LEADERSHIP GIVING IN CHARITABLE FUND-RAISING

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Abstract

Why do charities often begin new capital fund drives by announcing a large contribution by a single wealthy donor? This paper explores the possibility that such "leadership giving" provides a signal to all other givers that the charity is of high quality. The dilemma is that if the lead giver can deceive others to believe the charity is of higher quality than it truly is, then these followers will make larger contributions, which will benefit the leader. Hence, the leader must give an unusually large amount to convey a credible signal of the quality. This sets up a war-of-attrition game for who will pay the cost to signal the quality. Since the wealthy have the lowest opportunity cost of providing the signal, they, in equilibrium, move first to provide the signal of quality with exceptionally large gifts.

1. Introduction

Public economists have often attempted to understand charitable giving by studying models of privately provided public goods, that is, the supply of donations. Recently, however, researchers have recognized the importance of also considering the demand for donations, that is, the fund-raising side of the market. In the United States, fund-raising is a huge and sophisticated business. According to one estimate from the mid 1990s, about 115,000 organizations hire fund-raising staff and consultants, spending $2 billion per year on fund-raising. In 1995, the 25 largest charities spent an average of over $25 million each on fund-raising, or about 14% of charitable gifts.[1] Moreover, there is a great deal of institutional knowledge that has evolved over many years about the best practices for fund-raising. Although there is no formal catalogue or

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[1]The figures on the overall industry are from Kelly (1997). The 25 largest charities are as identified by Money Magazine Online, http://money/features/charity_1196/top25.html.

systematic data collection on fund-raising strategies, some "stylized facts" on fund-raising strategies can be gleaned from the many books, manuals, and guides written for professional fund-raisers, and from case studies reported in these books and in the popular press.

One of the most consistent of these stylized facts is the importance of leadership gifts. This is especially true with regard to capital campaigns, that is, fund drives that raise money for capital expenditures to start a new charity or expand an existing one. An example of a capital campaign is an initiative to build a new building for an economics department at a university, or to build a new church, or synagogue in a city. A leadership gift is a large donation made by a single person, a small set of people, or a foundation at the very start of the fund drive. It is typically the largest gift of the drive and is used to inspire others to contribute. A fund-raising consultant quoted recently in the *New York Times* characterized the effect this way: "When a big (leadership giver) comes in, the smaller donors pay attention. It legitimizes a fund-raising project and puts the institution on a much faster track." [2]

The importance of the leadership phase of fund-raising is emphasized in almost all handbooks for fund-raisers. *The Nonprofit Handbook,* which is the premier guide, recommends a pyramid strategy for "sequential solicitation." At the pinnacle of the pyramid is leaders: "Leadership people are the highest echelon of prospects—the people from whom the largest gifts are possible and . . . . the people whose generosity will set the pattern for others. These are the people you approach first." It makes the specific recommendation to fund-raisers that "the lead gift should be at least 10% of the overall goal"(Lawson 2001, p. 756). Such advice is repeated in most fund-raisers' training or advice manuals and has become the conventional wisdom among fund-raising professionals. *The Nonprofit Handbook* itself lists dozens of such guides that provide this advice, and quotes from them often.[3]

Since leadership giving is an important aspect of capital campaigns for charities, it is important to understand it from a strategic point of view. Understanding this can help us see how charities are established and may help to form government policy to assist or encourage such activity.

There are clearly many different reasons that we see leadership giving. This paper will present a stylized theoretical model to examine one of the most frequently hypothesized explanations, that is, the leader is sending a signal about the quality of the charity which later givers will follow. The central assumption of the model is that the quality of a potential charitable project is unknown, but can be learned by paying a private cost. For instance, a person may need to study the "business plan" of the charity, interview its

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[2]David Firestone, "Got a Match? If Not, You Lose the Grant," *New York Times*, November 18, 1998.

[3]Without any quantifiable data or systematic studies of fund-raising, citing the sheer frequency of such advice is the best evidence I can give to support the claim that this practice is commonplace.

managers, inspect its facilities, or hire experts to evaluate its effectiveness. The main insight, then, is that once someone knows the quality of the charity, he lacks incentives to convey the value truthfully to others. This is the free-rider problem in reverse—the leader wants everyone else to think the quality is higher than it really is so that they will give even more to the charity, from which the leader will benefit. The only credible way to convey the privately known quality is by giving a distinctively large gift, one that is larger than would have been given had true quality been publicly known.

The model builds on the fact that an informative signal of quality is a public good in itself. If the information can be signalled through a donation, then this becomes a discrete public good that can be provided by a single person. How will the provider of the informational public good be determined? As in the familiar problems of dragon-slaying (Bliss and Nalebuff 1984) and department chairing (Bilodeau and Slivinski 1996a, 1996b), the service will be provided by the person with the lowest cost-benefit ratio of signalling the quality. As is shown later, assuming identical preferences, this person will be the one with the highest income.

If incomes are known and the cost of the information is the same across all people, then in equilibrium the leadership gift that signals the true quality will always be provided immediately. Suppose, however, that individuals have varying expertise that will make their costs of obtaining information different. Suppose further that these individual costs are private knowledge. Then, in equilibrium, there will be delay before the first contribution is made. This is because people will wait in hopes that someone else will pay the information and signalling cost first. Since this delay creates an inefficiency, it presents an important role for fund-raisers—they can provide mechanisms to shorten the waiting time before the signal is provided. It also presents an inefficiency that can be addressed with government policy. By providing a selective grants process, the government can play the role of lead giver as well. This role accords with the goals of many government programs.

The paper is organized as follows. Next, I discuss the previous papers on fund-raising for public goods. Section 3 will be the main model. Section 4 will examine generalization of the model to consider warm-glow and prestige as possible motives for giving. Section 5 discusses the possibility of hetero-geneous private costs and Section 6 looks at the robustness of the model to other mechanisms. Section 7 considers grants to charities by governments or foundations as leadership gifts. Section 8 concludes.

2. Background

There is a small but growing literature on the institution of fund-raising. One attempt to explain leadership giving in fund-raising is based on an assumption of increasing returns. Suppose that a charity cannot operate unless it is of a sufficient scale. For instance, a public radio station needs to buy expensive equipment before it can begin to broadcast. These increasing returns can

cause an equilibrium to exist at zero contributions. Andreoni (1998) posits that leadership givers can provide enough "seed money" to assure other givers of surpassing the threshold in the public fund drive stage, thus eliminating the zero equilibrium.[4]

Harbaugh (1998) considers a model in which bigger gifts impart more prestige to the giver. By reporting gifts in carefully selected categories (such as the "$1000–$2000 donors club") a charity can push people to "round up" their contributions to get into higher prestige groupings. This model can explain the predilection of charities to report most gifts in categories. It also suggests that there should always be a separate category for the single highest contribution.

Romano and Yildirim (2001) assume that preferences exhibit a social effect such as a "snob appeal" that makes contributions of one person increasing in the contributions of another. Hence, a leader can expect others to follow in order to satisfy this competition for social approval. Glazer and Konrad (1996) assume that the charity provides a device for individuals to signal the value of their wealth. Bac and Bag (2003) discuss how a charity can strategically manipulate information about the number of potential donors to the charity, rather than information on the contributions per se. If there is a nonconvexity in the technology of producing the good, the charity may do better by keeping this number secret. Finally, Andreoni and Payne (2003) model continuing campaigns as devices for lowering search and transaction costs of donors, and show empirically that fund-raising responds to government policy.

Recent experimental research has also examined aspects of fund-raising. List and Lucking-Reiley (2002) provide evidence from a field experiment showing that leadership gifts, which they call seed grants, have a major effect on donations. List and Rondeau (2003) replicate this in a lab experiment. Andreoni and Petrie (2004) show that the practice of providing recognition and identification of givers matters greatly in increasing donations in the laboratory.

The paper in the literature most related to this paper is by Vesterlund (2003). She asks why charities announce donations, especially the first donation. Models of sequentially provided public goods indicate that, at best, such a practice is unimportant and, at worst, will *reduce* the equilibrium donations to the public good (Varian 1994). Vesterlund assumes that charities will have hidden qualities—either high or zero—that can only be known to people who pay a cost to learn them. Charities then select one of the givers to move first, and make the strategic choice of whether to announce this person's contribution. She derives an equilibrium in which both high- and zero-quality charities will choose to announce contributions, givers will pay to be informed about

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[4]Note also that the increasing returns can also be created from social rather than physical constraints. For instance, it would reflect badly on organization to fail to reach its intended campaign goal, and the leadership givers can provide the assurance that givers will not be part of an embarrassing failure.

the quality, and a positive contribution by the first giver will reveal the good to be of high quality to subsequent givers. If a charity refuses to announce the first gift, people will accurately infer that such a charity is of the zero quality. Potters, Sefton, and Vesterlund (2001, 2005) confirm the implications of this theory experiments on sequential giving.

This paper builds on the important work of Vesterlund, with two significant variations. First, the quality of the public good can take on one of several positive values. This is not a trivial difference. Allowing a public good of a "low" but positive quality creates an extra dilemma for signalling by the first mover. A leader who observes low quality would like to fool all others that the quality is actually "high," thus encouraging them to give more.[5] As shown below, the only way to distinguish that the quality truly is high is to give an exceptionally large gift. These exceptionally large leadership gifts, which are characteristic of actual leadership gifts, are not a feature of any prior model.[6]

The second addition in the model to follow is that the leader is not selected exogenously or by charity, but emerges voluntarily and, as with real leaders, is relatively rich.[7] The need to send a signal of the high quality creates a second public good that is discrete and can be provided by a single person. The selection of the richest person as the leader then draws the results of Bilodeau and Slivinski (1996a) and Bliss and Nalebuff (1984) on dragon-slaying—the rich have lower opportunity cost of purchasing the information on the charity and, thus, provide the signal of quality. We specify the model next.

3. The Model

Assume there is a continuous public good, such as a college building, park, swimming facility, sports arena, or a monument that is proposed to be built with private donations. The more money collected for the good, the bigger, taller, or grander the good can be. Once the good is built, it will last forever and cannot be (easily) improved. Donations are collected in one period to build the good. Consumption of the good begins in the following period and only then is the true quality revealed to all.

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[5]Note, when quality can only be either high or zero, there is no reason to fool others to give to a zero-quality good. This is not true if the lower quality is positive.

[6]Note that the model used here differs from dynamic models of giving to public goods by Admati and Perry (1991), Marx and Matthews (2000), and Compte and Jehiel (2003). These models explore a discrete rather than continuous public good, and they do not consider any incomplete information. Hence, while these models have first movers, no new information is conveyed by this action so they do not lead in the sense of "setting the tone" for future givers. Moreover, these models do not select the first mover endogenously.

[7]I also view this as adding realism. Even if the charity approaches a giver, this person must consent to participate in the game. Hence, while Vesterlund (2003) shows that charities will favor asking the rich first, the current paper shows why they would consent to being asked.

Assume that the true quality can be learned in advance, however, by paying a cost. For instance, a person can inspect the blue-prints for the building, survey the building site, study the construction bids, review studies of traffic through the building, and consider the projected benefits of the good. The problem is that conveying this information credibly is difficult. Whoever is informed has an incentive to lead others to believe that the good is of higher quality than it truly is. The reason is that if others believe the quality is high, then they will give more to the good, from which everyone will benefit. While each person would want the others to be deceived, if people can infer the truth from the actions of the informed person, then they will act upon it. As a result, the informed person must send a credible signal of the true value through her gift.

In this model, we will refer to the informed person as the leader, and the rest of the population as the followers. The leader is the person who chooses to become informed and then signals the quality of the good through her donation. But note the dilemma: If the quality of the good truly is high, then the leader not only has to pay the cost of the information, but also has to make an extra-large gift to convey that the quality is high. Therefore, each person would rather someone else be the leader, and that this leader emerge immediately.

Consider an economy of n individuals that lasts until some finite time T. For simplicity, we will ignore any discounting. Let α index the unknown quality of the public good. In order for individuals to require information on the value before building the good, we need to assume that there are values of α that would deter building. Hence, for simplicity assume that the quality $\alpha \in \{\alpha_0, \alpha_\ell, \alpha_h\}$, where $\alpha_0 < \alpha_\ell < \alpha_h$. Each quality α_k occurs with probability p_k and $p_0 + p_\ell + p_h = 1$. We assume that when $\alpha = \alpha_0$, everyone would prefer that the public good *not* be provided. When $\alpha = \alpha_\ell$, the quality is good enough that everyone prefers the public good be provided, but at a low level. When $\alpha = \alpha_h$, the good is of high quality and everyone prefers a high level of provision.[8]

Let $c > 0$ be the cost of obtaining the information on quality. All of the results we present will follow even for extremely small values of c. However, it is also essential that this cost not be zero. If information were free, then there would be no need for signals or leaders.

Next, assume that the probability that $\alpha = \alpha_0$ is sufficiently high and the cost c is sufficiently small that no one will be willing to provide the public good without first having information about the quality of the good. This

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[8]We are assuming here that government intervention to require charities to self-report α would be impossible or ineffective. However, if charities can misreport α and if enforcement is imperfect, then we would be back to situation assumed in this model. But even if full enforcement were possible, it may not be desirable. It is shown later that efficiency can be enhanced with incomplete information. Under a signalling equilibrium and high quality, the level of provision of the good will exceed the full information case.

assumption, which is easily met in the model, is necessary to have the interesting result that people will require information before giving, rather than giving on the chance that $\alpha \neq \alpha_0$. We later (see subsection 3.4) state this assumption precisely in a way that is sufficient to derive the signalling equilibrium of interest. As we show, a stricter assumption that guarantees this condition is simply that c is small relative to the income of the richest person.

Let x be the composite private good and G be the public good. The public good is produced from the private good on a one-for-one basis through private gifts. Let g_i be the contribution by person i. Then $G = \sum_{i=1}^{n} g_i$ is the total supply. Each individual is endowed with income m_i and faces a budget $x_i + g_i = m_i$. For simplicity assume that m_i is the same each period for person i, and that individuals are prohibited from borrowing.[9] In addition, we add the simplifying assumption that no two individuals have the same income.[10]

Finally, assume individuals have identical preferences. Define utility as $U_i = U(x_i, G; \alpha)$. Although all of the results presented will follow with the assumption that $U(x_i, G; \alpha)$ is strictly quasi-concave and both goods are normal, it will be convenient to assume that preferences are separable. In particular, assume $U(x_i, G_i; \alpha) = u(x_i) + v(G; \alpha)$, where $v(0; \alpha) = v(G; \alpha_0) = 0$, and u and v are both strictly concave functions. These assumptions are sufficient to imply that both x and G are normal goods. In addition, assume that $\partial v / \partial \alpha > 0$ and $\partial^2 v / \partial G \partial \alpha > 0$, that is, higher quality increases both total and marginal utility of G. This final assumption will provide the "single-crossing condition" to be applied later.

Note that preferences do not exhibit a warm-glow from giving and that no prestige is bestowed on givers. Certainly these are both important and will be considered later.[11] As we will show, however, both motives only strengthen the findings.

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[9]The lack of borrowing is assumed for simplicity. The ability to reallocate consumption across periods will preserve the relative costs in utility terms across individuals necessary for the result. The main effect of allowing borrowing will be to increase the level of free riding and concentrate giving among those with larger lifetime wealths. It also heightens the neutrality results in a way similar to that described by Bernheim and Bagwell (1988). Both of these troubling aspects of the modeling are counteracted once we generalize the model to include a warm-glow of giving, as we do in a later section. Since the warm-glow model has been shown to be more realistic, we beg tolerance of these assumptions now in appreciation of the generalization to come.

[10]Again, this is stronger than is necessary but greatly eases exposition. Accounting for the possibility that two individuals have the same income means that in equilibrium there may be a tie for who will be the leader. The literature on war-of-attrition models explores this generality. The result of doing so here would not make any meaningful changes in the insights of the model. For that reason, we will ignore the possibilities of ties.

[11]Amusingly, *The Nonprofit Handbook: Fundraising* says that a capital campaign "can be compared to fine cognac: Both should leave a pleasant taste, a warm glow, and generate good feelings about the future" (Lawson 2001, p. 780).

3.1. Timing

The timing of the provision can be broken into three stages. First is the time before the good is built or contributions are made. In this stage individuals consume their endowments m_i but no public goods, hence $U_i = u(m_i)$.

Second is the period in which the donations for building the public good are collected. We assume that all the fund-raising is done in one period and that only in the periods after the fund-raising will the public good be consumed. Thus, during the fund-raising period, utility will be $U_i = u(m_i - g_i)$. This assumption is also made for simplicity. With convex preferences it may be better for individuals to spread fund-raising out over several periods. What is essential is that only after all the funds are collected can the public good begin to be consumed. Forcing all the fund-raising to one period simply saves writing down many summations across the fund-raising periods.

The third stage is after the fund-raising has finished and the public good is generating services. In this stage no additional gifts are made, thus $U_i = u(m_i) + v(G; \alpha)$. Only in this stage is the true quality revealed to all.

3.2. The Level of Public Good Provision

Suppose that at time t the true quality of the public good were revealed to all. Assuming α is either α_ℓ or α_h, how much G will be provided in equilibrium? Let $G_{-i} = \sum_{j \neq i} g_j$ be the contributions of all others. Assume all individuals choose g_i in a simultaneous play Nash equilibrium environment, taking G_{-i} as given. Then each individual i solves

$$\max_{g_i} u(m_i - g_i) + (T - t)[u(m_i) + v(g_i + G_{-i}; \alpha)].$$

This yields the first-order conditions

$$u'(m_i - g_i) = (T - t)v'(G; \alpha). \tag{1}$$

Invert $u'(\cdot)$ in Equation (1) and rearrange to get

$$g_i = m_i - u'^{-1}((T - t)v'(G; \alpha)),$$
$$= m_i - \phi(G, T - t; \alpha), \tag{2}$$

where ϕ takes on the same value for all i. Sum Equation (2) across all i to get

$$G = \sum_{i=1}^{n} m_i - n\phi(G, T - t; \alpha)$$
$$= M - n\phi(G, T - t; \alpha), \tag{3}$$

where n is the number of givers and $M = \sum_{i=1}^{n} m_i$. This equation implicitly defines the unique Nash equilibrium.[12] Call this solution G^* and the equilibrium vector of contributions $(g_1^*, g_2^*, \ldots, g_n^*)$. By concavity of u and v, it is easy to verify that $\partial \phi / \partial G > 0$, $\partial \phi / \partial \alpha < 0$, and $\partial \phi / \partial (T - t) < 0$. This then implies that, in equilibrium $\partial G^* / \partial \alpha > 0$, $\partial G^* / \partial (T - t) > 0$, $\partial G^* / \partial M > 0$, and $\partial G^* / \partial n > 0$, that is, the level of the public good is increasing in quality, time left to consume it, income of society, and the number of givers. We can also see a simple artifact of the assumptions of identical preferences: since G will be the same for all in equilibrium, the first-order conditions (1) indicate that private consumption, $m_i - g_i$, will be identical as well.

Rather than knowing the true quality, it could be that people only know that $\alpha \neq \alpha_0$, that is, that the public good is good enough to build, but that it may be of either high or low quality. Let $p = p_\ell / (p_\ell + p_h)$ be the probability that the good is of low quality, given that $\alpha \neq \alpha_0$, leaving $1 - p$ to be the probability of high quality. Then the first-order conditions (1) would be rewritten

$$u'(m_i - g_i) = (T - t)[p v'(G; \alpha_\ell) + (1 - p) v'(G; \alpha_h)].$$

Call the (unique) Nash equilibrium solution to this problem $\tilde{G}_t = \sum_{i=1}^{n} \tilde{g}_{it}$. Then it follows trivially from concavity of $u(\cdot)$ and $v(\cdot)$ that $\tilde{g}_{it}$ will fall between the contributions in the high and low states as long as $0 < p < 1$.

Finally, we need to assume that $U(m_i - g_{it}^h, G^h; \alpha_\ell) > U(m_i - g_{it}^\ell, G^\ell; \alpha_\ell)$, that is, there is enough free riding that people would always prefer the public good to be provided at the high level, even if the quality is low. This assumption is necessary because of the simplification to three qualities. If quality were a continuous variable there would exist natural assumptions to guarantee that there would always exist a set of quality levels below α_h such that individuals would prefer that everyone is fooled into giving the amount corresponding to G^h. Hence, we add this assumption here to retain this interesting feature of the world that we are trying to capture in the model.

Note that since the public good is durable and time is finite, with each passing period the present value of the utility flow from the public good decreases. This means there may reach a time when the public good is no longer demanded if it has not already been built. We will assume that this will happen at some time $\bar{t}$, and that $\bar{t} < T$.

3.3. Signaling Quality

The two main questions for this model are (1) who will become informed and lead the economy to provide the public good, and (2) when will the leader emerge? To answer these questions, first suppose that the true quality is α_k, $k = 0, \ell, h$, and that this becomes known to all in period t. Let g_{it}^k and G_t^k indicate

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[12]Uniqueness of the Nash equilibrium follows trivially from the assumptions of concavity of $u(\cdot)$ and $v(\cdot)$.

the equilibrium levels of public goods for each k. Then, under complete information about quality our assumptions indicate that $g_{it}^0 = G_t^0 = 0$ for all i and t, that $g_{it}^\ell \leq g_{it}^h$ (although $g_{it}^\ell < g_{it}^h$ whenever $g_{it}^h > 0$) and $G_t^\ell < G_t^h$ for all i and $t < \bar{t}$. Now return to the case of incomplete information. Suppose person i becomes informed of the true quality α. If $\alpha = \alpha_0$ then the person can credibly announce the true quality and back it up with $g_{it} = 0$. If $\alpha = \alpha_\ell$ then the person can once again credibly announce that quality is α_ℓ and back it up with $g_{it} = g_{it}^\ell$. Now suppose that $\alpha = \alpha_h$. If the person announces quality α_h and gives g_{it}^h this action will not be credible. The uninformed followers would reason that if the true quality were α_ℓ, not α_h, then person i could benefit by deceiving all of the followers to believe quality is higher than it is. Hence, they will require an even higher contribution than g_{it}^h from person i before they believe that the $\alpha = \alpha_h$. Call this higher contribution $\hat{g}_{it}$.

We now turn to finding $\hat{g}_{it}$. This will be the level of giving by the leader that will make him no better off than truthfully revealing the quality in the event that $\alpha = \alpha_\ell$.

Given that someone has purchased the information on the quality, there are two possible types of equilibria in which the good is provided. First is a separating equilibrium in which the true quality, α_ℓ or α_h, is revealed. The second is a pooling equilibrium in which no credible information of high quality is revealed.

For ease of notation, define the following:

$$V_i(g_i, G; \alpha) = u(m_i - c - g_i) + (T - t)[u(m_i) + v(G; \alpha)].$$

Then for the separating outcome to occur, the following two expressions must be satisfied by the leader who signals with a gift of $\hat{g}_{it}$ when $\alpha = \alpha_h$:

$$V_i(g_{it}^\ell, G_t^\ell; \alpha_\ell) \geq V_i(\hat{g}_{it}, G_t^h; \alpha_\ell), \tag{4}$$

$$V_i(\hat{g}_{it}, G_t^h; \alpha_h) \geq V_i(g_{it}^\ell, G_t^\ell; \alpha_h). \tag{5}$$

These are the usual incentive constraints from signaling models. Equations (4) and (5) indicate that sending the signal that matches the state is the optimal choice to make. The assumption made earlier that $\partial^2 v/\partial G\partial \alpha > 0$ serves here as the single-crossing condition. It implies that (5) will never bind when (4) is binding. If followers have the reasonable beliefs that any other out-of-equilibrium choices correspond to the low-quality state, then the separating equilibrium is a sequential equilibrium.

Assuming separating is possible, then $\hat{g}_{it}$ is defined by making condition (4) binding. Substituting the definition for $V(\cdot)$ and rearranging, we find

$$(T - t)[v(G_t^h; \alpha_\ell) - v(G_t^\ell; \alpha_\ell)] = u(m_i - c - g_{it}^\ell) - u(m_i - c - \hat{g}_{it}). \tag{6}$$

From here we ask, how does $\hat{g}_{it}$ change across individuals of differing incomes? That is, if person $j \neq i$ were informed, what would be the signal $\hat{g}_{jt}$ he would send? Note that the left-hand side of expression (6) is independent of who is the leader. Moreover, recall that the first-order condition implies that

in the low-quality state the consumption of the private goods will be identical for all givers in equilibrium. Hence, $u(m_i - c - g_{it}^\ell) = u(m_j - c - g_{jt}^\ell)$ for all i and j who are givers. It follows that $u(m_i - c - \hat{g}_{it}) = u(m_j - c - \hat{g}_{jt})$ as well. That is, private consumption after the signal of quality is identical for all who would be leaders. However, it will be true that in the state $\alpha = \alpha_h$, the leader will clearly be worse off than had she been a follower in that period and spent only g_{it}^h on the public good. That is, $\hat{g}_{it} + c > g_{it}^h$.

Equation (6) also reveals a very important relation that will be useful later. Suppose person k is the leader. Since $u(m_i - c - \hat{g}_{it})$ is identical for all i who might be leaders, we can rearrange (6) to get

$$u(m_k - c - \hat{g}_{kt}) = u(m_i - c - g_{it}^\ell) - (T - t)[v(G_t^h; \alpha_\ell) - v(G_t^\ell; \alpha_\ell)].$$

$$= \bar{u}_t.$$

Solving for $\hat{g}_{kt}$, we get

$$\hat{g}_{kt} = m_k - c - u^{-1}(\bar{u}_t)$$

$$= m_k - \bar{m}_t,$$

where $\bar{m}_t = c + u^{-1}(\bar{u}_t)$. That is, whomever is the leader in time t signals by giving all his income above $\bar{m}_t$. What happens in the subsequent equilibrium among followers then $\hat{g}_{kt}$ is given? Let $G' = \sum_{i \neq k} g_i$. Then going back to the first-order conditions (2) we have, for $i \neq k$,

$$g_i = m_i - \phi(G' + m_k - \bar{m}_t; \alpha),$$

so that summing across followers give the equilibrium G' as

$$G' = \sum_{i \neq k} m_i - n\phi(G' + m_k - \bar{m}_t; \alpha).$$

Writing total giving as $G = G' + m_k - \bar{m}_t$, then this equation is transformed to

$$G = \sum_{i=1}^{n} m_i - \bar{m}_t - n\phi(G; \alpha)$$

$$= M - \bar{m}_t - n\phi(G; \alpha). \tag{7}$$

This now reveals that the equilibrium level of giving is independent of who (at time t) provides the signal. This will greatly simplify subsequent analysis.

How will the signaling equilibrium differ from a full-information equilibrium? Assuming c is small enough so that $\hat{g}_{it} > g_{it}^h$, then it is easy to show that there will be more public goods when $\alpha = \alpha_h$ is learned through a signal than if it were commonly known. However, because $c > 0$, the signaling outcome when $\alpha = \alpha_\ell$ will be slightly lower than under full information. It is also easy to show, however, that if the number of givers is large, then G in the signaling and full-information equilibria will be almost identical, since for a given α the equilibrium G has a finite asymptote in n (Andreoni 1988). For this reason,

we will economize on notation by not differentiating between g_{it} achieved from signaling or from full information.

Finally, we must address the possibility of equilibria besides the one just described. As is typical with sequential equilibria, there are a continuum of equilibria that could result in separating with signals $\hat{g}'_{it} > \hat{g}_{it}$. However, standard application of the Cho and Kreps (1987) intuitive criterion can rule these out. A more complicated issue arrises in the event that p_h is high relative to p_ℓ, so that $V_i(\tilde{g}_{it}, \tilde{G}; \alpha_h) \geq V_i(\hat{g}_{it}, G^h_t; \alpha_h)$, that is, a leader who gets either the low or high (but not zero) quality signal would prefer to simply send a signal that $\alpha \neq \alpha_0$ by, for instance, giving $\tilde{g}_{it}$. While we can eliminate this "partial pooling" outcome using the Cho–Kreps criteria, it does not satisfy the more stringent Grossman and Perry (1986) criterion. Hence, it is possible that the leader in our model would only signal that the good is worth providing without revealing whether it is of high or low quality.[13] As we show below, the lead giver would still be the richest individual, but the gift would no longer be extraordinarily large. However, there is an argument to be made that could eliminate even this equilibrium, if we add one more assumption. In particular, assume that in the period of fund-raising that the leader cannot commit to giving only one time. That is, after making his initial leadership gift, he cannot commit not to give again in the general fund-raising stage. Vesterlund (2003) and Bilodeau and Slivinski (1998) have made arguments in similar models that such commitment is impossible. Then suppose a leader gave $\tilde{g}_{it}$ in order to entice the followers to collectively supply $\tilde{G}$. Then if $\alpha = \alpha_h$ he would have incentive to give again in the general fund-raising stage, while if $\alpha = \alpha_\ell$ he would not. Suppose that the followers observe that the leader gives nothing in the general fund-raising phase. Then they can infer that $\alpha = \alpha_\ell$ and give g^ℓ_{it}. However, if the leader does give in the general phase, they cannot infer that $\alpha = \alpha_h$ unless he raises his total gift to $\hat{g}_{it}$. Hence, any gift other than $\hat{g}_{it}$ in the leadership phase can be seen as revealing $\alpha = \alpha_\ell$. This leaves only the fully separating equilibrium as the most reasonable of the equilibria.

3.4. Who Will Lead and When?

We are now ready to determine who, in equilibrium, will be the leader and in what period she will lead. The result will follow the well-known war-of-attrition framework. In general, the equilibrium in war-of-attrition games is constructed as follows (see Fudenberg and Tirole 1991). The objective is to provide a discrete public good, which in this case is the signal of quality. The good, however, must be produced by only one person. There is total time T available to consume a public good, and so as time goes on there is less incentive for anyone to provide it. Everyone enjoys the good equally but individuals have different costs. Hence, in a given period, each person

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[13]See Riley (2001) for an illuminating discussion of these refinement issues.

would prefer someone else to provide the good. For each individual i there is a time t_i such that i would be indifferent between providing the good immediately or never having the good provided at all. The t_i will, obviously, be highest for the person with the lowest cost. The equilibrium is then solved backward. Suppose people are named so that $t_1 > t_2 > \cdots > t_n$, and that time t_2 is eventually reached. Person 1 would then provide the good immediately because there is nothing to be gained by waiting. But then in the time between t_2 and t_3 Person 2 has no incentive to be a leader. Hence, Person 1 should immediately provide the good at t_3. Repeating this logic, we get that Person 1 will, in equilibrium, provide the good immediately at time $t = 0$.

In moving our model toward this logical framework, we must first ask which individuals would be willing to give to the public good at a particular point in time. Any leader must come from this set. Recall, as shown in (2), that when α is known the givers will satisfy $g_i = m_i - u'^{-1}((T - t)v'(G; \alpha)) > 0$. Let $m(t, \alpha) = u'^{-1}((T - t)v'(G; \alpha))$. Then we can define the set of givers at time t and quality α as $N(t, \alpha) = \{i : m_i > m(t; \alpha)\}$. By concavity of $u()$ we know $\partial m / \partial t > 0$, and by the assumption that $\partial^2 v / \partial G \partial \alpha > 0$ we know that $\partial m / \partial \alpha < 0$. It follows that $N(t, \alpha_\ell) \subseteq N(t, \alpha_h)$, and for $t_a > t_b$ that $N(t_b, \alpha) \subseteq N(t_a, \alpha)$. That is, when the quality is higher the set of givers will be larger, and as time is later the set of givers will be smaller.

At any given time, not all members of $N(t, \alpha)$ will be willing to be the leader. For instance, if $m_i - c < m(t, \alpha) < m_i$, this person would give as a follower but would not act as a leader. In addition, the leader faces the risk that $\alpha = \alpha_0$. So, next we ask, who would be willing to take this risk if the alternative is that the public good would never be provided?

To construct the equilibrium, first rank individuals by income and rename them such that $m_1 > m_2 > \cdots > m_n$. To get the desired result, we need to establish that it is possible to reach a point in time at which only one person is willing to be the leader. When we identify that one person, then we can show that in equilibrium, that person will be the leader. As indicated, that person will be Person 1, the one with the highest income.

Imagine that enough time has elapsed so that there is only one person in the set of givers under the condition that $\alpha = \alpha_h$. From the results above on $N(t, \alpha)$, this would be Person 1, since m_1 is the highest: $N(t, \alpha_h) = \{1\}$. Furthermore, at this t the set $N(t, \alpha_\ell) = \emptyset$. Then we can ask, will Person 1 be willing to buy the information and supply the public good (in the event that $\alpha = \alpha_h$) when he is the only person in the set of givers? The answer is yes if

$$p_h\{u(m_1 - c - g_{1t}^h) + (T - t)(u(m_1) + v(G_t^h, \alpha_h))\}$$
$$+ (1 - p_h)\{u(m_1 - c) + (T - t)u(m)\} \geq (T - t + 1)u(m_1),$$

where $G_t^h = g_{1t}^h$ when 1 is the only giver. Rearranging, this condition will hold if

$$p_h\{u(m_1 - c - g_{1t}^h) + (T - t)v(G_t^h, \alpha_h) - u(m_1 - c)\} \geq u(m_1) - u(m_1 - c).$$
$$(8)$$

Note that if $c = 0$ and $p_h > 0$ then this condition (8) holds automatically—the left-hand side is positive by the definition of being a giver, and the right-hand side is zero. Thus for c small there exists is a time at which only Person 1 is willing to be a leader.

What if at this time the condition (8) is not satisfied? It is easy to establish that, in equilibrium, the left-hand side of (8) is decreasing in t. Hence, if we move back in time, the left-hand side of (8) will become higher. Find the t, say t_1, such that (8) is satisfied with equality. At this time there will be other people besides Person 1 in the set of givers. However, if any of them are possible leaders, then our earlier results show that in equilibrium $m_i - c - g_{it}^h$ will be the same for all i who are leaders, and G_t^h will also be the same. Taking the derivative of (8) in equilibrium, we find that at t_1 Person 1 will be the only leader if

$$\frac{u'(m_1)}{u'(m_1 - c)} > 1 - p_h. \tag{9}$$

This is the condition on p_h and c alluded to earlier in the paper. It states that if, jointly, c is not "too big" and p_h is not "too small" then we will reach a point in time in which only the richest person is willing to be a leader. Note, however, that if m_1 is very high relative to c, which is the situation we have in mind for this model, then $u'(m_1)/u'(m_1 - c) \approx 1$, and condition (9) is satisfied automatically.

In the process of backing up time until Person 1 is willing to be a leader, it is possible that time could unwind to the extent that Person 1 and others are willing to provide the good at the low level as well, that is $N(t_1, \alpha_\ell) \neq \emptyset$. An exercise just like that presented above would lead to a similar conclusion. This time, however, we would say that we reach a time at which Person 1 is the only leader if this condition is satisfied:

$$\frac{u'(m_1)}{u'(m_1 - c)} > p_0. \tag{10}$$

Again, this will hold trivially if m_1 is high relative to c. Hence, we make the final assumption we need to solve our model, that the relevant condition (9) or (10) holds. These will both hold with the stronger but more intuitive assumption that m_1 is large enough relative to c so that $u'(m_1)/u'(m_1 - c) \approx 1$.

3.5. The Equilibrium

We have now shown that there will exist a time at which only the richest person will be willing to be the leader. As such, our equilibrium for the war-of-attrition result is satisfied. In equilibrium, therefore, the richest person in the economy will always be the leadership giver. If she learns that the quality is high, $\alpha = \alpha_h$, then she will not only give first but will give an extra-large

contribution to signal the high quality. If those with lower incomes see no giving by the richest person, then they will infer that Person 1 has indeed inspected the quality and determined it was poor.

4. Warm-Glow and Prestige

It has been argued elsewhere (Andreoni 1988, 1993) that individuals act as if they care for more than simply the level of the public good, but act as though they also gain some direct benefit from their contribution. This has generally been called the "warm-glow" of giving (Andreoni 1989, 1990). It has also been noted that large givers and leadership givers may get rewards such as public praise in the form of certificates, press releases, or names on buildings. This kind of benefit from public recognition has been called "prestige" (Harbaugh 1998). In this section, we will argue that the effects found above also hold up to more realistic generalizations of the model that include warm-glow and prestige

Begin with warm-glow. Suppose individuals gain extra utility based on the size of their contributions, and that this extra utility enters linearly, such as $U = u(x_i) + v(G; \alpha) + \beta g_i$. In this case, all of the results above follow exactly and trivially. Suppose instead that warm-glow were not linear, but took the form $U = u(x_i) + v(G; \alpha) + w(g; \alpha)$, where $w(\ )$ is concave in g and $\partial^2 w / \partial g \partial \alpha \geq 0$. Then proving the results from above would become fairly complicated. In particular, the warm-glow would create income effects that are swept away in both the no-warm-glow and the linear-warm-glow models. These income effects, while cumbersome to manipulate, turn out to reinforce the findings shown above. Intuitively, the war-of-attrition logic selects the person with the lowest cost-benefit ratio to be the leader in equilibrium. The result above showed that the richest individual has the lowest cost (in lost utility) of buying the information on the quality of the good, while the benefits are the same for all. When we add the warm-glow, this increases the benefits of giving to the public good for everyone, but increases it the most for the rich since they make the largest donations. Hence, the warm-glow skews the cost-benefit ratio even more favorably toward the rich, which again selects the richest person to be the leader.

Similar reasoning follows for prestige since we can interpret $w(g; \alpha)$ above as the utility of praise that the charity heaps on givers.

5. Heterogeneous Costs

A simplifying assumption from above is that the cost of learning the true quality is the same for all individuals. In reality, costs will vary as some individuals have greater expertise at discerning the quality of the project. This fact will obviously weaken the conclusion that the richest person will always be the leader. Instead the leader will be chosen on the basis of some combination of m_i and c_i. If m_i and c_i are uncorrelated but publicly known, then

we can only say that the wealthy are more likely to be leaders. Could income and costs be systematically related? One reasonable expectation is that those with higher incomes are more likely to have good educations, hence some expertise for evaluations, or to have contacts with experts who can help provide good evaluations, which would lead c_i to be lower for those with higher incomes. If m_i and c_i are negatively correlated, as this reasoning suggests, then the result again emerges and the wealthiest person will always be the leader.

An alternative generalization is that costs differ asystematically, and the difference in costs is private information. Suppose, for instance, that $c_i = c + \varepsilon_i$, where $\varepsilon_i \in [\underline{\varepsilon}, \bar{\varepsilon}]$ is a zero-mean random term, and that ε_i is only observable by i. As a result, no one can be sure that she has the highest t_i and should thus be the leader. What will be the prediction of this model?

The formal answer to this is complicated enough to merit an entirely separate paper. However, the structure provided in Section 3 can be combined with previous results to give an intuitive explanation of the solution. Fudenberg and Tirole (1991) provide a solution to a war-of-attrition problem under incomplete information about costs.[14] The Bayesian–Nash equilibrium to such a game is that each individual adopts a strategy of waiting until a time t_i' before moving. The critical t_i' is increasing in the benefit-cost ratio faced by i. If no one else has moved before time t_i', then person i infers (correctly) that she has the lowest cost, at which point she moves immediately.[15]

We can expect a similar result in this model of fund-raising and leadership giving. With unknown costs there will be a delay in providing the leadership gift, as people wait for time to reveal who actually has the lowest cost. However, the richer the individual, the lower the expected utility-cost. Hence, in equilibrium the war-of-attrition waiting game will be played out among the richest few.

Note that the finding that privately known costs will generate delays suggests an explanation for why there is often more than one leadership giver, but rather several in a group who agree to give as a unit. Imagine a fund-raiser who wants to reduce the waiting time until a leader emerges. The fund-raiser can gather a subset of wealthy individuals which likely contains the ultimate leader, and can conduct a game among them to learn the costs. For instance, everyone in the group could agree to pay c_i independently, could subsidize a single member of the group to learn α, or even find a cost-sharing arrangement for learning α. Upon becoming leaders, the appropriate signal must still be sent to the followers, but with this "group-leadership" the time for providing the good can be greatly accelerated. A careful theoretical analysis of this idea could be valuable.

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[14] See also Bliss and Nalebuff (1984).

[15] We must assume that a leader who discovers that $\alpha = \alpha_0$ announces this publicly to prevent others from paying c again in the future.

6. Other Strategic Manipulations by Leaders

Here we briefly examine two alternate strategies by leaders. First, can the leader instead offer to pay for the inspection cost for other individuals? That is, if c is small, could the rich person find it cheaper to pay the c for all other people, creating a situation in which quality α is known to all, rather than make and extra-large gift to signal the quality?

A possible answer is that people would refuse to take the offer, choosing instead to remain ignorant about the quality. The value of remaining ignorant is that it forces someone else to send a signal through a large gift. This means the uninformed person will give less than if he were informed, making him strictly prefer ignorance to information. In fact, the subsidy that an uninformed person would require in order to actually purchase the information will exceed c, and the money necessary to bribe everyone to learn the quality would eventually exceed the cost of providing the signal directly. Hence, subsidizing the costs of followers cannot be an equilibrium.[16]

Second, we ask could the leader to announce a fake gift, one that the leader announces only to fool followers into donating more but which the leader has no intention of actually giving? If this were allowed then this could possibly destroy the signaling equilibrium modeled in the paper—if the leader could renege on the gift in a final stage, he almost certainly would. Given this possibility, followers might never trust a leader's announced gift. To prevent this the charity can actually collect the money and provide proof to followers. Alternatively, the charity can insist that donations are made by a legally binding contract. This is, in fact, the primary practice among charities. In the rare instances that donors have tried to renege, some charities have successfully sued donors to meet their pledge.

7. Government or Foundations as Leaders

We often observe government seed grants to charities. Similarly, private foundations also provide seed money to private initiatives to build public goods. Can these be understood within our model as signals of quality?

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[16]This can be seen in this example. Suppose the signaling cost of the leader averaged $10 per follower, but the cost of becoming informed is only $.01 per person. In the signaling equilibrium, each follower will be reducing his contribution to the public good by slightly less than $10. If income effects are small, then individuals are going to be consuming slightly more public goods and almost $10 more in private goods. This means that the bribe required to get individuals to learn the information on quality would be at least $10 each. In fact, it will be larger since by having everyone pay c, money that used to go toward the public good is now being wasted on duplicate information gathering. As a result G will be lower than under the signaling equilibrium, and even lower than under the full-information equilibrium. Hence, there will never be an equilibrium in which a wealthy informed person would pay others to become informed rather than to provide the signal directly.

Recall that a necessary input into our model is that under complete information there will be free riding and under-provision of the good. As a result, everyone would prefer to be fooled into believing that a low-quality public good really is of high quality. This is what leads to the need for a signaling equilibrium, and the extra-large gift by the leader. The signal is credible because the leader wants to free ride as well.

Given that the government and the private donations have competing uses for their dollars and a fixed budget to spend, they are in exactly the same situation as our private leadership givers. By making a very large gift to seed the project they can signal that this is in fact a high-quality project that deserves support. Hence, governments and private foundations can indeed offer a leadership "stamp of approval" that allows a private fund drive to be successful (Payne 2001).

This point may be one of the most important implications of this model for policy purposes. Suppose, for instance, there is delay in the emergence of a leader. Then this creates an inefficiency. Alternatively, it is possible in the model that the gains from the public good are so high that the leadership contribution required to separate high from low quality is not affordable, so the only equilibrium provides no public goods. In both these cases either the government or a private foundation can establish an unbiased and selective grants processes to award leadership gifts to charities, and in doing so increase efficiency. Indeed, this is often the explicit purpose of many government grants programs.[17] And as stated in the introduction, many private foundations are adopting this position as well.

8. Challenge Grants from Leaders

An increasingly popular avenue for leadership giving is to provide "challenge grants," that is, pledged gifts from a leader that will be fulfilled only if the followers collectively give a stated amount, usually several times the leadership pledge. The Kresge Foundation, for instance, has adopted a policy of giving leadership gifts that require some match, often two dollars per dollar of grant.[18] How would this change the analysis of this paper?

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[17]For instance, the National Endowment for the Arts publishes guidelines for grant proposals that state, "All grants require a match of at least 1 to 1. For example, if an organization receives a $10,000 grant, the total project costs must be at least $20,000 and the organization must provide at least $10,000 toward the project from nonfederal sources."

[18]See the Kresge Foundation Annual Report, 2000. The program is described this way: "Grants generally require matching funds to be raised before payment is made. It has been the Foundation's experience that substantially all grantees meet the matching requirement. Accordingly, grants are considered unconditional and recorded as expense in the year approved. Grants approved in 2000 and 1999 are net of cancellations of $675,000 and $1,750,000, respectively. Grants payable are reported at net settlement value which approximates present value. Grant payments in 2000 and 1999 were $107,956,000 and $112,708,000, respectively."

Modeling such challenge grants would, of course, require a whole separate paper, but we can speculate here about some of the issues that arise with such a program. The first and foremost is the credibility of the threat to withdraw a grant if the goal of the general fund drive is not met. The Kresge Foundation, for instance, reported in the year 2000 that only 0.62% of the nearly $108 million dollars pledged in leadership grants were withdrawn for failure to meet the challenge. Moreover, the pledges are anecdotally described as often only partly withdrawn, and only after extensions of deadlines and much coaching and assistance to the recipient charities. Even then, the challenges may be reissued at more realistic levels in a future date.[19] If the threat to withdraw the grants is not credible, as this evidence seems to suggest, then they will likely be treated as binding gifts as the model presented assumes.

It does seem, however, that matching grants may be effective even if the threat of withdrawing them is not credible. Fund-raisers indicate that donors are often easier to motivate under the guise of a match. In addition, Eckel and Grossman (2003) find that matching gifts are a more effective form of subsidy than a rebate. As such, there may be behavioral or psychological reasons for exploring the potency of such matching or challenge schemes.

9. Conclusion

This paper set out to provide an economic foundation for the observation that charitable fund-raisers often rely on leadership givers, that is, typically wealthy individuals who give exceptionally large gifts at the starts of fund drives. The paper explored one popular explanation, that gifts can be a signal of the quality of the charitable good. Since the person sending the signal would rather all the followers think the quality is high—and thus give more to the good, which the leader enjoys—the leader must give an exceptionally large gift for the signal of quality to be credible. The game of providing the signal then reduces to a familiar war-of-attrition game. In these games the person with the lowest cost-benefit ratio is the one who provides the good immediately. In the model of charitable giving, assuming identical preferences, this is the person with the highest income.

Why is this result interesting and important? There are many normative studies about optimal institutions for provision of public goods. This is generally referred to as the mechanism design literature. By contrast, there are relatively few positive models of the institutions that actually exist for the private provision of public goods, that is, the institutions of fund-raising. If we understand fund-raising, we may be able to form better policies to encourage giving.

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[19]See Firestone, "Got a Match?"

One possible implication of this model of leadership giving is that not all dollars given to the charity have the same social value. In particular, the leadership donation is providing two public goods—first is the informational public good on the quality of the project and second is the project itself. Hence, the marginal social benefit of this gift is higher than the marginal social benefit of the first dollar of a follower's donation. It would be a mistake, however, to think that this would lead to higher subsidies to leadership giving. Since it is the leader's sacrifice that makes the signal credible, a subsidy to leadership would be ineffectual or even counterproductive. However, there may still be a role for government. In particular, heterogeneous costs lead to inefficient delays in the emergence of leadership givers. Moreover, in some cases the required leadership gift may be higher than any donor is capable of paying, leading to an equilibrium with no giving. This means that there is a role for an independent agent, such as the government or a large private foundation, to act as the lead giver by providing start-up funds though a politically independent and selective grants process. As stated in the quote in the introduction, a foundation or government grant "legitimizes a fund-raising project and puts the institution on a much faster track," and in doing so overcomes a market inefficiency.

This paper has presented a positive model that can perhaps explain one facet of fund-raising, but there are many more aspects to the institution that are ripe for economists to study. Modeling both the demand and supply sides of charitable markets will help shape empirical investigations into matters of both practical and policy interest.

References

ADMATI, A. R., and M. PERRY (1991) Joint projects without commitment, *Review of Economic Studies* **58**, 259–276.

ANDREONI, J. (1988) Privately provided public goods in a large economy: The limits of Altruism, *Journal of Public Economics* **35**, 57–73.

ANDREONI, J. (1989) Giving with impure Altruism: Applications to charity and Ricardian equivalence, *Journal of Political Economy* **97**, 1447–1458.

ANDREONI, J. (1990) Impure Altruism and donations to public goods: A theory of warm glow giving, *Economic Journal* **100**, 464–477.

ANDREONI, J. (1993) An experimental test of the public goods crowding out hypothesis, *American Economic Review* **83**, 1317–1327.

ANDREONI, J. (1998) Toward a theory of charitable fund-raising, *Journal of Political Economy* **106**, 1186–1213.

ANDREONI, J., and A. A. PAYNE (2003) Do government grants to private charities crowd out giving or fund-raising? *American Economic Review* **93**, 792–812.

ANDREONI, J., and R. PETRIE (2004) Public goods experiments without confidentiality: A glimpse into fund-raising, *Journal of Public Economics* **88**, 1605–1623.

BAC, M., and P. K. BAG (2003) Strategic information revelation in fund-raising, *Journal of Public Economics* **87**, 659–679.

BERGSTROM, T. C., L. E. BLUME, and H. VARIAN (1986) On the private provision of public goods, *Journal of Public Economics* **29**, 25–49.

BERNHEIM, B. D., and K. BAGWELL (1988), Is everything neutral? *Journal of Political Economy* **96**, 308–338.

BILODEAU, M., and A. SLIVINSKI (1998) Rational nonprofit entrepreneurship, *Journal of Economics and Management Strategy* **7**, 551–571.

BILODEAU, M., and A. SLIVINSKI (1996a) Toilet cleaning and department chairing: Volunteering a public service, *Journal of Public Economics* **59**, 299–308.

BILODEAU, M., and A. SLIVINSKI (1996b) Volunteering nonprofit entrepreneurial services, *Journal of Economic Behavior and Organization* **31**, 117–127.

BLISS, C., and B. NALEBUFF (1984) Dragon-slaying and Ballroom dancing: The private supply of a public good, *Journal of Public Economics* **25**, 1–12.

CHO, I.-K., and D. M. KREPS (1987) Signalling games and stable equilibria, *Quarterly Journal of Economics* **102**, 179–221.

COMPTE, O., and P. JEHIEL (2003) Voluntary contributions to a joint project with asymmetric agents, *Journal of Economic Theory* **112**, 334–342.

ECKEL, C. C., and P. J. GROSSMAN (2003) Rebate versus matching: Does how we subsidize charitable contributions matter? *Journal of Public Economics* **87**, 681–701.

FUDENBERG, D., and J. TIROLE (1991) *Game Theory*. Boston, MA: MIT Press.

GLAZER, A., and K. A. KONRAD (1996) A signalling explanation for private charity, *American Economic Review* **86**, 1019–1028.

GROSSMAN, S., and M. PERRY (1986) Perfect sequential equilibrium, *Journal of Economic Theory* **39**, 97–119.

HARBAUGH, W. (1998) What do gifts buy? A model of philanthropy and tithing based on prestige and warm glow, *Journal of Public Economics* **67**, 269–284.

KELLY, K. S. (1997) From motivation to mutual understanding: Shifting the domain of donor research, in *Critical Issues in Fundraising*, D. Burlingame, ed. New York: Wiley.

LAWSON, C. E. (2001) Capital fund appeals, in *The Nonprofit Handbook: Fund Raising*, *Third Edition*, J. M. Greenfield, ed. New York: NSFRE/Wiley Fund Development Series.

LIST, J. A., and D. LUCKING-REILEY (2002) The effects of seed money and refunds on charitable giving: Experimental evidence from a university capital campaign, *Journal of Political Economy* **110**, 215–233.

LIST, J. A., and D. RONDEAU (2003) The impact of challenge gifts on charitable giving: An experimental investigation, *Economics Letters* **79**, 153–159.

MARX, L., and S. A. MATTHEWS (2000) Dynamic voluntary contribution to a public project, *Review of Economic Studies* **67**, 327–358.

PAYNE, A. A. (2001) Measuring the effect of federal research funding on private dona-
    tions at research universities: Is federal research funding more than a substitute
    for private donations? *International Tax and Public Finance* **8**, 731–751.

POTTERS, J., M. SEFTON, and L. VESTERLUND (2001) Why announce leadership
    contributions? An experimental study of the signaling and reciprocity hypotheses,
    University of Pittsburgh working paper.

POTTERS, J., M. SEFTON, and L. VESTERLUND (2005) After you—Endogenous
    sequencing in voluntary contribution games, *Journal of Public Economics* **89**, 1399–
    1419.

RILEY, J. G. (2001) Silver signals: Twenty-five years of screening and signaling, *Journal
    of Economic Literature* **39**, 432–478.

ROMANO, R., and H. YILDIRIM (2001) Why charities announce donations: A positive
    perspective, *Journal of Public Economics* **81**, 423–447.

VARIAN, H. R. (1994) The sequential provision of public goods, *Journal of Public
    Economics* **53**, 165–186.

VESTERLUND, L. (2003) The informational value of sequential fundraising, *Journal
    of Public Economics* **87**, 627–657.