The Complementarities of Competition in Charitable Fundraising

Andreas Lange
University of Hamburg
Department of Economics
Von-Melle-Park 5
D-20146 Hamburg
Germany
andreas.lange@wiso.uni-hamburg.de

Andrew Stocking[†]
Congressional Budget Office
Ford House Office Building #480C
Washington, DC 20515
astocking@cbo.gov
(202) 226-2815 (phone)
(202) 226-0207 (fax)

Abstract

This paper examines the effect of competition between charities on solicitations of time and money donations. Theory and our field experiment demonstrate that solicitations from a competing charity may prove beneficial in fundraising, even at the individual level, if complementarities exist. Our field experiment was run with over 288,000 individuals and two charities. The Treatment Group were exposed to a second charity through a volunteer opportunity, after which those who volunteered were included in the regular stream of donation solicitations from that second charity (in addition to the first). We tracked over 890,000 subsequent time donations and $895,000 in contributions from the Treatment and Control groups over the next two years to measure the treatment effect. Controlling for a rich set of past behavioral observables, the Treatment Group gave more to the original charity and more overall than the Control Group, providing evidence that complementarities exist between charities.

Keywords: charitable fundraising, competition, field experiment, complementarities, matching, propensity score

[†] Corresponding author. The analysis and conclusions expressed in this paper are those of the author and should not be interpreted as those of the Congressional Budget Office.

The Complementarities of Competition in Charitable Fundraising

1. Introduction

The number of charities in the United States grew by more than 5% per year between 2006 and 2008, such that there are now over 1.5 million registered charities and foundations in the United States. By large part, those charities grow their pool of online donors by soliciting donations from the donors of other charities, typically by renting access to their donor list. For example, Amnesty International makes 300,000 donors available for rental and the National Parks Conservation Association makes 183,000 donors available for rental through their respective list brokerage companies.[1] Economic intuition suggests that a charity that exposes their donors to other charities runs the risk of losing future donations because their donors may find that other charities better align to their interests. Alternatively, if there exist complementarities in fundraising activities, such list rental could be mutual beneficial. In this paper we address the question of how charitable competition, particularly when multiple charities can solicit donations from the same individuals, affects donations of time and money.

The effect of charitable competition on giving has not been widely studied in the empirical economic literature and we are not aware of field experiments on the topic.[3] Much of the theoretical work on competition and giving assumes that multiple charities enter an individual's utility function as substitutes (Rose-Ackerman, 1992; Bilodeau and Slivinski, 1997; Aldashev and Verdier, 2010). As such, the research concludes that competition increases specialization between charities and causes donors to migrate toward their preferred specialized charity. One recent empirical paper (Reinstein 2011) evaluates competition between charitable sectors using survey data and concludes that donors may substitute between charitable sectors following a temporary shock (i.e., a natural disaster or other event that increases the funding

[1] See Carol Enters List Co (www.carolenters.com) and Names in the News (www.nincal.com) and their selection of managed lists. Discussions with fundraising professionals suggest that in a year, charities are likely to reach out to as many or more donors from other charities as they make available for rental. There are many other donor or member lists available from list brokerage companies, including the American Economic Association which rents its mailing list to charities for $90 per 1000 addresses for a one-time mailing to the general list (see: http://www.aeaweb.org/mailing_list_NP.php); higher fees are available for a more targeted subsample of the list.

[3] While inter-charity competition has not been studied extensively, charitable fundraising has been an increasing topic of economic exploration in the literature. See, eg., Lange and Stocking, 2009; List 2011; Andreoni and List, 2011.

need in particular sector). Two strains of empirical literature related to competition are the crowding out literature which finds that government grants tend to crowd out private contributions (see, for example, Andreoni and Payne 2003) and the literature on the effect of federal tax incentives on private contributions (for recent work, see CBO, 2011).

In this paper, we study the effect of competition among charities on time and money donations. We first develop a theoretical model in the tradition of Andreoni's (1990) warm-glow model that captures the main effects of multiple solicitations at the individual level. It demonstrates that complementarities in warm-glow are necessary for donations from a small individual donor to increase when they are solicited by an additional charity. We then test the theory in the field using a large-scale field experiment with over 288,000 subjects across two charities, both of which advocate on behalf of environmental issues on the national level. The treatment consists of offering a subset of each charity's audience the opportunity to volunteer for a second charity, which, if the opportunity is accepted, will result in the individual's addition to the second charity's regular solicitations. Over 15,000 individuals accepted the offer to be contacted by both charities. Those who did not accept and those who were not offered the treatment continued to receive solicitation only from one of the two charities. We followed all individuals for two years and tracked their donations of time (890,000 volunteer instances), and money ($895,000 donated) over that period.

Using a propensity score matching econometric strategy that relies on our rich set of behavioral characteristics for each donor, we find that there is evidence of complementarities between the two charities that participated in the field experiment. Both charities received more time donations from those members who were solicited by two charities instead of just the original charity and a weakly larger number and value of money donations. We also find that individuals in the Treatment Group donated more money to the combination of two charities than they gave when they were solicited by only one charity. While that result may not be of interest to either of the charities, it would be useful to any organization that is invested in the financial success of both charities: they can collectively earn more donations by sharing their lists.

Our research suggests that charities can financially benefit from partnering with other charities to jointly solicit the audience from which they request donations of time and money. Our paper makes two important contributions to the literature: first, we find evidence of the

existence of complementarities in the competition between charities, and second, we find differences between the effects of competition on solicitation attempts to generate money donations compared to time donations (or volunteering). The first result provides some confirmation that the donor list exchanges currently performed by most charities may not be detrimental to their fundraising efforts. The latter result contributes to a very small economic literature on volunteering. We therefore hope that this study provides a springboard for related research on the effect of competition within the charitable sector.

The paper proceeds as follows. Section II builds a theoretical model that illustrates the conditions under which complementarities exist. Section III describes the experimental design and Section IV describes our econometric strategy for identifying the effect of the treatment on the Treatment Group. Section V discusses the results and section VI concludes.

2 Theory

We provide a simple model to illustrate the individual's decision when being solicited by one or two charities. For this, we augment Andreoni's (1989, 1990) impure altruism model. We model an agent who receives utility from consuming a numeraire good, y^i, two public goods provided at levels G_t ($t = 1,2$), and (possibly) from her own contributions to the public good $b_t^i \geq 0$. The agent faces a budget constraint $y^i + b_1^i + b_2^i \leq w^i$. We assume that the agent takes the contributions from all other agents as given and that the two charities convert contributions into provision of a public good at unit costs c_t ($t = 1,2$). Thus, an individual's contribution leads to an increase in the provision of the public good by $g_t^i = b_t^i / c_t$. When taking the contributions from other players as given, we can write the utility of the agent as:

$$U^i(b_1^i, b_2^i) = u^i(w^i - b_1^i - b_2^i) + h_1^i G_1 + h_2^i G_2 + f^i(b_1^i, b_2^i) \tag{1}$$

where $u^i(\bullet)$ reflects the utility from consuming the numeraire, h_t^i the marginal utility from the public good, and $f^i(b_1^i, b_2^i)$ captures feelings of warm glow of having contributed to the provision of the public goods. We assume $u^i(\bullet)$ and $f^i(\bullet)$ are non-decreasing and concave. We also assume that for small dollar donors, as are considered here, the provision of the public good

is additive in individual donations only to the charity in question, and thus, $G_t = \sum_I g_t^i$.[4] Finally, we assume that agents may only donate if solicited by the charity.

We now consider the situation where the agent is solicited by (i) only one or (ii) both charities. If the agent is only contacted by charity t, donations are given by the first-order condition with respect to the soliciting charity:

$$\begin{aligned} -u^i{}_y(w^i - b_1^i) + h_1^i / c_1 + f^i{}_1(b_1^i, 0) \le 0 \\ -u^i{}_y(w^i - b_2^i) + h_2^i / c_2 + f^i{}_2(0, b_2^i) \le 0 \end{aligned} \tag{2}$$

with equality if $b_t^i > 0$. Here, $u_y^i(\bullet)$ and $f_t^i(\bullet)$ denote the partial derivatives. We denote the solution by $\hat{b}_t^{i,1}$ (reflecting that solicitation occurs from one charity only). If the agent is solicited by both charities, the first-order conditions are given by:

$$\begin{aligned} -u^i{}_y(w^i - b_1^i - b_2^i) + h_1^i / c_1 + f^i{}_1(b_1^i, b_2^i) \le 0 \\ -u^i{}_y(w^i - b_1^i - b_2^i) + h_2^i / c_2 + f^i{}_2(b_1^i, b_2^i) \le 0 \end{aligned} \tag{3}$$

with equality if $b_1^i > 0$ and $b_2^i > 0$ We denote the solution by $(\hat{b}_1^{i,2}, \hat{b}_2^{i,2})$.

Conditions (2) and (3) allow us to categorize the individual's decisions according to if she contributes to a single or to both charities. For this, we consider $\hat{b}_t^{i,1}$ as a function of h_t^i and define threshold values $\overline{h}_2^i(h_1^i)$ and $\overline{h}_1^i(h_2^i)$ as follows:

$$\begin{aligned} \overline{h}_2^i(h_1^i) / c_2 + f^i{}_2(b_1^{i,1}(h_1^i), 0) = h_1^i / c_1 + f^i{}_1(b_1^{i,1}(h_1^i), 0) \\ h_2^i / c_2 + f^i{}_2(0, b_2^{i,1}(h_2^i)) = \overline{h}_1^i(h_2^i) / c_1 + f^i{}_1(0, b_2^{i,1}(h_2^i)) \end{aligned} \tag{4}$$

Here $\overline{h}_2^i(h_1^i)$ denotes the threshold of the marginal valuation of public good 2 above which a consumer will not exclusively donate to public good 1 if solicited by both charities. Thus, the agents will definitely donate to good 2 ($\hat{b}_2^{i,2} > 0$) when solicited by both charities if their marginal value of public good 2 is greater than $\overline{h}_2^i(h_1^i)$. Similarly, $\overline{h}_1^i(h_2^i)$ is the threshold marginal valuation of public good 1 above which the agent will not exclusively donate to public good 2. Note that the threshold values as defined in (4) must exist, though they could be

[4] One could imagine a case where a large donations to charity 2 was complementary to charity 1, such as might occur if charity 2 advocated for land conservation and charity 1 advocated for wildlife protection on that land. This paper is focused on small donors (i.e., contributions less than $1000 and primarily less than $100) and thus we do not consider such public good complementarities across similar charities.

negative. Further note that $\overline{h}_s^i(h_t^i)$ is increasing in c_s and decreasing in $f_s^i(\bullet)$. These threshold values allow us to describe the donation decisions of agents as a function of h_1^i and h_2^i.

When solicited by both charities instead of only by charity t, the agent would not change their contributions, i.e. $\hat{b}_t^{i,2} = \hat{b}_t^{i,1}$ and $\hat{b}_s^{i,2} = 0$ ($s \neq t$), if and only if:

(5) $$h_s^i \leq \overline{h}_s^i(h_t^i)$$

Note that this model allows three reasons a donor may not give to charity s: 1) the public good provision is small (h_s^i small); 2) the donation triggers low warm glow ($f_s^i(\bullet)$ small); or 3) the charity is inefficient in providing the public good (c_s large).

Alternatively, the agent may completely switch their donations to the new charity s such that $\hat{b}_t^{i,2} = 0$ and $\hat{b}_s^{i,2} > 0$ ($s \neq t$). This is the case, if and only if:

(6) $$h_s^i > \overline{h}_s^i(h_t^i) \ \textit{and} \ h_t^i \leq \overline{h}_t^i(h_s^i)$$

Finally, agents may decide to give to *both* charities ($\hat{b}_1^{i,2} > 0$ and $\hat{b}_2^{i,2} > 0$) which happens if and only if:

(7) $$h_s^i > \overline{h}_s^i(h_t^i) \ \textit{and} \ h_t^i > \overline{h}_t^i(h_s^i)$$

Figure 1 illustrates these three possibilities: in region A2 to the left of $\overline{h}_1^i(h_2)$, donors will only give to charity 2, in region A1 below $\overline{h}_2^i(h_1)$ they will only give to charity 1; and in the shaded region B, they give to both charities. This illustration is useful for understanding the circumstances under which a charity may gain from exchanging its donor list with another charity. Consider a donor who was previously only contacted by charity 1. If the donor is in region A1, being additionally contacted by charity 2 will not change his contribution decisions.[5] If the donor is in region A2, she will stop giving to charity 1 and instead give to charity 2. That loss of a donor by charity 1 could be offset by gains from newly contacted donors who previously gave to charity 2 but are in region A1. We call this effect *sorting*. In the empirical analysis, we will investigate to what extent donors sort to their preferred charity.

[5] While we model the individual as having perfect knowledge about the charities and how donations translate into public good provision, one can easily perceive an additional channel through which solicitation by an additional charity may change donations to the initial charity: (i) it may elevate the individual's awareness of the public good or the importance of philanthropy. (ii) it may also give the donor new information on the relative importance of the cause served by the initial charity and/or its quality. In fact, consistent with such an information channel, we observes agents that did not originally give to Charity 1, but started to after receiving info from the second charity.

We are, however, particularly interested in the changes of giving among those who maintain their connection with the initial charity. We therefore now consider giving in region B of Figure 1, where agents give to both charities. Here, a charity may potentially *gain* even from increased donations from its original donors when they are solicited from another charity. Differentiation of (3) shows that contributions to the initial charity t change according to:

$$\frac{\partial b_t^i}{\partial b_s^i} = -\frac{u_{yy}^i + f_{ts}^i}{u_{yy}^i + f_{tt}^i} \tag{8}$$

As the denominator is negative and $u_{yy}^i < 0$, contributions to the initial charity can only increase if f_{ts}^i is positive and larger than $-u_{yy}^i$. That is, the initial charity may benefit from a donor being contacted by another charity if and only if the warm-glow component shows sufficient complementarities between the two charities. If that is not the case, the individual's contributions to the initial charity will likely decrease as the donor splits her donations across two charities.

We obtain the following proposition:

Proposition 1

An agent's donations to a charity can only increase when being contacted by a second charity if giving is complementary in creating warm glow ($f_{ts}^i > 0$) and sufficiently large ($f_{ts}^i > -u_{yy}^i$).

A second variable of interest is the sum of contributions across both charities from the individual, which represents the benefit to the charitable sector from allowing charities to solicit each other's potential donor base. As long as agents give to both charities (region B, condition (3)), the comparative static implies $\frac{\partial b_1^i + b_2^i}{\partial b_s^i} = -\frac{f_{ts}^i - f_{tt}^i}{u_{yy}^i + f_{tt}^i}$, which is positive as long as $f_{ts}^i > f_{tt}^i$ and always positive if $f_{ts}^i \geq 0$. This leads to the following proposition:

Proposition 2

Total contributions to both charities increase if the warm glow complementarities are weakly positive ($f_{ts}^i \geq 0$).

Proposition 1 indicates that donations from a charity's initial donor base may increase when the charity allows its donor base to be contacted by another charity if donations are

complementary. The charity, however, also runs the risk that individuals may stop donating to it ($h_t^i < \overline{h}_t^i(h_s^i)$) or may contribute less ($\partial b_t^i / \partial b_s^i < 0$). Proposition 2 shows, however, that an exchange of donor lists generates benefits for the charitable sector even if complementarities do not exist and those benefits increase as the complementarities become stronger. That occurs because exposure to a second charity can only result in weakly greater marginal utility from giving. In the extreme case, donors fully sort and only give to one charity.

In our empirical investigation, we will study the changes in giving at the individual level. If we observe that individuals increase giving to the initial charity, we have evidence for complementarities. In particular, this is supported if we observe an increase in the individual's joint contribution to both charities.

3 Experimental Design

We bring data to our theory using a donor exchange that occurred between two charitable organizations in 2007. Both organizations advocate on behalf of environmental issues, primarily in the United States, but with different objectives: organization A, hereafter referred to as Election Charity or EC, primarily works to elect pro-environment candidates and organization B, hereafter referred to as Wildlife Charity or WC, primarily works to support pro-environment regulations and policy. In April 2007, the Election Charity contacted 178,353 subscribers on its email list encouraging them to volunteer for the Wildlife Charity by going to WC's website and sending a letter to Congress on an issue important to WC. Of the 178,353 who were contacted, 10,605 members of EC's list accepted the invitation to volunteer for WC and in doing so agreed to join WC's online email list. Two weeks later in May 2007, the same happened in reverse. WC promoted a volunteer letter-writing opportunity on EC's website to 90,569 subscribers of its online email list and 4,470 WC members volunteered and in doing so agreed to join EC's online email list (see Figure 2). Henceforth, the groups are denoted as follows:

- Treatment Group. The email list subscribers who were solicited by two charities following the cross promotion treatment and their agreement to join the second charity's email list;
- Control Group 1. The email list members who received the promotion to join the second charity but did not accept; and

- Control Group 2. Those who were eligible to receive the promotion but did not receive it.

With this naming convention, the treatment is the experience of being solicited by two charities instead of just one. Both Control Group 1 and Control Group 2 were subscribed to the email list of just one charity at the time of the cross promotion and for the subsequent two years of the study.

Both EC and WC determined eligibility for receipt of the cross promotion based on the set of email subscribers who were not requested to be suppressed by the charity and were not large donors.[6] Once the eligible recipients were determined, both charities selected a subset from that group to promote the other charity, based on a goal of encouraging 5,000 people to volunteer for the other charity's letter-writing campaign. EC underestimated the volunteer rate of their members and more than doubled this target number by sending 10,605 volunteers to WC. WC estimated the volunteer rate much closer to their target and delivered 4,470 volunteers.

Typical communications between both charities and their email list consist of three primary types of activities: 1) fundraising appeals which request financial contributions and are generated by the fundraising department; 2) letter-writing campaigns, surveys, and event invitations which request non-financial contributions of time and are generated by the policy department; and 3) education or other general notifications which are informational and come from the policy or communications department. Requests for volunteer time to support each charity's lobbying efforts through letter-writing campaigns represent a large majority of the communications. Those emails notify the list subscribers of some situation that the charity believes is important to their constituency and ask the subscribers to take "action." Typically "action" involves a 5-10 minute process whereby the list subscriber visits a page on the charity's website and personalizes a letter for emailing or faxing to one or more elected officials. That was the objective of both EC's and WC's cross promotional emails.

Following acceptance of the invitation to join the second charity, the new members received the three types of communications at a frequency identical to the rest of the email list. That is, they were not solicited or treated differently than the other email list members. In

[6] EC described a large money donor as anyone who donated over $5,000 to the organization over their lifetime. WC defined a large money donor as anyone who had given over $250 in a single gift. Each charity had fewer than 100 large donors.

addition, both EC and WC worked with the same consultant for fundraising and volunteering solicitation strategies, such that both charities followed similarly strategies for generating money and time donations.

The treatment effect is measured across the treatment group and two control groups using three primary dimensions important to both charities: 1) number of volunteer actions, or time-donations; 2) number of money-donations; and 3) total value of money-donations. All are measured both one year and two years after the cross promotion in addition to the year before the cross promotion. For the treatment group we record outcomes performed for both the new charity and original charity. We also record the number of unsubscribe requests, or requests not to receive further information and solicitations from a particular group, both one and two years after the cross promotion.

4 Econometric Approach

Our econometric objective is to determine the effect on time and money donations of a marginal increase in the number of charities soliciting an individual. Were it possible to randomly assign individuals to multiple charities, the treatment effect could be identified simply by a difference-in-difference strategy. However, the privacy rules of most charities prohibit them from transferring the contact information for their subscribers to a second organization without the expressed desire of the individual. Consequently, most treatment strategies – this one included – require individuals to actively select into the treatment group.

An evaluation of historical money- and time-donations for the Treatment Group and Control Group 1 for WC and EC illustrate that selection into the treatment is not randomly assigned (see Table 1 and Table 2). Those in the Treatment Group became subscribers of the original charity more recently and were more likely to make time- and money-donations. That result may not be surprising given that the treatment – receiving solicitations from a second charity – is triggered when list members agree to make a time-donation to a second charity.

Combining the Treatment Group and Control Group 1 (Total Offered) and comparing aggregate behavior with Control Group 2 also indicates that Control Group 2 is probably not a randomly omitted subset of each charity's subscriber base. Differences between Control Group 2 and the Total Offered group stem from difficulties in replicating the suppression list. Prior to the

treatment, each charity provided a list of subscribers that they wanted suppressed from the treatment – mostly those already on their email list but some subscribers from other sources. While we could replicate the small overlap between each charity's email list at the time of the treatment, we could not identify those additional subscribers that the charities requested be suppressed from the treatment – they remain in Control Group 2 even though they were suppressed from the treatment. However, historical behavior of Control Group 2 is more similar to the Treatment Group than Control Group 1, suggesting that it may contain a set of subscribers who would have selected into the treatment if given the opportunity.

Our econometric strategy to identify the effect of the treatment on donations proceeds following the example of others who have non-randomized selection into a treatment group without a perfectly randomized control: we difference the dependent variable for the treatment and control groups after conditioning the selection into the treatment on observables (Angrist 1998; Dehejia and Wahba 1999).[7] Accurate identification of the treatment effect using a selection on observables strategy requires that all variables that contributed to selection into the treatment are included in the econometrics and any omitted variables are orthogonal to the treatment. To ease the difficulty of satisfying that objective, we construct a differenced dependent variable which precludes the need for time-invariant independent variables such as gender, education, occupation, and geographic location to which we lack access. Specifically, we are interested in estimating how the number of time-donations and number and value of money-donations (denoted generically as D_i) change in the period after the treatment.[8] Because no single solicitation event can be used to measure the effect of the treatment, $D_{i,t}$ is measured as the count of time- and money-donations and the sum of money-donations over the course of year

[7] As a robustness check, we also used an instrumental variable approach to proxy for selection into the treatment. Specifically, we selected an instrument that indicates that the subscriber is aware and reading communications from the charity at the time of the cross promotion. We use each charity's monthly email newsletter as the indicator communication. For those who received the email newsletter, they can choose to click on any of the story excerpts to read the complete story. We use this act of clicking on an excerpt to indicate that the subscriber is aware and reading the charity's outreach and as such, is more likely to read and consider the invitation to join the second charity than those who do not show interest in the newsletter. The results from this IV approach are consistent with the findings below; however, the instrument was more effective in identifying smaller donors or those who only donated time and not larger money-donors. IV results are available from the authors upon request.

[8] For EC and WC, solicitations of money-donations occur between 12-15 times/year and solicitations of time-donations occur 40-60 times/year, depending on a variety of factors including political environment and geographic location.

t. For a measure of the immediate effect of the treatment, the dependent variable is the difference between $D_{i,t}$ in the year after the treatment and the year before the treatment ($\Delta_1 D_i = D_{i,t=1} - D_{i,t=0}$). For a longer run effect of the treatment, we use a dependent variable as the difference in donations in the second year after treatment relative to the year before treatment ($\Delta_2 D_i = D_{i,t=2} - D_{i,t=0}$).

Generically, selection on observables identifies the treatment effect as:

$$
\begin{aligned}
ATT_1 &= E\left\{E\left[\Delta_1 D \mid T=1, X\right] - E\left[\Delta_1 D \mid T=0, X\right]\right\} \\
ATT_2 &= E\left\{E\left[\Delta_2 D \mid T=1, X\right] - E\left[\Delta_2 D \mid T=0, X\right]\right\}
\end{aligned} \tag{9}
$$

where the identifying assumption is that X contains all of the variables determining selection into the treatment. Our dataset contains a rich collection of behavioral variables, including all of the behavioral characteristics described in Table 1 and 2. A selection on observables strategy allows us to use Control Group 1 or Control Group 2 as the relevant comparison group to the Treatment Group to the extent that both control groups have a population that resembles the treatment group, as determined by the independent variables, and the other members are an unbiased sample of the whole population.

Our first approach is to begin with ordinary least squares (OLS) which assumes a linear structure on (9) for the treatment effect and all of the independent variables.

$$
\begin{aligned}
\Delta_1 D_i &= \alpha_1 + \beta_1 T_i + X_i' \gamma_1 + \mu_{i1} \\
\Delta_2 D_i &= \alpha_2 + \beta_2 T_i + X_i' \gamma_2 + \mu_{i2}
\end{aligned} \tag{10}
$$

Here β_t is the affect of the treatment on the treated for the tth year after the treatment. A consistent estimate of the treatment effect requires that the treatment (T_i) is exogenously determined conditional on the observed independent variables (X). The set of independent variables used are the full set of quarter dummies for the registration date with the original charity (*JQtr*Year*), number of time-donations made in the year before the treatment (*ActB4T*), number of money-donation made in the year before the treatment (*DonB4T*), value of money-donations made in the year before the treatment (*ValDonB4T*), and number of time-donations made in the year before treatment interacted with the length of time between first registration and the treatment date (*ActB4T*TOFatT*).

A second approach to selection on observables that relaxes the linearity assumption by allowing for a more complex relationship between the independent variables and selection into the treatment is propensity score matching (PSM). PSM has been widely used since 1983 (Rosenbaum and Rubin, 1983) to identify treatment effects in applications to public policy (Briggeman, Towe, and Morehart, 2009; Long, Stockley, and Yemane 2009) political economy (Persson and Tabellini, 2004; and Gerber and Green 2000) and labor outcomes (Dehejia and Wahba 2002; Heckman, Ichimura, and Todd, 1997).

The first underlying assumption of PSM is the conditional independent assumption (CIA) or unconfoundedness which states that selection into the treatment is made on observables. This assumption is similar to the requirement for consistency in the OLS case: any omitted variables are orthogonal to the treatment. Under CIA, differences in the dependent variable conditional on the propensity score can be assumed to be caused by the treatment. The second assumption is that there exists overlap in the propensity scores of treated and untreated observations.[9] Thus, the average treatment effect on the treated (ATT) using the PSM model can be written as:

$$
\begin{aligned}
ATT_1 &= E\left\{E\left[\Delta_1 D \mid T=1, P(W)\right] - E\left[\Delta_1 D \mid T=0, P(W)\right]\right\} \\
ATT_2 &= E\left\{E\left[\Delta_2 D \mid T=1, P(W)\right] - E\left[\Delta_2 D \mid T=0, P(W)\right]\right\}
\end{aligned}
\tag{11}
$$

Where $P(W)$ is the propensity score defined as the probability of treatment conditional on a vector of regressors (W).[10]

Given the sensitivity of PSM to CIA, PSM practitioners advocate the use of a differenced dependent variable to reduce bias (Heckman, Ichimura, and Todd, 1997; Heckman, Ichimura, Smith and Todd, 1998). In addition, practitioners suggest the use of multiple specification tests as a check for whether CIA has been satisfied. The literature concludes that well-specified models will be robust to multiple specification tests and multiple propensity score methods (Smith and Todd, 2005a, 2005b, 2001; Caliendo and Kopeinig, 2008). Our specification for selection into the treatment (as shown in Appendix A) passes the four most-cited specification

[9] For small samples this overlap or common support assumption can be important; however, in the current analysis given the large sample sizes (ranging from 11,000 to 178,000) it did not prove to be a binding assumption.
[10] The implementation of five is discussed extensively in a series of published communications between Smith and Todd (2005b, 2005, 2001) and Dehejia (Dehejia and Wahba, 2002; Dehejia, 2005).

tests at standard confidence levels.[11] And we find consistent results when we measure the treatment effect using three different matching algorithms:

- The nearest neighbor method compares each member of the Treatment Group with the one member of Control Group 1 who has the most similar propensity score.[12]
- The radius method compares each member of the Treatment Group with everyone from Control Group 1 who has a propensity score within a specified range (+/- 0.001).
- The kernel method, developed by Heckman, Inchimura and Todd (1998) compares each Treatment Group member with a weighted average of the Control Group 1 members within a specified bandwidth with the weights falling in that bandwidth.[13]

As a final robustness check to our analysis, we complete the analysis using both Control Group 1 and Control Group 2. Given that Control Group 2 was not offered the treatment, it likely contains some subscribers with characteristics similar to those in the Treatment group. Following the literature, we devise a second propensity score specific for this comparison that passes all specification tests (Smith and Todd 2005a). And we use the three PSM methods above to compare the Treatment Group to Control Group 2, with consistent results.

5 Results and Discussion

Without doing any regressions, summary statistics for the treatment group and both control groups provide an indication that solicitation by a second group are unlikely to be harmful and may be beneficial. Tables 3 and 4 describe the performance of each charity's newly shared subscribers for the other charity (row 5) and how newly recruited members from the other

[11] The four specifications (WC-Control1, WC-Control2, EC-Control1, EC-Control2) pass all four specification tests: 1) the standardized bias was below 3% on the matched sample for all regressors except one in WC-Control1; 2) a t-test of difference in covariate means on the matched sample yields no statistically significant difference for any regressors, except one in WC-Control1; 3) a test where the pseudo-R2 is calculated on the matched sample has 0.000 explanatory power (0.001 for WC-Control1); and 4) a likelihood ratio test on the joint significance of all regressors on the matched sample is rejected for all standard confidence levels for all four specifications.

[12] To avoid comparisons between treatment and control subscribers with drastically different propensity scores, no comparison was done if there was not a propensity score from the Control Group within 0.001 of the treatment group member's propensity score. This excluded 200 (1.7%) observations.

[13] Following Smith and Todd (2005a), Briggeman, Towe, and Morehart (2009), and Frolich (2004) we use the Epanechnikov kernel with the bandwidth (0.01) that produce the most consistent estimate of the ATT at the expense of efficiency.

charity perform (row 6). Each row is divided into three sub-rows that describe the group activity in the year before the treatment, the year after the treatment (0-12 months after treatment) and two years after treatment (13-24 months after treatment).[14] Comparing the summary statistics in Table 3 and 4 shows that the Treatment Group performed better than Control Group 1 or Control Group 2 in terms of donations in the first and second year after the treatment (e.g., average money donations for WC fell by 9.3 percent and 7.7 percent in the first year after treatment for Control Group 1 and Control Group 2, respectively; whereas they rose by 28.1 percent in the first year for the Treatment Group).

5.1 Charity Treatment Effect

Each charity appears to fare weakly better with respect to their subscribers who accepted the invitation to join the second charity, suggesting that complementarities exist with respect to charitable solicitation at least for the two similarly themed charities examined here (compare with Proposition 1). This result is shown in Tables 5 and 6 based on the various econometric strategies discussed above. The tables compare the Treatment Group with the two control groups across three dimensions: 1) number of actions taken 1 and 2 years after the treatment; 2) number of money donations made 1 and 2 years after the treatment; and 3) value of money donations made 1 and 2 years after the treatment.

Table 5 shows evidence of complementarities: those that were solicited by an additional charity make statistically more time donations to their original group than those who were only solicited by one charity. That result is stronger for WC which received 3 to 5 more time donations per subscriber in the year subsequent to the treatment compared to EC which received between 1.3 and 1.5 more time donations. The two charities also received a weakly higher number of money donations from their subscribers who were also solicited by the other charity, though the statistical significance varies across econometric methods. The OLS and at least one of the PSM algorithms show significant results of 11 to 20 more money donations per 1000 subscribers in the year after the treatment for both groups from those in the Treatment Group. Results for the value of the money donations are more mixed. EC saw lower total money

[14] Due to the different treatment dates for the two groups, the description of one year after the promotion for WC does not cover exactly the same date range as one year after the promotion for EC, thus row 5 from Table 3 does not exactly equal row 6 from Table 4 even though they describe the same people and their activity for the same charity.

donations from the Treatment Group, though the results were not significant; whereas, WC saw higher total money donations, though in all but one case the results were not significant.

The complementarities evident in the first year carry through to the second year, though appear to be somewhat muted across all three dimensions. The number of time-donations, while remaining statistically significant, falls for EC to 0.5 additional time donations per year per person for the Treatment Group and falls for WC to 2 per year per person. EC observes statistically more money donations (13 to 20 per 1000 subscribers in the second year after the treatment) but the total value of money donations is insignificantly different from the untreated group. WC sees no statistical difference between number and value of money donations two years after the treatment. Those results for EC and WC suggest that the complementarity effect of the treatment has some enduring effects but becomes muted over time.

The same analysis using Control Group 2 (Table 6) shows similar results for both charities with respect to the number of time and money donations. However, relative to Control Group 2, the Treatment group makes a statistically greater value of money-donations for WC in the year after the treatment and with respect to EC, two years after the treatment. Those results reinforce the possibility that complementarities are present in charitable solicitation.

We can summarize these results as follows:

Result 1

Time donations and, to a lesser extent, the number of money donations from initial donors increase if they are contacted by the second charity, demonstrating complementarities in giving when solicited by two charities.

5.2 Sector Treatment Effect

Next we consider how the charitable community fared following the treatment, i.e., by how much did donations increase overall for those in the Treatment Group who were solicited by two charities instead of one. Following Proposition 2, an increase in total giving necessarily occurs when complementarities exist. Given that the initial charity observed weakly larger donations of time and money, one would expect that if those in the Treatment Group donated at all to the second charity, their total donations would increase.

Tables 7 and 8 provide strong evidence that individuals in the Treatment Group increased the number of total time and money donations and the value of total money donations when they were solicited by both charities. Those in the Treatment Group made between 7 and 9 more time-donations per year and were 5 to 7 percent more likely to make a money donations in the year after the treatment. With respect to value of money donations, those in the Treatment Group who were originally from WC gave in total $2.70 to $5.08 more (statistically significant) in the year subsequent to the treatment. Those originally in EC gave between $0 and $2.71 more in the year after the treatment, though most of the statistical significance comes from Table 8 in comparing the Treatment Group to Control Group 2.

Two years after the treatment, individuals maintained their elevated money-donation frequency and amount, but decreased their number of time donations. Those in the Treatment Group who were originally from WC made statistically more time donations than the control group but fewer than they made in the first year after the treatment. However, money donations remained elevated for those in the Treatment Group for both charities: the Treatment Group was 5 to 7 percent more likely to make a money donation and when they donated, gave more. Those effects are consistent when the Treatment Group is compared to either Control Group 1 or Control Group 2.

We summarize our findings in the following result:

Result 2

Donors increase their total time donations and money donations when they are contacted by two charities instead of a single charity. The extent of this increase differs depending on which charity the agents were initially solicited from.

5.3 Evidence of Sorting and Heterogeneous Donor Quality

Independent of the presence of complementarities, one potential cost to each charity that participated in the exchange is that their subscribers who were exposed to a new charity may decide to switch affiliations as was described in the theory section for those subscribers originally in regions A1 or A2 of Figure 1. Such switching could occur when an individual just stops reading or responding to the communications from one charity, but that is difficult to

observe or know. Alternatively, switching can be observed in the data when individuals choose to unsubscribe from communications from one charity. Due to privacy laws, an unsubscribe request mandates that the charity not contact the subscriber again for any purpose unless the individual actively requests to be contacted again. Four types of unsubscribe requests can be used to tell the migration story: the two requests from subscribers in the Treatment Group to their original charity and the two requests from subscribers in the Treatment Group to their new charity.

Table 9 shows that EC was less proficient in retaining both their new subscribers and their original subscribers compared to WC and thus, there is evidence of a migration from EC to WC through the treatment. Because the selection into the new group is not something controllable by each group, it is appropriate for each group to consider the new members as exogenously assigned to the group. Consequently, we evaluated the unsubscribe rate using a probit regression on the Treatment variable. In the analysis comparing the unsubscribe rate of the Treatment Group to the sum of Control Group 1 and 2, EC observed a 7.0 percentage point higher unsubscribe rate for new members received from WC and a 3.3 percentage point higher unsubscribe rate for members shared with WC as a result of the treatment. Conversely, WC observed only a 1 percentage point higher unsubscribe rate for new members received from EC, but a 1.5 percentage point lower unsubscribe rate for existing members shared with EC. Thus, had each group received an equal number of subscribers in the exchange, WC would have retained a larger number of their original subscribers and new subscribers relative to EC.

Result 3

A subset of donors sorts from one charity to the other by unsubscribing. Differences in the success of retaining donors indicate quality differences between the charities.

To illustrate these quality differences we again refer to Figure 1. If one charity, say charity 1, has a higher quality (e.g., more efficient in providing a public good, providing a superior good, etc.), region A1 would be relatively large compared to region A2. Depending on the initial distribution of donor types, this would lead to a stronger movement of donors from charity 2 to 1 than in the opposite direction.

One way to evaluate the quality of the new subscribers is to consider each charity's success at generating time or money donations from the new subscribers relative to the rest of their list. Table 10 compares the Treatment Group with each charity's original members. In the year after the treatment, those in the Treatment Group were more likely to make time or money donations than others subscribers. The incremental quality of the new members joining EC appears to be higher than those joining WC, as evidenced by a larger number and value of money donations made to EC than WC. Specifically, those members who were new to EC were 3 percent more likely to donate and gave $1.21 per person per year more than the Control Groups in the year after the treatment; those new to WC were 1.6 percent more likely to donate and gave a statistical indistinguishable amount relative to the Control Groups. That provides support for the suggestion that WC began with a higher quality list than EC.

That effect is increased in the second year of the treatment. WC shows some evidence of eliciting more time donations from their new members (4 more time donations per year) but did not receive larger money donations from their new members. Conversely, EC saw fewer time donations in the second year for their new members, relative to the rest of their list, but observed no decrease in the quality of the new members with respect to number and value of money donations.

6 Conclusions

Competition between charities for donations from a finite group of potential donors is a question that interests charities and their fundraisers, particularly as they consider how aggressively to allow their current donors to be solicited by other charities. We provide an analytical model to predict that donations from any individual donor to a single charity can only increase when she is additionally solicited by another charity, if complementarities in giving exist. Using a unique dataset and experiment, we find evidence for such complementarities in charitable competition; namely, that when individuals are solicited by two charities instead of just one, their contributions to each charity and their collective contribution to both charities increases. We thereby demonstrate that for the observed charities, swapping their donor lists indeed proved beneficial.

Extending those results to the charitable sector at large depends on whether the observed complementarities do generally occur. It is obvious that the mutual benefits cannot occur if one

charity dominates the other, e.g. by providing the same public good in a more efficient way. The results from this study already provide a warning for those charities who believe they would benefit by sharing their subscribers with other organizations: WC saw more quantity and value of donations from their exchanged subscribers and fewer unsubscribe requests from their new members compared to EC. Thus, this research suggests that some charities may benefit more than others from exchanges. Anecdotal evidence suggests that WC was the more effective of the two groups in terms of campaign content and achieving successes for their constituents. That could explain the superior performance of their new recruits from the exchange.

Complementarities also may be weaker if the two interacting charities are not engaged in related charitable giving sectors. This study examined two charities that advocated on environmental issues, but does not necessarily provide insight into the complementarities between charities that provide completely distinct services. Speculating about the exact psychology of how the complementarity works, one might posit that receiving communications from two charities may elevate an individual's awareness of the public good or the importance of philanthropy. Similarly, solicitations from an additional charity may also give the donor new information on the relative importance of the cause served by the initial charity and/or the efficiency of the charity in generating the public good.

In this paper, we provide first insights that competition among charities for donors may prove beneficial for the charities involved. To investigate the generality and the source of the complementarities that we identified in this paper remains a beneficial area of future research.

REFERENCES

Aldashev, Gani and Thierry Verdier. 2010. "Goodwill bazaar: NGO competition and giving to development" *Journal of Development Economics*, 91(1): 48-63.

Andreoni, James. 1989. "Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence," *Journal of Political Economy* 97: 1147-1458.

Andreoni, James. 1990. "Impure Altruism, and Donations to Public Goods: A Theory of Warm-Glow Giving," *The Economic Journal* 100: 464-477.

Andreoni, James and A. Abigail Payne . 2003. "Do Government Grants to Private Charities Crowd out Giving or Fund-Raising?" *The American Economic Review*, 93(3): 792-812

Andreoni, James and John List. 2011. "Introduction to Charitable Giving and Fundraising Special issue," *Journal of Public Economics*, 95(5-6): 333

Angrist, Joshua. 1998. "Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicants." *Econometrica* 66(2): 249-288.

Bilodeau, M. and A. Slivinski 1997. "Rival charities". *Journal of Public Economics* 66: 449-467.

Briggeman, Brian C., Charles A. Towe, and Mitchell J. Morehart. 2009. "Credit Constraints: Their Existence, Determinants, and Implications for US Farm and Nonfarm Sole Proprietorships." *American Journal Agricultural Economics.* Vol. 1(2): 275-289.

Caliendo, Marco and Sabine Kopeinig. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching." *Journal of Economic Surveys*. Vol 22(1): 31-72.

Congressional Budget Office. 2011. "Options for Changing the Tax Treatment of Charitable Giving." The Congress of the United States.

Dehejia, R.H. 2005. "Practical Propensity Scorematching: A Reply to Smith and Todd." Journal of *Econometrics* 125: 355–64.

Dehejia, Rajeev and Sadek Wahba. 1999. "Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs." *Journal of the American Statistical Association,* 94(448): 1053-1062.

Dehejia, R.H., and S. Wahba. 2002. "Propensity Score-Matching Methods for Nonexperimental Causal Studies." *Review of Economics and Statistics* 84: 151–61.

Gerber, Alan S., and Donald P. Green. 2000. "The Effects of Canvassing, Telephone Calls, and Direct Mail on Voter Turnout: A Field Experiment." *American Political Science Review*. Vol 94(3): 653-663

Heckman, James, Hidehiko Ichimura, and Petra Todd. 1997. "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme." *Review of Economic Studies.* 64: 605–54.

Heckman, James, Hidehiko Ichimura, Jeffrey Smith and Petra Todd. 1998. "Characterizing Selection Bias Using Experimental Data." *Econometrica.* 66(5): 1017-1098.

Lange, Andreas, and Andrew Stocking. 2009. "Charitable Memberships, Volunteering, and Discounts: Evidence from a Large-Scale Online Field Experiment" NBER Working Paper Series #14941.

Long, Sharon K., Karen Stockley, and Alshadye Yemane. 2009. "Another Look at the Impacts of Health Reform in Massachusetts: Evidence Using New Data and a Stronger Model." *American Economic Review*. Vol 99(2): 508-511.

List, John. 2011. "The Market for Charitable Giving." *Journal of Economic Perspectives*. 25(2): 157-180.

Persson, Torsten and Guido Tabellini. 2004. "Constitutional Rules and Fiscal Policy Outcomes." *American Economic Review*. Vol 94(1): 25-45.

Reinstein, David A. 2011. "Does One Charitable Contribution Come at the Expense of Another?," *The B.E. Journal of Economic Analysis & Policy*: Vol. 11: Iss. 1 (Advances), Article 40.

Rosenbaum, P.R., and D.B. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika.* 70: 41–55.

Rose-Ackerman, S. 1982. "Charitable giving and 'excessive' fundraising." *Quarterly Journal of Economics***,** 97: 193-212.

Rose-Ackerman, S. 1996. "Altruism, Nonprofits, and Economic Theory." *Journal of Economic Literature***,** 34(2): 701-728.

Smith, Jeffrey A. and Petra E. Todd. 2001. "Reconciling Conflicting Evidence on the Performance of Propensity-Score Matching Methods." *American Economic Review* Vol 91(2): 112-118,

Smith, Jeffrey A. and Petra E. Todd. 2005a. "Does matching overcome LaLonde's critique of nonexperimental estimators?" *Journal of Econometrics*. Vol 25: 305-353.

Smith, Jeffrey A. and Petra E. Todd. 2005b. "Rejoinder" *Journal of Econometrics*. Vol 125: 365-375.

Table 1. Behavior Comparison of Control and Treatment Groups for EC

		Control Group 1	Treatment Group	Total Offered	Control Group 2
1	Total Number	167,748	10,605	178,353	12,380
2	Average Years on File (std)	1.50 (0.779)	0.886 (0.782)	1.47 (0.793)	1.49 (0.765)
Money Donor Behavior					
3	% Previous Money Donors	1.80%	5.13%	2.00%	2.59%
4	No. of M-Donations since Reg, cond on giving	62.66 (242.56)	45.05 (54.37)	59.97 (224.39)	38.13 (30.50)
5	Average Total $ M-Donation since Reg, cond on giving	1.66 (2.20)	1.87 (2.13)	1.69 (2.19)	2.14 (2.95)
6	No. of M-Donations 1 yr before Offer	0.0218 (0.271)	0.0755 (0.487)	0.0250 (0.289)	0.0353 (0.378)
7	No. of M-Donations 1 yr before Offer, cond on 1 T-Don	1.54 (1.69)	1.68 (1.61)	1.56 (1.68)	1.88 (2.04)
8	Val. of M-Donations 1 yr before Offer	1.28 (40.61)	3.42 (30.55)	1.41 (40.09)	1.16 (11.07)
9	Val. of M-Donations 1 yr before Offer, cond on 1 T-Don	90.59 (329.11)	75.99 (123.56)	88.15 (304.61)	61.58 (52.88)
Time-Donation (Action) Behavior					
10	% Previous Time Donors	43.57%	89.84%	46.32%	58.34%
11	No. of T-Donations since Reg	1.44 (3.05)	5.55 (6.40)	1.69 (3.49)	4.31 (7.35)
12	No. of T-Donations since Reg, cond on 1 T-Don	3.72 (4.27)	6.27 (6.51)	4.08 (4.73)	8.44 (8.82)
13	No. of T-Donations 1 yr before Offer	0.838 (1.79)	3.92 (3.70)	1.02 (2.09)	2.22 (3.73)
14	No. of T-Donations 1 yr before Offer, cond on 1 T-Don	2.49 (2.32)	4.48 (3.62)	2.78 (2.64)	4.63 (4.23)

Table 2. Behavior Comparison of Control and Treatment Groups for WC

		Control Group 1	Treatment Group	Total Offered	Control Group 2
1	Total Number	86,099	4,470	90,569	7,014
2	Average Years on File	2.23 (1.43)	1.41 (1.41)	2.19 (1.44)	2.61 (1.36)
Money Donor Behavior					
3	% Previous Money Donors	4.45%	7.47%	4.60%	6.06%
4	No. of M-Donations since Reg, cond on giving	1.50 (1.00)	1.80 (1.50)	1.53 (1.05)	1.82 (1.46)
5	Average Total $ M-Donation since Reg, cond on giving	70.1 (253.2)	48.5 (56.9)	68.4 (243.4)	41.2 (28.6)
6	No. of M-Donations 1 yr before Offer	0.0262 (0.188)	0.0707 (0.352)	0.0284 (0.199)	0.0391 (0.265)
7	No. of M-Donations 1 yr before Offer, cond on 1 T-Don	1.16 (0.498)	1.39 (0.780)	1.19 (0.539)	1.31 (0.829)
8	Val. of M-Donations 1 yr before Offer	2.19 (56.11)	3.77 (42.28)	2.27 (55.51)	1.71 (15.01)
9	Val. of M-Donations 1 yr before Offer, cond on 1 T-Don	97.54 (361.51)	73.99 (173.15)	95.06 (346.58)	57.54 (66.10)
Time-Donation (Action) Behavior					
10	% Previous Time Donors	70.85%	98.10%	72.20%	85.22%
11	No. of T-Donations since Reg	6.30 (15.11)	20.46 (30.29)	6.99 (16.49)	24.82 (34.89)
12	No. of T-Donations since Reg, cond on 1 T-Don	12.39 (20.89)	21.39 (30.76)	13.33 (22.30)	36.67 (38.59)
13	No. of T-Donations 1 yr before Offer	2.09 (4.85)	9.67 (9.13)	2.46 (5.40)	7.00 (10.11)
14	No. of T-Donations 1 yr before Offer, cond on 1 T-Don	4.97 (6.45)	10.18 (9.08)	5.51 (6.96)	11.22 (10.79)

Table 3. Average Treatment Affects 1 and 2 Years after the Treatment for EC

			Number in EO Group	Avg # Time Donations	% Increase from "1 Year Before"	Avg # Money Donations	% Increase from "1 Year Before"	Avg Value Money Donation	% Increase from "1 Year Before"	% Unsub from EC
1	Total Offered	1 Year Before	178,353	1.02	--	0.0250	--	$1.41	--	--
		1 Year After		0.62	-39.2%	0.0253	1.2%	$1.14	-19.1%	10.0%
		2 Years After		0.25	-75.9%	0.0275	10.3%	$1.28	-8.9%	20.0%
2	Treatment Group	1 Year Before	10,605	3.92	--	0.0755	--	$3.42	--	--
		1 Year After		3.37	-14.1%	0.0896	18.6%	$3.02	-11.6%	12.7%
		2 Years After		1.36	-65.4%	0.0971	28.6%	$3.77	10.3%	18.4%
3	Control Group 1	1 Year Before	167,748	0.84	--	0.0218	--	$1.28	--	--
		1 Year After		0.45	-46.6%	0.0212	-2.6%	$1.02	-20.4%	9.9%
		2 Years After		0.18	-78.8%	0.0233	6.9%	$1.13	-11.8%	20.1%
4	Control Group 2	1 Year Before	12,380	2.22	--	0.0353	--	$1.16	--	--
		1 Year After		1.02	-53.8%	0.0292	-17.4%	$0.83	-28.3%	3.4%
		2 Years After		0.42	-81.0%	0.0292	-17.3%	$0.92	-20.8%	28.2%
5	EC Members On WC Site	1 Year Before	10,605	--	--	--	--	--	--	--**
		1 Year After		7.38	--	0.0456	--	$2.06	--	12.3%
		2 Years After		7.39	--	0.0469	--	$1.93	--	14.7%
6	New Members from WC site	1 Year Before	4,470	--	--	--	--	--	--	--
		1 Year After		4.57	--	0.0568	--	$2.33	--	16.4%
		2 Years After		1.76	--	0.0714	--	$2.44	--	18.8%

**Note that the unsubscribe rate here is the unsubscribe rate from WC.

Table 4. Average Treatment Affects 1 and 2 Years after the Treatment for WC

			Number in WG Group	Avg # Time Donations	% Increase from "1 Year Before"	Avg # Money Donations	% Increase from "1 Year Before"	Avg Value Money Donation	% Increase from "1 Year Before"	% Unsub from WC
1	Total Offered	1 Year Before	90,569	2.46	--	0.0284	--	$2.27	--	--
		1 Year After		2.95	19.9%	0.0297	4.9%	$2.13	-6.2%	9.4%
		2 Years After		2.49	0.9%	0.0323	13.9%	$2.27	-0.2%	14.3%
2	Treatment Group	1 Year Before	4,470	9.67	--	0.0707	--	$3.77	--	--
		1 Year After		15.78	63.1%	0.0787	11.4%	$4.84	28.1%	7.9%
		2 Years After		11.95	23.5%	0.0746	5.5%	$4.70	24.6%	13.0%
3	Control Group 1	1 Year Before	86,099	2.09	--	0.0262	--	$2.19	--	--
		1 Year After		2.29	9.5%	0.0272	4.0%	$1.99	-9.3%	9.5%
		2 Years After		1.99	-5.0%	0.0301	14.9%	$2.14	-2.5%	14.4%
4	Control Group 2	1 Year Before	7,014	7.00	--	0.0391	--	$1.71	--	--
		1 Year After		7.59	8.5%	0.0345	-11.7%	$1.58	-7.7%	8.6%
		2 Years After		8.30	18.7%	0.0345	-11.8%	$2.35	36.8%	11.7%
5	WC Members On EC Site	1 Year Before	4,470	--	--	--	--	--	--	--**
		1 Year After		4.22	--	0.0573	--	$2.34	--	16.6%
		2 Years After		1.52	--	0.0729	--	$2.50	--	18.9%
6	New Members from EC site	1 Year Before	10,605	--	--	--	--	--	--	--
		1 Year After		6.57	--	0.0461	--	$2.09	--	10.4%
		2 Years After		7.20	--	0.0452	--	$1.86	--	14.2%

**Note that the unsubscribe rate here is the unsubscribe rate from EC

.

Table 5. Donations to Original Charity Comparing Treatment Group with Control Group 1 for EC and WC;

Results are difference in annual activity summed across both charities for 1 year and 2 years after treatment compared to 1 year before treatment.

indep var = Treat (relative to Offer) (From EC only to EC & WC)	1 Year After X-Promotion			2 Year After X-Promotion		
	No. of T-Donations (Y1-Y0)	**No. of M-Donations (Y1-Y0)**	**Value M-Donations (Y1-Y0)**	**No. of T-Donations (Y2-Y0)**	**No. of M-Donations (Y2-Y0)**	**Value M-Donations (Y2-Y0)**
(1) **OLS**	1.506***	0.0208***	-0.493	0.520***	0.0206***	-0.159
(n = 178,353)	[0.0287]	[0.00594]	[0.901]	[0.0167]	[0.00634]	[0.796]
(2) **Matching - Nearest Neighbor**	1.303***	0.0113	-1.867	0.465***	0.0160*	-0.888
(n = 178,337)	[0.0379]	[0.00937]	[1.338]	[0.0263]	[0.00950]	[1.111]
(3) **Matching - Radius**	1.337***	0.0148**	-0.335	0.481***	0.0182**	0.135
(n = 178,337)	[0.0367]	[0.00730]	[0.865]	[0.0276]	[0.00819]	[0.683]
(4) **Matching - Kernel**	1.378***	0.0139*	-0.816	0.514***	0.0137*	-0.272
(n = 178,350)	[0.0420]	[0.00714]	[0.756]	[0.0333]	[0.00718]	[0.710]
indep var = Treat (relative to Offer) (From WC only to EC & WC)	**No. of T-Donations (Y1-Y0)**	**No. of M-Donations (Y1-Y0)**	**Value M-Donations (Y1-Y0)**	**No. of T-Donations (Y2-Y0)**	**No. of M-Donations (Y2-Y0)**	**Value M-Donations (Y2-Y0)**
(1) **OLS**	5.320***	0.0176***	0.780	3.703***	0.0105**	0.959
(n = 90,569)	[0.183]	[0.00527]	[0.736]	[0.176]	[0.00498]	[0.684]
(2) **Matching - Nearest Neighbor**	3.167***	0.00405	0.565	2.012***	-0.00942	0.454
(n = 90,552)	[0.248]	[0.00789]	[0.861]	[0.247]	[0.00932]	[0.922]
(3) **Matching - Radius**	3.171***	0.00899	0.916	1.951***	0.00530	0.952
(n = 90,552)	[0.211]	[0.00699]	[0.656]	[0.229]	[0.00658]	[0.662]
(4) **Matching - Kernel**	3.241***	0.0111*	1.001*	2.002***	0.00424	0.774
(n = 90,567)	[0.200]	[0.00593]	[0.579]	[0.212]	[0.00652]	[0.639]

Notes: Standard errors are robust for OLS and bootstrapped (100 iterations) for all matching estimators. Dep var is difference between 1 year after or 2 years after treatment and 1 year before treatment; Reg (1) includes a variable measuring the time since registration with the original group at the time of treatment (*TOFatT*), # actions in year before treatment (*ActB4T*), # donation in year before treatment (*DonB4T*), value of donations in year before treatment (*ValDonB4T*), # actions in year before treatment interacted with time on file at treatment (*ActB4T*TOFatT*); Propensity score probit estimation underlying reg (2)-(4) include full set of year and quarter dummy variables for registration date with the original group (*JQtr*Year*), *ActB4T*TOFatT*, *ActB4T*, *ActB4T^2*, *ActB4T^3*, *ActB4T^4*, *DonB4T*, *ValDonB4T*; Nearest Neighbor matching was done on a common support with caliper=0.001, matching the single nearest neighbor(s) (plus others with identical propensity score to that closest nearest neighbor), radius matching compares all neighbors within caliper=0.001, Kernal matching done using Epanechnikov kernal with bandwidth set at 0.01. * p<0.10; ** p<0.05; *** p<0.01.

Table 6. Robustness Check on Donations to Original Charity Comparing Treatment Group with Control Group 2 for EC and WC;

Results are difference in annual activity summed across both charities for 1 year and 2 years after treatment compared to 1 year before treatment.

indep var = Treat (relative to Control) (From EC only to EC & WC)	1 Year After X-Promotion			2 Year After X-Promotion		
	No. of T-Donations (Y1-Y0)	**No. of M-Donations (Y1-Y0)**	**Value M-Donations (Y1-Y0)**	**No. of T-Donations (Y2-Y0)**	**No. of M-Donations (Y2-Y0)**	**Value M-Donations (Y2-Y0)**
(1) **Matching - Nearest Neighbor**	1.292***	0.0143	0.643	0.389***	0.0188	1.057
(n = 22,643)	[0.0765]	[0.0132]	[0.868]	[0.0499]	[0.0162]	[0.860]
(2) **Matching - Radius**	1.331***	0.00883	0.313	0.429***	0.0196	1.065*
(n = 22,643)	[0.0672]	[0.0145]	[0.686]	[0.0621]	[0.0157]	[0.588]
(3) **Matching - Kernel**	1.302***	0.0206*	0.727	0.445***	0.0183	0.998*
(n = 22,867)	[0.0656]	[0.0120]	[0.573]	[0.0503]	[0.0138]	[0.528]
indep var = Treat (relative to Control) (From WC only to EC & WC)	**No. of T-Donations (Y1-Y0)**	**No. of M-Donations (Y1-Y0)**	**Value M-Donations (Y1-Y0)**	**No. of T-Donations (Y2-Y0)**	**No. of M-Donations (Y2-Y0)**	**Value M-Donations (Y2-Y0)**
(1) **Matching - Nearest Neighbor**	2.838***	0.0174	1.508*	2.065***	0.00412	0.895
(n = 11,284)	[0.474]	[0.0122]	[0.826]	[0.499]	[0.0173]	[2.948]
(2) **Matching - Radius**	3.217***	0.0214	2.212**	2.324***	0.0225	1.760
(n = 11,284)	[0.538]	[0.0148]	[0.979]	[0.541]	[0.0194]	[4.178]
(3) **Matching - Kernel**	3.197***	0.0289**	2.845***	2.882***	0.0157	0.942
(n = 11,475)	[0.405]	[0.0134]	[0.959]	[0.490]	[0.0163]	[2.413]

Notes: Standard errors are bootstrapped (100 iterations) for all matching estimators. Dep var is difference between 1 year after or 2 years after treatment and 1 year before treatment; Propensity score probit estimation includes a variable measuring the time since registration with the original group at the time of treatment (*TOFatT*), # actions in year before treatment (*ActB4T*), # donation in year before treatment (*DonB4T*), value of donations in year before treatment (*ValDonB4T*), # actions in year before treatment interacted with time on file at treatment (*ActB4T*TOFatT*) and *TOFatT^2*, *TOFatT^3*, *ActB4T^2*, *ActB4T^3*, *ActB4T^4*; Nearest Neighbor matching was done on a common support with caliper=0.001, matching the single nearest neighbor(s) (plus others with identical propensity score to that closest nearest neighbor), radius matching compares all neighbors within caliper=0.001, Kernal matching done using Epanechnikov kernal with bandwidth set at 0.01. * p<0.10; ** p<0.05; *** p<0.01.

Table 7. Combined Treatment Effect comparing Treatment Group with Control Group 1 for EC and WC;

Results are difference in annual activity summed across both charities for 1 year and 2 years after treatment compared to 1 year before treatment

indep var = Treat (relative to Control) (From EC only to EC & WC)	1 Year After X-Promotion			2 Year After X-Promotion		
	No. of T-Donations (Y1-Y0) (2 groups)	No. of M-Donations (Y1-Y0) (2 groups)	Value M-Donations (Y1-Y0) (2 groups)	No. of T-Donations (Y2-Y0) (2 groups)	No. of M-Donations (Y2-Y0) (2 groups)	Value M-Donations (Y2-Y0) (2 groups)
(1) **OLS**	8.355***	0.0650***	1.534	6.477***	0.0606***	1.506*
(n = 178,353)	[0.108]	[0.00687]	[0.936]	[0.105]	[0.00729]	[0.818]
(2) **Matching - Nearest Neighbor**	8.642***	0.0565***	0.181	6.920***	0.0567***	0.792
(n = 178,337)	[0.126]	[0.00987]	[1.302]	[0.124]	[0.0108]	[1.077]
(3) **Matching - Radius**	8.676***	0.0599***	1.713**	6.935***	0.0589***	1.815***
(n = 178,337)	[0.114]	[0.00879]	[0.734]	[0.115]	[0.00958]	[0.571]
(4) **Matching - Kernel**	8.755***	0.0595***	1.243	6.999***	0.0548***	1.421*
(n = 178,350)	[0.131]	[0.00821]	[0.968]	[0.118]	[0.00902]	[0.763]
indep var = Treat (relative to Control) (From WC only to EC & WC)	**No. of T-Donations (Y1-Y0) (2 groups)**	**No. of M-Donations (Y1-Y0) (2 groups)**	**Value M-Donations (Y1-Y0) (2 groups)**	**No. of T-Donations (Y2-Y0) (2 groups)**	**No. of M-Donations (Y2-Y0) (2 groups)**	**Value M-Donations (Y2-Y0) (2 groups)**
(1) **OLS**	9.380***	0.0722***	3.001***	4.915***	0.0685***	2.975**
(n = 11,484)	[0.215]	[0.00985]	[0.915]	[0.191]	[0.00963]	[0.741]
(2) **Matching - Nearest Neighbor**	7.385***	0.0588***	2.770**	3.278***	0.0494***	2.435***
(n = 11,284)	[0.244]	[0.0121]	[1.116]	[0.278]	[0.0133]	[0.928]
(3) **Matching - Radius**	7.389***	0.0638***	3.121***	3.216***	0.0641***	2.933***
(n = 11,284)	[0.215]	[0.0114]	[0.976]	[0.205]	[0.0107]	[0.780]
(4) **Matching - Kernel**	7.462***	0.0675***	3.312***	3.269***	0.0647***	2.838***
(n = 11,475)	[0.217]	[0.0107]	[0.782]	[0.208]	[0.0102]	[0.666]

Notes: Standard errors are robust for OLS and bootstrapped (100 iterations) for all matching estimators. Dep var is difference between 1 year after or 2 years after treatment and 1 year before treatment; Reg (1) includes a variable measuring the time since registration with the original group at the time of treatment (*TOFatT*), # actions in year before treatment (*ActB4T*), # donation in year before treatment (*DonB4T*), value of donations in year before treatment (*ValDonB4T*), # actions in year before treatment interacted with time on file at treatment (*ActB4T*TOFatT*); Propensity score probit estimation underlying reg (2)-(4) include full set of year and quarter dummy variables for registration date with the original group (*JQtr*Year*), *ActB4T*TOFatT*, *ActB4T*, *ActB4T^2*, *ActB4T^3*, *ActB4T^4*, *DonB4T*, *ValDonB4T*; Nearest Neighbor matching was done on a common support with caliper=0.001, matching the single nearest neighbor(s) (plus others with identical propensity score to that closest nearest neighbor), radius matching compares all neighbors within caliper=0.001, Kernal matching done using Epanechnikov kernal with bandwidth set at 0.01. * p<0.10; ** p<0.05; *** p<0.01.

Table 8. Robustness Check on Combined Treatment Effect comparing Treatment Group with Control Group 2 for EC and WC

Results are difference in annual activity summed across both charities for 1 year and 2 years after treatment compared to 1 Year before treatment.

indep var = Treat (relative to Control) (From EC only to EC & WC)	1 Year After X-Promotion			2 Year After X-Promotion		
	No. of T-Donations (Y1-Y0) (2 groups)	**No. of M-Donations (Y1-Y0) (2 groups)**	**Value M-Donations (Y1-Y0) (2 groups)**	**No. of T-Donations (Y2-Y0) (2 groups)**	**No. of M-Donations (Y2-Y0) (2 groups)**	**Value M-Donations (Y2-Y0) (2 groups)**
(1) **Matching - Nearest Neighbor (n = 22,643)**	8.533***	0.0586***	2.622***	6.785***	0.0594***	2.697***
	[0.146]	[0.0136]	[0.599]	[0.125]	[0.167]	[0.581]
(2) **Matching - Radius (n = 22,643)**	8.572***	0.0532***	2.291***	6.826***	0.0601***	2.705***
	[0.121]	[0.0144]	[0.657]	[0.119]	[0.0138]	[0.484]
(3) **Matching - Kernel (n = 22,867)**	8.627***	0.0651***	2.712***	6.900***	0.0589***	2.641***
	[0.140]	[0.0118]	[0.627]	[0.125]	[0.0156]	[0.657]
indep var = Treat (relative to Control) (From WC only to EC & WC)	**No. of T-Donations (Y1-Y0) (2 groups)**	**No. of M-Donations (Y1-Y0) (2 groups)**	**Value M-Donations (Y1-Y0) (2 groups)**	**No. of T-Donations (Y2-Y0) (2 groups)**	**No. of M-Donations (Y2-Y0) (2 groups)**	**Value M-Donations (Y2-Y0) (2 groups)**
(1) **Matching - Nearest Neighbor (n = 11,284)**	6.982***	0.0640***	3.273***	3.314***	0.0578***	2.815
	[0.547]	[0.0153]	[0.978]	[0.530]	[0.0205]	[3.458]
(2) **Matching - Radius (n = 11,284)**	7.362***	0.0680***	3.977***	3.573***	0.0762***	3.680
	[0.534]	[0.0167]	[1.205]	[0.549]	[0.0164]	[2.894]
(3) **Matching - Kernel (n = 11,475)**	7.416***	0.0845***	5.080***	4.147***	0.0758***	2.984
	[0.471]	[0.0158]	[0.970]	[0.497]	[0.0180]	[1.870]

Notes: Standard errors are bootstrapped (100 iterations) for all matching estimators. Dep var is difference between 1 year after or 2 years after treatment and 1 year before treatment; Propensity score probit estimation includes a variable measuring the time since registration with the original group at the time of treatment (*TOFatT*), # actions in year before treatment (*ActB4T*), # donation in year before treatment (*DonB4T*), value of donations in year before treatment (*ValDonB4T*), # actions in year before treatment interacted with time on file at treatment (*ActB4T*TOFatT*) and *TOFatT^2*, *TOFatT^3*, *ActB4T^2*, *ActB4T^3*, *ActB4T^4*; Nearest Neighbor matching was done on a common support with caliper=0.001, matching the single nearest neighbor(s) (plus others with identical propensity score to that closest nearest neighbor), radius matching compares all neighbors within caliper=0.001, Kernal matching done using Epanechnikov kernal with bandwidth set at 0.01. * p<0.10; ** p<0.05; *** p<0.01.

Table 9. Comparison of Unsubscribe Rate for Treatment Group One Year after Treatment

	1 Year After X-Promotion	
Group EC	**Probit, New Unsub (mfx)**	**Probit, Old Unsub (mfx)**
Treat Discription	New from WC	Existing To WC
# in Treat Group	4,470	10,605
Treat (d)	0.0698***	0.0328***
	[0.00558]	[0.00331]
Baseline Obs.	0.0956	0.0958
# Observations	184,598	190,733
Psuedo-R^2	0.00178	0.000950
Group WC	**Probit, New Unsub (mfx)**	**Probit, Old Unsub (mfx)**
Treat Discription	New from EC	Existing To EC
# in Treat Group	10,605	4,470
Treat (d)	0.00976***	-0.0145***
	[0.00311]	[0.00416]
Baseline Obs.	0.0949	0.0933
# Observations	103,718	97,583
Psuedo-R^2	0.000158	0.000184

Marginal effects; Standard errors in brackets; * p<0.10; ** p<0.05; *** p<0.01; Dep var is whether member requested no additional email contact (Unsubscribe); First row of regressions: New from other group=1, Control Group 1 + 2 = 0; Second row of regressions: Treatment Group=1; Control Group 1 + 2 = 0.

Table 10. Donation Behavior for Treatment Group members new to each charity

	1 Year After X-Promotion			2 Years After X-Promotion		
EC Group	**No. of T-Donations Year 1**	**No. of M-Donations Year 1**	**Value M-Donations Year 1**	**No. of T-Donations Year 2**	**No. of M-Donations Year 2**	**Value M-Donations Year 2**
Treat (d)	3.923***	0.0313***	1.212**	1.239***	0.0347***	0.904*
	[0.0264]	[0.00556]	[0.612]	[0.0133]	[0.00571]	[0.502]
Constant	0.647***	0.0255***	1.121***	0.233***	0.0250***	1.139***
	[0.00400]	[0.000841]	[0.0926]	[0.00202]	[0.000865]	[0.0760]
# Observations	195,203	195,203	195,203	195,203	195,203	195,203
Adj R^2	0.101	1.57e-04	1.50e-05	0.0423	1.84e-04	1.15e-05
F	22007.4	31.69	3.926	8614.0	36.97	3.239
WC Group	**No. of T-Donations Year 1**	**No. of M-Donations Year 1**	**Value M-Donations Year 1**	**No. of T-Donations Year 2**	**No. of M-Donations Year 2**	**Value M-Donations Year 2**
Treat (d)	3.277***	0.0160***	0.00171	4.029***	0.0111***	-0.395
	[0.0885]	[0.00225]	[0.485]	[0.0731]	[0.00226]	[0.420]
Constant	3.288***	0.0301***	2.091***	2.425***	0.0294***	2.061***
	[0.0277]	[0.000704]	[0.152]	[0.0229]	[0.000709]	[0.132]
# Observations	108,188	108,188	108,188	108,188	108,188	108,188
Adj R^2	0.0125	4.60e-04	-9.24e-06	0.0273	2.14e-04	-1.07e-06
F	1369.9	50.82	1.23e-05	3036.1	24.16	8.85e-01

Standard errors in brackets; * p<0.10; ** p<0.05; *** p<0.01; Dep var is activity for new members from other charity 1 year after treatment and 2 years after treatment compared to Treatment Group, Control Group 1, and Control Group 2

Figure 1. Illustration of sorting of donor types

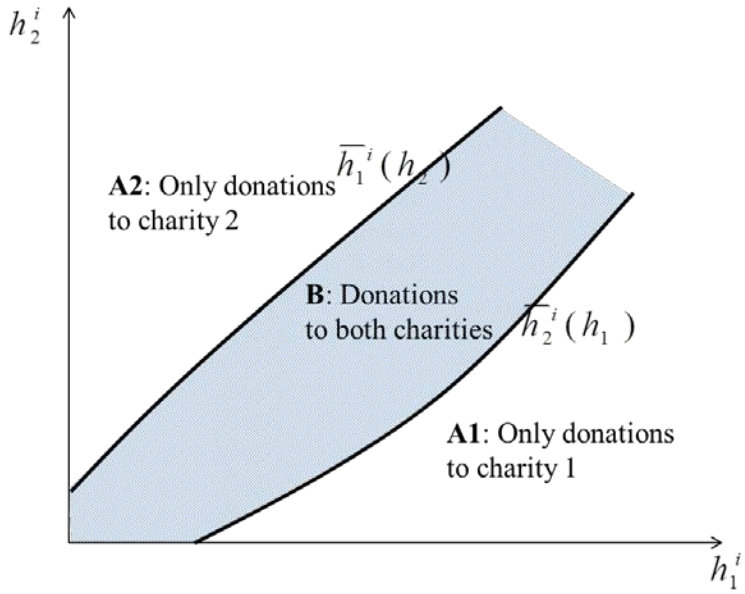
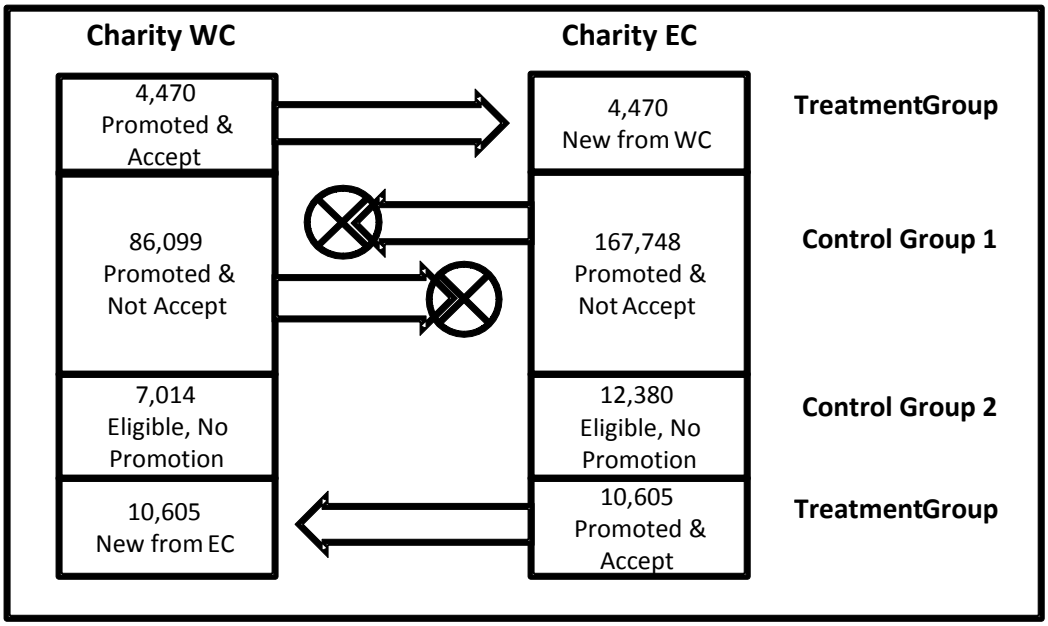


Figure 2. Experimental Setup



Appendix A – First stage of matching estimation for Tables 5 - 8

indep Var	(1) Table 5 & 7 WC only to EC & WC Treat = 1 Control Group 1 = 0	(2) Table 6 & 8 WC only to EC & WC Treat = 1 Control Group 2 = 0	(3) Table 5 & 7 EC only to EC & WC Treat = 1 Control Group 1 = 0	(4) Table 6 & 8 EC only to EC & WC Treat = 1 Control Group 2 = 0
# Actions before Treat (ActB4T)	0.302*** [0.00755]	0.239*** [0.0103]	0.378*** [9.241e-04]	0.347*** [9.486e-03]
ActB4T * TOFatT	4.059e-09 [1.083e-07]	-1.435e-07 [1.240e-06]	-4.447e-06*** [5.258e-07]	-5.078e-05*** [5.224e-06]
# Donations before Treat (DonB4T)	5.520e-03*** [1.495e-03]	5.452e-02** [2.283e-02]	1.004e-03 [7.225e-04]	-1.736e-02 [1.280e-02]
Value of Donations before Treat (ValDonB4T)	-1.590e-05 [1.255e-05]	3.839e-04 [3.938e-04]	-4.848e-06 [6.783e-06]	1.889e-03*** [3.976e-04]
ActB4T^2	-7.996e-04*** [3.871e-05]	-5.435e-03*** [3.703e-04]	-4.898e-03*** [2.516e-04]	-5.518e-02*** [2.701e-03]
ActB4T^3	1.928e-05*** [1.341e-06]	1.230e-04*** [1.162e-05]	3.487e-04*** [2.694e-05]	3.897e-03*** [2.787e-04]
ActB4T^4	-1.464e-07*** [1.441e-08]	-8.895e-07*** [1.100e-07]	-8.920e-06*** [8.858e-07]	-9.634e-05*** [8.902e-06]
Time On File at Treat (TOFatT)	--	-1.215e-03*** [1.026e-04]	--	-5.221e-03*** [1.784e-04]
TOFatT^2	--	6.169e-07*** [1.531e-07]	--	1.220e-05*** [5.634e-07]
TOFatT^3	--	-7.721e-11 [5.971e-11]	--	-8.755e-09*** [4.763e-10]
Join Qtr x Year Dummy	Included	--	Included	--
N	90,569	11,484	178,353	22,985
P-bar	0.0182	0.36	0.0232	0.442
Pseudo R2	0.2719	0.2407	0.2721	0.2499

Note: Marginal effects from a probit with robust standard errors in brackets; * p<0.10; ** p<0.05; *** p<0.01