DISCUSSION PAPER SERIES

IZA DP No. 4567

Will There Be Blood? Incentives and Substitution Effects in Pro-social Behavior

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November 2009

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
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ABSTRACT

Will There Be Blood? Incentives and Substitution Effects in Pro-social Behavior*

We examine how economic incentives affect pro-social behavior through the analysis of a unique dataset with information on more than 14,000 American Red Cross blood drives. Our findings are consistent with blood donors responding to incentives in a "standard" way; offering donors economic incentives significantly increases turnout and blood units collected, and more so the greater the incentive's monetary value. In addition, there is no disproportionate increase in donors who come to a drive but are ineligible to donate when incentives are offered. Further evidence from a small-scale field experiment corroborates these findings and confirms that donors are motivated by the economic value of the items offered. We also find that a substantial fraction of the increase in donations due to incentives may be explained by donors substituting away from neighboring drives toward drives where rewards are offered, and the likelihood of this substitution is higher the higher the monetary value of the incentive offered and if neighboring drives do not offer incentives. Thus, extrinsic incentives motivate pro-social behavior, but unless substitution effects are also considered, the effect of incentives may be overestimated.

JEL Classification: D12, D64, I18

Keywords: incentives, altruism, public good provision, pro-social behavior, public health

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* We thank the seminar participants at the AEA meetings in San Francisco, the PET conference in Galway, UC San Diego, UC Santa Barbara, the University of Michigan, the Australian National University, Melbourne University, Monash University, and Case Western Reserve University for their comments. We are extremely thankful to the President, Board, members, and staff of the Northern Ohio chapter of the American Red Cross, and in particular to Brent Bertram and Barbara Thiel for their invaluable assistance and collaboration. Andrew Zhang, Tina Chen, Il Myoung Hwang, and Dominic Smith provided outstanding research assistance. We also thank John Felkner for his help with the GIS analysis. Financial support from the Russell Sage Foundation and the University of Michigan Ross School Small Grants Fund is gratefully acknowledged.

1. Introduction

Understanding and motivating individual behavior involving pro-social activities is of great interest to researchers and policymakers. These activities represent a substantial part of social life and include actions from donating money and time across many different causes and organizations. In the US alone, the value of volunteer time is over $240 billion annually (Independent Sector 2006). Yet supply is still below societal needs for many of these activities. Because the supply of pro-social activities often falls short of societal demands, and since most of these activities are provided voluntarily, a potential solution would be to offer economic incentives as a further motivator. Standard economic theory generally predicts that adding an economic incentive to perform an activity will increase the supply of that activity. A number of contributions in psychology and economics, however, argue that when people are "intrinsically" motivated to perform the task, adding an extrinsic incentive could reduce supply of the activity because the extrinsic incentive might undermine the intrinsic motivation and also attract the "wrong" types of agents to perform the activity (Deci 1975, Frey and Oberholzer-Gee 1997, Benabou and Tirole 2006). Surveys and laboratory experiments lend support to this non-standard response to economic incentives for the provision of pro-social behavior (Deci 1975, Frey and Oberholzer-Gee 1997, Gneezy and Rustichini 2000).

The academic community's interest in understanding motivations for pro-social behavior and the policy relevance associated with the voluntary supply of blood makes blood donations an ideal environment to assess the effects of offering material incentives. In this paper, we find that blood donors respond to the presence of extrinsic incentives in a standard way; donations increase when incentives are offered, the increase is greater for incentives of higher economic value, and donors substitute toward blood drives with incentives and away from drives without incentives, and more so the greater the value of incentive offered. Furthermore, the presence of incentives does not disproportionately attract individuals to a drive who are not eligible to donate.

Situations of blood supply shortage are the rule rather than the exception in most western countries, and even more so in developing nations. This chronic shortage is worrisome since blood transfusions can be life-saving in situations following a trauma, during surgical interventions, and to treat several chronic diseases, and there remains no substitute for human blood. In addition, surgical innovations such as organ transplants and demographic changes such as population aging are significantly increasing demand.[1] Neither eligibility criteria nor a lack of information are likely to explain the supply shortage since, for example, only about 8% of the 115 million Americans who are eligible to donate blood actually donate

[1] The Web site BloodBook.com reports that more than 16 million units of blood are collected annually in the United States. In the US, the American Red Cross and other organizations collecting blood target to have, at each point in time, the blood necessary for three days of demand at each location and for each blood type, but this target is seldom met, especially for rare blood types (including 0 negative, which is the universal donor and therefore particularly precious). Moreover, it is estimated that worldwide, there is currently a shortage of about 22 million units of blood per year (HemoBiotech 2008). This shortage may grow worse over time as demand for blood increases. For instance, on average a liver transplant requires 40 units of blood and about half of the blood supply is used for those age 65 and older (www.bloodbook.com).

each year despite information campaigns and frequent communication about shortages (American Red Cross 2009, Riley, Schwei, and McCullough 2007). Thus, even among eligible and informed individuals it appears that the benefits (utility) of donating blood fall short of the costs.

Offering material rewards to motivate blood donations has a long history of opposition, however. Titmuss (1971), in particular, hypothesized that *monetary* payments would have a negative effect on both the quantity and quality of blood donations, a claim that more recent theories mentioned above have formalized. Since the early 1970s many countries have implemented policies prohibiting payment for blood donations, and the World Health Organization set a goal in 1997 for all blood donations to come from unpaid volunteer donors (WHO 2006).

The limited empirical evidence on the effects of offering incentives on blood donations has been mixed. Partially consistent with recent theories, Mellstrom and Johannesson (2008) found that female college students, when involved in a study on attitudes toward blood donations, were less willing to undertake a health test to check for their eligibility as blood donors if they were offered a monetary incentive (however, they found no effect among men).[2] In contrast and partially inconsistent with these theories, Goette and Stutzer (2008) found that offering lottery tickets to donors increased turnout at blood drives among infrequent donors, but they also found no effect among frequent donors nor any effect when donors were offered a free cholesterol test. Furthermore, Lacetera and Macis (2008a) show that the legislative provision that guarantees a paid day off work to Italian blood donors led to a substantial increase in donation frequency. Thus, the results from the studies that have examined the effects of offering economic incentives have been mixed, possibly due to differences in the incentives offered, differences in the demographics and the populations studied, or a variety of other factors that varied across these studies.

In addition to the results being inconclusive, there are several unanswered questions from the existing research on the effect of incentives on blood donations in particular, and on the supply of pro-social activities in general. First, most laboratory experiments use college students as subjects who are typically ages 18 to 25. However, individuals under the age of 25 represent only a small portion of the population of blood donors; so results may not reflect how older people would respond to incentives. Second, most studies examine the effects of just one or two specific incentives on a pro-social behavior, and thus the results could be idiosyncratic to features of the incentive used. Third, surveys and experiments meant to assess the determinants of pro-social behavior might suffer from scrutiny and social desirability biases if the subjects are aware of being observed as part of a study (Lazear, Malmendier and Weber 2006, Levitt and List 2007).

[2] Several studies have focused on other types of extrinsic motives, namely the quest for social recognition through the performance of altruistic activities. Theoretical models, anecdotal evidence, and laboratory experiments suggest that, in fact, individuals' altruistic behavior is also driven by social-image concerns. See, for example, Harbaugh (1998a, 1998b), Wedekind (1998), Nowak and Sigmund (2000), Price (2003), Ariely, Bracha and Meier (2007), Polborn (2007), and Lacetera and Macis (2008b). On the whole debate on the determinants of pro-social behavior, see the comprehensive survey by Meier (2006).

A fourth feature of existing studies is that they examine the effect of incentives on altruistic behavior typically at a single location and period where the activity can be performed. This approach does not consider the complete set of choices individuals face when incentives are offered. Individuals might substitute among several voluntary pro-social activities, and thus offering incentives at one location and time, whatever its immediate effect may be, may have consequences at other locations. For instance, incentives may increase blood donations when offered at one location, but could perhaps reduce donations at other locations or in the future. The opposite is also possible; incentives may crowd out blood donations at one location, but increase donations at other locations (presumably where incentives are not offered). Testing for the presence of these substitution effects will give a more comprehensive assessment of responses to incentives, and also has major policy implications for the design and coordination of initiatives meant to increase pro-social behavior in a population.

Substitution from lower to higher utility activities is a standard behavioral response, but the evidence on how it plays out in the context of pro-social behavior is scant. Gross (2005) suggests that the patterns of donations in the aftermath of the 2005 Asian Tsunami reflect substantial substitution effects with donors redirecting monetary donations away from other charities. Cairns and Slonim (2008) document that when a second collection is present at Catholic Mass, the amount collected for the first collection (which typically has a different destination) decreases significantly. On the other hand, Shang and Croson (2009) find that social comparisons that increase charitable contributions to public radio do not adversely affect future contributions. These studies, however, highlight the difficulty of examining substitution effects involving monetary contributions; it remains quite possible that donors are still substituting their charitable monetary donations away from other charitable causes and organizations not observed in these studies. Thus, with monetary donations there could be potentially many substitutes.

In this paper, we examine the impact of the provision of economic incentives on voluntary blood supply, using detailed data on all the American Red Cross (ARC) blood drives occurring in northern Ohio between May 2006 and October 2008. Crucial for the analysis, the data include information on whether an incentive was offered at each blood drive, the type of item offered (e.g., blankets, T-shirts, mugs, coupons, etc.), and the ARC cost to purchase the item. Our unit of observation is a blood drive, and our data include 14,029 observations. With an average of 37 donors per drive, the data reflect the behavior of more than 500,000 donor-drive pairs. The sample size and composition makes this study of incentives for blood donation (and more generally for pro-social activities) the largest and most representative to date.

The data for each drive also include the number of people who present to donate, the number of blood units collected, the number of people deferred from donating, as well as the drive's sponsor, date, and address. Many drives are run at the same location repeatedly over time and are typically run by the same sponsor. Moreover, most drives run at a same location by a specific sponsor sometimes offer incentives while other times do not offer incentives. Further, institutional details indicate that within

drives at a given location by a given sponsor the presence or absence of a promotion is to a large extent non-systematic. The data, therefore, allow us to perform fixed-effect regressions to identify the impact of the presence of incentives on the turnout and units collected at a drive, as well as on the percentage of donors who are deferred because they are ineligible to donate; the percentage of donors who are deferred provides a measure of the type of individuals who are attracted to a drive. Finally, we exploit the information on the location and date of each drive to analyze the impact that incentives have not only at the drive where they are offered, but also on the temporally and spatially neighboring drives to assess substitution and aggregate effects of incentive on donations. In contrast to monetary donations which have many possible substitutes, there are few close substitutes to donating blood at a given drive other than donating blood at a different time or location.[3] This relative lack of substitutes makes an examination of substitution effects for blood donations particularly insightful for whether pro-social activities are positively or negatively affected by the presence of material incentives.

Our estimates show that the number of donors who attempt to donate and the number of units of blood collected significantly increase when incentives are offered. On average, offering incentives leads to between 5 and 6.7 extra donors presenting at a drive – an increase of about 13 to 18 percent. Using the cost of each different item to the ARC as a proxy for the value of these promotions to the donors, we find a positive and significant relationship between the cost of the incentives and turnout and units collected. We also find that the effect of incentives on donations is significantly larger when more donors are made aware that an incentive is offered and when more donors are permitted to donate at a drive. We further find that offering incentives did not increase the percent of donors being deferred, suggesting that the composition of the donor pool does not change when incentives are offered. These results indicate that economic incentives do not crowd out the quantity of pro-social behavior in the context of blood donations – in fact, quite the opposite.

These conclusions from the analysis of the large sample of historical drives are replicated in a small-scale field experiment run at randomly selected Red Cross blood drives. In the experiment, a set of similar drives were selected and then randomly divided into control conditions where no incentives were offered and treatment conditions where $5 and $20 gift cards for local merchants were offered. Comparing outcomes between control and treatment drives, and controlling for past outcomes at the same drives (a difference-in-difference analysis) shows that turnout and units collected are higher in the treatment conditions and higher the greater the value of the gift cards, with no impact on the percent of deferred donors.

[3] Besides neighboring ARC blood drives that are close substitutes, other potential substitutes, though less close than donating whole blood to the ARC, include plasma donations and donations at a few existing private blood banks. However, both of these potential substitutes are a small portion of the blood donation market; for instance, plasma donations are a tiny fraction of the blood donation market. In addition, plasma donations take substantially longer and typically attract distinct donors. To the extent that there are additional substitutes not captured by other ARC northern Ohio drives, our estimates will underestimate substitution effects and consequently overestimate the total effect of incentives on donations.

Donors not only respond to the presence of incentives in a standard way by increasing supply at a given site, but also substitute supply across locations in response to incentives; our analysis indicates that donors substitute their blood donation activity toward neighboring drives that offer incentives. Moreover, donors are more likely to substitute away from drives that do not offer incentives than from drives that offer incentives. In addition, we find that the substitution effects are larger if incentives are offered at physically and temporally close neighboring drives (e.g., within 2 miles) and more so when the incentives offered at the close neighboring drives are of higher monetary value. Our results further show that these substitution effects may be substantial, depending on the value of the incentive given and on the number of neighboring drives. Thus, ignoring substitution effects can lead to a substantial overestimate of the total effect of incentives on pro-social behavior.

The paper is organized as follows. Section 2 offers institutional and organizational details on the ARC activities related to the collection of blood and describes the data used in this study. Section 3 analyzes the "direct effects" of providing incentives for blood donation. Section 4 describes and reports the results from the small-scale field experiment. Section 5 examines substitution effects and Section 6 concludes.

2. Institutional Context and Data

Our strategy to identify the effects of incentives on blood donation takes advantage of several institutional features of the blood collection system run by the American Red Cross. Before introducing the data of this study, we describe some of these institutional details.

2.1 The American Red Cross in Northern Ohio

The ARC operates 36 regional blood centers within the U.S. and Puerto Rico. The data for this study covers all (14,029) blood drives organized by the Northern Ohio Blood Services Region from May 1, 2006, to October 8, 2008. A blood drive consists of a sponsor who works with an ARC representative for collection of blood at a specific location on a specific date.

The ARC defines individuals who have attempted to donate blood within the past two years as "active" and those who have not been disqualified as "eligible." Donors can be disqualified for a variety of reasons that either endanger the donor or result in an unusable donation, including anemia, low blood pressure and low iron, and certain behaviors (e.g., travel) that increase the risks of potential blood problems that tests cannot detect. Donors are also ineligible to donate for 56 days after making a whole blood donation.

The ARC follows several rules to determine who to inform of upcoming blood drives. First, the ARC restricts who they contact to only eligible donors. Second, donors are typically informed only about the drives occurring in the county where they live. In some counties ARC representatives send donors a postcard informing them of one specific drive occurring in the forthcoming calendar month, typically the

drive taking place in the location where a donor has donated in the past. We call drives in these counties "postcard county drives." In the other counties (the majority), representatives send instead a flyer informing donors of all drives in the county occurring in the next calendar month. We refer to drives occurring in these counties as "flyer county drives." Flyers are mailed out on the 23rd or 24th of the month, and postcards are mailed on an ongoing basis as a drive approaches. Figure 1 provides an example of a flyer and postcard advertisement (names and contact information are blackened over for privacy considerations).

[Figure 1 about here]

A blood drive is either "open" or "closed." In open drives, anyone can present to donate. Closed drives are not advertised on the monthly flyers, and only members of a given organization (e.g., students or employees) are informed about these drives.

The ARC offers a variety of economic incentives at blood drives. Importantly, if a drive offers an item as an incentive, the item *must* be given to all presenting donors (i.e., those who turn out to donate) regardless of whether they donate, are eligible, or are deferred for any reason. The most common items include T-shirts, jackets, coolers, blankets, and coupons and gifts cards from various merchants. The ARC officer responsible for recruitment is given a budget each year to use to decide which items to purchase. These items are then allocated proportionally to district managers. Each district manager then decides how to allocate the different promotions across the drives in his or her district. There are three district managers in northern Ohio.

ARC officials and managers informed us that the *sponsor-drive* combination is the relevant unit of observation for the assignment of incentives. Some sponsor-drive combinations systematically attract a greater number of donors, and some drives and locations may have donors who are more responsive to the presence of an incentive, for instance, because some items may appeal to different populations. Nonetheless, the ARC managers stressed that they make a conscious attempt to offer incentives evenly across most sponsor-drive locations over time, mostly because of budget constraints and fairness considerations toward all sponsors. The allocation of incentives across drives within a given drive-sponsor combination, therefore, is to a large extent non-systematic.

Sponsors have some flexibility in organizing drives. For instance, they can choose to make a drive open or closed, determine the location and number of hours of the drive, and whom to inform (in addition to the county contact rules and donors satisfying the ARC active and eligible requirements). This opens the possibility that economic incentives might affect how sponsors behave. For instance, sponsors might contact more donors when an incentive is given at a drive. Thus, higher turnout in response to economic incentives could be explained by either changes in donor supply or changes in sponsor behavior. From a public policy or Red Cross perspective, the total effect on donations is likely the most critical outcome. It is also critical to separate these alternative explanations to isolate the effect of incentives on donor supply. However, while economic incentives may be affecting sponsor behavior in addition to donor

behavior, this alternative explanation seems unlikely. In fact, the flexibility of sponsors to change the features of a drive is limited in a number of ways, and, importantly, it is not related to the presence of incentives at a drive. First, the vast majority of sponsors organize either all open or all closed drives. Second, once the length of a drive is determined, which typically occurs in advance of determining whether an incentive will offered, the length cannot be changed because of the presence of an incentive. Third, the vast majority of donors are contacted through standardized and centralized procedures, with sponsors and representatives affecting the number and types of donors contacted only very marginally. In addition to the limited flexibility sponsors have, our econometric analyses along with corroborative results from our small-scale controlled field experiment provide further support that donors rather than sponsors are changing behavior.

2.2 The Data

We have information on the date, time, and location (street address, town, and zip code) of a drive, the number of donors presenting and deferred, the units of blood collected, and whether a drive is open or closed and in a flyer or postcard county. Table 1 presents descriptive statistics on these variables. On average, 31.3 units of blood are collected from 37 donors presenting and drives last 5.4 hours. Turnout varies from more than 700 to fewer than 10 donors.[4] Seventy-eight percent of drives are open, and 80 percent are advertised using county-level monthly flyers. For each blood drive, we also gathered weather data for the day and location of each drive. There is substantial variation in temperature, rain, and snow conditions in northern Ohio. Temperature, rain, rain intensity (average rain per hour), and snow on the ground can exert significant influence on the outcome of blood drives, and thus controlling for these factors improves the precision of the estimates.

[Table 1 about here]

The data also indicate whether a promotion was offered at each drive and, if so, what kind of promotion. About 37 percent of drives, overall, offer material incentives. ARC record data began to keep track of the presence of promotions on May 1, 2006, which explains the starting date for the data we analyze.

Table 2 lists common promotion items that the ARC offers. The most common material incentive is represented by T-shirts, given out in nearly 50 percent of all drives that offer incentives. Coupons are the second most common material incentive and are given out in over eight percent of the drives offering incentives. Coolers, sweatshirts, and hats are the next most common promotional items. In some cases, sponsors propose or add incentives to those offered by the ARC. This occurs in about 25 percent of the drives with incentives. Unfortunately, information on the nature of the sponsor incentives is not available;

[4] In a handful of drives, the number of donors presenting was zero due to extraordinary circumstances such as power interruptions. In our regression analysis we make sure the results are not driven by outliers by dropping from the sample the drives in the top and bottom one percent of the distribution of presenting donors.

conversations with ARC managers indicated that these sponsor incentives tend to have small value (e.g., mugs or lottery tickets with expected values less than two dollars). Some drives are also characterized by special attributes; for example, a drive may be run in memory of or in honor of an individual, or it may be particularly (but not exclusively) targeted to 0-type donors.

[Table 2 about here]

Table 3a shows summary statistics on sponsor types using the ARC's codification.[5] The most common sponsor type, sponsoring 44 percent of all drives, was the general community, which includes drives at town halls and libraries. Manufacturing firms, hospitals, and high schools each sponsored more than seven percent of the drives. The percent of drives that offer incentives varied substantially across sponsor types. There is also substantial variation among the 2,664 different individual sponsors in terms of both the number of drives sponsored and in the use of incentives. While 846 sponsors organized exactly one drive between May 2006 and October 2008, 1,818 others organized two or more drives.

[Table 3a about here]

Table 3b shows that there is large variation also *within* sponsors who run more than one drive in their use of incentives. In particular, more than 40 percent of sponsors (constituting more than 77 percent of all the drives and nearly 11,000 drives) run multiple drives with variation in terms of having drives with and without incentives. This variation, together with the ability to control for a number of other factors, will be critical for our identification strategy.

[Table 3b about here]

The present study departs from past empirical work by estimating the effects of incentives, not only when and where they are offered, but also at potential "substitute drives" that donors may be attracted to (or away from) that are temporally and geographically close. We used GIS software to compute the driving distance between the street addresses of all blood drives in our sample.[6] To determine potential substitute drives for each of the drives in our data, we initially limited the travel distance between drives to be within ten miles. Next, we limited the set of potential substitute drives to those that are within 56 days prior to a drive's date, since donors are not eligible to donate again if they donated less than 56 days prior to a drive.[7] Finally, we limited potential substitute drives going forward in time to include only

[5] We only report sponsor types in Table 3a with at least 100 drives to protect the privacy of individual sponsors who ran just a few drives and would be easily identifiable. However, all sponsors are included in the regression analyses.

[6] Driving distances were calculated using standard GIS network-path algorithms for finding the shortest path through a network, following from Dijkstra's (1959) shortest-path approach. The approach uses a shortest-path algorithm to find the shortest, least-cost route through a network from one point to another. In the case of distance, each road segment in the network was weighted by its Euclidean distance across space as the measure of "cost" in the shortest-path algorithm. All locations within a specified maximum distance (10 miles) were identified. All calculations were performed in GIS using the ESRI Streetmap 9.3 GIS data for North America, which includes highly detailed US street and rail network data provided by Tele Atlas. When the GIS software could not find an exact geo-location, the address of the nearest US post office was used. There were 321 such cases.

[7] It is of course possible that drives occurring more than 56 days earlier could be a substitute. For instance, if donors donate once per year, and their next planned donation is 4 months away, but a drive advertises a promotion that attracts them to shift forward their next donation, but has no effect on their once a year donation behavior, then there would be no change in overall donations and only a substitution effect would have occurred. In analyses not shown, we did not detect temporal substitution over 56 days.

drives that donors would have been made aware of by either the monthly flyers or postcards. For drives occurring prior to the 25th of the month, we limit potential substitute drives going forward to only those that occur up to the end of that same month, since donors would not have been made aware of drives occurring in the following month; and for drives occurring after the 25th of a given month, we extend potential substitute drives to those occurring up to the end of the following month since donors would have been made aware of drives occurring in the following month.

Table 4 shows that, on average, 6.5 potential substitute drives occur within two miles of every drive, 7.7 between two and four miles away, and nearly 37 additional potential substitute drives occur between four and ten miles away. Further, the average number of potential substitute drives that offer an incentive are 2.6, 3.1, and 14.6 that occur within two miles, between two and four miles, and between four and ten miles, respectively. The bottom panel in Table 4 shows that when we limit the number of potential substitute drives to open drives in flyer counties we obtain similar numbers of potential substitutes.

[Table 4 about here]

On the basis of these data, we now describe our empirical identification strategy and then our findings. We first focus on the "direct" or "local" effects of incentives, i.e., ignoring substitution, and then assess the impact of substitution effects.

3. The "Direct" Effect of Incentives

3.1 Empirical model and identification strategy

We present estimates of the following model:

$$y_{ijt} = \alpha + \beta INCENTIVE_{ijt} + \gamma X_{ijt} + \eta_i + \varepsilon_{ijt}, \quad (1)$$

where *i*, *j*, and *t* denote the drive, sponsor, and calendar date, respectively. We examine three outcomes y_{ijt}: the number of people presenting (turnout),[8] the units of blood collected, and the percentage of deferred people relative to those presenting. The variable $INCENTIVE_{ijt}$ is an indicator for the presence of promotions at drive *ijt*. Therefore the parameter β represents, ceteris paribus, the marginal effect on the dependent variable (i.e., turnout, units collected, or percent deferred donors) between drives with no incentives and drives with incentives.

The vector X_{ijt} includes a drive's length in hours, weather conditions on the day of the drive (temperature dummies, rain, rain intensity, and snow on the ground),[9] and dummies for year, month, week-of-the-month, day-of-the week, ARC representative, and zip-codes, as well as the presence of

[8] If a donor leaves at any time after registering, she will be classified as presenting. It is possible that a donor could show up and then not register for some reason (e.g., if there is a crowded waiting area). The ARC believes that donors who leave without signing in are rare since there is virtually never any delay to sign in. If donors showing up but not registering cause a bias in our estimates, it may be in the direction of underestimating the effect of incentives on donors presenting since incentives might have caused the longer lines or crowds.

[9] We use flexible functional forms for weather conditions in order to account for non-linear effects. For example, both very low and very high temperatures may have a negative impact on the turnout.

specific attributes for a drive. Weather conditions represent temporary shocks to donations that should, however, be orthogonal to incentives. Including month fixed effects is important because the ARC operations have a seasonal dimension, with the district managers and drive representatives trying to attract donors, for example, around the December holidays or in the summer months when donations are typically lower than other times of the year. We also control for ARC representative fixed effects since they may have different abilities and social networks that affect turnout. Representatives have monthly and occasionally yearly targets that might cause them to reallocate their limited budgets for offering incentives toward the end of the month or year to meet their goals. Dummy variables for months and weeks of the month control for these types of variation (and we do not find incentives have any differential effect for any week within a month). Finally, we include zip-code fixed effects to capture heterogeneity correlated with socio-economic characteristics of the neighborhoods where drives take place. Incentives, and especially those with higher economic value, might have a greater impact in lower socio-economic areas. We also control for any other attribute, e.g., if the drive is given in memory or in honor of someone, if it is a drive specifically addressed to 0-type donors, etc., in order to control variation due to these attributes.

Crucially for our identification strategy, the parameter η_i represents drive-sponsor fixed effects. We include drive-sponsor fixed effects because, as discussed above, heterogeneity across sponsors could explain some of the differences in outcomes across drives. Sponsors may have different abilities and social networks that can affect donor turnout. Sponsor fixed effects will control for this type of heterogeneity. Within drive and sponsors, however, the presence of incentives is not systematically linked to other characteristics, since it is mostly dictated by fairness and budget considerations. Once the confounding factors described above are controlled for, therefore, an analysis of the effect of incentives on blood donation outcomes performed *within sponsor-drives* through fixed-effect regressions will lead to well-identified, causal estimates. To the extent that different sponsor characteristics (e.g., motivation and abilities) are connected with drives offering incentives, controlling for sponsor fixed effects is vital to separate incentive effects from sponsor effects. However, to the extent that sponsor characteristics are independent of the presence and types of incentives offered, including sponsor fixed effects unnecessarily reduces the power to estimate the effect of incentives, although as reported in Table 3b there remains nonetheless nearly 11,000 drives with the same sponsors having variation in whether the drives they run offer incentives that we can use *within sponsor* to identify incentive effects by controlling for sponsor fixed effects. Controlling for sponsor fixed effects thus errs on the side of caution and is justified since we do not observe many potentially important differences across sponsors. We also estimate and report robust standard errors clustered at the sponsor level.[10]

As mentioned above, one additional concern is that sponsors might change their behavior when

[10] For the small percentage of sponsors who ran both open and closed drives, we include a unique fixed effect for the open and the closed drives. This again reduces power to estimate the effect of incentives in order to err on the side of caution.

incentives are offered compared to when they are not. For instance, they might contact more people when incentives are present, run an open drive rather than a closed one, or have the drive last longer. However, this alternative explanation for the effect of incentives seems very unlikely for several reasons. First, as mentioned above, interviews with ARC managers and multiple ARC representatives revealed that sponsors follow nearly identical procedures regardless of the presence of incentives. Second, on every observable that we could test in which sponsors have some discretion (specifically drive length and whether a drive was open or closed), we detected no significant differences *within* sponsor behavior depending on whether incentives were or were not offered.[11] Thus, we cannot find any evidence in the data that sponsors are changing their behavior when incentives are offered.

In a further attempt to isolate the impact of incentives and determine the mechanisms behind any effect they have on any of the outcomes, we examine the impact of incentives not only over all drives but also separately for closed drives, open drives, and open drives in flyer counties. If incentives attract more donors, this effect should be greater at open drives where more donors are able to donate, and greater when promoted in flyer than postcard counties where more donors would be made aware that an incentive is being offered.

A final question we examine is whether donors are attracted by incentives for their symbolic rather than, or in addition to, their economic value (e.g., T-shirts with the ARC logo – see Figure 1). To address this question, we estimate whether incentives of higher monetary value attract more donors. If the symbolic value is the only reason that the items increase turnout and units collected, and the economic and social value of an item are not strongly correlated, then the economic value of the incentives should have minimal impact on turnout and units collected. On the other hand, if there is no symbolic value, then the main effect of offering an incentive should have no effect on turnout or units collected after controlling for the items' costs. To examine this question, we will present regressions that include the economic value of incentives using the ARC cost of the items as a proxy for the economic value.

3.2 Findings

Table 5a presents regressions on the number of donors presenting. The OLS estimates shown in Column 1 without covariates compare simple mean differences between drives without incentives and drives with incentives. These comparisons indicate a statistically significant increase in 5.0 donors presenting when incentives are offered than when incentives are not offered. Compared to the mean number of 37 donors presenting across all drives, this estimated coefficient is substantial in magnitude. Including the controls described above does not substantively change the estimated effect of incentives (Column 2), nor does the inclusion of drive-sponsor fixed effects (Column 3).[12]

[11] These analyses are available upon request.

[12] The coefficients on the control variables are not reported here but are available upon request. Their signs are as expected. The length of a drive is associated with more donors presenting; rain, rain intensity, and snow all discourage donations (although

[Table 5a about here]

Estimates presented in Columns 4-9 examine the effect of incentives at closed and open drives and open drives in flyer counties, and confirm expectations that incentives have a greater impact when anyone can present (in open rather than closed drives) and when more potential donors are made aware of the incentives (in flyer than postcard counties). Columns 4-6 add interactive terms between the presence of incentives and whether a drive is open and/or in a flyer county.[13] These regressions show that the effect of incentives on turnout at open drives is significantly greater than at closed drives (by an additional 3.2 donors presenting – Column 4), that significantly more donors present when incentives are offered in flyer than postcard counties (by an extra 1.8 donors presenting – Column 5), and that the effect of incentives is significantly greater on donors presenting in open drives in flyer counties than at either closed drives or in postcard counties (by an additional 3.5 donors – Column 6). Columns 7-9 present estimates where the sample is split according to whether drives are closed, open, or open in flyer counties, and shows similar results to the previous columns.

Table 5b presents regressions examining the effects of incentives on units of blood collected (Columns 1-4) and on the percent of donors deferred (Columns 5-8) using the final four models presented in Table 5a. The effect of incentives on units of blood collected is nearly identical to the effect on donors presenting. Column 4 shows that the effect of incentives at open drives in flyer counties is substantial; on average, compared to the mean number of 31.3 units collected across all drives, offering incentives increases donors presenting by 18.5 percent (5.8/31.3). Again, the effect is significantly stronger when the incentives are offered at drives that are open in flyer counties than when the drives are either closed or in postcard counties.

[Table 5b about here]

Columns 5-8 of Table 5b show that offering incentives does not increase the percent of donors who are deferred. For instance, in open drives in flyer counties (Column 8) the percent of individuals presenting that are deferred is actually approximately 0.3 percent *lower* at drives that offered incentives, though this difference is not statistically significant. Thus, these results indicate that offering incentives does not disproportionately attract individuals who are not in condition (i.e., ineligible) to donate blood.

So far, the results indicate a strong positive effect of incentives on turnout and units of blood collected with no disproportionate negative effect on the fraction of donors deferred. There are, however, potentially two distinct sources of utility people may get when obtaining the items. First, people may be attracted by the material (internal consumption) value of the item. Second, donors may be attracted by the

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these effects are not always statistically significant); and moderate temperatures are associated with more donations relative to either very cold or very warm weather.

[13] The variable indicating whether a drive is open cannot be estimated (i.e., drops out of the regression) since the sponsor-drive fixed effects are always nested within either open or closed drives. Likewise, the variable indicating whether a drive is in a flyer or a postcard county also cannot be estimated since the sponsor-drive fixed effects are always nested within either a flyer or postcard county.

symbolic and social content from receiving the items. For instance, donors might be attracted by a T-shirt or a jacket with the ARC logo because wearing them lets donors signal their pro-social behavior and obtain status as a donor to friends, peers, colleagues, and total strangers. As a first attempt to disentangle the symbolic and social content value from the items' material value, Table 6 reports the results from the fully specified regressions of Tables 5a and 5b while adding the cost of each promotion item and its square.

The estimates in Table 6 indicate that incentives of higher value have a substantial and strongly significant impact on turnout and units collected. Moreover, once the cost of the items is controlled for, the coefficient on the dummy variable indicating the presence of incentives becomes small in magnitude and statistically insignificant. This strongly suggests that it is mostly the economic value of incentives that explains their effect rather than their symbolic value. Figure 2 shows the estimated effect of the cost of the items on turnout, units collected, and percent of donors deferred using the estimates in Table 6 for open drives in flyer counties; the estimated effect is essentially linear in the range of values observed in the sample (there is a slight concavity, and although statistically significant, it is quantitatively negligible) for both presenting donors and collected units. Finally, Columns 3 and 6 in Table 6 show, again, no significant relationship between the value of incentives and the percentage of deferred donors.

[Table 6 about here]

[Figure 2 about here]

Table 7 presents results from a similar analysis where, instead of the cost of each item being included as a single continuous variable, a dummy variable for each item that is offered in at least 40 drives is included in the regressions. The results in Tables 6 and 7 are similar. Items of higher monetary value generally appear to attract a larger number of donors; for instance, T-shirts that cost $2.95 attract 6.5 extra donors, sweatshirts that cost $6.67 attract 13.3 additional donors, and jackets that cost $9.50 attract 25.1 extra donors. One exception is the 6-pack coolers which are the second-most-expensive item at $9.37 yet have one of the smaller, albeit significant, effects on turnout, only attracting 4.3 additional donors. Overall, the results in Tables 6 and 7 suggest that symbolic value is unlikely to be the reason that offering incentives increases turnout and units collected, and pure economic value considerations are most likely driving the behavioral changes. The next section strengthens all these findings by reporting the results from a small-scale field experiment we conducted in which we offered gift cards with no ARC logo and thus no symbolic value.

[Table 7 about here]

4. Evidence from a Small-scale Field Experiment

We corroborate all the main findings we obtained from the large-sample, retrospective study with a small-scale field experiment that we ran in collaboration with the ARC in northern Ohio. The experiment was meant to offer further insights on some of the patterns found in the historical data.

First, as we mentioned above, it may be argued that the positive effect of promotions may not be due to their material value, but to their symbolic and social content. Therefore, it is useful to look at the effect of incentives that are clearly devoid of any symbolic attribute. Second, while in our analysis we control for ARC-representative and drive-sponsor fixed effects, we cannot completely rule out that a given representative or sponsor changes recruitment efforts and strategies when there is a promotion.

To fulfill these goals through the field experiment, we selected two non-neighboring counties in northern Ohio. Within each county, we randomly selected four drives planned for the month of March 2009 where no promotion was present. Two of the four drives in each county were then randomly selected to be controls. For the other two drives in each county, a gift card of $5 at selected local stores was offered in one, and a gift card of $20 was offered in the other. We chose gift cards because they are the rewards closest to cash (there are strict guidelines on what the FDA deems as acceptable gifts for blood donors, and cash is never an acceptable gift to give a volunteer blood donor) and do not have any symbolic or social recognition value (there is no indication of the Red Cross on the cards). The different amounts were meant to estimate the impact of both small and large rewards, while still being within the range of (retail) values of the items offered for promotion by the ARC (the items with the highest cost to the ARC are around $11, but we assume a higher value to the donors based on higher retail prices – with gift cards, there is no difference between the cost we paid and the retail price for consumers). In collaboration with the ARC in northern Ohio, we also ensured that the recruitment procedures were kept uniform for the drives with and without incentives, and that the donors were completely unaware that a study was being conducted. In addition to providing us with data on the outcomes of the eight drives that were used in our field experiment, the ARC provided us with information on the number of potential donors who were contacted and informed about the drives. These numbers do not differ significantly across the different drives of the study.

Figure 3 shows the striking impact of incentives at the treatment drives. The increase in turnout and units collected at the drives where donors received a $5 gift card with respect to the averages in the previous three drives at the same locations was 6.5 and 3.7, respectively, whereas in the control locations there was no change in turnout and only 0.8 extra units collected. The size of increase in turnout and units collected at the $5 treatment drives are comparable to our estimated coefficients in the above analysis, on average and for items of roughly the same monetary value. For instance, T-shirts increased turnout by 6.5 and 5.7 units, respectively. In the $20 treatments, turnout and units collected increased on average more than triple compared to the historical average at those same drives. Turnout increased by 47 donors, and blood collected rose by 41 units. No discernible differences were found in the control drives before and after the interventions. Difference-in-difference estimates for the $20 treatment, despite the small number of observations, are statistically significant at the 5 percent level for both turnout and units of blood collected. Once again, there was no disproportionate increase in deferrals.

[Figure 3 about here]

The results from the field experiment confirm our findings and interpretation from the historical data analysis. Donors respond positively to incentives, and this response seems to be driven primarily by the monetary value of the items rather than by their symbolic value. Also, the effects appear to be genuine behavioral responses of donors and not due to sponsors changing their behavior (e.g., contacting a larger number of potential donors) when incentives are given.

5. Assessing the Presence of Substitution Effects

A robust finding in our analyses so far is the larger effect of incentives when drives are open than closed and when drives are in flyer than postcard counties. This is a first indication of the possible presence of substitution effects; the interaction parameters in Columns 4-6 of Table 5a and Column 1 of Table 5b estimate the additional donors who are attracted to donate at drives they would not otherwise be aware of (in the case of flyer rather than county information) or would not otherwise be aware of nor able to donate at (in the case of open rather than closed drives). If donors are flexible regarding when and where they donate, then they may be influenced by incentives to change the date and location of their donations, in which case the above analysis could overestimate the overall effect of incentives; at least some of the increase may be explained by donors substituting away from one drive toward another drive offering an incentive. To the extent donors are substituting across drives there is no increase in overall donations.

As a first exploration of possible substitution patterns in blood donation due to incentives being offered, Table 8 presents regressions examining whether incentives in past drives had an effect on donations in subsequent drives at the same location. The models estimated in Table 8 replicate the full models estimated in Columns 1 and 4 of Table 6 and add dummy variables for (a) whether a drive was run at the identical location within the last 56 days, (b) whether incentives were offered at that past drive, and (c) the cost (and its square) of the incentive offered at that past drive. The estimates indicate that the presence of a drive at the same location in the previous 56 days reduced turnout and units of blood collected at the current drive. This result is not surprising since anyone who donated at the past drive would be ineligible to donate at the current drive since it occurred less than 56 days prior to the current drive.[14] However, although the estimated incremental effect of offering an incentive at the previous drive, in most cases, directionally decreases turnout and units collected, suggesting donors might be temporally substituting forward in time donations when incentives are offered, this particular form of substitution by itself does not reach conventional levels of significance. However, this is just one possible way to substitute donations, and, for instance, donors also could have been substituting not only temporally, but also across locations, and so we now turn to a broader examination of potential substitution effects.

[14] The presence of a drive in the same location within the past 56 days seems to have a positive and significant effect on the percentage of donors deferred. This is most likely due to the fact that when drives are run in the same location at frequencies higher than once every 56 days, some donors may return at the subsequent drive at that location but will be ineligible to donate (FDA regulations mandate a period of at least 56 days between consecutive donations), and therefore end up being deferred.

[Table 8 about here]

5.1 Empirical strategy

To analyze the impact of incentives offered at drives that neighbor a drive *i* at time t and location j, we estimate the following modification of model (1):

$$y_{ijt} = \alpha + \beta INCENTIVE_{ijt} + \mu N_{ijt} + \rho NI_{ijt} + \gamma X_{ijt} + \eta_i + \varepsilon_{ijt}, \quad (2)$$

where *y, INCENTIVE, X* and η are defined in equation (1) above, N_{ijt} is the number of neighboring drives, and NI_{ijt} indicates the number of neighboring drives offering incentives.

We adopt a series of strategies to isolate the effects of interest. First, if they occur, substitution effects should be more pronounced with drives that are closer in time and space. Thus we distinguish neighboring drives occurring within 2 miles from a focal drive, within the 2-4 mile range, and within the 4-10 mile range. Our construction of the set of potential substitute drives was described in section 2.2 above. Table 4 shows summary statistics on the number of potential substitute drives at various distances and on the number of potential substitute drives which offered incentives. For instance, on average 2.6 drives within a 2-mile distance offer incentives across all drives.

Second, as discussed previously, potential donors are informed of the upcoming drive either through a flyer or a postcard. More precisely, in flyer counties donors are informed in advance of all the *open* drives planned for that month *in that county*, and for each drive the flyer indicates if there is a promotion and, if so, what kind. In postcard counties, in contrast, donors are informed only about one drive (or a small number of drives if they receive more than one postcard) just a few days before the drive date. Thus, if substitution effects occur, they should be stronger where donors are informed in advance about a larger number of drives and, of course, if these drives are open so they can attend.[15] Therefore, we perform separate analyses for closed drives, open drives, and open drives in flyer counties. Also, if substitution is driven not only by the presence of a neighboring drive, but also by the presence of incentives, then we should see a stronger decline in turnout at a given drive if there are incentives offered at neighbor drives. Thus we calculate the impact of having any drives in the neighborhood of a focal drive, and the effects of having neighboring drives with incentives, and look at all drives as well as closed drives, open drives, and open drives in flyer counties separately. Finally, the analysis above suggests that drives are more attractive to donors the more valuable the incentive offered at that drive. Thus, we examine whether substitution effects are stronger when potential substitute drives offer more expensive incentives.

[15] Since some donors may receive more than one postcard if they have donated at more than one location previously, they may have information on more than one drive. Therefore, some substitution may still occur in postcard counties, but on average it should be weaker than in flyer counties where all donors would be informed of all upcoming drives in the county.

For our purposes in this section, we use all observations with enough forward and backward temporal lags to have a complete record of all possible neighbors. To have a complete set of neighbor observations for every drive, we removed drives from the analysis (as dependent variables) that occurred within the first 56 days or the last 30 days. This truncation of the data removes almost 7.5 percent of the observations. Regressions not reported (available upon request) show that all our previous results remain qualitatively (and essentially quantitatively) unchanged when repeated on this reduced dataset.

5.2 Findings

Table 9a shows the effect of potential substitute drives on donors presenting. All the regressions are versions of the full models estimated in Table 6 with additions for frequencies of potential substitute drives. The regression in Column 1 includes among the regressors the number of potential substitute drives in three distance ranges: 0-2, 2-4, and 4-10 miles. The results indicate that the presence of one additional drive that is a potential substitute for a given drive reduces turnout, significantly, by 0.2 donors on average if it takes place within 0-2 miles. Additional drives taking place farther away than 2 miles do not have a significant impact. Column 2 examines whether the number of neighboring drives that offer incentives affects turnout at a drive. The estimates suggest that if one additional neighboring drive among the potential substitutes within 2 miles offers an incentive, the turnout will decline, significantly, by 0.25 donors. Drives that offer incentives but that are located farther away do not have any effect on turnout. Column 3 estimates the effects of a change in the dollar value of the highest monetary value of incentives offered across potential substitute drives. We obtain negative, marginally significant coefficients for an increase in the highest monetary value incentives offered at potential substitute drives occurring within 0-2 and 2-4 miles, but no effect for drives 4-10 miles away. These results reinforce the interpretation that donors are attracted toward drives offering incentives, and more so when the incentives offered have higher value, but also indicate that the spatial substitution is limited to drives that are within 2 miles of each other.

Columns 4-6 repeat the analyses from columns 1-3, and include estimates of the interaction of the variables of interest with the dummy variable indicating whether an incentive was given at the current drive. We include these interactions since we anticipate that donors will be less likely to substitute away from a drive if the drive already offers an incentive. While we do not find any significant effect for this interaction when examining the total number of potential substitute drives (Column 4) or the number of potential substitutes offering incentives (though in this case the direction of the estimate is as anticipated), Column 6 shows that the negative effect on turnout at the current drive from the substitute drive offering the costliest incentives (-0.21 fewer donors) occurs only for drives not offering incentives and entirely disappears in drives which offer an incentive (the effect at these drives is +0.08=-0.21+0.29). This result indicates that donors are increasingly likely to substitute away from drives without incentives than from drives offering incentives the higher the value of the most expensive item offered at a

substitute drive.

The results from Table 9a, Columns 1-6, strongly indicate that only potential substitute drives located within 2 miles have significant effects on turnout at the current drive. Therefore, in what follows we restrict the analysis to substitute drives located within 2 miles. In Column 7, both the total number of potential substitute drives and the number of potential substitute drives offering incentives are included at the same time. The coefficient estimate on the total number of potential substitute drives within 0-2 miles decreases by just over 50% (compared to Column 4) from -0.199 to -0.095 and is not significant, while the coefficient estimate on the number of neighboring drives offering incentives falls only slightly (Compared to Column 5) from -0.296 to -0.255 and remains highly significant. Column 8 adds the highest monetary value of incentives offered in potential substitute drives. All three variables of interest appear to affect turnout in a way that is consistent with substitution effects being important. Column 8 estimates show that an increase in the number of neighboring drives, an increase in the number of neighboring drives offering incentives, and an increase in the highest cost of an item offered at a neighboring drive will all negatively affect turnout, while offering an incentive at a drive will significantly decrease the number of donors substituting away from it toward other drives offering an incentive.

Our estimates imply that substitution effects can be substantial since adding incentives can potentially affect many neighbors, and can be especially large if the incentive is the highest valued item offered in the neighborhood. For instance, consider a simple case in which an item that costs $2.50 is added as an incentive to an existing drive in a neighborhood (0-2 miles driving distance) with four other drives with none otherwise offering incentives. If we ignore substitution effects, the estimates in Column 1 of Table 6 indicate that an additional 5.46 donors ($0.572 + \$2.5*2.22 - 2.5^2*0.106$) will turn out. However, the estimates in Column 8 of Table 9a indicate that turnout also will decrease by $0.6045 = 0.157 + 0.179 * \$2.50$ donors at each of the neighboring drives since none of the other drives offer incentives. This implies that adding the incentive reduces turnout across all neighboring drives by a total of $2.42 = 4 * .6045$ donors. Thus, 44 percent (2.42 / 5.46) of the *extra* donors who turn out at the drive offering the incentive when we ignored substitution effects will consist of donors who would have donated otherwise at one of the neighboring drives. Thus, in this simple scenario for every "new" donor showing up to donate when a $2.50 cost incentive is offered in a neighborhood with four other drives with none of them offering incentives, over 40 percent of the local increase is due to existing donors substituting away from donating at other drives. Hence, ignoring these temporal and spatial substitution effects can result in substantially overestimating the total effect of incentives on donations.

[Table 9a about here]

Table 9b provides further evidence that donors are substituting across drives. The estimates in Table 9b show that substitution effects are essentially non-existent in closed drives, generally occur at open drives, and are largest at open drives in flyer counties. For instance, the point estimates indicate that

adding an incentive to a neighboring drive decreases turnout by an insignificant -0.037 donors at closed drives (Column 4), but decreases turnout by 0.148 donors at open drives (Column 7), and by 0.181 donors at open drives in flyer counties (Column 10). It is not surprising that the substitution effects are more than three times larger at open drives and open drives in flyer counties since more donors are aware of, and able to substitute, their donations toward the open drives. Similarly, the estimates indicate that an increase in the value of the highest cost incentive offered at a potential substitute drive is smallest and insignificant at closed drives (-0.063) and is much larger and significant at open drives (-0.201) and open drives in flyer counties (-0.229) when the current drive does not offer an incentive. Thus, as anticipated, substitution effects are larger when donors are able to substitute (at open drives) and when more donors are aware of more options to donate (in flyer counties). These results are consistent with standard economic theory in general, but have generally not been documented in the context of pro-social behavior.

Table 9b presents similar regressions to those in Table 9a for the units of blood collected and the percent of donors deferred. The patterns that emerge for units collected are very similar to those estimated for the number of donors presenting. For deferrals, it is possible that drives offering incentives could siphon donors who are more likely to be deferred because they have qualities that might be more attracted to drives with incentives. However, we find no systematic evidence of this type of substitution occurring.

[Table 9b about here]

6. Discussion and Conclusions

We present evidence indicating that incentives offered at blood drives significantly increase the number of donors presenting, the number of units of blood collected, and does not increase the proportion of deferrals. We have also shown, however, that donors substitute donations across time and locations to take advantage of the material incentives. In the case of donors presenting at a drive, the estimated effect of incentives on donations may indeed be unchanged if there are no or just a few neighboring drives, but could be severely attenuated if there are many neighboring drives.

The most important contributions of this study to the literature on the effects of extrinsic incentives on pro-social behavior are twofold. First, within the current paradigm of looking at the "local" effects of incentives, we provide field evidence from a large and representative population, and analyze the effects of many incentives used in the field. In this setting – and with specific reference to blood donations – we found that neither crowding out of motivations nor adverse selection appear to be consequences of the presence of incentives. Second, we expanded beyond the existing approaches and explore the "total" effects of incentives, when donors can choose between different locations and times to donate. This extension is crucial since it shows that the positive, local effects of incentives are attenuated when we consider substitution effects.

Our results also contribute to the literature on whether "repugnance" can be a barrier to the existence of a market for certain goods or services such as blood or human body organs (Becker and Elias 2007; Roth 2007). Repugnance for certain transactions goes beyond crowding out arguments and potential market failures to include moral concerns that raise opposition to certain market transactions being acceptable. The positive response to explicit incentives we document suggests that receiving rewards for offering blood is not considered on average repugnant among blood donors in the US today. However, this does not mean that no donors exist who perceive receiving incentives for blood as repugnant, nor can we say anything about overall social welfare affects from this study in regard to the repugnance. It is possible that the US donor attitudes may be evolving with the increasing presence of private blood banks that pay donors for their blood products, though it is difficult to assess cause and effect; if repugnance for compensation for blood donations is receding in the US, the presence of private blood banks could be part of the reason, yet the receding repugnance attitudes due to unrelated reasons could alternatively be opening the possibility for private blood banks to flourish.

Our approach and results are also of interest for the organization of pro-social and charitable activities. On the one hand, we provided evidence that donors are not "shied away" by the presence of rewards. In fact, the organization we studied in this paper, the ARC Blood Service in northern Ohio, uses promotions in a conscious effort to increase donations. On the other hand, we show that the geographical and temporal organization of charitable activities influences the overall outcomes of these activities.

There are some important limitations to the current study. While it is reasonable to argue that there are few close substitutes for donating blood at one location and at one time other than donating at another location and time, it is also possible that there are other substitutes. For instance, it is also possible that donors may substitute away from donating plasma to instead donate blood, which suggests our analysis including only American Red Cross blood donations as a possible substitute may still overestimate the overall effect of material incentives on blood donations on the more general category of blood product donations. While plasma donations have some differences from whole blood donations (e.g., it takes longer and has more health restrictions), in one respect it may be a close substitute since many plasma donors are paid for their plasma donations. Broadening the category of possible substitutes even further, additional pro-social activities that may be a substitute for blood donations could be any number of other physical activities that require some effort and possibly some minor discomfort. It is also possible that some donors substitute away from monetary donations to the American Red Cross when material incentives are offered, but we cannot observe this behavior. Thus, we conjecture that the current analysis presents a potential lower bound on the size of the substitution effect, but we do not expect that the estimates are too far off the total substitution effects since we are able to estimate the effects of the closest substitutes, and also since we find that going beyond four miles and more than 56 days we cannot detect any substitution effects.

The analysis may further overestimate the effect of incentives if sponsor behavior depends on

whether promotions are offered. For instance, when incentives are offered sponsors may view the drive as more important, or believe that donors will be more satisfied with the experience as a consequence of the material incentives. For these reasons, and possibly several others, sponsors could attempt to contact additional donors (some of whom may donate elsewhere), including friends, family, and colleagues. The results of our small-scale field experiment, however, which revealed strong effects of incentives even when the sponsors and representatives behavior was unchanged, makes us confident that what we measured is, in large part, a genuine reflection of donor behavior.

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Table 1: Summary statistics

	Mean	*St.Dev.*	*Min.*	*Median*	*Max.*
Number of donors presenting	37.0	26.9	0	31	797
Units of blood collected	31.3	23.0	0	26	688
Donors deferred (% of presenting)	15.4	9.0	0	14.3	100
Open drives	0.78	0.42	0	1	1
Drives in "flyer" counties	0.80	0.40	0	1	1
Open drives in "flyer" counties	0.61	0.49	0	1	1
Drive length (hours)	5.4	1.2	1	5	18
Incentives given (yes = 1)	0.37	0.48	0	0	1
Temperature (F)	55.2	18.0	0	59	89
Fraction <32F	0.14				
Rain	0.13	0.32	0	0	6.89
Rain intensity	0.03	0.08	0	0	3.33
Fraction days with rain	0.46				
Snow	0.23	0.96	0	0	15.4
Fraction days with snow	0.09				

Notes: Rain measures inches of rain on the day of the drive; Rain intensity is measured as rain divided by hours of precipitation on the day of the drive; Snow measures the amount of snow (inches) in the 48 hours preceding a drive, and it is meant to capture the amount of snow on the ground on the day of the drive. "Flyer" counties are counties where donors receive, every month, a flyer with information on all (open) drives that will take place in their county in that month. Donors in "non-flyer" or "postcard" counties, in contrast, receive a postcard informing them of upcoming drives in usual location(s) only.

Table 2: Incentives

	At drives where incentives were offered	At open drives	At open drives in "flyer" counties
	%	%	%
t-shirt	49.00	47.15	46.49
coupon	8.38	9.14	9.73
cedar point ticket (raffle)	5.02	4.29	3.85
cooler	3.00	3.20	3.17
sweatshirt	2.43	2.85	2.97
umbrella	2.37	2.54	2.20
hat	1.71	1.93	1.94
6-pack cooler	1.52	1.81	1.94
blanket	1.15	1.30	1.41
scarf	1.15	1.30	1.29
mug	0.95	0.99	0.50
music download card	0.93	1.04	1.00
jacket	0.86	1.01	1.03
other	3.21	3.25	3.17
sponsor promo	25.03	25.57	26.77
# Drives	5,141	4,244	3,403

Notes: The percentages do not sum up to 100 because more than one item might be offered at a single drive. The "other" category includes incentives that were offered in fewer than 40 drives. The "sponsor promos" category includes a variety of typically small-value items whose nature was not specified in the ARC database

Table 3a: Sponsor types and incentives

Type of Drive Sponsor	*Frequency*	*Percent of all drives*	*Mean # of donors presenting*	*Fraction with material incentives*
General Community	6,164	43.9%	36.9	0.42
Manufacturing	1,517	10.8%	30.5	0.22
Hospital	1,242	8.9%	35.7	0.40
High School	991	7.1%	65.8	0.54
Professional Services	618	4.4%	27.5	0.22
Catholic	429	3.1%	37.0	0.23
College	401	2.9%	41.4	0.34
Banking	241	1.7%	32.7	0.31
Elementary School	232	1.7%	35.7	0.03
Red Cross Chapter	224	1.6%	32.0	0.55
Clinic	156	1.1%	29.0	0.50
Federal	146	1.0%	37.4	0.31
Lutheran	140	1.0%	30.9	0.24
Nursing Homes	140	1.0%	18.1	0.34
County	125	0.9%	24.6	0.29
Utilities	115	0.8%	31.5	0.26
Retail	114	0.8%	25.6	0.31
State	107	0.8%	24.2	0.23
Other	927	6.6%	35.9	0.34
Total	14,029	100.0%	37.0	0.37

Table 3b: Individual sponsors and incentives

	Number of sponsors	**Percent of all sponsors**	**Number of drives**	**Percent of all drives**	**Mean # of donors presenting**
1. Sponsors who ran exactly one drive	846	31.8	846	6.0	27.3
AND offered incentives	527	19.8	527	3.8	31.1
2. Sponsors who ran at least two drives	1,818	68.2	13,183	94.0	37.6
AND never offered incentives	416	15.6	1,534	10.9	28.2
AND always offered incentives	218	8.2	771	5.5	42.2
AND sometimes offered incentives	1184	44.4	10878	77.5	38.6
All Drives	2,664	100%	14,029	100%	37.0

Table 4: Statistics on potential substitute drives

For all drives

Potential substitute drives taking place within:

	0-2 miles	2-4 miles	4-10 miles
mean	6.5	7.7	36.6
sd	8.0	9.0	34.7
min	0	0	0
max	50	72	190

Potential subst. drives **with** incentives taking place within:

	0-2 miles	2-4 miles	4-10 miles
mean	2.6	3.1	14.6
sd	3.8	4.5	15.8
min	0	0	0
max	35	42	108

For drives with incentives

Potential substitute drives taking place within:

	0-2 miles	2-4 miles	4-10 miles
mean	6.8	7.9	36.9
sd	7.8	9.1	34.3
min	0	0	0
max	50	71	190

Potential subst. drives **without** incentives taking place within:

	0-2 miles	2-4 miles	4-10 miles
mean	3.6	4.4	21.0
sd	4.6	5.8	20.2
min	0	0	0
max	31	49	120

Notes: The unit of observation is a location/date. N = 12,425: Drives in the bottom and top 1 percent of the distribution of donors presenting were dropped from the sample; we also deleted from the sample used for the regressions (but not for the computation of the number of substitute drives) the drives that took place in the first 56 days and in the last 30 days of the sample period (5/1/2006-10/8/2008). The number of possible substitute drives was computed as follows. For a given drive X, **potential substitute drives** are open drives that occurred in the same County as drive X, between 56 days prior to drive X and (1) the end of the month in which drive X occurred, when drive X occurred on the 24th of the month or earlier, (2) the end of the following month, when drive X occurred on the 25th of the month or later. Further explanations are provided in the text. Distance was measured in travel miles between street addresses, computed using standard GIS network-path algorithms for finding the shortest path through a network. All calculations were performed in GIS using the ESRI Streetmap 9.3 (2008). More details are provided in the text.

Table 5: Direct effects of incentives regressions

5a: Turnout: Donors presenting at a drive

	Donors presenting at a drive								
	OLS		Sponsor Fixed Effects						
	All drives						Closed drives	Open drives	Open drives in "Flyer" Counties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Incentive dummy	5.028***	5.238***	5.385***	3.123***	3.972***	3.213***	2.142***	6.108***	6.674***
	(0.372)	(0.315)	(0.319)	(0.500)	(0.563)	(0.404)	(0.504)	(0.370)	(0.440)
Incentive*Open Drive				3.209***					
				(0.630)					
Incentive*Drive in "Flyer" County					1.772***				
					(0.667)				
Incentive*Open Drive in "Flyer" County						3.467***			
						(0.598)			
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sponsor fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,707	13,529	13,529	13,529	13,529	13,529	2,999	10,530	8,340
R-squared	0.01	0.52	0.20	0.20	0.20	0.20	0.21	0.22	0.22
Number of sponsors	2,664	2,664	2,582	2,582	2,582	2,582	792	1,790	1,469
Mean of the dependent variable	37.0								

5b: Units of blood collected and donors deferred regressions

	Units of blood collected				Donors deferred (% of presenting)			
	All drives	Closed drives	Open drives	Open drives in "Flyer" Counties	All drives	Closed drives	Open drives	Open drives in "Flyer" Counties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Incentive dummy	2.828***	1.788***	5.352***	5.823***	-0.018	0.302	-0.263	-0.284
	(0.366)	(0.443)	(0.325)	(0.385)	(0.278)	(0.356)	(0.189)	(0.211)
Incentive*Open Drive in "Flyer" County	2.980***				-0.213			
	(0.530)				(0.348)			
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sponsor fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,529	2,999	10,530	8,340	13,529	2,999	10,530	8,340
R-squared	0.18	0.20	0.19	0.20	0.04	0.05	0.04	0.04
Number of sponsors	2,582	792	1,790	1,469	2,582	792	1,790	1,469
Mean of the dependent variable	31.3				15.4%			

Notes: Columns (1) and (2) of Table 5a present results of OLS regressions. The remaining columns of Table 5a and all the columns in Table 5b present results of fixed effects regressions, where the fixed effects are defined at the level of the individual sponsor. Controls include: year effects, month effects, week-of-the-month and day-of-the-week effects; dummy variables for other attributes of the drive; the length of the drive (in hours); weather conditions on the day of the drive (amount of rain in inches and its square, rain intensity [measures as rain per hour of precipitation] and its square, amount of snow fallen in the 48 hours before a drive and its square, and temperature dummy variables [0-36, 36-53, 53-68, 68-75, 75+]); dummy variables for each ARC representative as well as for zip codes are also included. Standard errors clustered at the sponsor level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Effects of incentive costs regressions

	All drives			Open drives in "flyer" Counties		
	Donors presenting	**Units collected**	**% Donors deferred**	**Donors presenting**	**Units collected**	**% Donors deferred**
	(1)	(2)	(3)	(4)	(5)	(6)
Incentive dummy	0.572	0.423	0.363	1.435	0.972	0.151
	(1.080)	(0.950)	(0.630)	(1.300)	(1.150)	(0.720)
Cost of incentive ($)	2.220***	1.986***	-0.259	2.436***	2.272***	-0.238
	(0.490)	(0.430)	(0.270)	(0.580)	(0.520)	(0.310)
Cost of incentive squared	-0.106**	-0.0947**	0.00875	-0.107**	-0.104**	0.0114
	(0.047)	(0.041)	(0.026)	(0.054)	(0.048)	(0.030)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sponsor fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,529	13,529	13,529	8,340	8,340	8,340
Number of sponsor fixed effects	2,582	2,582	2,582	1,469	1,469	1,469
R-squared	0.21	0.19	0.04	0.24	0.22	0.04

Notes: The cost to the ARC of each specific promo is shown in Table 7. All results are from fixed effects regressions, where the fixed effects are defined at the level of the individual sponsor. Controls include: year effects, month effects, week-of-the-month and day-of-the-week effects; dummy variables for other attributes of the drive; the length of the drive (in hours); weather conditions on the day of the drive (amount of rain in inches and its square, rain intensity [measured as rain per hour of precipitation] and its square, amount of snow fallen in the 48 hours before a drive and its square, and temperature dummy variables [0-36, 36-53, 53-68, 68-75, 75+]); dummy variables for each ARC representative as well as for zip codes are also included. We have also included a dummy variable for the items for which information on cost was not available. Standard errors clustered at the sponsor level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Effects of specific incentive items

	# Drives offered at	ARC cost	All Drives: Donors presenting	All Drives: Units collected	All Drives: % Donors deferred	Open Drives in "flyer" Counties: Donors presenting	Open Drives in "flyer" Counties: Units collected	Open Drives in "flyer" Counties: % Donors deferred
t-shirt	2,519	$2.95	6.460***	5.712***	-0.455**	7.822***	6.968***	-0.707***
			(0.374)	(0.327)	(0.204)	(0.474)	(0.410)	(0.251)
coupon	431	$3.64	6.018***	5.211***	0.09	7.695***	6.578***	0.369
			(0.683)	(0.618)	(0.430)	(0.833)	(0.760)	(0.536)
cedar point ticket (raffle)	258	NA	2.179**	1.687*	0.272	3.778*	2.793	0.683
			(1.038)	(0.898)	(0.732)	(2.086)	(1.780)	(1.151)
cooler	154	$1.78	2.569***	2.179***	0.207	3.962***	3.347***	0.179
			(0.945)	(0.801)	(0.901)	(1.295)	(1.080)	(1.126)
sweatshirt	125	$6.67	13.331***	12.076***	-2.082**	16.246***	14.33***	-1.133
			(1.283)	(1.171)	(0.879)	(1.395)	(1.300)	(1.001)
umbrella	122	$4.58	5.496***	4.584***	0.175	7.435***	6.268***	-0.102
			(0.997)	(0.873)	(0.728)	(1.326)	(1.140)	(0.972)
hat	88	$1.94	3.757***	3.599***	-1.554	4.394***	3.959***	-0.877
			(1.206)	(1.012)	(0.960)	(1.543)	(1.260)	(1.154)
6-pack cooler	78	$9.37	4.339***	3.604***	0.311	7.404***	6.364***	-0.101
			(1.504)	(1.336)	(0.994)	(1.672)	(1.490)	(1.092)
blanket	59	$6.33	14.359***	13.002***	-1.763	16.718***	14.90***	-0.972
			(1.772)	(1.681)	(1.169)	(1.980)	(1.900)	(1.250)
scarf	59	$2.50	9.151***	7.007***	2.193	10.834***	8.474***	2.194*
			(1.674)	(1.532)	(1.384)	(1.947)	(1.790)	(1.273)
mug	49	1.42	9.228***	7.844***	0.605	10.679***	8.684***	-0.751
			(1.607)	(1.359)	(0.987)	(2.711)	(1.980)	(1.728)
music download card	48	NA	5.140**	4.263**	0.428	7.755**	6.296**	-1.01
			(2.434)	(2.129)	(1.798)	(3.095)	(2.660)	(1.854)
jacket	44	$9.50	25.073***	21.942***	-2.111*	27.256***	23.61***	-1.278
			(2.293)	(2.005)	(1.280)	(2.846)	(2.520)	(1.475)
other material	165	N.A.	4.602***	3.359***	1.341*	5.149***	3.684***	1.732**
			(1.177)	(1.009)	(0.689)	(1.482)	(1.240)	(0.857)
sponsor promo	1,287	N.A.	2.100***	1.764***	0.216	2.229***	1.953***	-0.048
			(0.551)	(0.468)	(0.354)	(0.689)	(0.580)	(0.431)
Controls			Yes	Yes	Yes	Yes	Yes	Yes
Sponsor fixed effects			Yes	Yes	Yes	Yes	Yes	Yes
Observations			13,529	13,529	13,529	8,340	8,340	8,340
Number of sponsors			2,582	2,582	2,582	1,469	1,469	1,469
R-squared			0.22	0.20	0.04	0.26	0.24	0.04

Notes: All results are from fixed effects regressions, where the fixed effects are defined at the level of the individual sponsor. Controls include: year effects, month effects, week-of-the-month and day-of-the-week effects; dummy variables for other attributes of the drive; the length of the drive (in hours); weather conditions on the day of the drive (amount of rain in inches and its square, rain intensity [measured as rain per hour of precipitation] and its square, amount of snow fallen in the 48 hours before a drive and its square, and temperature dummy variables [0-36, 36-53, 53-68, 68-75, 75+]); dummy variables for each ARC representative as well as for zip codes are also included. Standard errors clustered at the sponsor level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Effect of previous drive and incentives at previous drive

	Donors presenting				Units collected		% Donors deferred	
		All drives		Open drives in "flyer" Counties	All drives	Open drives in "flyer" Counties	All drives	Open drives in "flyer" Counties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Incentive at current drive	0.526	0.526	0.542	1.252	0.374	0.831	0.663	0.152
	(1.200)	(1.200)	(1.200)	(1.410)	(1.050)	(1.250)	(0.670)	(0.740)
Cost of incentive ($)	2.377***	2.377***	2.371***	2.623***	2.104***	2.414***	-0.327	-0.189
	(0.550)	(0.550)	(0.550)	(0.650)	(0.480)	(0.570)	(0.290)	(0.320)
Cost of incentive squared	-0.123**	-0.123**	-0.121**	-0.122**	-0.107**	-0.117**	0.016	0.012
	(0.052)	(0.052)	(0.053)	(0.060)	(0.046)	(0.053)	(0.028)	(0.031)
Previous drive (within 56 days of current)	-1.294***	-1.294***	-1.306***	-1.530***	-1.384***	-1.611***	0.658***	0.730***
	(0.330)	(0.330)	(0.330)	(0.400)	(0.300)	(0.360)	(0.220)	(0.270)
Incentive at previous drive		-0.003	-0.380	-0.419	-0.303	-0.283	-0.107	-0.309
		(0.260)	(0.450)	(0.580)	(0.370)	(0.480)	(0.300)	(0.360)
Cost of incentive at previous drive ($)			0.148	-0.003	0.165	0.004	-0.037	-0.013
			(0.230)	(0.290)	(0.200)	(0.240)	(0.160)	(0.200)
Cost of incentive at previous drive squared			0.000	0.018	-0.007	0.010	0.013	0.017
			(0.029)	(0.035)	(0.024)	(0.029)	(0.020)	(0.023)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sponsor fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,996	10,996	10,996	6,894	10,996	6,894	10,996	6,894
Number of sponsor fixed effects	1,788	1,788	1,788	1,021	1,788	1,021	1,788	1,021
R-squared	0.22	0.22	0.22	0.25	0.20	0.23	0.04	0.05

Notes: All results are from fixed effects regressions, where the fixed effects are defined at the level of the individual sponsor. Controls include: year effects, month effects, week-of-the-month and day-of-the-week effects; dummy variables for other attributes of the drive; the length of the drive (in hours); weather conditions on the day of the drive (amount of rain in inches and its square, rain intensity [measured as rain per hour of precipitation] and its square, amount of snow fallen in the 48 hours before a drive and its square, and temperature dummy variables [0-36, 36-53, 53-68, 68-75, 75+]); dummy variables for each ARC representative as well as for zip codes are also included. We have also included a dummy variable for the items for which information on cost was not available. Standard errors clustered at the sponsor level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9a: Substitution effects on number of donors presenting

	Dependent variable: number of donors presenting at a drive; All drives							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Incentive dummy	0.527	0.750	0.537	1.235	0.858	0.054	0.750	0.285
	-1.134	-1.139	-1.140	-1.165	-1.155	-1.176	-1.145	-1.146
Cost of incentive ($)	2.287***	2.226***	2.292***	2.247***	2.223***	2.235***	2.229***	2.156***
	(0.520)	(0.521)	(0.522)	(0.520)	(0.521)	(0.521)	(0.519)	(0.519)
Cost of incentive squared	-0.112**	-0.105**	-0.111**	-0.107**	-0.105**	-0.106**	-0.106**	-0.101**
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
Number of Potential Substitute Drives Overall								
taking place within 0-2 miles	-0.201			-0.199			-0.095	-0.107
	(0.056)***			(0.057)***			(0.058)	(0.057)*
x Incentive dummy				-0.009			-0.04	-0.051
				(0.041)			(0.061)	(0.062)
taking place within 2-4 miles	-0.049			-0.036				
	(0.048)			(0.052)				
x Incentive dummy				-0.03				
				(0.041)				
taking place within 4-10 miles	0.015			0.02				
	(0.017)			(0.018)				
x Incentive dummy				-0.011				
				(0.011)				
Number of Potential Substitute Drives With Incentives								
taking place within 0-2 miles		-0.246***			-0.296***		-0.255***	-0.157**
		(0.057)			(0.070)		(0.071)	(0.074)
x Incentive dummy					0.079		0.091	-0.026
					(0.073)		(0.108)	(0.114)
taking place within 2-4 miles		-0.002			-0.004			
		(0.045)			(0.054)			
x Incentive dummy					0.005			
					(0.069)			
taking place within 4-10 miles		0.000			0.011			
		(0.016)			(0.017)			
x Incentive dummy					-0.023			
					(0.022)			
Highest cost ($) of incentive offered at potential substitute drives, at drives:								
taking place within 0-2 miles			-0.093*			-0.207***		-0.179***
			(0.051)			(0.059)		(0.060)
x Incentive dummy						0.285***		0.345***
						(0.087)		(0.093)
taking place within 2-4 miles			-0.093*			-0.084		
			(0.050)			(0.053)		
x Incentive dummy						-0.027		
						(0.092)		
taking place within 4-10 miles			-0.025			-0.015		
			(0.043)			(0.048)		
x Incentive dummy						-0.027		
						(0.078)		
Sponsor fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,254	12,254	12,254	12,254	12,254	12,254	12,254	12,254
Number of sponsors	2,469	2,469	2,469	2,469	2,469	2,469	2,469	2,469
R-squared	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21

Table 9b: Substitution effects, by type of drive

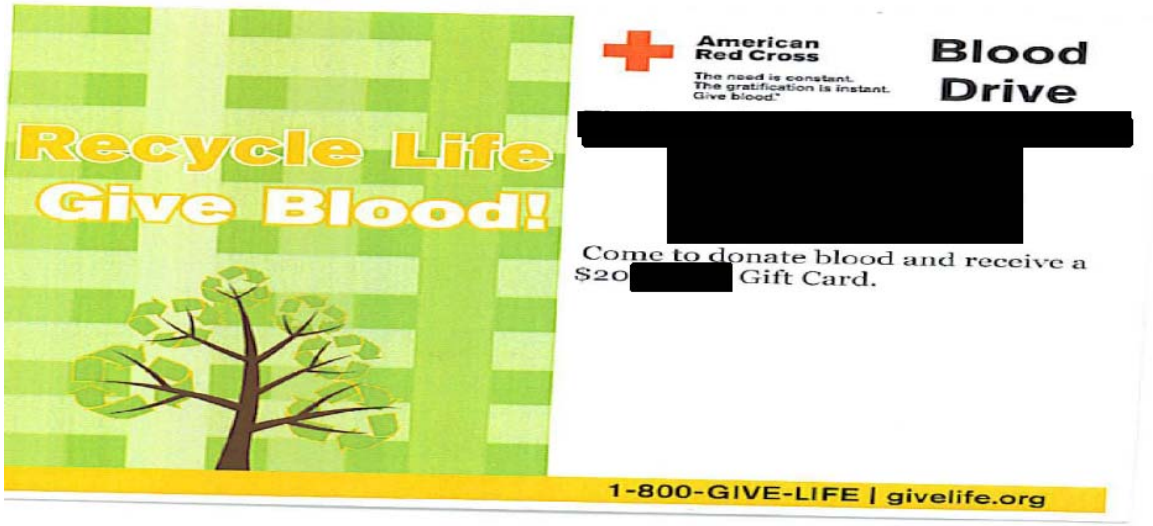
	All drives			Closed drives			Open drives			Open drives in "flyer" counties		
	Donors presenting	Units collected	% Donors deferred	Donors presenting	Units collected	% Donors deferred	Donors presenting	Units collected	% Donors deferred	Donors presenting	Units collected	% Donors deferred
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Incentive dummy	0.285	0.096	0.489	-3.17	-1.682	-1.748	1.157	0.798	0.651	0.681	0.338	-0.067
	(1.146)	(0.998)	(0.672)	(3.960)	(3.005)	(2.187)	(1.191)	(1.045)	(0.719)	(1.361)	(1.197)	(0.796)
Cost of incentive ($)	2.156***	1.909***	-0.206	2.237	1.369	1.034	2.156***	1.954***	-0.316	2.316***	2.13***	-0.091
	(0.519)	(0.453)	(0.283)	(1.815)	(1.363)	(1.013)	(0.537)	(0.472)	(0.300)	(0.606)	(0.535)	(0.319)
Cost of incentive squared	-0.101**	-0.087**	0.003	-0.195	-0.113	-0.123	-0.095*	-0.086*	0.011	-0.093*	-0.089*	-0.002
	(0.049)	(0.043)	(0.027)	(0.180)	(0.132)	(0.114)	(0.050)	(0.044)	(0.028)	(0.056)	(0.050)	(0.030)
Number of Potential Substitute Drives Overall												
taking place within 0-2 miles	-0.107*	-0.095*	0.011	0.128	0.102	-0.021	-0.156**	-0.136**	0.022	-0.260**	-0.223**	-0.043
	(0.057)	(0.051)	(0.047)	(0.111)	(0.096)	(0.112)	(0.066)	(0.060)	(0.051)	(0.110)	(0.094)	(0.054)
x Incentive dummy	-0.051	-0.021	-0.019	-0.023	0.012	-0.049	-0.051	-0.026	-0.007	0.119	0.111	0.044
	(0.062)	(0.052)	(0.055)	(0.084)	(0.065)	(0.101)	(0.073)	(0.061)	(0.061)	(0.121)	(0.099)	(0.090)
Number of Potential Substitute Drives With Incentives												
taking place within 0-2 miles	-0.157**	-0.101	-0.085	-0.037	-0.028	0.029	-0.148*	-0.087	-0.114*	-0.181*	-0.101	-0.168**
	(0.074)	(0.062)	(0.057)	(0.150)	(0.126)	(0.159)	(0.082)	(0.069)	(0.060)	(0.109)	(0.097)	(0.075)
x Incentive dummy	-0.026	-0.069	0.047	-0.255	-0.318**	0.186	-0.023	-0.056	0.017	-0.101	-0.145	0.076
	(0.114)	(0.096)	(0.107)	(0.179)	(0.150)	(0.197)	(0.128)	(0.109)	(0.118)	(0.164)	(0.140)	(0.159)
Highest $ value of incentive offered at potential substitute drives, at drives…												
taking place within 0-2 miles	-0.179***	-0.199***	0.127**	-0.063	-0.117	0.138	-0.201***	-0.215***	0.126**	-0.229***	-0.248***	0.182***
	(0.060)	(0.051)	(0.050)	(0.101)	(0.088)	(0.122)	(0.069)	(0.059)	(0.055)	(0.081)	(0.069)	(0.063)
x Incentive dummy	0.345***	0.317***	-0.067	0.464**	0.452***	-0.092	0.302***	0.275***	-0.059	0.263**	0.262**	-0.134*
	(0.093)	(0.082)	(0.065)	(0.197)	(0.168)	(0.159)	(0.102)	(0.091)	(0.070)	(0.120)	(0.105)	(0.080)
Sponsor fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,254	12,254	12,254	2,715	2,715	2,715	9,539	9,539	9,539	7,541	7,541	7,541
Number of sponsors	2,469	2,469	2,469	765	765	765	1,704	1,704	1,704	1,393	1,393	1,393
R-squared	0.21	0.20	0.04	0.23	0.22	0.05	0.24	0.22	0.05	0.25	0.23	0.05

Notes to Tables 9a and 9b: All results are from fixed effects regressions, where the fixed effects are defined at the level of the individual sponsor. The number of observations in these regressions differs from the previous tables because here we are excluding from the sample the drives that occurred in the first 56 days and those occurring in the last 30 days of the sample period. The number of potential substitute drives was computed as described in the notes to Table 8. All regressions include: year effects, month effects, week-of-the-month and day-of-the-week effects; dummy variables for other attributes of the drive; the length of the drive (in hours); weather conditions on the day of the drive (amount of rain in inches and its square, rain intensity [measured as rain per hour of precipitation] and its square, amount of snow fallen in the 48 hours before a drive and its square, and temperature dummy variables [0-36, 36-53, 53-68, 68-75, 75+]); dummy variables for each ARC representative as well as for zip codes are also included. The standard errors of the coefficients (reported in parentheses) are clustered at the sponsor level. *** p<0.01, ** p<0.05, * p<0.1

Figure 1: Examples of ARC flyer and postcards

1a: Monthly flyer with all upcoming drives in a County

1b: Postcards



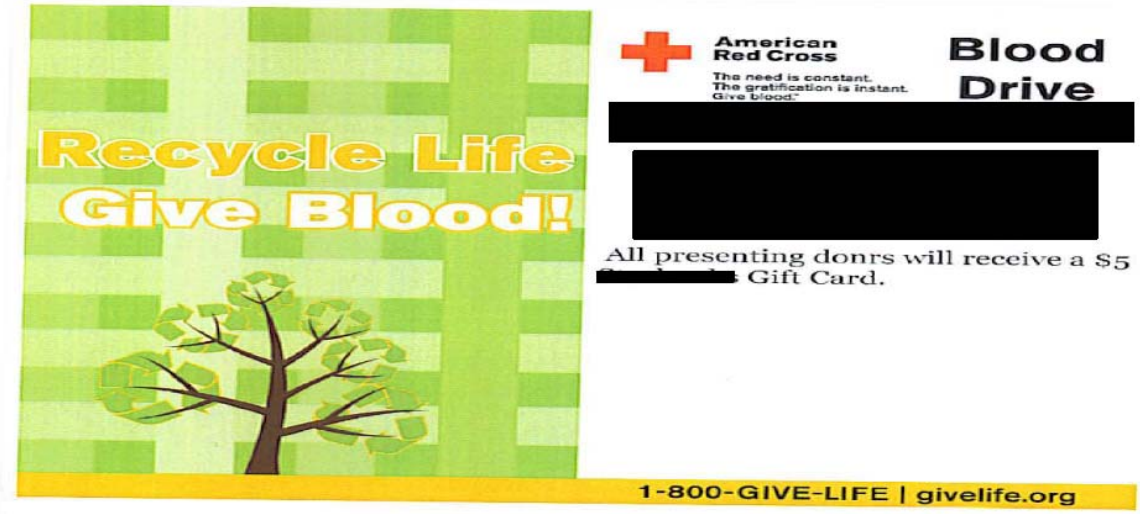
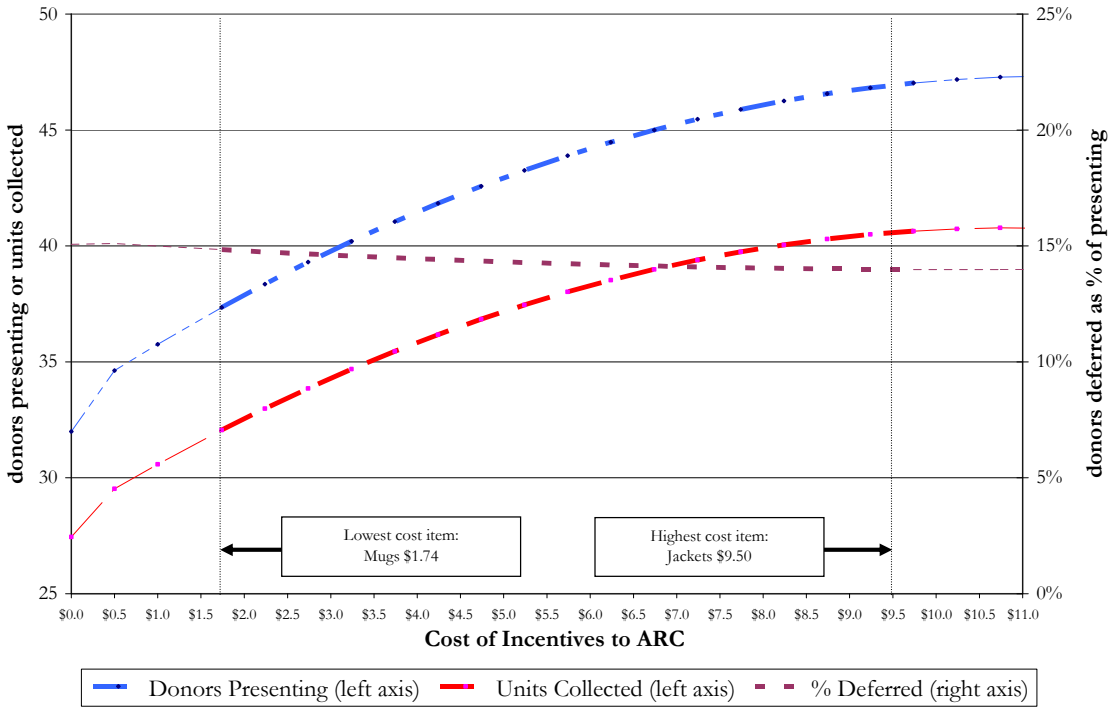


Figure 2: Estimated effects of incentive costs



Notes: Predicted values obtained using the results from Table 6, columns 4-6. The baseline is open drives of average length (5.4 hours) taking place in flyer counties on the first Wednesday of April, on days with no rain, no snow, and with temperature between 53F-68F.

Figure 3: Results from the field experiment