effect, we observed that more uninformed and non-contacted subjects donated when others had been informed of the rewards, suggesting that the reward offer caused an indirect effect in which informed individuals motivated others to donate. We also found that rewards led to some spatial and short-term inter-temporal displacement. Finally, we observed a long-term decline in donations among subjects who received a gift by surprise; thus we found no evidence of reciprocity and instead observed responses consistent with motivational undermining effects after receiving an unexpected reward.

The results suggest some key implications for blood collection agencies. First, although spatial substitution in a given period might be a concern since it reduces the full impact of incentives, the presence of substitution over time could enhance efficiency in blood collection or any other pro-social activity for which demand varies over time; incentives might be an effective way of reallocating donations toward periods of greater shortage. Second, the negative long term effect on donations after the surprise gifts were given to donors implies that it is preferable to inform people of the presence of rewards in advance.

The experiment and evidence described in this paper, in addition to contributing to the debate on how economic incentives affect the supply of public goods and pro-social activities, also offers insights to policymakers and organizations interested in enhancing the supply of blood as well as other health-related products whose availability relies on a vast and disperse set of (mostly volunteer) suppliers. Examples

[30] Note that one unit of blood collected provides a full unit of red cells and several partial units of plasma, platelets and cryoprecipitate. In general, up to three of these four products can be derived from one unit and used on multiple patients.

include the millions of hours that people volunteer in hospitals and organizations like the Red Cross, or the donation of bone marrow and organs. A number of initiatives in developing countries are also based on the diffused distribution of health products, such as bed nets and condoms (Ashraf, Bandiera and Jack, 2011, Cohen and Dupas, 2010; Dupas, 2011).

We conclude by discussing some directions for future research. First, the subjects studied in this paper had all donated at least once in the past. Although studying existing donors is a natural starting point to study the effect of incentives on donations, future research can examine whether incentives can be used to induce non-donors to donate, and potentially become long-term donors. Note, however, that people who have never donated are, *ceteris paribus*, presumably less intrinsically motivated than current donors, and therefore it might be problematic (if appropriate at all) to test for any tradeoff between extrinsic and intrinsic incentives. Second, in this paper we assessed the effect of incentives in an environment where donors are used to seeing them offered. An interesting question is whether incentives would have similar positive effects if they were offered a setting where they have never been offered. Third, and closely related to the previous point, it would also be interesting to learn whether incentives would have a similar positive effect if they were offered all the time, or whether individuals would habituate to the presence of incentives and so donation levels would revert to levels without reward offers. Fourth, we focused on incentives with a financial value in this paper, but other motivators and actions (e.g., social recognition, reducing waiting times, having donors make appointments, rewarding hosts or ARC representatives, or encouraging donors to actively focus on the donation decision)[31] could be used to induce more blood donations, and it would be interesting – from both academic and policy points of view - to assess how these policies compare to those of the economic incentives.

[31] For instance, Stutzer, Goette and Zehnder (2011) find that active-decision reflection increases donations among individuals who have not thought about the importance of blood donations.

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Figures

Figure 1: Example of the ARC flyers used in the experiment

The drive locations have been redacted for confidentiality reasons. This flyer was received by the individuals informed of rewards, and the Advertised reward drive of which they were informed is the one in the bottom-left corner (the position within the drive was the same within a given county, but varied in a random way across counties for different drives). The contacted individuals uninformed of the rewards would receive the exact same flier, with the exclusion of the information about the reward at the intervention drive highlighted (by us) in the flier reported here. A flier communicating about a Surprise drive would, again, include information about the host, location and time of a drive, but not on the rewards.

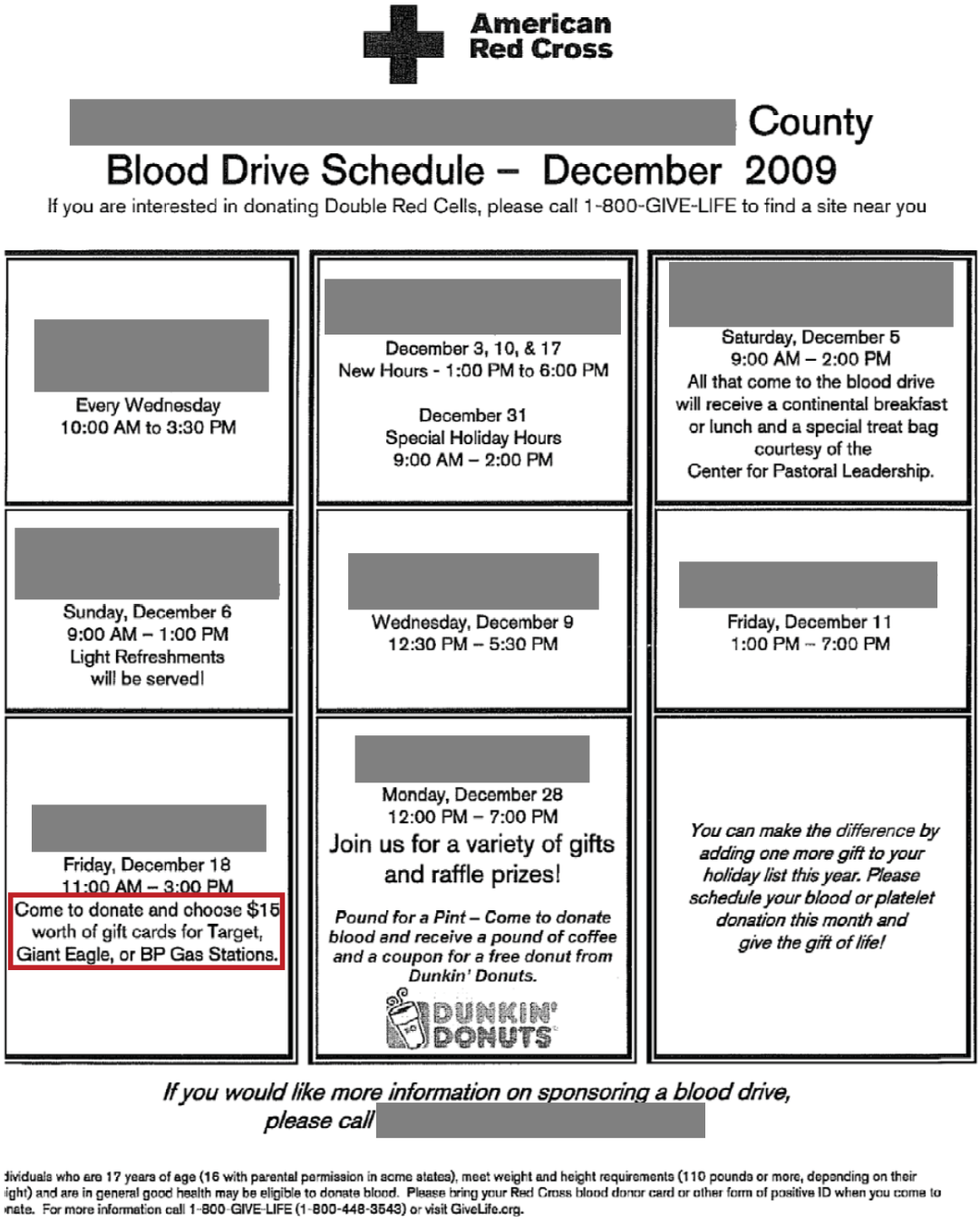
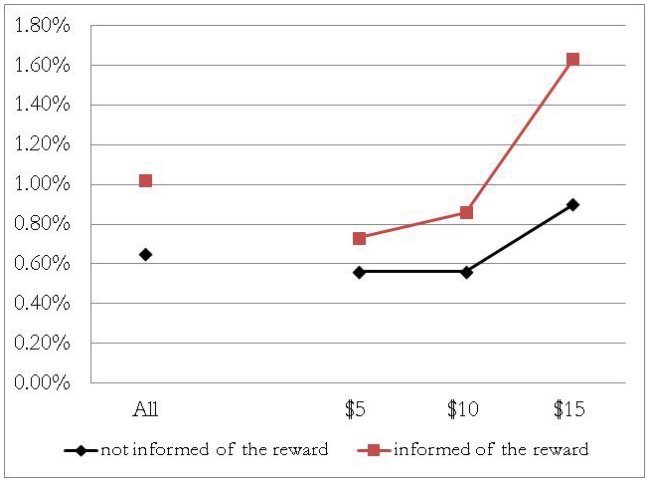


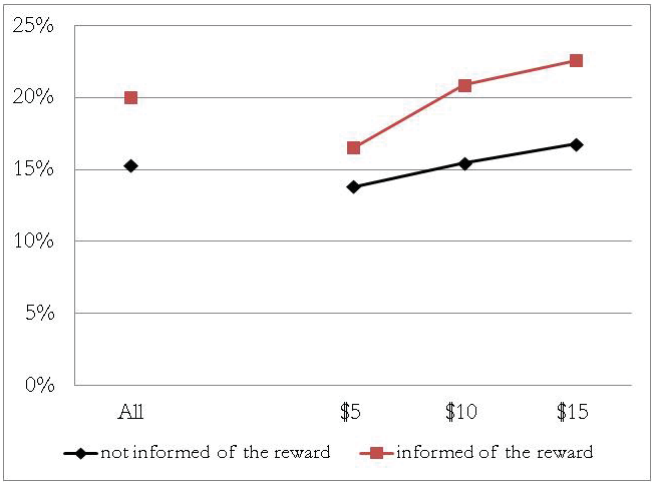
Figure 2: Percent of subjects who donated at the Advertised Reward drives

The graphs show the percent of subjects contacted for an Advertised reward drive who donated blood at that drive who were not informed of the reward (black diamonds) and who were informed of the reward (red squares) The overall donations are shown on the left side. The right side shows the donations broken into the specific reward dollar values.

2a: All subjects contacted (N = 92,722 individual-period observations)



2b: Subjects who had previously donated at intervention sites (N = 3,516 individual-period observations)



2c: Subjects who had not previously donated at intervention sites (N = 89,206 individual-period observations)

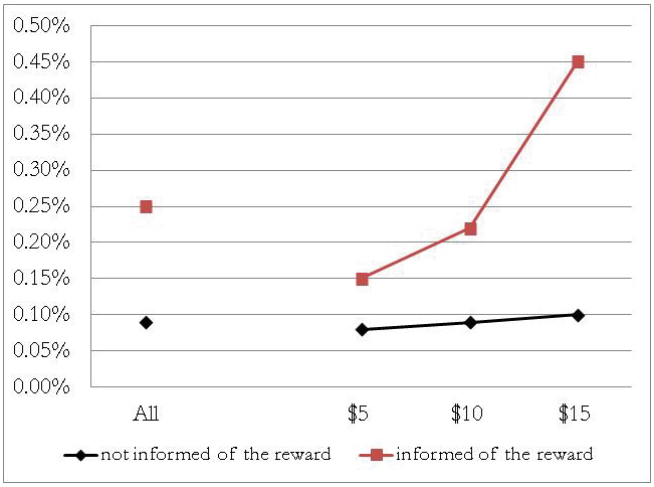
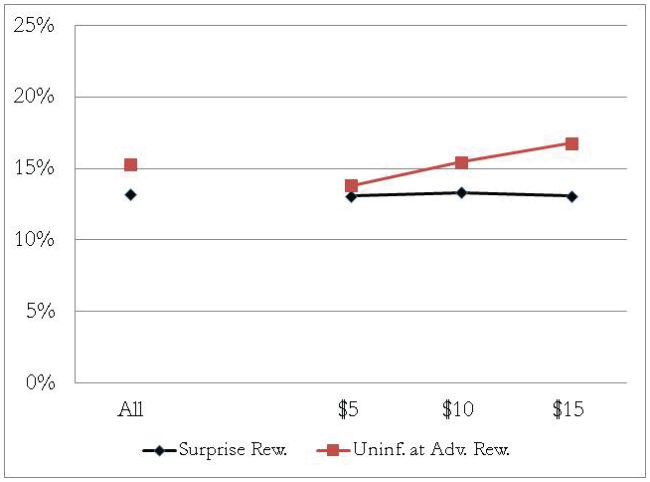


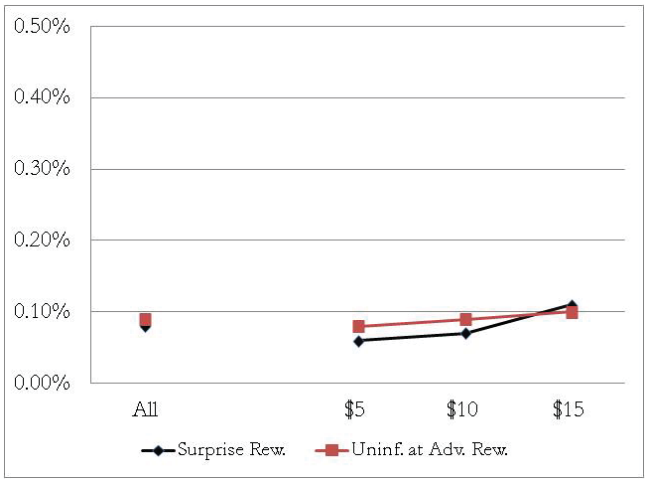
Figure 3: Percentage of subjects, uninformed of the rewards at Advertised Reward drives, and at Surprise Reward drives, who donated at the treatment drives

The black diamonds report the percent of subjects informed of a Surprise reward drive who donated at that drive. The red squares report the percent of subjects informed of an Advertised reward drives, but not informed by the ARC of the reward offer, who donated at that drive.

3a: Subjects who previously donated at intervention sites (N = 2,939 individual-period observations)



3b: Subjects who had not previously donated at intervention sites (N = 79,317 individual-period observations)



Tables

Table 1a: Experimental design – effect identified by each type of drive

The shadowed areas show the different sources in which subjects in each condition could have learned about the incentives. Subjects in the Advertised reward condition who were informed by the ARC (condition 1) could have heard about the incentives through the flyers, from other informed donors or potentially informally from ARC representatives or drive hosts. Subjects in the Advertised reward condition who were not informed by the ARC's formal channels (condition 2) could have heard about the incentives from an informed donor or potentially informally from ARC representatives or drive hosts. Subjects in the Surprise reward condition (condition 3) could only have heard about the incentives potentially from ARC representatives or drive hosts. The difference in donations between conditions (1) and (2) estimates the direct reward communication effect at Advertised reward drives. The difference in response between (2) and (3) estimates the indirect donor-to-donor communication effect. The difference between (1) and (3) estimates the direct reward communication effect excluding potential donor-to-donor communication effects. The difference between (3) and (4) during the intervention lets us verify whether our protocols were followed regarding no informal host/representative communication with donors. More importantly, the No reward condition (4) lets us estimate the long term effect of offering a reward by comparing donors at the intervention drives in (1) vs. (4), and of giving a surprise reward by comparing donors at the intervention drives in (3) vs. (4).

		Potential Effects		
Treatment Condition		Direct incentive effect	Donor-to-Donor communication	Rep-to-Donor, Host-to-Donor communication
(1)	Advertised reward drive & Subjects informed of rewards			
(2)	Advertised reward drive & Subjects uninformed of Rewards			
(3)	Surprise reward drive (No subject informed of rewards)			
(4)	No Reward drive			

Table 1b: Experimental Design – type of drives and sample size

The figures in each cell indicate to the number of drives and subjects contacted for each treatment.

		Level of treatment			
Treatment Condition		None	$5	$10	$15
(1)	Advertised reward drive & Subjects informed of rewards (26 drives total)		9 drives 17,847 subjects contacted	9 drives 15,849 subjects contacted	9 drives 12,738 subjects contacted
(2)	Advertised reward drive & Subjects uninformed of rewards (26 drives total)		9 drives 17,986 subjects contacted	9 drives 15,744 subjects contacted	9 drives 12,558 subjects contacted
(3)	Surprise reward drive (No subject informed of rewards) (9 drives total)		3 drives 10,846 subjects contacted	3 drives 12,515 subjects contacted	3 drives 12,607 subjects contacted
(4)	No Reward	36 drives 128,820 subjects			

Table 2: Characteristics of the field experiment sites before and during the intervention

The table presents characteristics of the 71 experimental drive locations measured in the reference year (before the first intervention wave) and on the intervention date.

	No Reward	Advertised Reward	Surprise Reward
Pre-Intervention			
N. of drives in reference year	5.56	5.70	6.00
	(1.38)	(1.30)	(0.71)
Fraction of drives with incentives	0.21	0.24	0.25
	(0.19)	(0.18)	(0.19)
Average drive length (hours)	5.22	5.29	4.98
	(0.76)	(0.62)	(0.77)
Average N. of donors presenting	30.68	32.05	27.38
	(10.20)	(9.63)	(7.97)
Average N. of units of blood collected	26.69	28.07	23.79
	(8.94)	(8.34)	(7.59)
Donors deferred as a share of presenting	0.13	0.12	0.14
	(0.04)	(0.03)	(0.04)
At intervention drive			
Drive length	5.18	5.08	4.89
	(0.90)	(0.78)	(0.78)
N. of drives in flyer		15.35	13.67
		(6.42)	(4.95)
N. of drives with ARC rewards in flyer		8.50	6.89
		(5.16)	(2.52)
N	36	26	9

Table 3: Individuals contacted for the intervention drives -- Descriptive statistics

The table presents characteristics for the total unique 128,690 individual-period subjects contacted for an intervention drive. Note that approximately 50% of the subjects were contacted for exactly one reward treatment drive. The remainder, who were contacted for more than one treatment drive, by design, would always have been in a different condition each period they were contacted.

	All individuals contacted			Individuals with previous donation experience at the intervention site			Individuals without previous donation experience at the intervention site		
	Advertised reward		Surprise reward	Advertised reward		Surprise reward	Advertised reward		Surprise reward
	Informed of reward	Not. Inf. of reward		Informed of reward	Not. Inf. of reward		Informed of reward	Not. Inf. of reward	
Female	0.52	0.52	0.51	0.49	0.50	0.48	0.52	0.53	0.51
O-Negative blood type	0.09	0.09	0.09	0.11	0.10	0.11	0.09	0.09	0.09
Age									
16-25	0.31	0.31	0.30	0.13	0.14	0.14	0.32	0.32	0.31
26-50	0.38	0.38	0.38	0.36	0.35	0.32	0.38	0.38	0.38
51+	0.31	0.30	0.32	0.51	0.51	0.54	0.30	0.30	0.31
Total N. of previous donations									
1-4	0.53	0.53	0.53	0.22	0.23	0.23	0.54	0.54	0.54
5-9	0.16	0.16	0.16	0.19	0.19	0.17	0.16	0.16	0.16
10+	0.31	0.31	0.31	0.59	0.58	0.60	0.30	0.30	0.30
Time of last donation prior to intervention									
within 6 months	0.38	0.38	0.38	0.57	0.57	0.59	0.37	0.37	0.37
between 6 and 12 months	0.28	0.28	0.28	0.20	0.19	0.20	0.28	0.28	0.28
more than 12 months	0.34	0.35	0.35	0.23	0.24	0.21	0.35	0.35	0.35
Number of sites where donated in the past									
Mean	2.0	2.0	1.8	3.1	2.9	3.1	2.0	1.9	1.7
Share donated at one site only	0.55	0.55	0.64	0.29	0.33	0.29	0.56	0.56	0.65
N	46,434	46,288	35,968	1,806	1,710	1,229	44,628	44,578	34,739

Table 4: The direct effect of the incentives at the Advertised reward drives

The sample includes all subjects who were contacted for an Advertised reward drive. The dependent variable is equal to 1 if a subject has donated blood at the intervention drive, and 0 otherwise. The estimates are from linear probability models. Intervention period fixed effects are present in all specifications (except when drive fixed effects are included), and robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Dependent Variable	1 if donated at intervention drive, 0 otherwise								
Sample	Subjects contacted for an Advertised reward drive								
	All			Previous history at site			No previous history at site		
Mean of dep. var. (for Uninformed subjects)	0.65 %			15.32 %			0.09 %		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Informed of Reward	0.33***			4.55***			0.16***		
	(0.06)			(1.23)			(0.03)		
Informed of $5 Reward		0.10	0.15*		1.37	3.21*		0.05*	0.06*
		(0.07)	(0.08)		(1.66)	(1.93)		(0.03)	(0.04)
Informed of $10 Reward		0.32***	0.31***		4.89**	5.57**		0.13***	0.14***
		(0.08)	(0.09)		(1.94)	(2.30)		(0.04)	(0.05)
Informed of $15 Reward		0.67***	0.61***		7.29***	4.65**		0.36***	0.34***
		(0.11)	(0.13)		(1.73)	(2.08)		(0.06)	(0.07)
Female	-0.17***	-0.16***	-0.17***	-2.55**	-2.46**	-2.03	-0.01	-0.01	-0.01
	(0.06)	(0.06)	(0.06)	(1.24)	(1.24)	(1.23)	(0.03)	(0.03)	(0.03)
Age 26-50	-0.00	-0.00	-0.00	2.59	2.65	3.38**	0.06**	0.07**	0.06**
	(0.05)	(0.05)	(0.06)	(1.67)	(1.66)	(1.69)	(0.03)	(0.03)	(0.03)
Age 50+	0.33***	0.33***	0.35***	7.23***	7.42***	9.09***	0.16***	0.16***	0.16***
	(0.08)	(0.08)	(0.08)	(1.75)	(1.74)	(1.77)	(0.05)	(0.05)	(0.05)
O-Negative blood type	-0.08	-0.08	-0.07	-0.51	-0.33	-0.20	-0.06	-0.05	-0.05
	(0.10)	(0.10)	(0.10)	(2.04)	(2.04)	(1.96)	(0.04)	(0.04)	(0.04)
Between 5 and 9 past donations	-0.26***	-0.26***	-0.26***	-1.99	-1.95	-1.57	0.01	0.01	0.00
	(0.07)	(0.07)	(0.07)	(1.64)	(1.64)	(1.65)	(0.04)	(0.04)	(0.04)
More than 10 past donations	0.23***	0.22***	0.20***	3.40**	3.31**	3.12**	0.06	0.05	0.04
	(0.08)	(0.08)	(0.08)	(1.57)	(1.57)	(1.59)	(0.04)	(0.04)	(0.05)
Last donation within past 6 months	0.95***	0.96***	0.96***	18.46***	18.44***	19.19***	0.26***	0.26***	0.25***
	(0.06)	(0.06)	(0.06)	(1.28)	(1.28)	(1.29)	(0.03)	(0.03)	(0.03)
Last donation between 6 and 12 months	0.09**	0.09**	0.09**	2.38*	2.39*	3.61***	0.06**	0.06**	0.06**
	(0.04)	(0.04)	(0.04)	(1.32)	(1.32)	(1.36)	(0.02)	(0.02)	(0.02)
Previous history at site	17.19***	17.17***	16.95***						
	(0.63)	(0.63)	(0.64)						
P-value of:									
$10 Informed ≥ $5 Informed		0.01	0.09		0.06	0.22		0.05	0.08
$15 Informed ≥ $10 Informed		0.00	0.02		0.15	0.61		0.00	0.01
$15 Informed ≥ $5 Informed		0.00	0.00		0.00	0.31		0.00	0.00
Drive FEs	No	No	Yes	No	No	Yes	No	No	Yes
Observations	92,722	92,722	92,722	3,516	3,516	3,516	89,206	89,206	89,206
R-Squared	0.14	0.14	0.14	0.09	0.09	0.12	0.002	0.002	0.002

Table 5: Potential Donor-to-Donor Effects; Uninformed at Advertised reward drives vs. Uninformed at Surprise reward drives

This table compares donations of subjects contacted but not informed of the rewards at the Advertised and Surprise reward drives. The dependent variable is equal to 1 if a subject has donated blood at the intervention drive, and 0 otherwise. The estimates are from linear probability models. Controls for gender (dummy for female), age (dummies for 25-49 and 50+), O-Negative blood type, total donations to date (dummies for 2-9 and 10+) and most recent donation (within the last 6 months or in the last 6 to 12 months) as well as period fixed effects are included in all the regressions. Robust standard errors are reported in round brackets, and clustered standard errors for the 35 drive-level clusters are reported in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Dependent Variable	1 if donated at intervention drive, 0 otherwise			
Sample	Uninformed Subjects (either at Surp. or Adv. Reward drives)			
	Previous history at site		No previous history at site	
Mean of dep. var. (for Uninformed subjects)	13.18 %		0.08 %	
	(1)	(2)	(3)	(4)
Uninformed at Advertised Reward Drives	2.37		0.004	
	(1.30)*		(0.02)	
	[1.98]		[0.02]	
Uninformed at $5 Advertised Reward Drives		0.77		-0.005
		(1.68)		(0.03)
		[2.78]		[0.02]
Uninformed at $10 Advertised Reward Drives		1.76		0.003
		(1.84)		(0.03)
		[3.22]		[0.04]
Uninformed at $15 Advertised Reward Drives		4.39		0.017
		(1.78)**		(0.03)
		[2.71]		[0.03]
P-value of:				
$10 Adv.Rew. ≥ $5 Adv.Rew.		0.40		0.41
$15 Adv.Rew. ≥ $10 Adv.Rew.		0.25		0.37
$15 Adv.Rew. ≥ $5 Adv.Rew.		0.16		0.26
Observations	2,939	2,939	79,317	79,317
Adjusted R-squared	0.07	0.07	0.001	0.001

Table 6: Distribution of Not Contacted Donors at Intervention Drives

This table reports which intervention drives individuals donated at who were not contacted by the ARC. We distinguish two types of non-contacted donors: first-time donors and those with some past donations.

	All non-contacted donors		
	at No Reward Drives	at Surprise Reward Drives	at Advertised Reward Drives
N. of drives	36	9	26
Share of total N. of drives	50.7%	12.7%	36.6%
N. of non-contacted donors	148	28	152
Share of total N. of non-contacted donors	45.1%	8.5%	46.3%
Difference			9.7%
Binomial test p-value			0.01
	First-time donors		
	at No Reward Drives	at Surprise Reward Drives	at Advertised Reward Drives
N. of drives	36	9	26
Share of total N. of drives	50.7%	12.7%	36.6%
N. of non-contacted donors	56	5	47
Share of total N. of non-contacted donors	51.9%	4.6%	43.5%
Difference			6.9%
Binomial test p-value			0.07
	Non first-time donors		
	at No Reward Drives	at Surprise Reward Drives	at Advertised Reward Drives
N. of drives	36	9	26
Share of total N. of drives	50.7%	12.7%	36.6%
N. of non-contacted donors	92	23	105
Share of total N. of non-contacted donors	41.8%	10.5%	47.7%
Difference			11.1%
Binomial test p-value			0.01

Table 7: The total direct effect of the incentives

This table compares the donations of informed of reward subjects at the Advertised reward drives with the donations of subjects contacted for Surprise reward drives. The dependent variable is equal to 1 if a subject has donated blood at the intervention drive, and 0 otherwise. The estimates are from linear probability models. Controls for gender (dummy for female), age (dummies for 25-49 and 50+), O-Negative blood type, total donations to date (dummies for 2-9 and 10+) and most recent donation (within the last 6 months or in the last 6 to 12 months) as well as period fixed effects are included in all the regressions. Robust standard errors are reported in round brackets, and clustered standard errors for the 35 drive-level clusters are reported in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Dependent Variable	1 if donated at intervention drive, 0 otherwise			
	Subjects informed of reward at Adv. or uninformed at Surp. drives			
Sample	Previous history at site		No previous history at site	
Mean of dep. var. (for Uninformed subjects)	13.18 %		0.08 %	
	(1)	(2)	(3)	(4)
Informed of Reward	6.72		0.17	
	(1.33)***		(0.03)***	
	[2.04]***		[0.05]***	
Informed of $5 Reward		3.45		0.06
		(1.74)**		(0.03)*
		[2.48]		[0.04]
Informed of $10 Reward		6.87		0.14
		(2.01)***		(0.04)***
		[3.01]**		[0.08]*
Informed of $15 Reward		9.47		0.37
		(1.79)***		(0.06)***
		[2.91]***		[0.11]***
P-value of:				
$10 Informed ≥ $5 Informed		0.16		0.17
$15 Informed ≥ $10 Informed		0.25		0.04
$15 Informed ≥ $5 Informed		0.05		0.00
Observations	3,035	3,035	79,367	79,367
Adjusted R-squared	0.09	0.09	0.002	0.002

Table 8: Testing for Heterogeneous Effects

This table compares the donations of informed of reward subjects at the Advertised reward drives with the donations of subjects contacted for Surprise reward drives. The dependent variable is equal to 1 if a subject has donated blood at the intervention drive, and 0 otherwise. The estimates are from linear probability models. Period fixed effects are included in all specifications. Robust standard errors are reported in round brackets, and clustered standard errors for the 35 drive-level clusters are reported in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Dependent Variable	1 if donated at intervention drive, 0 otherwise									
Sample	Subjects informed of reward at Adv. or uninformed at Surp. drives									
	Previous history at site					No previous history at site				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Informed of Reward	7.93	5.65	6.66	7.00	2.67	0.18	0.04	0.17	0.06	0.02
	(1.96)***	(2.63)**	(1.41)***	(2.17)***	(1.65)	(0.04)***	(0.04)	(0.03)***	(0.03)*	(0.02)
	[2.76]***	[2.55]**	[2.05]***	[2.56]***	[1.91]	[0.05]***	[0.04]	[0.05]***	[0.04]	[0.02]
Female	-1.82	-3.31	-3.30	-3.30	-3.38	0.04	0.03	0.03	0.03	0.03
	(1.88)	(1.33)**	(1.33)**	(1.33)**	(1.33)**	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
	[1.27]	[1.31]**	[1.31]**	[1.31]**	[1.33]**	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Age 26-50	0.24	0.37	0.25	0.26	0.44	0.03	-0.06	0.03	0.03	0.02
	(1.82)	(2.32)	(1.82)	(1.82)	(1.82)	(0.03)	(0.03)*	(0.03)	(0.03)	(0.03)
	[1.58]	[2.65]	[1.57]	[1.57]	[1.58]	[0.04]	[0.02]***	[0.04]	[0.03]	[0.03]
Age 50+	4.42	3.21	4.42	4.41	4.61	0.15	0.02	0.15	0.15	0.14
	(1.89)**	(2.34)	(1.89)**	(1.89)**	(1.89)**	(0.05)***	(0.05)	(0.05)***	(0.05)***	(0.05)***
	[1.76]**	[2.32]	[1.76]**	[1.75]**	[1.71]**	[0.04]***	[0.04]	[0.04]***	[0.04]***	[0.04]***
O-Negative blood type	-3.87	-3.89	-4.28	-3.93	-3.95	-0.03	-0.03	0.00	-0.03	-0.03
	(2.01)*	(2.01)*	(2.85)	(2.01)*	(2.01)**	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)
	[2.26]*	[2.26]*	[2.84]	[2.26]*	[2.26]*	[0.06]	[0.06]	[0.05]	[0.06]	[0.06]
Between 5 and 9 past donations	-0.11	-0.04	-0.08	0.53	-0.28	0.08	0.08	0.08	-0.01	0.07
	(1.73)	(1.73)	(1.73)	(2.30)	(1.73)	(0.05)	(0.05)*	(0.05)	(0.05)	(0.05)
	[1.76]	[1.76]	[1.77]	[2.90]	[1.81]	[0.04]*	[0.04]*	[0.04]*	[0.03]	[0.04]
More than 10 past donations	4.88	4.89	4.89	4.97	4.74	0.05	0.05	0.05	-0.10	0.05
	(1.67)***	(1.67)***	(1.67)***	(2.22)**	(1.67)***	(0.05)	(0.05)	(0.05)	(0.04)**	(0.05)
	[1.89]**	[1.90]**	[1.89]**	[2.71]*	[1.92]**	[0.05]	[0.05]	[0.05]	[0.05]*	[0.05]
Last donation within past 6 months	18.15	18.15	18.13	18.16	13.99	0.29	0.28	0.29	0.28	0.10
	(1.37)***	(1.37)***	(1.37)***	(1.37)***	(1.85)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***
	[2.19]***	[2.18]***	[2.19]***	[2.20]***	[2.02]***	[0.05]***	[0.05]***	[0.05]***	[0.05]***	[0.04]**
Last donation between 6 and 12 months	1.69	1.72	1.72	1.73	1.55	0.08	0.08	0.08	0.08	0.04
	(1.35)	(1.35)	(1.35)	(1.35)	(1.78)	(0.03)***	(0.03)***	(0.03)***	(0.03)***	(0.03)
	[1.00]	[0.99]*	[1.00]*	[1.00]*	[1.51]	[0.03]***	[0.03]***	[0.03]***	[0.03]***	[0.03]
Female*Informed of Reward	-2.46					-0.03				
	(2.58)					(0.06)				
	[2.41]					[0.05]				
Age 26-50*Informed of Reward		-0.09					0.15			
		(3.36)					(0.05)***			
		[3.52]					[0.06]**			
Age 50+*Informed of Reward		2.10					0.23			
		(3.29)					(0.08)***			
		[3.36]					[0.08]***			
O-Negative*Informed of Reward			0.59					-0.06		
			(3.94)					(0.10)		
			[4.37]					[0.11]		
5-9 Past Donations*Informed of Reward				-1.02					0.15	
				(3.32)					(0.09)*	
				[3.56]					[0.07]*	
10+ Past Donations*Informed of Reward				-0.16					0.28	
				(2.88)					(0.07)***	
				[3.74]					[0.09]***	
Last.Don.within 6 months*Informed of Reward					6.93					0.33
					(2.61)***					(0.07)***
					[3.71]*					[0.09]***
Last.Don.6-12 months*Informed of Reward					0.25					0.08
					(2.59)					(0.05)
					[2.09]					[0.05]
Observations	3,035	3,035	3,035	3,035	3,035	79,367	79,367	79,367	79,367	79,367
Adjusted R-squared	0.09	0.09	0.09	0.09	0.09	0.002	0.002	0.002	0.002	0.002

Table 9: Local, Displacement, and Total Effects - The Effect of incentives on a) donating at the intervention drive, b) donating at some other drive in the intervention month, and c) donating anywhere during the intervention month.

The table reports estimated coefficients on a dummy variable equal to 1 if the subject was informed of the reward. Each coefficient in the first row comes from a separate linear probability regression, and the coefficients in rows 2-4 come from one linear probability regression for each dependent variable. The samples include all the subjects informed of rewards who were invited to an Advertised reward drive and all subjects invited to the Surprise reward drives. The dependent variable is indicated at the top of each column, and the specifications are the same as those in Table 7 with the addition of control variables for the number and characteristics of alternative drives during the intervention period. Robust standard errors are reported in round brackets, and clustered standard errors for the 35 drive-level clusters are reported in square brackets. *** p<0.01, ** p<0.05, * p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Sample	Subjects informed of reward at Adv. or uninformed at Surp. drives					
	Previous history at intervention site			No previous history at intervention site		
Dependent Variable	Donated at Intervention Drive	Donated at Other Locations	Donated Anywhere	Donated at Intervention Drive	Donated at Other Locations	Donated Anywhere
Mean of dep. var. (for Uninformed subjects)	13.19%	11.56%	24.75%	0.08%	9.37%	9.43%
	(1)	(2)	(3)	(4)	(5)	(6)
All	7.41	-1.94	5.46	0.19	0.13	0.33
	(1.39)***	(1.16)*	(1.61)***	(0.03)***	(0.21)	(0.22)
	[2.29]***	[1.57]	[1.76]***	[0.05]***	[0.31]	[0.31]
$5 Adv. Rew.	4.36	-0.95	3.41	0.09	-0.41	-0.31
	(1.82)**	(1.61)	(2.14)	(0.04)**	(0.27)	(0.27)
	[2.74]	[1.78]	[2.48]	[0.05]*	[0.34]	[0.35]
$10 Adv. Rew.	7.14	-0.35	6.79	0.15	0.38	0.53
	(2.01)***	(1.64)	(2.29)***	(0.04)***	(0.27)	(0.27)**
	[3.16]**	[2.17]	[2.39]***	[0.08]*	[0.41]	[0.40]
$15 Adv. Rew.	10.15	-4.09	6.07	0.39	0.41	0.80
	(1.89)***	(1.36)***	(2.09)***	(0.07)***	(0.32)	(0.33)**
	[3.04]***	[1.62]**	[2.58]**	[0.10]***	[0.37]	[0.35]**
P-value of:						
$10 Adv.Rew. ≥ $5 Adv.Rew.	0.26	0.57	0.20	0.21	0.98	0.01
$15 Adv.Rew. ≥ $10 Adv.Rew.	0.26	0.10	0.56	0.04	0.43	0.39
$15 Adv.Rew. ≥ $5 Adv.Rew.	0.08	0.10	0.22	0.00	0.99	0.00
N	3,034	3,034	3,034	79,329	79,329	79,329

Table 10: Long-term effects of incentives. Informed of the Reward and donated at Advertised Reward site vs. Donated at No Reward site.

The sample includes all subjects who either (A) donated at the No Reward drives (and were not informed of any Advertised reward drive) or (B) donated at the Advertised reward drives and were informed of the reward. Each subject has two observations, one for the pre-intervention period and one for the post-intervention period. POST is a dummy variable equal to 1 for the post-intervention observation and 0 for the pre-intervention observation. The variable DON_ INFO_REWARD is equal to 1 if the subject was in group (B). Individual fixed effects are included in all the regressions. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In 10a, the estimated coefficients were multiplied by 100 so they represent percentage changes.

10a: Dependent variable equals 1 if the subject donated anywhere in the 13, 26 or 39 weeks before or after intervention

Dependent variable	Donated in the N weeks before/after intervention											
	13 weeks		26 weeks		39 weeks		13 weeks		26 weeks		39 weeks	
Sample	Previous history at site						No previous history at site					
Mean of the dep. var. (No reward donors before intervention)	47.57%		86.08%		92.23%		20.00%		60.00%		75.56%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
POST	4.21	4.21	-7.12***	-7.12***	-6.15***	-6.15***	2.22	2.22	-6.67	-6.67	-15.56*	-15.56*
	(3.59)	(3.60)	(2.65)	(2.65)	(2.29)	(2.29)	(7.41)	(7.43)	(8.60)	(8.63)	(8.92)	(8.95)
POST*DON_INFO REWARD	-12.43**		-1.65		-1.80		1.23		0.63		5.21	
	(4.97)		(3.77)		(3.25)		(9.29)		(10.08)		(10.13)	
POST*DON_$5 INFO REWARD		-2.34		-0.36		0.54		9.78		6.67		7.56
		(7.06)		(5.42)		(4.75)		(16.17)		(13.13)		(13.24)
POST*DON_$10 INFO REWARD		-11.90		-0.57		-0.58		-5.00		15.00		15.56
		(7.25)		(6.02)		(5.12)		(10.49)		(13.22)		(12.60)
POST*DON_$15 INFO REWARD		-19.79***		-3.27		-4.24		1.41		-11.52		-2.63
		(6.42)		(4.78)		(4.16)		(11.36)		(11.36)		(11.31)
P-value of:												
$10 Informed - $5 Informed		0.27		0.98		0.86		0.36		0.56		0.55
$15 Informed - $10 Informed		0.23		0.69		0.53		0.57		0.04		0.11
$15 Informed - $5 Informed		0.03		0.64		0.38		0.62		0.14		0.40
Observations	1,348	1,348	1,348	1,348	1,348	1,348	322	322	322	322	322	322
N of donors	653	653	653	653	653	653	161	161	161	161	161	161
R-squared	0.01	0.02	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.04	0.05	0.06

10b: Dependent variable = Number of donations made in the 26 or 39 weeks before or after intervention

Dependent variable	Number of donations in the N weeks before/after intervention							
	26 weeks		39 weeks		26 weeks		39 weeks	
Sample	Previous history at site				No previous history at site			
Mean of the dep. var. (No reward donors, before interv.)	1.54		2.09		0.76		1.20	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
POST	-0.16***	-0.16***	-0.13*	-0.13*	-0.02	-0.02	-0.04	-0.04
	(0.06)	(0.06)	(0.07)	(0.07)	(0.12)	(0.12)	(0.17)	(0.17)
POST*DON_INFO REWARD	0.06		-0.01		0.06		-0.08	
	(0.08)		(0.10)		(0.14)		(0.21)	
POST*DON_$5 INFO REWARD		0.22*		0.11		0.14		-0.04
		(0.12)		(0.13)		(0.20)		(0.30)
POST*DON_$10 INFO REWARD		-0.13		-0.07		0.19		-0.07
		(0.12)		(0.15)		(0.19)		(0.26)
POST*DON_$15 INFO REWARD		0.07		-0.04		-0.07		-0.12
		(0.11)		(0.12)		(0.17)		(0.24)
P-value of:								
$10 Informed - $5 Informed		0.02		0.31		0.83		0.92
$15 Informed - $10 Informed		0.15		0.89		0.19		0.84
$15 Informed - $5 Informed		0.26		0.33		0.31		0.77
Observations	1,348	1,348	1,348	1,348	322	322	322	322
N of donors	653	653	653	653	161	161	161	161
R-squared	0.02	0.03	0.01	0.02	0.01	0.02	0.01	0.01

Table 11: Long-term effects of incentives. Donated at Surprise Reward site vs. Donated at No Reward site.

The sample includes all subjects who either (A) donated at the No reward drives (and were not informed of any Advertised reward drive) or (C) donated at the Surprise Reward drives (and were not informed of any Advertised Reward drive). Each subject has two observations, one for the pre-intervention period and one for the post-intervention period. POST is a dummy variable equal to 1 for the post-intervention observation and 0 for the pre-intervention observation. The variable DON_ SURPR_TREAT is equal to 1 if a donor was in group (C). Individual fixed effects are included in all the regressions. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In 11a, the estimated coefficients were multiplied by 100 so they represent percentage changes.

11a: Dependent variable equals 1 if the subject donated anywhere in the 13, 26 or 39 weeks before or after intervention

Dependent variable	Donated in the N weeks before/after intervention											
	13 weeks		26 weeks		39 weeks		13 weeks		26 weeks		39 weeks	
Sample	Previous history at site						No previous history at site					
Mean of the dep. var. (No reward donors, before interv.)	47.57%		86.08%		92.23%		20.00%		60.00%		75.56%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
POST	4.21	4.21	-7.12***	-7.12***	-6.15***	-6.15***	2.22	2.22	-6.67	-6.67	-15.56*	-15.56*
	(3.59)	(3.60)	(2.64)	(2.65)	(2.29)	(2.29)	(7.47)	(7.52)	(8.67)	(8.73)	(8.99)	(9.05)
POST*DON_SURPR.REWARD	-20.77***		-10.67**		-8.58**		4.92		-4.05		8.41	
	(5.86)		(4.86)		(4.36)		(14.53)		(12.76)		(12.55)	
POST*DON_$5 SURPR.REWARD		-14.55*		-3.23		-5.92		14.44		-10.00		-1.11
		(8.42)		(7.28)		(7.32)		(29.62)		(17.82)		(17.98)
POST*DON_$10 SURPR.REWARD		-27.64***		-16.32**		-9.48		-2.22		-15.56		-17.78
		(8.11)		(6.72)		(5.99)		(17.72)		(16.63)		(18.42)
POST*DON_$15 SURPR.REWARD		-18.84*		-12.39		-10.92		5.47		6.67		30.94**
		(10.18)		(9.03)		(7.21)		(21.99)		(17.97)		(13.65)
P-value of:												
$10 Surpr. - $5 Surpr.		0.21		0.15		0.69		0.61		0.79		0.46
$15 Surpr. - $10 Surpr.		0.46		0.71		0.87		0.77		0.30		0.01
$15 Surpr. - $5 Surpr.		0.74		0.40		0.61		0.80		0.45		0.09
Observations	944	944	944	944	944	944	146	146	146	146	146	146
N of donors	471	471	471	471	471	471	73	73	73	73	73	73
R-squared	0.03	0.03	0.06	0.06	0.06	0.06	0.01	0.01	0.02	0.04	0.05	0.11

11b: Dependent variable = Number of donations made in the 26 or 39 weeks before or after intervention

Dependent variable	Number of donations in the N weeks before/after intervention							
	26 weeks		39 weeks		26 weeks		39 weeks	
Sample	Previous history at site				No previous history at site			
Mean of the dep. var. (No reward donors, before interv.)	1.54		2.09		0.76		1.20	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
POST	-0.16***	-0.16***	-0.13*	-0.13*	-0.02	-0.02	-0.04	-0.04
	(0.06)	(0.06)	(0.07)	(0.07)	(0.12)	(0.12)	(0.17)	(0.18)
POST*DON_SURPR.REWARD	-0.12		-0.35***		-0.01		0.12	
	(0.11)		(0.13)		(0.18)		(0.28)	
POST*DON_$5 SURPR.REWARD		0.11		-0.25		-0.14		0.04
		(0.15)		(0.19)		(0.20)		(0.38)
POST*DON_$10 SURPR.REWARD		-0.31*		-0.53***		-0.09		-0.18
		(0.16)		(0.18)		(0.28)		(0.45)
POST*DON_$15 SURPR.REWARD		-0.16		-0.19		0.10		0.35
		(0.20)		(0.24)		(0.26)		(0.38)
P-value of:								
$10 Surpr. - $5 Surpr.		0.04		0.25		0.85		0.68
$15 Surpr. - $10 Surpr.		0.53		0.23		0.59		0.33
$15 Surpr. - $5 Surpr.		0.26		0.83		0.39		0.53
Observations	944	944	944	944	146	146	146	146
N of donors	471	471	471	471	73	73	73	73
R-squared	0.04	0.05	0.05	0.06	0.00	0.01	0.01	0.02

Table 12: Cost calculations

In this table we show the cost calculations that are used in the welfare analysis presented in section 4.3.

		Past history at sites			No past history at sites		
		$5	$10	$15	$5	$10	$15
	All values are per 100 individuals contacted						
1	Units collected - baseline when no incentives offered [(1)]	13.18	13.18	13.18	0.08	0.08	0.08
2	Donors presenting - baseline when no incentives offered[(2)]	15.14	15.14	15.14	0.09	0.09	0.09
3	Extra units collected when incentives offered[(3)]	--	6.79	6.07	--	--	0.80
4	Extra donors presenting when incentives offered[(1)(2)]	--	8.20	11.66	--	--	0.45
5	Total N. of donors presenting when incentives offered	15.14	23.35	26.81	0.09	0.09	0.54
6	$ cost of providing incentives[(4)]	$75.70	$233.5	$402.1	$0.50	$0.50	$8.1
8	$ cost per extra unit collected[(5)]	--	$34.4	$66.2	--	--	$10.1

[(1)] From Table 9, columns 1 and 4.

[(2)] Donors presenting = units collected * 1.149 (donors deferred are 13% of donors presenting, irrespective of the presence of incentives).

[(3)] From Table 9, columns 3 and 6. Note that we used zeros when the coefficients were statistically insignificant.

[(4)] $ value of the incentives * total N. of donors presenting at drives with incentives. [(5)] Total cost of providing incentives/N. of extra units collected when incentives provided.

Appendix A: Glossary

Intervention Drives (N=72) = Drives that were included in the study. The intervention drives refer to a specific location and date.

Advertised Reward Drives (N=26) = Intervention Drives in which rewards were provided and about 50 percent of individuals contacted were informed of the rewards and about 50 percent were not informed

Surprise Reward Drives (N=9) = Intervention Drives in which rewards were provided but no individual contacted was informed of the rewards.

No Reward Drives (N=36) = Intervention Drives in which rewards were NOT provided.

Subjects = Refers to any individual who received a flyer for an Intervention Drive. Note that a subject could in one time period receive a flyer for a Surprise Reward Drive and at a different time receive a flyer for an Advertised Reward Drive.

Informed Subjects = Individuals who received a flyer for an Advertised Reward drive and the flyer informed them that they would receive a reward if they donated at the Advertised drive.

Uninformed Subjects = Individuals who received a flyer for an Advertised Reward drive and the flyer was identical to the flyer Informed subjects received except that the flyer does not include any reference to the reward.

Past History = We say that a subject ***has Past History*** at specific intervention drive X if the subject has *donated* at least one time prior to drive X at the host location of drive X and we say that a subject **has no Past History** at drive X if the subject has *never donated* at the host location of drive X prior to the intervention drive X.

Contacted Subjects = Individuals who received a flyer for an Advertised, Surprise, or No Reward drive. To receive a flyer about drive X, the individual must have donated at least one time at a drive in the past two years in the county in which drive X will occur. Further, we use the term “subject” in the spirit of a person as the unit of observation in an experiment, but these subjects were unaware that a research study was being conducted or that their donation behavior was being monitored.

Not Contacted Donors = Anyone who donated at an Advertised, Surprise or No Reward drive who is not a Contacted Subject.

Appendix B: Additional analyses

Table A1: Donating at a No Reward drive vs. donating at a Surprise drive

The table shows t-tests of the differences between the percent of subjects who donated at the Surprise reward sites and the No reward sites. Sample sizes (N) are reported in square brackets.

	All	Past history	No past history
Donated at Surprise Reward drive [N]	0.53 [35,968]	13.18 [1,229]	0.08 [34,736]
Donated at No Reward drive [N]	0.59 [101,870]	14.95 [3,626]	0.06 [98,244]
Difference	-0.06	-1.77	0.02
P-value	0.20	0.13	0.21

Table A2: Individual-level regressions of the probability to donate at the intervention drives; Logit regressions.

The estimates are the marginal effects obtained from Logit models of equation (1), with drive-level fixed effects and robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. The estimates shown have been multiplied by 100 to represent percentage changes.

A2-a: Informed vs. Uninformed at Advertised reward drives

Dependent Variable	1 if donated at intervention drive, 0 otherwise					
Sample	Subjects contacted for an Advertised reward drive					
	All		Previous history at site		No previous history at site	
Mean of dep. var. (for Uninformed	0.65 %		15.32 %		0.09 %	
	(1)	(2)	(3)	(4)	(5)	(6)
Informed of Reward	0.06***		3.80***		0.083***	
	(0.01)		(1.07)		(0.02)	
Informed of $5 Reward		0.04**		3.37		0.05
		(0.02)		(2.12)		(0.04)
Informed of $10 Reward		0.07***		5.07**		0.11**
		(0.03)		(2.51)		(0.05)
Informed of $15 Reward		0.09***		4.13**		0.21***
		(0.03)		(2.00)		(0.08)
Observations	92,722	92,722	3,509	3,509	89,206	89,206
Adjusted R-squared	0.45	0.45	0.16	0.16	0.10	0.10

A2-b: Informed vs. Uninformed at Surprise reward drives

Dependent Variable	1 if donated at intervention drive, 0 otherwise					
Sample	Subjects contacted for an Advertised reward drive					
	All		Previous history at site		No previous history at site	
Mean of dep. var. (for Uninformed	0.65 %		13.18 %		0.09 %	
	(1)	(2)	(3)	(4)	(5)	(6)
Informed of Reward	0.08***		6.021***		0.10***	
	(0.02)		(1.79)		(0.03)	
Informed of $5 Reward		0.05*		3.51		0.05
		(0.03)		(2.64)		(0.04)
Informed of $10 Reward		0.10***		7.26**		0.12
		(0.03)		(3.16)		(0.08)
Informed of $15 Reward		0.18***		9.71***		0.30***
		(0.05)		(3.09)		(0.10)
Observations	82,402	82,402	3,035	3,035	79,367	79,367
Adjusted R-squared	0.43	0.43	0.11	0.12	0.08	0.09

Table A3: Individual-level regressions of the probability to donate at the intervention drives – Testing for Heterogeneous Effects. Informed vs. Uninformed at Advertised rewards drives.

The sample includes all subjects who were contacted for an Advertised reward drive. The dependent variable is equal to 1 if a subject has donated blood at the intervention drive, and 0 otherwise. The estimates are from linear probability models. The estimates are from linear probability models with drive level fixed effects. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Dependent Variable	1 if donated at intervention drive, 0 otherwise									
Sample	Subjects contacted for an Advertised reward drive									
	Previous history at site					No previous history at site				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Informed of Reward	6.12***	6.84***	5.00***	3.89*	2.13	0.14***	0.08***	0.16***	0.06*	0.01
	(1.79)	(2.50)	(1.28)	(2.08)	(1.60)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)
Female	-0.24	-2.05*	-1.98	-2.02	-2.02	-0.04	-0.01	-0.01	-0.01	-0.01
	(1.67)	(1.23)	(1.23)	(1.23)	(1.23)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 26-50	3.34**	5.16**	3.33**	3.35**	3.41**	0.06**	0.02	0.06**	0.06**	0.06**
	(1.69)	(2.02)	(1.68)	(1.69)	(1.68)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 50+	9.06***	10.20***	9.02***	9.08***	9.12***	0.16***	0.06	0.16***	0.16***	0.16***
	(1.77)	(2.11)	(1.77)	(1.78)	(1.78)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
O-Negative blood type	-0.15	-0.24	2.89	-0.23	-0.25	-0.06	-0.06	-0.06	-0.06	-0.06
	(1.96)	(1.96)	(2.92)	(1.96)	(1.96)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Between 5 and 9 past donations	-1.68	-1.60	-1.59	-2.03	-1.52	0.00	0.00	0.00	-0.13***	0.00
	(1.65)	(1.65)	(1.65)	(2.15)	(1.65)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)
More than 10 past donations	3.06*	3.14**	3.12**	2.82	3.15**	0.05	0.05	0.05	-0.07	0.05
	(1.59)	(1.59)	(1.59)	(2.02)	(1.59)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Last donation within past 6 months	19.25***	19.15***	19.20***	19.18***	16.92***	0.25***	0.25***	0.25***	0.25***	0.08**
	(1.29)	(1.29)	(1.29)	(1.29)	(1.66)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Last donation between 6 and 12 months	3.72***	3.58***	3.62***	3.59***	4.47**	0.06**	0.06**	0.06**	0.06**	0.00
	(1.37)	(1.36)	(1.36)	(1.36)	(1.87)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Female*Informed of Reward	-3.48					0.05				
	(2.42)					(0.06)				
Age 26-50*Informed of Reward		-3.59					0.08			
		(3.12)					(0.05)			
Age 50+*Informed of Reward		-2.29					0.19**			
		(3.12)					(0.07)			
O-Negative*Informed of Reward			-5.79					0.01		
			(3.92)					(0.09)		
5-9 Past Donations*Informed of Reward				0.84					0.26***	
				(3.20)					(0.07)	
10+ Past Donations*Informed of Reward				0.59					0.23***	
				(2.70)					(0.07)	
Last.Don.within 6 months*Informed of Reward					4.46*					0.34***
					(2.45)					(0.07)
Last.Don.6-12 months*Informed of Reward					-1.52					0.12**
					(2.69)					(0.05)
Observations	3,516	3,516	3,516	3,516	3,516	89,206	89,206	89,206	89,206	89,206
Adjusted R-squared	0.12	0.12	0.12	0.12	0.12	0.002	0.002	0.002	0.002	0.003

Table A4: Individual-level regressions of the probability to donate at the intervention drives: Heterogeneous Effects by $ amount

This table compares the donations of informed of reward subjects at the Advertised reward drives with the donations of subjects at the Surprise reward drives. The dependent variable is equal to 1 if a subject has donated blood at the intervention drive, and 0 otherwise. The estimates are from linear probability models, and intervention periods fixed effects are included in all regressions. Robust standard errors are reported in round brackets, and clustered standard errors for the 35 drive-level clusters are reported in square brackets. *** p<0.01, ** p<0.05, *p<0.1. The estimated coefficients were multiplied by 100 so they represent percentage changes.

Dependent Variable	1 if donated at intervention drive, 0 otherwise									
Sample	Subjects informed of reward at Adv. or uninformed at Surp. drives									
	Previous history at site					No previous history at site				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Informed of $5 Reward	2.30	-2.32	4.10*	3.51	2.24	0.09*	-0.04*	0.05	-0.03	-0.02
	(2.75)	(2.51)	(2.40)	(3.32)	(2.27)	(0.04)	(0.02)	(0.03)	(0.03)	(0.02)
Informed of $10 Reward	8.28**	6.16	6.31*	10.01**	3.24	0.12	0.03	0.14	0.02	0.05
	(4.00)	(3.96)	(3.22)	(4.48)	(3.10)	(0.09)	(0.07)	(0.09)	(0.06)	(0.06)
Informed of $15 Reward	12.41***	11.60***	9.08***	7.71**	2.61	0.40***	0.17*	0.39***	0.26**	0.06**
	(4.23)	(3.07)	(2.84)	(3.00)	(2.53)	(0.14)	(0.10)	(0.11)	(0.10)	(0.03)
Female	-1.82	-3.24**	-3.21**	-3.18**	-3.27**	0.04	0.03	0.03	0.03	0.03
	(1.27)	(1.27)	(1.29)	(1.30)	(1.30)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age 26-50	0.15	0.41	0.26	0.26	0.43	0.03	-0.06***	0.03	0.03	0.02
	(1.59)	(2.66)	(1.55)	(1.56)	(1.58)	(0.04)	(0.02)	(0.04)	(0.04)	(0.04)
Age 50+	4.55**	3.29	4.55**	4.64**	4.85***	0.15***	0.02	0.15***	0.15***	0.14***
	(1.75)	(2.32)	(1.70)	(1.71)	(1.69)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
O-Negative blood type	-3.68	-3.66	-4.25	-3.67	-4.02*	-0.03	-0.03	0.00	-0.03	-0.03
	(2.20)	(2.20)	(2.83)	(2.19)	(2.20)	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)
Between 5 and 9 past donations	-0.03	-0.00	-0.04	0.50	-0.13	0.07	0.08	0.07	-0.01	0.07
	(1.76)	(1.75)	(1.75)	(2.90)	(1.82)	(0.05)	(0.05)	(0.05)	(0.03)	(0.05)
More than 10 past donations	4.88**	4.87**	4.90**	4.95*	4.83**	0.04	0.04	0.04	-0.10*	0.04
	(1.90)	(1.90)	(1.89)	(2.72)	(1.88)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Last donation within past 6 months	18.12***	18.13***	18.04***	18.14***	13.95***	0.29***	0.28***	0.29***	0.28***	0.10**
	(2.17)	(2.17)	(2.17)	(2.18)	(2.00)	(0.05)	(0.05)	(0.06)	(0.05)	(0.04)
Last donation between 6 and 12 months	1.65	1.82*	1.80*	1.72*	1.53	0.09***	0.09***	0.09***	0.09***	0.04
	(1.02)	(1.03)	(1.02)	(1.01)	(1.50)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Female*Informed of $5 Reward	2.21					-0.06				
	(3.19)					(0.05)				
Female*Informed of $10 Reward	-2.80					0.03				
	(3.64)					(0.09)				
Female*Informed of $15 Reward	-6.12*					-0.05				
	(3.48)					(0.10)				
Age 26-50*Informed of $5 Reward		4.12					0.12***			
		(4.48)					(0.03)			
Age 26-50*Informed of $10 Reward		0.48					0.05			
		(4.31)					(0.06)			
Age 26-50*Informed of $15 Reward		-3.72					0.33*			
		(4.88)					(0.19)			
Age 50+*Informed of $5 Reward		8.08*					0.17**			
		(3.99)					(0.08)			
Age 50+*Informed of $10 Reward		0.95					0.28**			
		(5.26)					(0.11)			
Age 50+*Informed of $15 Reward		-1.61					0.24			
		(4.28)					(0.20)			
O-Negative*Informed of $5 Reward			-4.64					0.03		
			(4.39)					(0.14)		
O-Negative*Informed of $10 Reward			6.07					-0.03		
			(7.77)					(0.18)		
O-Negative*Informed of $15 Reward			3.73					-0.20		
			(6.15)					(0.22)		

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Dependent Variable	1 if donated at intervention drive, 0 otherwise									
Sample	Subjects informed of reward at Adv. or uninformed at Surp. drives									
	Previous history at site					No previous history at site				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
5-9 Past Don.*Informed of $5 Reward				0.13					0.26***	
				(3.92)					(0.09)	
5-9 Past Don.*Informed of $10 Reward				-3.33					0.13	
				(5.95)					(0.09)	
5-9 Past Don.*Informed of $15 Reward				0.20					0.00	
				(4.41)					(0.21)	
10+ Past Don.*Informed of $5 Reward				-0.13					0.15*	
				(5.09)					(0.09)	
10+ Past Don.*Informed of $10 Reward				-4.31					0.31***	
				(3.81)					(0.11)	
10+ Past Don.*Informed of $15 Reward				2.83					0.36*	
				(5.26)					(0.19)	
Last.Don.w/in 6 mos*Inform. of $5 Rew.					1.91					0.19**
					(4.03)					(0.08)
Last.Don.w/in 6 mos*Inform. of $10 Rew.					6.12					0.17**
					(8.04)					(0.08)
Last.Don.w/in 6 mos*Inform. of $15 Rew.					12.08***					0.71***
					(4.15)					(0.21)
Last.Don.6-12 mos*Inform. of $5 Rew.					0.58					0.04
					(3.08)					(0.04)
Last.Don.6-12 mos*Inform. of $10 Rew.					0.51					0.07
					(2.89)					(0.06)
Last.Don.6-12 mos*Inform. of $15 Rew.					-0.19					0.15
					(2.60)					(0.15)
Observations	3,035	3,035	3,035	3,035	3,035	79,367	79,367	79,367	79,367	79,367
Adjusted R-squared	0.09	0.09	0.09	0.09	0.09	0.002	0.002	0.002	0.002	0.003