DEMAND FOR GIVING TO MULTIPLE CHARITIES: AN EXPERIMENTAL STUDY

Emel Filiz-Ozbay
University of Maryland

Neslihan Uler
University of Maryland

Abstract
We study how competition among charities affects individuals' giving behavior. We characterize situations where charities benefitting substitute or complementary causes incentivize donations by offering subsidies in the form of rebates. Our theory predicts that an increase in the rebate rate offered by a given charity relative to a substitute charity will shift donations away from the substitute charity, but this "stealing" effect is not expected when complementary charities are considered. Our model further characterizes the conditions under which total donations increase with rebates. We test the model in an experimental setting, and demonstrate that the experimental results support our theoretical predictions. We derive the demand for giving as rebates vary for both substitute and complementary causes. The social net benefit of rebates is calculated by comparing campaign costs with new donations generated. (JEL: C90, D62, H41)

1. Introduction

In the sizable industry of philanthropy, multiple nonprofit organizations operate at the same time and compete constantly. Given that the size of the charitable market is generally stable at around 2% of GDP in the United States, there have been worries both in the media and in academic research that competition between charities might simply be shifting donations between organizations (as opposed to increasing total donations),

---

and might even be socially wasteful.[1] In this paper, we focus on the demand side of this industry and question whether competition among charities triggers new donations or shifts donations from one charity to another without increasing the charitable pie. We further analyze net benefits of campaigns while controlling for their costs.

The first part of our paper provides a theoretical model that studies individuals' giving behavior when they donate to multiple charities. We assume charities offer subsidies in the form of rebates for charitable donations and the rebates are paid by third parties in the form of cash/gifts, or by the government through tax subsidies.[2] The theory predicts that competition using rebates leads to a shift of donations across charities (i.e., one charity "steals" donations from the other charity) when charities have substitute causes, but such stealing effects are not expected among charities with complementary causes. We further characterize when the charitable pie can be increased and how that increase compares with the campaign cost (which has important implications for social welfare).

The second part of our paper tests the model's predictions by using four laboratory experiments with donations to real charities.[3] In our first (second) experiment, each subject contributes toward two individualized public goods with substitute (complementary) causes and determines the level of charitable giving singlehandedly. Without strategic incentives, our design affords a clean environment to provide a strong test of theory. By systematically changing the rebates provided for donations to one public good relative to the other, we elicit the demand for giving to multiple charities. Our third experiment serves as a control experiment to our second experiment, wherein complementarities between charities were weakened. Next, we acknowledge that most causes reach out to many people to collect donations. This creates strategic concerns and free-riding incentives, so we also conduct a fourth experiment to check for robustness by randomly pairing two subjects who simultaneously contribute to the same two charities with substitute causes.

We have five main contributions to the literature. First, we provide a simple theoretical model that analyzes how donors respond to competing charities that use different rebate strategies. Second, we provide support to our theoretical predictions via a controlled laboratory experiment with actual charitable donations (constituting the first systematic analysis of individual demand to give in an environment with multiple charities). Unlike previous papers, our paper focuses on identifying the demand for

---

1. For an overview of charitable giving, see surveys by List (2011) and Andreoni and Payne (2013). In addition, the concern that a sudden success of campaigns for one cause may adversely affect giving to other charities has been raised in media in regards to charitable donations after the September 11, 2001 attacks, Hurricane Katrina in 2005, and the Ice Bucket Challenge for ALS research in 2014. For example, see http://qz.com/249649/the-cold-hard-truth-about-the-ice-bucket-challenge/.

2. In many countries, including the United States, most charitable contributions are tax deductible. Therefore, giving to charities that qualify for tax deductions is cheaper compared to the charities that do not offer tax deductions.

3. Among others, see also Eckel and Grossman (1996) for a dictator game experiment where the recipient is a real charity.

giving to multiple charities at different price conditions.[4] Third, we question to what extent new donations are generated by different rebate campaigns and how the additional donation amounts compare with their campaign costs. Fourth, our paper provides evidence on both individualized public goods and standard public goods. This helps us to build a bridge between the charitable giving literature and industrial organization literature (the latter of which extensively studies "business stealing" and "demand expansion", in which firms compete through prices). Although the industrial organization literature focuses on private goods and does not deal with free-riding incentives, the charitable giving literature studies the provision of public goods where free-riding is an important concern. Finally, we estimate price elasticities of giving for each of our experiments and contrast these with the findings of the previous literature.

Our paper shows that charities have individual incentives to use rebate/match strategies in some competitive fundraising environments even when the costs of these subsidies are taken into account. However, the effect of rebates on giving is not constant and, therefore, it is important for practitioners and policymakers to understand the demand functions of individuals before they implement their fundraising strategies and adapt policies. We also show that competition among charities may come at a cost to society in terms of lost welfare.

The research on the demand side of the market with competing charities is relatively limited. To our knowledge, there are only three related papers that study fundraising strategies that vary price incentives in a multiple charity environment.[5] Krieg and Samek (2017) conduct a laboratory experiment where subjects play two public goods games simultaneously with two different groups. They find evidence of complementarities: giving for *both* public goods increases with a bonus condition for giving to one of these public goods. Reinstein (2012) conducts a laboratory experiment with real donations and finds that when a price shock leads subjects to increase their giving to the targeted charity, they are far more likely to decrease their giving to the other unshocked charities.[6] In contrast with Krieg and Samek (2017), positive cross-price elasticities between charities that serve similar goals have been identified. In a related paper based on field data, Meer (2017) finds that matching campaigns at DonorsChoose.org increases the likelihood of a project being funded as well as increasing the donations for that project. Meer does not find a significant effect of a matching campaign for one project on donations to other projects.

---

4. For example, Reinstein (2012) focuses on whether expenditure substitution occurs and how it depends on the charities compared by systematically changing the charity being "shocked". Our paper instead keeps the charity being shocked constant and focuses on studying the demand to multiple charities by identifying the demand at differing price conditions.

5. In a related paper, Lacetera et al. (2012) study substitution between neighboring blood drives and finds donations increase with economic incentives but there are large displacement effects. Donors shift their donations to drives with higher economic incentives.

6. Null (2011) also has subjects donating to real charities under different price conditions. However, the aim of that paper is not related to understanding competition across charities. In Null (2011), subjects have a constrained action space and cannot change the amount of total donations under different prices.

Competition among charities that does not create price incentives has also been studied.[7] There are a few empirical papers that study "expenditure substitution" in charitable giving and the results are mixed (Reinstein 2011; Scharf et al. 2017). Harwell et al. (2015) finds, in a lab experiment, that a video-based advertising campaign for one of the charities fully crowds out giving to the other charities without changing the total donations. Corazzini et al. (2015) use a threshold public goods set-up and show that total donations to charities might decrease as the number of charities increases. They also find that when the number of charities is fixed, and charities compete by becoming more efficient, coordination problems arise and total donations to the charitable sector decline. Lange and Stocking (2012) provide a field experiment and show that donor list exchanges between rival charities may increase charitable donations for complementary charities. Clearly, the effect of competition on giving is highly context/environment dependent and is not yet clearly understood.

The theoretical literature on charitable giving and competitive fundraising has focused mostly on the supply side; in particular, this literature mainly addresses inefficiencies in the market size, charity selection, and quality of charities (see, e.g., Rose-Ackerman 1982; Bilodeau and Slivinski 1997; Aldashev and Verdier 2010; Aldashev et al. 2014; Krasteva and Yildirim 2016).

We present our model in Section 2. Section 3 explains the experimental design, procedures and findings. A discussion of our results and conclusions follow in Section 4.

2. Model

One approach to model preferences in charitable giving using economic theory is to define charities as privately provided public goods where donors gain utility from the provision of public goods and/or the act of giving (Bergstrom, Blume, and Varian 1986; Andreoni 1989, 1990). It is well-known that modeling such a public goods game among donors introduces free-riding incentives. Since the free-riding problem is not central to our research question, we first assume away the externalities among the donors and model a single-agent charitable giving problem.[8] This scenario not only provides us with a simple benchmark but also has its own merits—it provides important insights into understanding charities that provide individualized public goods (such as charities matching each donor with a child in need, or a single microfinance project, etc.). In addition, in the single-agent case, both pure altruism and warm-glow

_____

7. Previous literature has also studied whether time and money donations are substitutes or complements and found that these are mainly substitutes (Andreoni, Gale and Scholz 1996; Lilley and Slonim 2014; Brown, Meer and Williams forthcoming). In addition, although not in the context of multiple charities, another related paper is by Cairns and Slonim (2011). They look at the substitution effects of the presence of 2nd collections on 1st collections at Catholic Masses and find a negative effect on 1st donations and a positive effect on total donations.

8. An extension of the model for a representative multidonor case follows our analysis of the single-donor case.

models (Andreoni and Miller 2002) make the same predictions, since the total public good is equivalent to the amount given by the single-agent. The results derived in what follows provide a theoretical benchmark for our experiments with substitute and complementary charities (experiments Subs, Comp, and Comp-W).

Consider an agent endowed with $w > 0$, deciding how much to donate to two charities: A and B. Her utility is a function of her consumption of a private good $x \geq 0$, her donations to charity A, $g_A \geq 0$, and her donations to charity B, $g_B \geq 0$. It is assumed that she is the only agent donating to these charitable causes.

We consider a quasilinear utility function: $u(x, g_A, g_B) = x + h(g_A, g_B)$, where the function h is defined on $\mathbb{R}^2_+$, continuously differentiable, increasing, and concave in both arguments.

Each charity employs a rebate strategy in its fundraising campaign and we denote the rebate rates of charity A and charity B by $r_A = (1 - \alpha)$ and $r_B = (1 - \beta)$, respectively. This means that an agent who donates (g_A, g_B) will consume

$$w - g_A - g_B + r_A g_A + r_B g_B = w - \alpha g_A - \beta g_B.$$

We assume that the rebate amounts are paid by third parties (as opposed to the charities themselves) and, therefore, do not affect how much money the cause receives. One may think of this assumption either as an external donor or as the government financing the rebates.[9] In our experiments, the experimenter pays the rebate amounts. In order to have meaningful rebate campaigns, we assume that α, β $\in [0, 1)$. It is important to highlight that, under an interior solution assumption, our theory also applies to matching strategies since rebate and matching strategies become mathematically equivalent, that is, a matching rate of $m = r/(1 - r)$ is equivalent to a rebate rate of r.[10]

The optimization problem of the agent is

$$\max_{g_A, g_B} \quad w - \alpha g_A - \beta g_B + h(g_A, g_B)$$

$$\text{subj. to:} \quad g_A + g_B \leq w, \ g_A \geq 0, \ g_B \geq 0$$

Note that the agent can donate at most her initial endowment.[11] The first-order conditions for the interior solution to this optimization problem are

$$\alpha = h_1(g_A, g_B) \quad \text{and} \quad \beta = h_2(g_A, g_B),$$

---

9. Examples of rebates in the field include Minnesota Public Radio (Eckel and Grossman 2008) and Lutheran Social Service (Eckel and Grossman 2017).

10. A large proportion of our data is consistent with an interior solution assumption, which will be discussed in detail in Section 3.

11. We assume that the donors cannot give more than their endowment even though the rebate amount will cover the deficit. Note that without this cap on total giving, a donor with a $10 endowment can give $6 to each charity and still have a positive amount remaining for private consumption if the rebate rates are high enough.
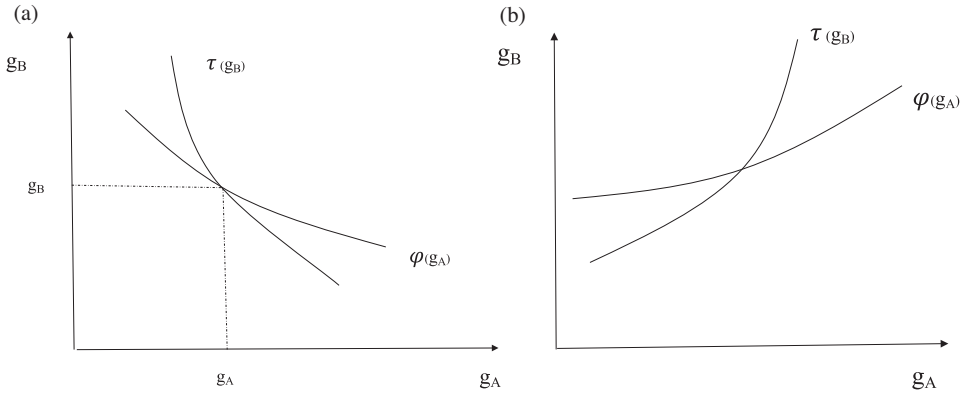
FIGURE 1. (a) Optimal donations (substitutes). (b) Optimal donations (complements).

where h_1 and h_2 are the partial derivatives with respect to the first and second variables, respectively. Define functions $\tau(g_B)$ and $\varphi(g_A)$ as implicit solutions to the first-order conditions so that $\alpha = h_1(\tau(g_B), g_B)$ and $\beta = h_2(g_A, \varphi(g_A))$.

By differentiating the previous equations, we get

$$\tau'(g_B) = -\frac{h_{12}}{h_{11}} \quad \text{and} \quad \varphi'(g_A) = -\frac{h_{12}}{h_{22}}$$

Note that the sign of these derivatives is the same as the sign of the cross-derivative of h. In particular, $\tau(g_B)$ and $\varphi(g_A)$ are decreasing (increasing) if and only if $h_{12} < 0$ ($h_{12} > 0$). Therefore, for $h_{12} < 0$ ($h_{12} > 0$) we will call charities A and B substitutes (complements). Assuming that h is strictly concave, there is a unique solution to the agent's optimization problem and this occurs at the intersection of $\tau(g_B)$ and $\varphi(g_A)$. This is illustrated in Figures 1(a) and (b) for the cases of substitute and complementary charities, respectively. Note that τ is steeper than φ. This property guarantees that contributions to each charity would increase if it becomes cheaper to contribute to that charity. A sufficient condition for this property (together with the previous assumptions we have made) is to have $|h_{XY}| < |h_{XX}|$ for $X, Y \in \{1, 2\}$, because that implies that $0 > \varphi' > -1$ for the substitutes and $1 > \varphi' > 0$ for the complementary cases.

Suppose that the initial rebate rates of charities A and B are $1 - \alpha$ and $1 - \beta$, respectively. Then, charity A increases its rebate rate to $1 - \tilde{\alpha}$, where $\alpha > \tilde{\alpha}$. Define $\tilde{\tau}(g_B)$ as the implicit solution to the new first-order condition, that is,

$$\tilde{\alpha} = h_1(\tilde{\tau}(g_B), g_B)$$

Note that for any g_B, $h_1(\tau(g_B), g_B) = \alpha > \tilde{\alpha} = h_1(\tilde{\tau}(g_B), g_B)$, and, since h_{11} is assumed to be negative, $\tau(g_B) < \tilde{\tau}(g_B)$. Therefore, increasing the rebate rate will cause a shift of the function τ. Figures 2(a) and (b) illustrate this effect.
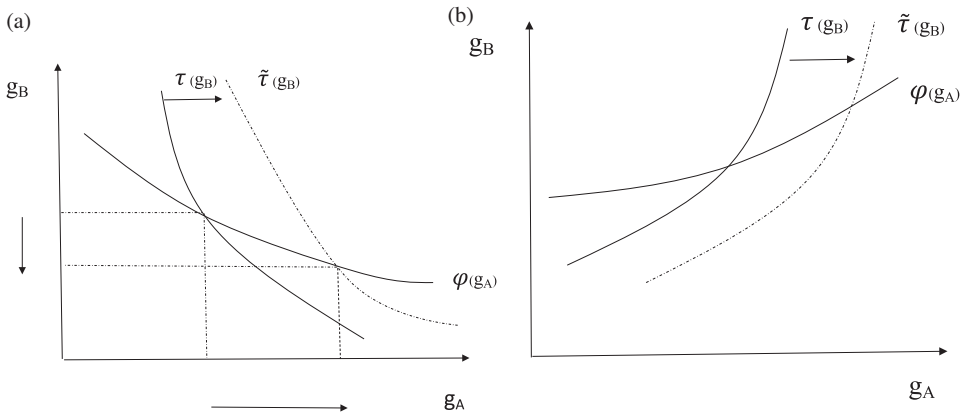
FIGURE 2. (a) Effect of a rebate rate increase by one charity (substitutes). (b) Effect of a rebate rate increase by one charity (complements).

As can be seen from Figures 2(a) and (b), increasing the rebate rate of Charity A will lead to a higher level of contribution to Charity A and a lower (higher) level of contribution to Charity B for the substitutes case (for the complements case).[12] The effect on the total contribution is clearly positive for the complements case but ambiguous for the substitutes case. The slope of function φ at the optimal donation level at the initial rebate rates determines the change in total contributions for the substitutes case. If $0 > \varphi' > -1$ in Figure 2(a), the total contributions to charities will increase, that is, a new fundraising campaign generates additional donations.

Our results show that the charities used in experiments Subs and Subs-M are in line with the substitutes assumption; and the charities used in experiments Comp and Comp-W are in line with the complements assumption. Moreover, as we will see later, our data are consistent with the effects summarized in Figures 2(a) and (b).

We acknowledge that most causes reach out to many people to collect donations, so the multidonor case is quite relevant in application. One may easily extend the previous model to a multidonor case with altruistic preferences. This extension provides a benchmark for our experiment with two agents (experiment Subs-M). The comparisons between our findings in the experiments with single and multiple agents for the substitutes case (Subs and Subs-M) will allow us to generalize our results from environments without free-riding issues to environments where donors may free-ride on each others' donations.

---

12.   Note that if the cross-derivative of h was zero, $h_{12} = 0$, and hence if $\varphi' = \tau' = 0$, we would have no change in donations to charity B if Charity A increased its rebate rate. The magnitude of the cross-derivative, therefore, might shed light on the mixed findings of the previous literature regarding substitution effects.

We now assume that there are N agents donating to Charities A and B.[13,14] In the altruism model in what follows, agents gain utility from total donations to charities. As such, the utilities of agents are modified as

$$u_i\left(x, G_A, G_B\right) = x + h\left(G_A, G_B\right)$$

where $G_X = \sum_{i=1}^{N} g_{iX}$ is the total donation to charity X and g_{iX} is the donation of agent i to charity $X \in \{A, B\}$.

The equilibrium total contributions to each charity, G_A and G_B, must satisfy the following first-order conditions for the agents who contribute positive amounts:

$$\alpha = h_1\left(G_A, G_B\right) \quad \text{and} \quad \beta = h_2\left(G_A, G_B\right)$$

We can define functions $\tau(G_B)$ and $\varphi(G_A)$ as implicit solutions to the first-order conditions. Note that these are the same functions as we previously defined for the single-agent case, but this time they are defined on total donations to the charities. One may repeat the same exercise that we performed for a single-agent case by only changing the variables from g_X to G_X. All the arguments of the previous analysis will apply here. Note that the contributing agents will donate the same *total* amounts to the charities as the total amounts donated for the single-agent case. This implies that we expect to see lower average donations per donor when we have multiple agents rather than a single-agent.[15] This result is intuitive, since free-riding incentives are now introduced in the model.

3. Experiments

We designed four experiments to test the implications of the model outlined previously for substitute and complementary causes.

3.1. Design and Procedures

Experiments with substitutable charities took place at the RCGD Robert B. Zajonc Laboratory at the University of Michigan in April and May of 2015; experiments with complementary causes took place at the Experimental Economics Laboratory at

---

13. In our experiments, $N = 2$.

14. If the utility function of an agent depends only on her private consumption and how much she gives away (as in the warm-glow theory), then the optimization problem of the agent is the same as in the previous analysis for a single-agent. Hence, we would find the exact same individual contributions as before because the warm-glow assumption alone would eliminate the strategic aspect of the game between multiple agents.

15. The same level of public goods provision prediction relies heavily on the assumption that we use the same h function for both versions of the model.

TABLE 1. Summary of the experiments.

Experiment	No. of subjects	No. of donors assigned to each recipient	Relations between causes
Subs	42	1	Substitutes
Comp	48	1	Complements
Comp-W	48	1	Weak complements
Subs-M	40	2	Substitutes

the University of Maryland in February 2017.[16] In each experiment, we followed a within-subject design with our treatment variable being the rebate rate.

In total, we had 178 participants recruited from the registered subject pools of the two universities.[17] Instructions were read aloud to the subjects to create common knowledge. The experiments were programmed and conducted with the software *z*-Tree (Fischbacher 2007).

We conducted two main experiments: (Subs) wherein substitutable causes were used as the competing charities, and (Comp) wherein complementary causes were competing for donations.[18] In addition, we conducted two control experiments: (Subs-M) wherein substitute charities competed for donations from multiple donors, and (Comp-W) wherein the complementarities between the two causes are weakened. Each subject participated in only one of the experiments. See Table 1 for a summary of the experiments.

In our single-agent experiments, subjects contributed to individualized public goods and determined the levels of charitable giving singlehandedly.[19] These experiments eliminated free-riding incentives among multiple agents and converted the game into an individual decision-making problem. One advantage of this simple environment was that it provided the best conditions for the theory to work. If the theory was not consistent with the data here, then we would not expect the theory to work for richer environments.

---

16.   Our research aims to test the implications of substitute and complementary causes independently (by studying how contributions change as our treatment variable—the charity-specific rebate rate—changes) rather than comparing those cases with each other. Nevertheless, we stress that the two universities are very similar, which would likely lead to similar subject pools: both universities are public schools with similar net annual average cost to attend ($16k), median debt for students ($20k-UMD and $22k-UMich), gender composition (46% female-UMD and 49% female-UMich), and similar undergraduate enrollments (about 28k). (The information is from https://www.goschoolwise.com/tools/compare-colleges and the Universities websites).

17.   The ORSEE recruitment system (Greiner 2004) was used at the University of Michigan.

18.   We thank the associate editor and an anonymous referee for encouraging us to test the theoretical predictions of the complementary case.

19.   In order to study determinants of giving in a single charity environment, Ottoni-Wilhelm, Vesterlund, and Xie (2017) also employ an individualized public good experiment. In their study, each subject was paired with a child who has lost his/her home in a fire.

In all experiments subjects were asked to make donation decisions to two causes under 5 different situations.[20] At the end of the experiment, one of the situations was chosen at random to determine donors' payoffs (and the actual donations). In all of the situations, the rebate rate of one cause was fixed at $r_{\text{fix}} = 0.5$, and the rebate rate for the other cause took values of $r_{\text{vary}} \in \{0.1, 0.3, 0.5, 0.7, 0.9\}$. Varying the rebate rate of the second cause in this fashion allows for the systematic study of the effect of changes in rebate strategies on the donations to each charity, as well as its effect on the total donations.[21] It was made clear to the subjects that the experimenter pays the rebates and not the charities.

All five rebate situations were presented on the same screen. Given that we are primarily interested in the changes in donations as a response to the changing rebate rates (as opposed to the absolute donation amounts), we made the changes in the rebate rates as obvious as possible to the subjects. The subjects were free to make decisions in any order and revise their decisions before submitting them.

In each of the 5 situations, subjects started with an endowment of 100 tokens and they decided how many tokens to donate to two causes. The exchange rate was $1 for every 10 tokens. Subjects were also told that they would receive rebates from the experimenters for the donations that they made. The rebates were added to the amount the subjects kept for themselves (if any).

Subjects were provided with a "calculator" as part of their decision screens. Once subjects entered their possible donation amounts for the two causes, the calculator would then provide them with a table displaying the number of tokens remaining for themselves after donating (pre-rebate), the rebate amounts from donations, and the total number of tokens after rebates. Subjects could use the calculator as many times as they liked.

Before the experiment started, each subject took a short quiz to test their understanding. All subjects had to answer the quiz accurately before the experiment could start.

A short questionnaire was implemented at the end of the experiment, and it can be found in Online Appendix B. We now explain the differences between each experiment in detail.

3.1.1. Experiment "Subs". Each subject was randomly assigned to one rescued animal in an animal rescue organization and one homeless person who is a resident

---

20. We kept the number of questions small on purpose in order to allow subjects to make decisions as carefully as possible.

21. This paper adopted rebates in lieu of matches for the following advantages they provided over matches: First, using rebates, the public goods contributions of individuals and the actual public good provided are identical. This not only simplifies the presentation but also controls for whether individuals have preferences on their own contributions versus total contributions. Second, related to our first point, when matches are used, the strategy space changes from one price condition to another. This may create unintended behavioral consequences that have nothing to do with a subjects' response to price changes.

of a homeless shelter.[22] Subjects were allowed to donate any number of tokens to the two causes from their 100 tokens. The rebate rate for the donations to homeless persons was fixed at 0.5 and the rebate rate for the donations to animals was varied. No two subjects gave to the same homeless person or animal. They were told that their donations would be delivered to their assigned homeless person and/or animal in the form of equal-value food or other supplies (such as hygiene products, clothing, etc.).

3.1.2. Experiment "Comp".   Each subject decided how much to donate to purchase tubes of toothpaste and/or toothbrushes for their assigned homeless people. Each tube of toothpaste and each toothbrush cost 5 tokens. Hence, the subjects were able to donate tokens in increments of five toward each cause using their endowment of 100 tokens. The experimenter generated as many toothpaste/toothbrush pairs as possible based on donations of each subject. Each pair was donated to a different homeless person registered to a homeless shelter. Any donations remaining after generating all the toothpaste/toothbrush pairs were neither donated nor returned to the donating subject. For example, if a subject donated 35 tokens toward tubes of toothpaste and 30 tokens toward toothbrushes, 6 toothpaste/toothbrush pairs were donated to six different homeless people. The experimenter kept the donations toward unpaired items (in this case, one tube of toothpaste). The rebate rate for the donations to toothbrushes was fixed at 0.5 and the rebate rate for donations toward tubes of toothpaste was varied.

3.1.3. Experiment "Comp-W".   This experiment was based on experiment Comp with the only difference being the level of complementarity between toothpaste and toothbrushes. In this experiment, we again generated as many toothpaste/toothbrush pairs as possible based on a subject's donations and gave each pair to a different homeless person. This time any unpaired donations toward toothpaste or toothbrushes were not kept by the experimenter. Instead, unpaired items were given to a different homeless person as a single tube of toothpaste or a single toothbrush. Since a toothbrush that was not paired with a tube of toothpaste may still have an individual use (and vice versa), a subject may want to donate unequal number of toothbrushes and tubes of toothpaste without worrying about wasting her donations. Hence, the level of complementarity between the two items was weaker in this experiment than that in experiment Comp.

3.1.4. Experiment "Subs-M".   This experiment was based on experiment Subs with only one difference. In Subs-M, each subject was anonymously matched with another subject to form a pair. Each pair was randomly assigned to one rescued animal and one homeless person. Each member of the pair simultaneously and anonymously decided how many tokens to donate to his/her group's assigned animal and homeless person,

---

22.   In all four experiments, subjects were told that the charities were local, however, the name of the charities was not revealed to the subjects.

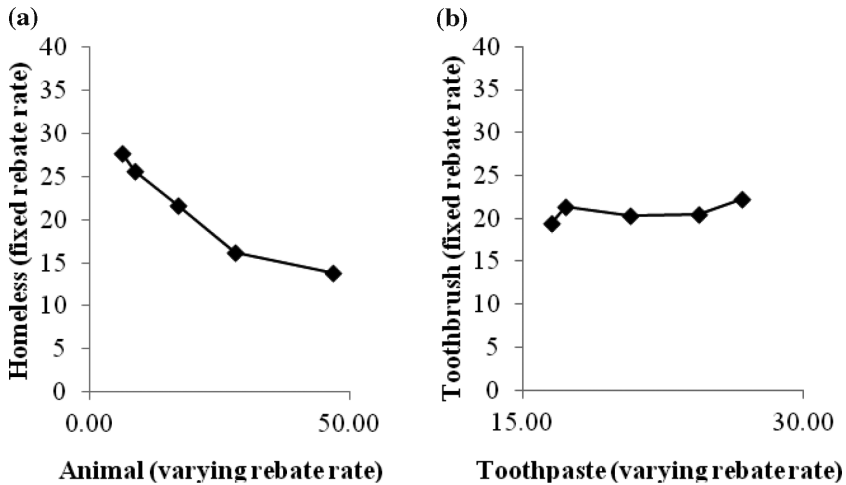**(a)**   **(b)**

FIGURE 3. (a) Average donations in Subs. (b) Average donations in Comp. The rebate rate increases from 0.1 to 0.9 (from left to right) in the figures.

and how many tokens to keep for him/herself. Subjects did not know how much their partner donated until the end of the experiment (i.e., after their individual donation decisions were made).

Note that donating toward toothbrushes and toothpaste is similar to having two charities, where one charity only provides toothpaste and the other charity only provides toothbrushes. Although it is not difficult to find two charities that provide substitutable goods, it is a challenge to find two different charities that provide perfectly complementary goods. One obvious reason is that each charity has an incentive to provide a good that is useful by itself, without need for another charity to perfectly complement its service/product. However, one can imagine many situations where charities provide some level of complementarity and some level of substitution to each other. Our experiment Comp provides a novel way to test the theory in an extreme case, and our experiment Comp-W provides a control experiment where some level of substitution and complementarity exist at the same time and provides a more realistic environment.

3.2. Results

3.2.1. Experiments Subs and Comp.   Figures 3(a) and (b) show the average demand for giving in experiments Subs and Comp as the rebate rate varied. The vertical axis represents the average donations to the cause with the fixed rebate and the horizontal axis represents the average donations to the cause with the varying rebate rate.

As shown in Figure 3(a), as expected, donations to the assigned animal increases with the rebate rate. Mann-Whitney tests confirm that the donations increase significantly as the rebate rate increases from 0.3 to 0.5, from 0.5 to 0.7 and from
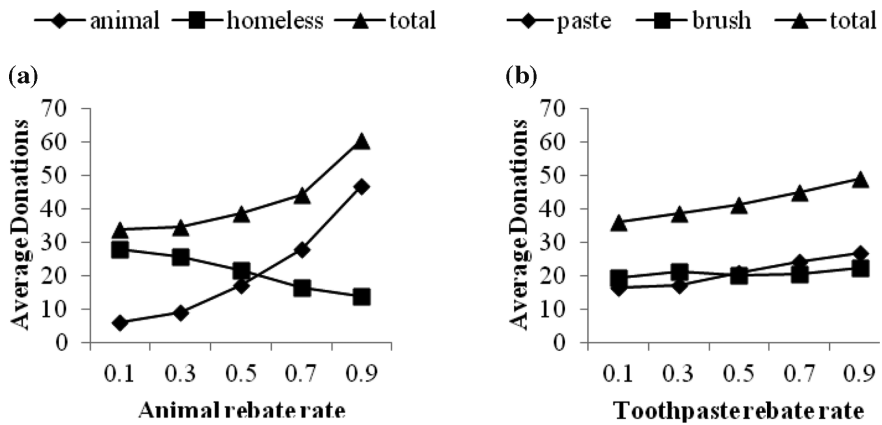
FIGURE 4. (a) Average donations at different rebate rates: experiment Subs. (b) Average donations at different rebate rates: experiment Comp.

0.7 to 0.9 (all *p*-values are less than 0.05).[23] The increase in donations to the assigned animal is not significant as the rebate rate changes from 0.1 to 0.3 (*p*-value = 0.22). More importantly, it can easily be seen from Figure 3(a) that the rebate strategy of the animal rescue organization "steals" donations from the homeless shelter. However, the change in donations to the assigned homeless person is not statistically significant for one-step changes from 0.1 to 0.3, or from 0.3 to 0.5, etc. All of the *p*-values are larger than 0.14 for small rebate changes. Stealing becomes statistically significant for larger changes in rebate rates. For example, donations to the homeless person decrease significantly as the rebate rate changes from 0.1 to 0.7 (*p*-value = 0.02).

As shown in Figure 3(b), donations toward tubes of toothpaste also increase with the rebate rate. The increase in donations is significant as the rebate changes from 0.3 to 0.5 (*p*-value = 0.01) or from 0.5 to 0.7 (*p*-value = 0.10). In addition, larger changes in the rebate rate have even more statistical significance, such as the rebate rate change from 0.1 to 0.7 (*p*-value = 0.00). There is, however, a big difference between experiments Subs and Comp. In the experiment Comp, we do not see stealing. In fact, none of the rebate rate changes have a statistically significant effect on donations toward toothbrushes.

We can also investigate whether increasing the rebate rate increases the charitable pie, or whether it only shifts contributions from one charity to another. Figures 4(a) and (b) show the average donations to each cause as well as total giving. Tables A.1 and A.2 in Online Appendix A present the numbers corresponding to Figures 4(a) and (b) in greater detail. As can be seen from Figures 4(a) and (b), total giving increases with the rebate rate in both experiments. The difference is statistically significant mostly for large changes in rebate rate such as from 0.1 to 0.9 (*p*-values are less than 0.01

---

23.   Throughout the paper we report two-tailed results.

TABLE 2. OLS Regression Analysis for Experiments Subs and Comp.

(a) OLS Regression Analysis for Experiments Subs and Comp (Full data)

	Experiment Subs			Experiment Comp		
Dep. Var.	Treated	Untreated	Total	Treated	Untreated	Total
rebate	− 12.49	− 18.69***	− 27.18*	13.65***	2.29	15.94***
	(14.89)	(5.11)	(13.92)	(3.65)	(4.02)	(3.36)
rebate^2	62.59***		58.59***			
	(18.01)		(17.48)			
constant	69.42***	63.77**	132.50***	35.15	42.43	77.58
	(22.25)	(30.25)	(45.80)	(35.98)	(35.50)	(71.23)
Obs.	210	210	210	240	240	240
(b) OLS Regression Analysis for Experiments Subs and Comp (Dropping the corner solutions)						
rebate	− 23.33	− 12.97***	− 39.00***	11.05***	7.24***	18.29***
	(14.50)	(3.43)	(13.94)	(2.11)	(2.07)	(3.78)
rebate^2	69.11***		71.81***			
	(18.95)		(18.57)			
constant	29.43	22.97	52.86	1.51	7.36	8.88
	(18.77)	(21.74)	(33.43)	(27.89)	(27.46)	(55.00)
Obs.	185	185	185	190	190	190

Notes: Robust standard errors are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

for both experiments). We also see that total giving increases more as the rebate rate becomes larger in experiment Subs, suggesting a convex total giving function (which we will further investigate using regression analysis).

Table 2(a) reports an OLS regression analysis to test the effect of the rebates on giving to the treated charity (with varying rebates), giving to the untreated charity (with fixed rebate rate) as well as on the total giving.[24] Our main independent variable is *rebate*, which takes values between 0 and 1. We also test for nonlinear effects of rebates on donations (as suggested by Figure 4(a)). We use *rebate*^{2}, the square of the rebate rate, to test for nonlinearities in experiment Subs.[25] Note that our theoretical predictions do not comment on the curvature of the donation responses to rebate changes. This is due to the generality of the model. Table 2(a) reports linear regressions for experiment Comp as well as for donations to the untreated charity in experiment Subs. This is because we did not find any nonlinearities in those cases. Nevertheless, Table A.5 in Online Appendix A provides both linear and nonlinear specifications of the rebate variable for experiments Subs. By using data from our questionnaire, our regressions control for age, gender, family income, political view, religion, previous donations to charities, knowledge of animal, and homeless shelters (for experiments Subs and Subs-M) and guesses regarding the chances of a homeless person to own a toothpaste

---

24. None of our qualitative results change if we instead run Tobit regression analyses. The results are available upon request from the authors.

25. We also tried a third order polynomial but that was not statistically significant.

and toothbrush (for experiments Comp and Comp-W).[26] Table 2(a) reports only the coefficients on variables related with the rebate and constant in order to simplify the presentation. Tables A.5 and A.6 in Online Appendix A provide the full list of coefficients for these regressions.

In both experiments Subs and Comp, donations to the treated charity and total donations increase with the rebate rate of the treated charity. This is in line with our theoretical predictions and earlier observations from Figures 4(a) and (b). In the experiment Subs, we find that the marginal increase in giving (and total giving) is higher as the rebate rate becomes larger for the treated charity. Consistent with previous nonparametric tests, there is a negative and statistically significant relationship between rebate from the animal shelter and giving to the homeless person. In other words, the treated charity "steals" donations away from the untreated charity when the causes are substitutes. On the other hand, although not statistically significant, the coefficient of rebate is positive for the untreated cause in experiment Comp and, therefore, there is no evidence of "stealing" when causes are complements.[27]

It is important to highlight that in experiment Subs, we see an example of a situation where the effect of the rebate rate is not constant, that is, the coefficient of $rebate^2$ is significant. Hence, for the low rebate rates, the stealing may be a dominating explanation for the increase in donations toward the treated charity, but for the higher rebate rates, larger new donations toward the treated charity are generated and therefore total giving is positively affected by the increase in rebate rates. Our findings not only improve our understanding of demand for giving in a multiple-charity framework with substitute and complementary causes, but also help us evaluate the literature, as no other study has systematically measured the effect of changing rebate rates.

Recall that our theoretical predictions rely on the interior solution assumption, that is, the endowment is not binding. If there were subjects that were constrained by the endowment provided in the experiment, then our results would be confounded.[28] For example, in experiment Comp, if a subject donates all of his/her endowment when rebate rate is low, then there is no room for this subject's donations to increase as rebate rate increases. This would undermine our results. Alternatively, a subject in the experiment Subs may substitute their donations between charities only because he/she did not have more endowment. This has the potential to impose more stealing. In order to check whether our results are affected by subjects who donate all their endowment, we provide a robustness check by eliminating these subjects from our analysis. Table 2(b) shows the results.

---

26.   See Online Appendix B for the questionnaire conducted at the end of our experiment.

27.   Note that in the experiment Comp, we did not impose perfect complementarity (in the sense of Leontief production technology for toothpaste/toothbrush pairs). Subjects were free to make donations in any way they liked as long as they did not exceed their endowments. In our data, we see that 9 out of 48 subjects made unpaired donations, which is not in line with the complementarity assumption. If we drop these 9 subjects from the analysis, then consistent with our model, we see a statistically significant increase at the 1% level in toothbrush donations as the rebate rate for toothpaste increases. Naturally, total giving also statistically significantly increases in that case as well.

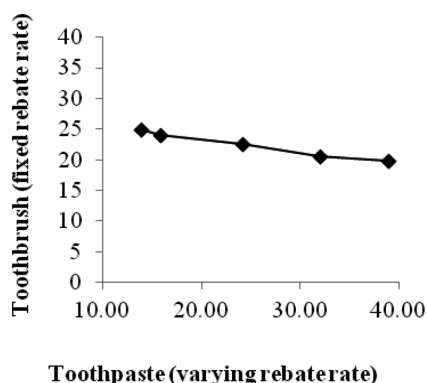28.   We thank an anonymous referee for pointing out this issue.

FIGURE 5. Average donations in Comp-W: The rebate rate increases from 0.1 to 0.9 from left to right in the figure.

First, we see that there are not many subjects that are constrained by the endowment. Second, although our qualitative result for experiment Subs does not change, our results for experiment Comp get stronger when we drop the constrained subjects.[29] For example, we now see that donations to both treated and untreated charities significantly increase in experiment Comp.

3.2.2. Experiment Comp-W. Our robustness experiment Comp-W weakens the complementarity between toothpaste and toothbrushes. Recall that the subjects' unpaired donations toward toothbrushes or toothpaste are donated to homeless persons as single items in Comp-W. Hence, in this experiment, each product has individual value apart from its value when paired with the other product. The relation between a tube of toothpaste and a toothbrush in Comp-W may be thought of as somewhat in between substitutes and complements (as they complement each other when paired but each has some use for a homeless person separately). Our findings from Comp-W support this view.

Figure 5 shows the average donations toward toothbrushes and toothpaste (see Table A.3 in Online Appendix A for a summary statistics). Note that the slope seems negative but not as steep as the one in Figure 3(a) for experiment Subs. The trend is somewhat similar to the one in Figure 3(b) for experiment Comp, as it is again largely flat. Figures 5 and 6 report that even though the subjects respond to the increase in the rebate rate on toothpaste by giving more to this cause, they do not shift donations much from toothbrushes to toothpaste (likely because subjects are aware that these two dental hygiene products have better use together than alone). In fact, Mann–Whitney tests do not show any evidence of stealing (all pairwise comparisons have *p*-values

---

29. We also performed a similar analysis for the following experiments Comp-W and Subs-M. If anything, our results got stronger. Therefore, we choose to report the results from all data (without eliminating constrained subjects) in what follows. The results without the constrained subjects can be requested from the authors.
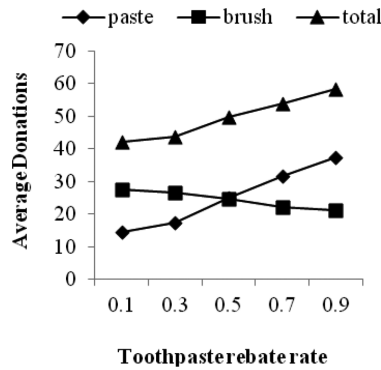
FIGURE 6. Average donations at different rebate rates: experiment Comp-W.

TABLE 3. OLS Regression analysis for experiment Comp-W.

Dep. Var.	Treated	Untreated	Total
rebate	33.07***	− 6.82*	26.25***
	(5.47)	(3.90)	(4.78)
constant	− 33.79	5.43	− 28.35
	(35.41)	(41.08)	(73.51)
Obs.	240	240	240

Notes: Robust standard errors are in parentheses. *Significant at 10%; ***significant at 1%.

larger than 0.24). We find a positive relationship between rebate rates and toothpaste donations (i.e., p-value $= 0.02$ when rebate rate changes from 0.1 to 0.9). In addition, there is a positive relationship between rebate rates and total giving (i.e., p-value $= 0.08$ when the rebate rate changes from 0.1 to 0.9).

Table 3 reports OLS regressions in order to test the effect of the rebates on giving to the treated cause (toothpaste), giving to the untreated cause (toothbrushes), as well as total donations. Our main independent variable is again *rebate*, which takes values between 0 and 1. Here we excluded the variable *rebate*^{2}, as Figure 6 did not suggest strong nonlinearity and this variable was not significant when included. In addition, by using data from our questionnaire, we control for age, gender, family income, political view, religion, previous donations to charities, and guesses regarding the chances of a homeless person owning a toothbrush/toothpaste. Table 3 reports only the coefficient of the variable rebate and the constant to simplify the presentation. Table A.7 in Online Appendix A provides the full list of coefficients for these regressions.

As in the case of experiment Comp, here both donations to toothpaste and total donations increase with rebate. In Comp-W we see some mild but (weakly) significant stealing effect as the rebate coefficient for the untreated charity is negative and significant at 10% level. Such stealing was not observed in Comp and it was much stronger in Subs (see Table 2 and Tables A.5 and A.6 in Online Appendix A).
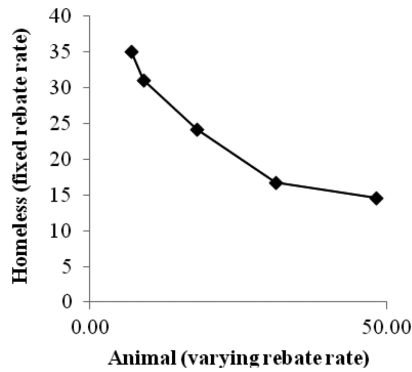
FIGURE 7. Average donations in Subs-M: The rebate rate increases from 0.1 to 0.9 from left to right in the figure.
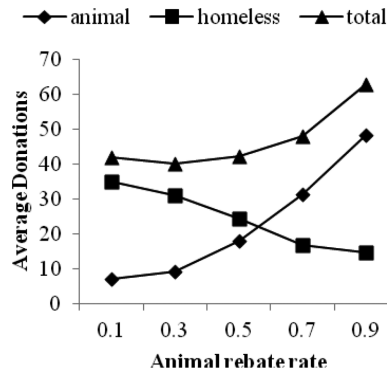

FIGURE 8. Average donations at different rebate rates: experiment Subs-M.

3.2.3. Experiment Subs-M. Subs-M is the two-agent version of experiment Subs, wherein the charities are considered to be substitutes for each other. In this two-agent version of giving, we see similar results as in the single-agent case. Figure 7 shows average donations to the assigned animal (treated charity) and homeless person (untreated charity). Donations to the assigned animal significantly increase as the rebate rate increases from 0.3 to 0.5, 0.5 to 0.7 and 0.7 to 0.9 (all *p*-values are less than 0.05), whereas donations to the assigned homeless person decrease with the rebate rate. Similar to the single-agent case, stealing is not statistically significant at the 5% level for small rebate changes (i.e., none of the 20 percentage point changes are significant, such as from 0.1 to 0.3 and 0.7 to 0.9.), but are significant for larger rebate changes such as from 0.1 to 0.7 (*p*-value = 0.01).

Figure 8 (as well as Table A.4 in Online Appendix A) show that the total donations increase with the rebate rate (except from 0.1 to 0.3, where stealing cancels out the increased donations to the animal). Small rebate changes initially do not change total giving significantly, but change in total giving is statistically significant as the rebate

TABLE 4. OLS Regression analysis for experiment Subs-M.

Dep. Var.	Treated	Untreated	Total
rebate	− 8.54	− 27.63***	− 41.44**
	(12.77)	(7.12)	(16.63)
rebate^2	60.89***		66.16***
	(16.07)		(18.84)
constant	1.27	53.70***	55.87***
	− 8.54	(13.22)	(18.54)
Obs.	200	200	200

Notes: Robust standard errors are in parentheses. **Significant at 5%; ***significant at 1%.

rate changes from 0.7 to 0.9 (*p*-value = 0.03), as well as for larger rebate changes. The total giving function is again convex with respect to the rebate rate.

We repeat the OLS analysis for experiment Subs-M in Table 4. Results are extremely similar to what we reported for experiment Subs in Table 2. Again, to capture the convex looking increase in total giving as a response to increasing rebate rate, we included the variable *rebate*^{2} in the regressions for donations to the treated charity as well as in the regressions for total donations. Giving to the assigned animal increases with the rebate rate and the rate of increase is larger at large rebate levels. Giving to the assigned homeless person decreases as the rebate rate for the animal increases, and again we could not find any nonlinearity in rebate rate. The total giving function is convex in the rebate rate and steeply increasing with higher rebate rates. As before, we do not report in Table 4 the coefficients of the demographic variables or the other variables subjects self-reported in the questionnaire to simplify the presentation. The full list of variables can be found in Table A.8 in Online Appendix A.

Although experiment Subs-M was mainly conducted in order to check the robustness of our results, it allows us to provide important insights for comparing altruism and warm-glow motives.[30] One interesting aspect of our design is that we can actually compare two treatments to see which motive, warm-glow or altruism, is more prevalent for the charities used in the experiment.[31]

The altruism model would predict that individuals, on average, give less when they are in groups of two versus when they are the sole giver. Therefore, individual giving in experiment Subs-M should be lower than in experiment Subs if subjects behaved consistent with altruism. However, the warm-glow model (in isolation) suggests that it does not matter if someone else is also contributing to the same cause, so we would expect similar giving across the two experiments if a warm-glow characterization of subjects' behavior were more appropriate.

---

30. We can also study the effect of increasing group size on the public goods provision in a multiple-charity environment. Isaac and Walker (1988), Isaac et al. (1994), and Nosenzo et al. (2015) study the effect of group size on the public goods provision in a single public good environment.

31. This type of comparison is justified since both experiments use the same subject pool.

Comparing Tables A.1 and A.4 of Online Appendix A, individual giving levels seem slightly higher in experiment Subs-M at any given rebate rate. However, according to Mann–Whitney tests, the differences between single- and multiple-agent cases are not statistically significant (p-values range between 0.27 and 0.73). In addition, the result is the same if we perform an OLS regression analysis and add a dummy variable for experiment Subs (p-values range between 0.68 and 0.87). Therefore, our data suggest that for the charities used in our experiment, the warm-glow model better explains subjects' behavior.

Experiments Subs and Subs-M provide evidence on both individualized public goods and standard public goods. This helps us to build a bridge between the charitable giving literature and the industrial organization literature (the latter of which extensively studies "business stealing" and "demand expansion" in which firms compete through prices). The dynamics of competition in the industrial organization literature is similar to our setting in experiment Subs. We show that similar business stealing concerns apply to the Subs-M case in terms of shifting donations from one charity to another due to rebate competition. Moreover, the increase in total giving due to rebates has the same underlying mechanism as demand expansion in industrial organization.

3.2.4. Are Rebates Wasteful?. We investigate whether rebates are effective fundraising strategies by comparing (opportunity) costs and benefits of rebate-driven campaigns. In this section, we acknowledge that the third party could have applied the funds allocated to fundraising directly toward the cause instead of fundraising purposes. Therefore, we now treat refunds as a cost, and we are interested in the amount of donations net of paid refunds.[32]

First, we discuss the experiment Subs and Subs-M. Figures 9 and 10 show the average net benefit (donations—cost of rebates) for both charities as well as total donations at each rebate rate. We find that the animal shelter would have an incentive to use rebates as a response to the homeless shelter's rebate rate of 50%. Figure 9 suggests that the animal shelter should have a rebate rate of about 0.5–0.7, and it should not be overly aggressive in increasing the rebate rate, since the net benefit of doing so would be lower (that is, for rebate rates for the animal shelter above 0.7, its net benefit decreases). On the other hand, donations to the assigned homeless person net of rebates are decreasing with the rebate rate for the assigned animal, which is expected. The surprising result is that total donations (net of total rebates) are decreasing with the rebate rate for the assigned animal. The OLS regressions confirm that net donations decrease with the rebate rate for both homeless and total giving at the 1% significance level.[33] Therefore, if the rebates are provided by the same source[34] and the aim is to

---

32.   None of the qualitative results presented in this section change if we eliminate the subjects that are constrained by the endowment from the analysis.

33.   Available by the authors upon request.

34.   In our experiments, the experimenter was financing rebates for both charities. In applications, it might be the government or the same foundation (e.g., the Gates foundation) campaigning for multiple charities.
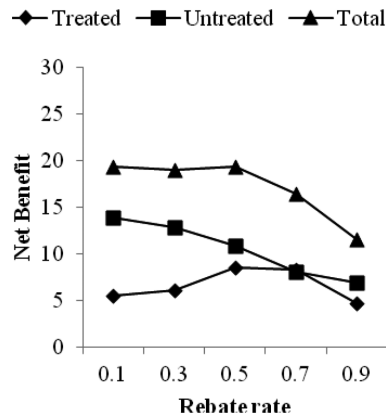
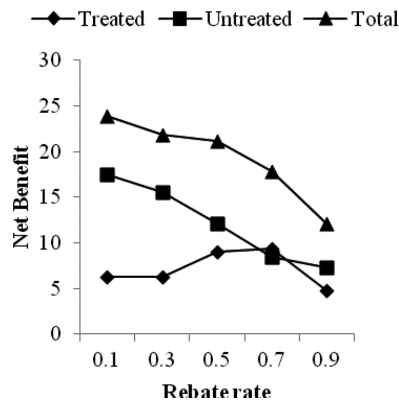FIGURE 9. Effectiveness of refunds for experiment Subs.

FIGURE 10. Effectiveness of refunds for experiment Subs-M.

maximize the total net giving, rather than the net giving to a certain cause, minimal rebate rates seem to work better. This is especially true for the experiment Subs-M (see Figure 10), in which total net donations strictly decreases as rebate rate for the animal shelter increases.

Among others, Davis et al. (2005), Davis (2006), and Huck and Rasul (2011) question the usefulness of rebate and match strategies. A rebate/match campaign that diminishes net giving to a particular charity may look unreasonable in lab experiments with a single charity or field experiments where one charity is more salient than the others. However, when we extend the environment to the multicharity case, we can see why an individual charity may want to employ such fundraising campaigns. Our findings show that a selfish charity may benefit from rebates, since this allows the charity to attract donations away from other charities to itself. We further argue that the level of the rebate rate is important to judge if a campaign is good or bad. For example, we find that the animal shelter has no incentive to increase the rebate rate beyond 0.7.
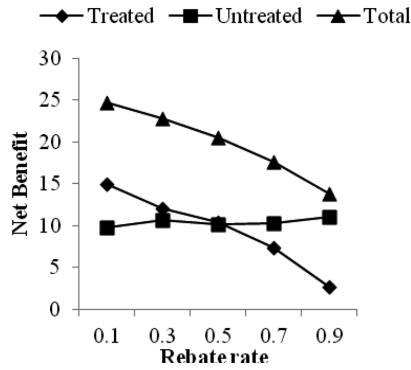
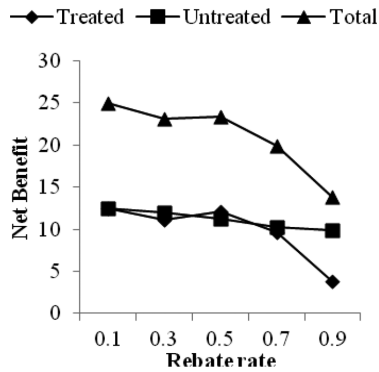FIGURE 11. Effectiveness of refunds for experiment Comp.

FIGURE 12. Effectiveness of refunds for experiment Comp-W.

To sum up, we point out that the detrimental effects of rebate/match campaigns that are found, especially in field experiments, can only be understood through studying the competition between charities (see Huck and Rasul 2011 for a similar point).

Next, we analyze the effectiveness of refunds for the experiments Comp and Comp-W in Figures 11 and 12. Interestingly, when complementary causes are used, net donations to the treated cause do not increase with rebate. On the contrary, net donations decrease significantly at the 1% significance level for toothpaste for both experiments Comp and Comp-W. In experiment Comp, net donations to the untreated charity (toothbrush) increase as the rebate rate increases (p-value $= 0.00$).[35] In Comp-W, we see a negative effect of rebate rate on net donations to the untreated charity (p-value $= 0.08$). Net total donations in both experiments, however, statistically significantly decrease as rebate rate increases (p-values are less than 0.02). Therefore, competition

---

35. Note that in contrast to the substitute charities, when complementary charities are involved, increasing rebate rate for one charity benefits the other charity. This is intuitive since individuals increase donations to both charities but only the treated charity pays the cost.

TABLE 5. Estimated elasticity coefficients.

Treatment	Don. to treated	Don. to untreated	Total don.	Net don. to treated	Net don. to untreated	Net total don.
Subs	−0.87***	0.41***	−0.38***	−0.07	0.35***	0.09
	(0.11)	(0.11)	(0.09)	(0.09)	(0.10)	(0.07)
Comp	−0.30***	−0.15*	−0.25***	0.42***	−0.12*	0.09
	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.06)
Comp-W	−0.51***	0.16**	−0.23***	0.31***	0.13**	0.18***
	(0.09)	(0.07)	(0.06)	(0.08)	(0.06)	(0.04)
Subs-M	−0.90***	0.50***	−0.31***	−0.06	0.43***	0.19***
	(0.13)	(0.13)	(0.09)	(0.10)	(0.11)	(0.07)

Notes: Robust standard errors are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

also has a negative effect on net total donations when fundraising costs are incorporated into analysis.

It is important to highlight that our conclusion relies on the assumption that crowding out either would not happen or would be limited when the third party donates the funds to the charities instead of offering them as rebates. This assumption would be valid only if individuals have warm-glow preferences. As we showed in the previous section, our data are consistent with warm-glow preferences. However, one needs to be careful generalizing this result to other contexts where individuals might mainly be driven by altruistic preferences, implying crowding-out. In such environments, one may expect rebate campaigns to improve net total donations. On the other hand, it is also possible that when a third party becomes a lead donor, this by itself could generate higher donations (as shown by Huck and Rasul 2011) and, therefore, our findings in this subsection might even be a lower bound for the lost welfare.

3.2.5. Price Elasticities.   We report price and cross-price elasticities in Table 5.[36] The price elasticity estimates are consistent with theoretical predictions and our previous analysis.[37] We find that donations to the treated charity increase as the price of donations decreases in all our experiments. We see stealing of donations in all experiments with the exception of the experiment Comp. Total donations, nevertheless, increase when the price of donation decreases in all experiments. Even though this result suggests that rebates are beneficial for total donations, when we look at net total donations, we see a decrease in *net* total donations when the price of donations decreases (and the relationship is statistically significant at 1% level for Subs-M and Comp-W). According to the elasticity estimates, even the treated charity, on average, does not benefit from rebates when the cost of the subsidy is taken into account.

36.   Elasticities are calculated by regressing ln(donations in dollars) on ln(price of giving in dollars to the treated charity) as well as control variables. We have added 10 cents to the donation levels to avoid a zero donation in logarithm.

37.   We report the results from all data. Our results are stronger (especially for the experiment Comp) if we eliminate the subjects that are constrained by their endowment.

It is reassuring to see that our own-price elasticity estimates of donations (especially for the substitute charities) are within the range of the ones from previous laboratory and field experiments, as well as empirical studies.[38] As Table 5 (column (1)) shows, we have a range of estimates from −0.30 to −0.90. Eckel and Grossman (2003, 2006b) use laboratory experiments in a single charity set-up with rebates. Eckel and Grossman (2003) compute a price elasticity of −0.34, and Eckel and Grossman (2006b) compute a price elasticity of −1.49.

In addition, there are papers that use field experiments to study the effect of rebates on giving. The price-elasticity estimates are in the range of −0.19 and −5.12 (Eckel and Grossman 2008, 2017). We can also compare our estimates with the estimated price elasticities from the empirical charitable giving literature. As the tax rate increases, the price of giving to registered charities decreases since donations to such charities are tax-deductible and will generate tax rebates. Earlier empirical studies using cross-sectional data typically find the price elasticity to be greater than 1 in absolute value (i.e., Clotfelter 1985, 1990). Using panel data, Randolph (1995) estimates a price elasticity of −0.5 with respect to persistent price changes and a price elasticity of −1.5 with respect to transitory price changes. More recently, Auten et al. (2002) and Bakija and Heim (2011) find the price elasticity greater than 1 in absolute value, whereas Hungerman and Ottoni-Wilhelm (2016) report a price elasticity of −0.2.

Finally, we can also compare our estimates with the papers that compute price elasticities in response to matching campaigns. For example, Eckel and Grossman (2003, 2006b, 2008, 2017) not only report rebate elasticities, but they also report matching elasticities. They find that match price elasticities (of total contributions including matches) are systematically larger than their rebate counterparts and are in the range of −1.10 to −5.43. Karlan and List (2007) conduct a field experiment and report match price elasticities (of gross amount given by the donor—*not* including matches) between 0 and −0.67. Huck and Rasul (2011) report own-price elasticities (of total contributions including matches) between −0.53 and −1.12. It is also important to highlight that the results of Huck and Rasul (2011) imply that straight linear matching schemes raise the total donations *received* including the match value, but partially crowd out the actual donations *given* excluding the match. They argue that matching might harm fundraising as it may reduce donations given, consistent with our results presented in this paper with substitute charities. Our results show that when a charity uses a suboptimal rebate/match strategy, net donations to that charity might decrease.

3.2.6. Individual Analysis. Figures A.1–A.4 (Online Appendix A) show donations to the treated and untreated charities for each individual for all experiments, as well as the fitted linear regression lines. One thing is clear: there is quite a bit of heterogeneity

---

38.   The only paper, that we are aware of, that estimates cross-price elasticities in a multiple-charity framework is Reinstein (2012). The cross-price elasticity estimates reported in that paper vary from −0.12 to 2.71.

TABLE 6. Analysis of individual donations.

% of subjects who:	Subs	Comp	Comp-W	Subs-M
Never donate to treated	11.9	14.6	8.3	10.0
Increase donations to treated with rebate	64.3	37.5	62.5	70.0
Decrease donations to treated with rebate	0.0	0.0	2.1	0.0
Do not change donations to treated with rebate	23.8	47.9	27.1	20.0
Never donate to untreated	16.7	14.6	10.4	12.5
Increase donations to untreated with rebate	0.0	29.2	16.7	2.5
Decrease donations to untreated with rebate	35.7	4.2	18.8	37.5
Do not change donations to untreated with rebate	47.6	52.1	54.2	47.5
Never donate	7.1	14.6	8.3	7.5
Increase total giving with rebate	38.1	33.3	45.8	40.0
Decrease total giving with rebate	0.0	0.0	2.1	0.0
Do not change total giving with rebate	54.8	52.1	43.8	52.5

Notes: The categories listed here do not overlap. Categories may not exactly add up to 100 due to rounding.

in individual preferences in terms of how subjects react to rebate rate changes.[39] While some individuals are sensitive to the rebate rates, some do not change their contributions with changes in the rebate at all. Table 6 provides a classification of subjects into different categories.[40]

Table 6 shows a very similar classification of behavior in experiments Subs and Subs-M. It is also reassuring to see that in experiment Comp, there is a very small percentage of individuals who decrease donations to the untreated charity (4.2% compared with 29.2% who increase donations). One can compare that with experiment Comp-W, where 18.8% of individuals decreased their donations to the untreated charity, whereas only 16.7% of individuals increased their donations to the untreated charity. In terms of how total giving is affected by rebate, we see that although our previous analysis shows that in all treatments there is an increase in total giving when rebate rate increases, a little over half of the individuals do not statistically significantly change their total donations (with the exception of the Comp-W experiment).

4. Conclusion

According to the National Center for Charitable Statistics, there are over one and a half million charities in the United States alone that compete for donations. It is extremely important to understand how this competition affects donations to charities and the overall charitable pie.

This paper makes several important contributions to the literature. The biggest fear after a successful campaign for one cause is possible lower funding for other charities

---

39.   We have explained some of the heterogeneity based on subjects' answers to our questionnaire in our previous regression analysis.

40.   The classifications are supported by OLS regressions run separately for each individual.

(a scenario that is validated in our study through the results of our experiments on charities with substitute causes: more funding for the animal shelter leads to less funding for the homeless shelter). Next, we look at whether this is a simple shift of donations from one charity to another without increasing the total charitable pie. We find that the animal shelter generates some new donations by increasing rebates, that is, total giving increases when the rebate rate increases. We show that the change in giving for a unit change in rebate rate is not constant as rebate rate increases. Understanding the demand at different prices is, therefore, crucial for setting the subsidy levels optimally. In addition, we consider charities with complementary causes. We find that donations to both charities increase when one charity increases its rebate rate. Finally, we make an important discovery—when opportunity costs of rebate campaigns are taken into account, total donations net of the rebate costs decrease as the rebate rate for one of the charities increases. This raises doubt as to whether fundraising campaigns that provide monetary incentives increase social welfare.

Our paper has important policy implications for practitioners who use refunds/matches as fundraising strategies as well as for policy makers who propose tax incentives for giving to certain charities, which would imply a price change for giving to some charities while keeping the price the same for others.[41] For example, although 501(c)3 organizations enjoy tax deductions, 501(c)4 organizations do not. The recent executive order signed by the president on May 4, 2017, that allows for churches to be involved in more political advocacy or lobbying without losing their 501(c)3 status, might lead political organizations and churches to compete over donations for lobbying and act more like substitutes. This may shift donations from political organizations toward churches since giving to churches would be cheaper. Based on our results, total giving to political causes might increase, but the increase may not be enough to cover the cost imposed by such subsidies.

Our theoretical results are not limited to rebates, but can also be applied to matching strategies (i.e., Karlan and List 2007; Meier 2007; Huck and Rasul 2011), since these are mathematically equivalent.[42] Having said that, behaviorally, we expect matching strategies to generate more total giving compared to rebate strategies (among others, see Eckel and Grossman 2003, 2006a,b, 2008, 2017; Davis et al. 2005).[43] Nevertheless, we conjecture that our *qualitative* results would continue to hold under matching.

We are also able to answer an important question. Among others, Davis et al. (2005), Davis (2006), Meier (2007), and Huck and Rasul (2011) find that rebate/match subsidies are not beneficial for the charities themselves (when the cost of subsidies

---

41. Moreover, some charities send gifts to donors with varying valuations, which has a similar spirit to rebates.

42. Rebates and matches are theoretically equivalent as long as agents are not constrained in their donations (i.e., total donations are less than 100 tokens). This is true for the majority of our data, as can be seen in Section 3.

43. Not all studies find a difference between rebate and matching subsidies. Davis (2006) finds no differences between rebates and matches under a novel decision environment that controls for isolation effects.

is taken into account). Thus, they ask why rebate/match strategies are nevertheless so popular in the charitable sector? We find that competing charities have individual incentives to use these strategies in environments with multiple competing charities, because by offering rebate/match subsidies, charities are able to "steal" donations away from their competitors.

References

Aldashev, Gani and Thierry Verdier (2010). "Goodwill Bazaar: NGO Competition and Giving to Development." *Journal of Development Economics*, 91, 48–63.

Aldashev, Gani, Marco Marini, and Thierry Verdier (2014). "Brothers in Alms? Coordination between Nonprofits on Markets for Donations." *Journal of Public Economics*, 117, 182–200.

Andreoni, James (1989). "Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence." *Journal of Political Economy*, 97, 1447–1458.

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 John Miller (2002). "Giving According to GARP: An Experimental Test of the Consistency of Preferences for Altruism." *Econometrica*, 70, 737–753.

Andreoni, James and A. Abigail Payne (2013). "Charitable Giving." In *Handbook of Public Economics*, Vol. 5. North Holand, Amsterdam, pp. 1–50.

Andreoni, James, William Gale, and John Karl Scholz (1996). "Charitable Contributions of Time and Money." Working paper, University of California - San Diego, CA.

Auten, G.E., C. Clotfelter, and R.L. Schmalbeck (2000). "Taxes and Philanthropy Among the Wealthy." In *Does Atlas Shrug? The Economic Consequences of Taxing the Rich*, edited by J. Slemrod. Russell Sage and Harvard University Press, New York, NY, pp. 392–424.

Auten, G.E., H. Sieg, and C.T. Clotfelter (2002). "Charitable Giving, Income, and Taxes: An Analysis of Panel Data." *American Economic Review*, 92(1), 371–382.

Bakija, J. and B. Heim (2011). "How Does Charitable Giving Respond to Ircentives and Income? New Estimates from Panel Data." *National Tax Journal*, 64, 615–650.

Bergstorm, T., L. Blume, and H. Varian (1986). "On the Private Provision of Public Goods." *Journal of Public Economics*, 29, 25–49.

Bilodeau, Marc and Al Slivinski (1997). "Rival Charities." *Journal of Public Economics*, 66, 449–467.

Brown, Alexander, Jonathan Meer, and J. Forrest Williams (forthcoming). "Why Do People Volunteer? An Experimental Analysis of Preferences for Time Donations." *Management Science*.

Cairns, J. and R. Slonim (2011). "Substitution Effects Across Charitable Donations." *Economics Letters*, 111, 173–175.

Clotfelter, Charles T. (1985). *Federal Tax Policy and Charitable Giving*. University of Chicago Press, Chicago, IL.

Clotfelter, Charles T. (1990). "The Impact of Tax Reform on Charitable Giving: A 1989 Perspective." In *Do Taxes Matter? The Impact of the Tax Reform Act of 1986*, edited by J. Slemrod. MIT Press, Cambridge, MA, pp. 203–235.

Corazzini, L., C. Cotton, and P. Valnonesi (2015). "Donor Coordination in Project Funding: Evidence from a Threshold Public Goods Experiment." *Journal of Public Economics*, 128, 16–29.

Davis, D. Douglas (2006). "Rebate Subsidies, Matching Subsidies and Isolation Effects." *Judgment and Decision Making*, 1, 13–22.

Davis, D. D., E. L. Millner, and R. J. Reilly (2005). "Subsidy Schemes and Charitable Contributions: A Closer Look." *Experimental Economics*, 8, 85–106.

Eckel, Catherine C. and Philip J. Grossman (1996). "Altruism in Anonymous Dictator Games." *Games and Economic Behavior*, 16, 181–191.

Eckel, Catherine C. and Philip J. Grossman (2003). "Rebate Versus Matching: Does how we Subsidize Charitable Contributions Matter?." *Journal of Public Economics*, 87, 681–701.

Eckel, Catherine C. and Philip J. Grossman (2006a). "Do Donors Care about Subsidy Type? An Experimental Study." In *Research in Experimental Economics* (Experiments Investigating Fundraising and Charitable Contributions, Vol. 11), edited by D. Davis and M. Isaac. JAI Press, New York, pp. 163–182.

Eckel, Catherine C. and Philip J. Grossman (2006b). "Subsidizing Charitable Giving with Rebates or Matching: Further Laboratory Evidence." *Southern Economic Journal*, 72, 794–807.

Eckel, Catherine C. and Philip J. Grossman (2008). "Subsidizing Charitable Contributions: A Natural Field Experiment Comparing Matching and Rebate Subsidies." *Experimental Economics*, 11, 234–252.

Eckel, Catherine C. and Phillip J. Grossman (2017). "Comparing Rebate and Matching Subsidies Controlling for Donors' Awareness: Evidence from the Field." *Journal of Behavioral and Experimental Economics*, 66, 88–95.

Fischbacher, Urs (2007). "z-Tree: Zurich Toolbox for Ready-Made Economic Experiments." *Experimental Economics*, 10, 171–178.

Greiner, B. (2004). "An Online Recruitment System for Economic Experiments." In *GWDG Bericht 63*, edited by K. Kremer and V. Macho. Ges. fur Wiss Datenverarbeitung, Gottingen, pp. 79–93.

Harwell, H., D. Meneses, C. Moceri, M. Rauckhorst, A. Zindler, and Catherine Eckel (2015). "Did the Ice Bucket Challenge Drain the Philanthropic Reservoir?" Working paper, Economic Research Laboratory, Texas A&M University.

Huck, S. and I. Rasul (2011). "Matched Fundraising: Evidence from A Natural Field Experiment." *Journal of Public Economics*, 95, 351–362.

Hungerman, D. and M. Ottoni-Wilhelm (2016). "What is the Price Elasticity of Charitable Giving? Toward a Reconciliation of Disparate Estimates." Working paper, University of Notre Dame, IN, USA.

Isaac, R. M. and J. M. Walker (1988). "Group Size Effects in Public Goods Provision: The Voluntary Contributions Mechanism." *The Quarterly Journal of Economics*, 103, 179–199.

Isaac, R. M., J. M. Walker, and A. W. Williams (1994). "Group Size and the Voluntary Provision of Public Goods." *Journal of Public Economics*, 54, 1–36.

Karlan, D. and J. A. List (2007). "Does Price Matter in Charitable Giving? Evidence from a Large-Scale Natural Field Experiment." *American Economic Review*, 97(5), 1774–1793.

Krasteva, S. and H. Yildirim (2016). "Information, Competition, and the Quality of Charities." *Journal of Public Economics*, 144, 64–77.

Krieg, Justin and Anya Savikhin Samek (2017). "When Charities Compete: A Laboratory Experiment with Simultaneous Public Goods." *Journal of Economic Behavior and Organization*, 66, 40–57.

Lacetera, N., Mario Macis, and Robert Slonim (2012). "Will There Be Blood? Incentives and Displacement Effects in Pro-Social Behavior." *American Economic Journal: Economic Policy*, 4, 186–223.

Lange, Andreas and Andrew Stocking (2012). "The Complementarities of Competition in Charitable Fundraising." Working paper, Congressional Budget Office, Washington, DC.

Lilley, Andrew and Robert Slonim (2014). "The Price of Warm Glow." *Journal of Public Economics*, 114, 58–74.

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

Meier, S. (2007). "Do Subsidies Increase Charitable Giving in the Long Run? Matching Donations in a Field Experiment." *Journal of European Economic Association*, 5, 1203–1222.

Meer, Jonathan (2017). "Does Fundraising Create New Giving?" *Journal of Public Economics*, 145, 82–93.

Nosenzo, Daniele, Simone Quercia, and Martin Sefton (2015). "Cooperation in Small Groups: The Effect of Group Size." *Experimental Economics*, 18, 4–14.

Null, C. (2011). "Warm Glow, Information, and Inefficient Charitable Giving." *Journal of Public Economics*, 95, 455–465.

Ottoni-Wilhelm, Mark, Lise Vesterlund, and Huan Xie (2017). "Why Do People Give? Testing Pure and Impure Altruism." *American Economic Review*, 107(11), 3617–3633.

Randolph, W. (1995). "Dynamic Income, Progressive Taxes, and the Timing of Charitable Contributions." *Journal of Political Economy*, 103, 709–738.

Reinstein, D. (2011). "Does One Charitable Contribution Come at the Expense of Another?." *The B.E. Journal of Economic Analysis and Policy*, 11, 1–54.

Reinstein, D. (2012). "Substitution Among Charitable Contributions: An Experimental Study." Working paper, University of Exeter.

Rose-Ackerman, Susan (1982). "Charitable Giving and "Excessive" Fundraising." *The Quarterly Journal of Economics*, 96, 193–212.

Scharf, K., S. Smith, and M. Wilhelm (2017). "Do Disaster Appeals Reduce Other Donations? Evidence from the U.K." Working paper, University of Birmingham.

Shang, J. and R. Croson (2009). "A Field Experiment in Charitable Contribution: The Impact of Social Information on the Voluntary Provision of Public Goods." *Economic Journal*, 119, 1422–1439.

Supplementary Data

Supplementary data are available at *JEEA* online.