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"Giving" in to social pressure [☆]

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A B S T R A C T

We develop a theory of charitable giving in which donors feel social pressure from a direct solicitation. We show that equilibrium donations are concentrated around a social norm. Despite a higher level of the public good, relatively poor and/or low altruism givers fare worse under social pressure and would avoid the solicitor at a cost. Aggregate donor welfare improves to the extent that the added social motive alleviates the underprovision of the public good; however, overprovision may result. Our theory therefore predicts a light-handed regulation for charitable solicitations, which is consistent with their exemption from the popular Do Not Call list in the U.S. We further show that contrary to pure altruism, a more equal income distribution may produce more of the public good. In fundraising campaigns where a social norm is not apparent, one may emerge endogenously if donors are not too heterogeneous.

1. Introduction

Why do people give money to charity? One hypothesis is that people feel altruistic toward its recipients. Recent evidence, however, suggests that giving is motivated mostly by social pressure and may lower donor's welfare: field experiments (Landry et al., 2006; Alpizar et al., 2008; Chen et al., 2010; DellaVigna et al., 2012; Lazear et al., 2012; Castillo et al., 2014; Conte, 2014; Andreoni et al., forthcoming), the lab (Andreoni and Petrie, 2004; Dana et al., 2006; Broberg et al., 2007; Andreoni and Bernheim, 2009; Ariely et al., 2009; Fong and Luttmer 2009; Reyniers and Bhalla, 2013), and the data (Meer, 2011; Meer and Rosen, 2011; Scharf and Smith, 2014).[1] To understand the evidence and its policy implications, we present an equilibrium theory of charitable giving in which donors experience social pressure from a direct solicitation. In doing so, we provide a possible microfoundation for the theory of warm-glow giving[2] (Andreoni, 1990) and complement the existing explanations of conformity in a giving context (Akerlof, 1980; Bernheim 1994; Benabou and Tirole 2006; Andreoni and Bernheim 2009; Dillenberger and Sadowski, 2012; Gillen, 2015).[3]

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[1] The presence of social pressure has also been identified in other contexts such as referee favoritism in soccer (Garicano et al., 2005), team work (Mas and Moretti, 2009), and voter turnout (DellaVigna et al., 2014).

[2] "Clearly social pressure, guilt, sympathy, or simply a desire for a "warm glow" may play important roles in the decisions of agents." (Andreoni, 1990; p. 464).

"These [papers] provide the needed evidence to turn this *ad hoc* fix [of warm-glow] into a solid foundation of human motivation." (Andreoni, 2006; p. 1223).

[3] These studies on conformity formalize the idea that heterogeneous agents might follow a single behavior or "norm" if they value social status enough. Akerlof's explanation relies on discontinuity in utility while the rest rely on signaling, with the exception of Dillenberger and Sadowski (2012) whose

We build on the standard, purely altruistic model of giving in which individuals care only about the provision of the public good and their private consumption (Bergstrom et al., 1986). Giving decisions are simultaneous and anonymous. To this model, we introduce a social motive as in DellaVigna et al. (2012): if solicited in person, the individual receives disutility to the extent that his contribution falls short of a social norm, which may, for instance, be based on past contributions or the fundraiser's suggested amount.[4] A unique (Nash) equilibrium is shown to exist in this extended setting.

Our equilibrium analysis reveals that social pressure results in donations that are concentrated around the norm: donors who would anonymously give below the norm increase their donations and, relying on this increase, donors who would give above the norm reduce theirs. On balance, the added social motive improves the total amount raised for the public good. Despite this direct benefit, some "social givers" who donate disproportionately fare worse than anonymous giving. In particular, with identical preferences, it is the least wealthy who are worse off and the most wealthy who are better off under social pressure. Clearly, if it were costless to avoid the solicitor, then no social giving would take place, rendering solicitations ineffective. When it is costly, however, the effective fundraising will target the middle income donors – those who would respond to social pressure but not avoid the solicitor. Extending this argument, we show that the provision of the public good grows (up to some limit) with the cost of avoiding the fundraiser. In other words, the increased social pressure alleviates the free-rider problem and in turn the underprovision of the public good; in fact, it may lead to overprovision. Our analysis therefore predicts that despite exerting social pressure, regulation of charitable solicitations is likely to be light-handed. This prediction is consistent with mild registration requirements for charities and their exemption from the popular Do Not Call list in the U.S.[5] It is also consistent with organizations' restriction – but occasional ban – on workplace solicitations.

The fact that social pressure countervails the free riding incentive may also reverse the well-known effect of an income redistribution on the provision of the public good. As proved by Bergstrom et al. (1986), all else equal, an income transfer from contributors to noncontributors lowers the provision in the standard model. We demonstrate that the same transfer increases the provision if donors worry sufficiently about social pressure. This reversal in conclusion is important for policy because directly asking donors is viewed to be the most effective fundraising tool (Andreoni, 2006; Edwards and List, 2014); as such, social pressure is likely to be present in most charitable campaigns. This view is further confirmed by our investigation of mass campaigns. We establish that although donors may carry both altruistic and social motives to give, positive contributions must be purely social in a limit economy. The intuition is that in a limit economy, any remaining altruism – or concern for the charitable output – would create severe enough free riding to drive one's contribution to zero.[6] We further establish that if the social motive is sufficiently strong, all donors conform to the norm despite their heterogeneity.

In our base model, the social norm is fixed; perhaps, as mentioned above, it is set by past contributions or the fundraiser's suggested amount. Even without an apparent norm though, people may experience social pressure since at least the solicitor observes their donations. We find that if donors are not too heterogeneous, they all give the same – average – amount in equilibrium; in fact, multiple equilibria are possible. Our analysis therefore offers an endogenous theory of conformity in a giving context as well as a focal point argument for suggested donations. We predict that fundraisers with less heterogeneous donor bases such as colleges and religious organizations are more likely to make suggestions.[7]

Our theoretical results are in line with the evidence. In their door-to-door fundraising experiments, DellaVigna et al. (2012) estimate that given the opportunity, 9 to 25% of the households avoided the fundraiser, which reduced total giving by 28 to 42%, especially by those who previously contributed less than $10. They also estimate that 75% of solicetees have no altruism toward the charities in question and conclude that door-to-door fundraising campaigns, on average, lower donor welfare. In a field experiment during the Salvation Army's annual campaign, Andreoni et al. (forthcoming) also found dramatic avoidance (and very rare seeking) of the solicitors during a direct ask. Furthermore, asking increased donations by 75%. Since these field experiments involve a relatively large number of donors, we believe that their estimates accord well with our limit results. We predict less avoidance (as a fraction of population) in lab experiments and workplace solicitations. As for our conformity results, Shang and Croson (2009) and Edwards and List (2014) observe that donations revolve around the suggested amount. Most notably, the percentage of donations above the suggested amount is substantially reduced relative to the control with no suggestion. In a different application of public good provision, Chen et al. (2010) find that

arguments are decision-theoretic. One key assumption in all of these studies is that any nonconforming action – low or high – is socially unacceptable. This differs from our setting where high generosity *is* socially acceptable.

[4] To be sure, DellaVigna et al. (2012) also offer a theoretical analysis but one without an equilibrium play, which is crucial to fully understand donor behavior and policy.

[5] The Internal Revenue Service (IRS) approves somewhere between 69 and 98% of applications for a charity status (98% for all instances where a decision is rendered, 69% when withdrawn applications are included); see Reich et al. (2009). As for the popularity of the national Do-Not Call list, within 4 years of its implementation in 2003, 72% of Americans had registered on it, and 77% of those reported a large drop in the number of telemarketing calls that they receive; see the Economic Report of the President (2009, p. 244).

[6] A similar result is found by Ribar and Wilhelm (2002) and Yildirim (2014) within the reduced-form model of warm-glow giving a la Andreoni (1990).

[7] If donors are sufficiently heterogeneous, then there is a unique equilibrium in which at least one donor gives above and another gives below the average.

after receiving information about the median user's total number of movie ratings, users below the median demonstrate a 530% increase in the number of monthly movie ratings, while those above the median decrease their ratings by 62%.[8]

The rest of the paper is organized as follows. In the next two sections, we present the basic model and characterize its equilibrium. In Section 4, we examine comparative statics with respect to the cost of avoiding the solicitor, social norm, income distribution, and population size. We consider the endogenous social norm in Section 5 and conclude in Section 6. All proofs are relegated to the appendix.

2. The model

The standard model of voluntary provision of public goods constitutes the benchmark for our analysis (Bergstrom et al., 1986). We briefly review this model before introducing social pressure.

Standard (altruistic) model of giving. There are $n \geq 2$ individuals who each simultaneously allocate their respective wealth, $w_i > 0$, between private consumption, $x_i \geq 0$, and a gift to the charity, $g_i \geq 0$. Units are normalized so that $x_i + g_i = w_i$. Letting $G = \sum_i g_i$ be the supply of the public good or charity, $u_i(x_i, G)$ represents individual i's utility, which is strictly increasing, strictly quasi-concave, and twice differentiable. Since individual i cares about contributions only through G, this standard setting is also called (purely) "altruistic" giving. Individual i's (Marshallian) demand for the public good, denoted by $f_i^a(w)$, is assumed to satisfy the strict normality: $0 < f_i^{a\prime}(w) \leq \theta < 1$ for some parameter θ.[9] Let $(g_1^{a,*}, g_2^{a,*}, ..., g_n^{a,*})$ denote the profile of (Nash) equilibrium gifts. Under strict normality, such a profile uniquely exists. By further assuming $f_i^a(0) = 0$, we guarantee a positive provision, $G^{a,*} > 0$.

Giving under social pressure. In the standard model, donors are informed of the charitable cause – perhaps, through media and the internet – but giving is anonymous.[10] Suppose instead that the fundraiser solicits each donor directly. Thus, as identified in the literature discussed above, the donor may feel social pressure if his contribution falls short of a social norm or "rule", g^r. The norm may be based on the average of past contributions or the fundraiser's suggested amount, for instance. Following DellaVigna et al. (2012), we assume that the associated social cost for donor i takes a linear form:

$$v_i(g_i) = s_i \max\{g^r - g_i, 0\}, \tag{1}$$

where $s_i \geq 0$ is the constant marginal cost of social pressure.[11,12] The marginal cost s_i may be borne by internal feelings or external sanctions (as in López-Pérez, 2008),[13] amplifying with the closeness of the solicitor's social ties and shared characteristics (Fong and Luttmer 2009; Meer, 2011), the exposure of giving to a wider audience (e.g., friends and colleagues), the duration of such exposure, etc. We assume that donor i's utility when faced with the fundraiser is

$$u_i^s(x_i, G, g_i) = u_i(x_i, G) - v_i(g_i). \tag{2}$$

Evidently, if there is no norm, $g^r = 0$, or the donor feels no pressure, $s_i = 0$, then there is no social cost either, or equivalently, the donor acts as a pure altruist.[14] The donor may also act as a pure altruist, however, if the norm is nonbinding for him. To focus our analysis on the latter – nontrivial – cases, we assume $0 < g^r < w_i$ and $s_i > 0$ for all i unless stated otherwise.

It is worth noting that the (social) utility in (2) is reminiscent of the (reduced-form) warm-glow specification in Andreoni (1990). This is not surprising since social pressure is a manifestation of warm-glow (see Footnote 2). The significant difference is that in our context, whether a donor behaves as a pure altruist or warm-glow giver will be determined in equilibrium, thereby offering a possible microfoundation for the theory of warm-glow giving.

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[8] Relatedly, Reyniers and Bhalla (2013) observe that average donations for paired subjects are significantly higher than the unpaired but the former are also less happy with their donation decisions. Conte (2014) estimates that the access to social information about giving by others induces more generosity from low altruism and less generosity from high altruism individuals.

[9] The existence of parameter θ is not necessary for our analysis, but will make the role of social pressure transparent by ensuring a finite free-riding level of the public good, $G_i^{a,0}$, defined below. It is also commonly assumed in the literature (e.g., Andreoni, 1988).

[10] We use anonymous and altruistic giving interchangeably since they both correspond to the standard setting.

[11] The linear social cost eases exposition but is not essential for our results. As shown in Appendix B, our results would continue to hold under a nonlinear and differentiable social cost such as the quadratic form: $v_i(g_i) = s_i\left(\max\{g^r - g_i, 0\}\right)^2$. In this sense, Andreoni and Bernheim's (2009) critique of Fehr and Schmidt (1999) for assuming kinked preferences is not valid in our model.

[12] Conceivably, donors may also enjoy giving above the norm. We abstract from this motive here to isolate social pressure as the sole source of warm-glow. Our model would, however, easily extend. Let $u_i^s(x_i, G, g_i) = u_i(x_i, G) - s_i(g^r - g_i)$ where $s_i = s_i^b$ if $g_i \leq g^r$ and $s_i = s_i^a$ if $g_i > g^r$. For $s_i^a < s_i^b$, our qualitative results with $s_i^a = 0$ hold, though the norm-conformity would be less pronounced owing to the reduced free-riding incentive. For $s_i^a \geq s_i^b$, social pressure becomes nonbinding for the giving decision, which is inconsistent with the evidence alluded to in the Introduction.

[13] In López-Pérez (2008), however, s_i is conditional on others' compliance decisions, which is more in line with our endogenous norm treatment in Section 5.

[14] Even without an apparent norm, an endogenous one may form in equilibrium, depending on donors' expectations of the average donation, for instance. We examine this interesting possibility in Section 5.

3. Equilibrium characterization

Let $(g_1^{s,*}, g_2^{s,*}, ..., g_n^{s,*})$ and $G^{s,*} = \sum_i g_i^{s,*}$ denote the profile of equilibrium gifts and the total provision under social pressure, respectively. To characterize, consider person i's gift choice given others', G_{-i}. Ignoring the nonnegativity of social cost for now, person i's program can be written:

$$\max_{x_i, g_i} u_i(x_i, G) - s_i(g^r - g_i) \tag{3}$$

$$\text{s.t. } x_i + g_i = w_i.$$

Inserting $g_i = G - G_{-i}$, (3) can be re-written:

$$\max_{G \geq G_{-i}} u_i(w_i + G_{-i} - G, G) - s_i(g^r + G_{-i} - G). \tag{4}$$

For a positive contribution (or nonbinding constraint $G \geq G_{-i}$), the first-order condition becomes,[15]

$$\frac{d}{dG} u_i(w_i + G_{-i} - G, G) + s_i = 0. \tag{5}$$

Let the solution to (5) be

$$G = f_i^s(w_i + G_{-i}, s_i), \tag{6}$$

where it follows from normality that $0 < \partial f_i^s / \partial w_i < 1$ and $\partial f_i^s / \partial s_i > 0$. The first derivative signifies the usual crowd-out effect due to altruism while the second signifies the increased generosity due to social pressure.

In public good games such as this one, it is often more convenient to write the optimal gift as a function of the total contribution, G, rather than G_{-i}. To this end, we invert f_i^s and express (6) as: $\phi_i^s(G; s_i) = w_i + G_{-i}$. Clearly, $G \geq f_i^s(w_i, s_i)$, $\partial \phi_i^s / \partial G > 1$ and $\partial \phi_i^s / \partial s_i < 0$. Substituting for $G_{-i} = G - g_i$, we obtain i's gift under social pressure:

$$g_i = w_i + G - \phi_i^s(G; s_i) \equiv R_i^s(G). \tag{7}$$

Not surprisingly, this gift is dictated by both altruistic and social motives as it is decreasing in G and increasing in s_i. If social pressure is nonconcerning for person i, i.e., $g_i > g^r$, then he only maximizes his altruistic utility, u_i, which is equivalent to setting $s_i = 0$ in (3). This yields i's altruistic gift:

$$g_i = w_i + G - \phi_i^a(G) \equiv R_i^a(G), \tag{8}$$

where $\phi_i^a(G) \equiv \phi_i^s(G; 0)$. Clearly, $R_i^s(G) > R_i^a(G)$. Combining (7) and (8) with the nonnegativity of social cost, we can state person i's "reaction" function, which is also depicted in Fig. 1.

Lemma 1. *Given the total provision G, person i's optimal gift is given by:*

$$g_i^s(G) = \begin{cases} R_i^a(G) & \text{if} \quad f_i^a(w_i) \leq G < G_i^{a,r} \\ g^r & \text{if} \quad G_i^{a,r} \leq G < G_i^{s,r} \\ R_i^s(G) & \text{if} \quad G_i^{s,r} \leq G < G_i^{s,0} \\ 0 & \text{if} \quad G_i^{s,0} \leq G, \end{cases} \tag{9}$$

*where the unique critical levels of the public good solve the norm-conformity and free-riding conditions: $R_i^a(G) = g^r = R_i^s(G)$ and $R_i^a(G) = 0 = R_i^s(G)$, implying $G_i^{a,r} < G_i^{a,0}$, $G_i^{s,r} \leq G_i^{s,0}$. Moreover, $g_i^s(G)$ is continuous; **(a)** weakly decreasing in G; and **(b)** weakly increasing in the norm, g^r and in the marginal social cost, s_i.*

Being the total, G cannot be less than the stand-alone contributions – i.e., $G \geq f_i^a(w_i)$ and $G \geq f_i^s(w_i, s_i)$. In addition, the free-riding incentive implies a decreasing optimal gift in G. If the total contribution is sufficiently low, $G < G_i^{a,r}$, i's contribution exceeds the social norm, g^r, and coincides with his altruistic choice, $R_i^a(G)$. If the total contribution is moderate, $G_i^{a,r} \leq G < G_i^{s,r}$, i's contribution conforms to the norm: in this case, ignoring the social cost would lead to too low an altruistic gift whereas accounting for the social cost would dictate a gift unnecessarily topping the norm. Finally, if the total contribution is sufficiently high, $G > G_i^{s,r}$, i's contribution falls strictly below g^r and follows his social giving, $R_i^s(G)$. The person free rides whenever G grows beyond $G_i^{s,0}$, although it is possible that $G_i^{s,0} = \infty$ so the person always contributes

[15] The second-order condition is satisfied due to strict quasi-concavity of u_i.

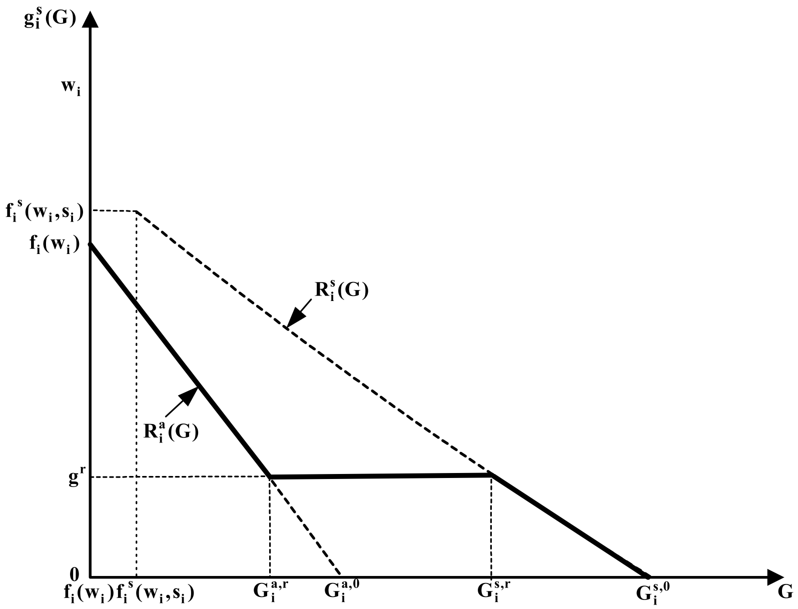

Fig. 1. Giving under social pressure.

some under social pressure – a behavior that will be especially relevant in large economies in Section 4.4.[16] It is worth emphasizing that the critical levels of the public good in Lemma 1 are determined solely by person i's own preferences, income, and the norm. Eqs. (7) and (8) reveal that all four critical levels are increasing in wealth, w_i, with the social levels, $G_i^{s,r}$, and $G_i^{s,0}$, increasing in the marginal cost, s_i, too.

From Lemma 1, Proposition 1 is immediate.

Proposition 1. *There exists a unique equilibrium under social pressure. In equilibrium,*

(a) $g_i^{a,*} < g_i^{s,*}$ *implies* $g_i^{s,*} \leq g^r$*, whereas* $g_i^{a,*} \geq g^r$ *implies* $g_i^{a,*} \geq g_i^{s,*}$.
(b) $G^{s,*}$ *is weakly increasing in the norm,* g^r.

As in the standard model, the uniqueness of equilibrium under social pressure obtains from decreasing reaction functions. Part (a) of Proposition 1 says that if a person responds to social pressure, then his anonymous or altruistic contribution must be "small": $g_i^{a,*} < g^r$.[17] Under social pressure, such a giver will at most meet the norm to minimize social cost. If, on the other hand, a person is already generous, he actually gives less under pressure! The reason is that a generous person partially free rides on the increased social giving by others. Combining these observations, part (a) suggests that compared to anonymous gifts, gifts under social pressure are likely to be less heterogeneous, revolving around the norm. Notice that unlike the extant theories of conformity, e.g., Bernheim (1994), conformity in our setting arises despite no social pressure for high generosity.[18] In addition, it is consistent with the evidence on charitable giving that donations are concentrated around the fundraiser's suggested amount; see, e.g., Shang and Croson (2009), Chen et al. (2010), and Edwards and List (2014).

Part (b) of Proposition 1 shows that by pressuring more donors, a higher social norm raises total provision. This is easily seen from Lemma 1: since person i's optimal gift, $g_i^s(G)$, is decreasing in G and increasing in g^r, if a higher norm meant lower total giving, then each person would contribute more and generate a greater total, which is a contradiction. Social norm, however, has no marginal effect on the total provision once the latter becomes sufficiently large, i.e., $G^{s,*} \geq G_i^{s,r}$ for all i. This observation points to the existence of a revenue-maximizing norm in settings where it is based on the fundraiser's suggested amount – an issue we address in Section 4.2. A direct implication of part (b) is that with respect to anonymous giving, face-to-face solicitations cannot reduce the money raised, though, as the next Corollary indicates, they may be inconsequential, i.e., $G^{s,*} = G^{a,*}$, if everyone is already generous.

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[16] In contrast, for a pure altruist, the free-riding level, $G_i^{a,0}$, is finite, which is ensured by the (standard) assumption that $f_i^{a\prime}(w)$ is bounded away from 1.

[17] It is tempting to conclude that the converse of this statement is also true – but it is not: expecting an increase in total giving, a person with a small anonymous contribution may be even less generous under social pressure if he cares little about pressure. The intuitive conclusion is, however, true under identical preferences: if $0 < g_i^{a,*} < g^r$, then $g_i^{a,*} < g_i^{s,*} \leq g^r$.

[18] A quadratic social cost, $v_i(g_i) = s_i(g^r - g_i)^2$, for instance, would create social pressure for all deviations from the norm. It is, however, hard to imagine that high generosity would be socially unacceptable.

Corollary 1 *(Inconsequential fundraising). If* $g_i^{a,*} \geq g^r$ *for all i, then* $G^{s,*} = G^{a,*}$*. Moreover, if* $0 < g_i^{a,*} < g^r$ *for some i, then* $G^{s,*} > G^{a,*}$*.*

Intuitively, for face-to-face solicitations to be consequential and generate more funds, social pressure must be a concern for some donors, i.e., $g_i^{a,*} < g^r$. In addition, if all concerned donors are not free-riders to begin with, fundraising is indeed consequential. In order to keep the analysis nontrivial in the sequel, we assume that this is the case; namely $G^{s,*} > G^{a,*}$.[19] Specifically, we impose

Assumption 1. $0 < g_i^{a,*} < g^r$ for some i.

Note that the increased provision of the public good due to social pressure directly benefits everyone. Whether a specific donor is better off than anonymous giving, however, depends also on the social cost borne. The following two propositions provide insights into this key comparison for donor welfare. Let $u_i^{a,*}$ and $u_i^{s,*}$ be person i's equilibrium utilities under anonymous and social giving, respectively.

Proposition 2. ***(a)*** *If* $g_i^{a,*} \geq g^r$*, then* $u_i^{s,*} > u_i^{a,*}$*;* ***(b)*** *if* $g_i^{a,*} < g^r$ *and* $g_j^{a,*} \geq g^r$*,* $\forall j \neq i$*, then* $u_i^{s,*} < u_i^{a,*}$*.*

Part (a) of Proposition 2 says that generous donors favor face-to-face fundraising since it pressures the less generous. Put differently, if a donor dislikes fundraising, his anonymous gift must be small, $g_i^{a,*} < g^r$. Although the converse of this statement does not follow in general, part (b) identifies one environment in which it does: if there is a single donor whose anonymous gift is below the norm, that donor dislikes fundraising as he stands to be the sole "reluctant" giver that everyone else free rides on.[20] Proposition 3 extends this environment to multiple reluctant givers under identical preferences: the less wealthy donors opt for anonymous giving whereas the more wealthy opt for fundraising.

Proposition 3 *(Identical preferences). Suppose that* $u_i = u$ *and* $s_i = s$ *for all i. Also suppose* $g_i^{a,*} > 0$ *for all i. Then,* ***(a)*** *(Bergstrom et al., 1986)* $u_i^{a,*} = u^{a,*}$*,* ***(b)*** $u_i^{s,*}$ *is weakly increasing in* w_i*, and thus* ***(c)*** *there exists a cutoff wealth* w^* *such that* $u_i^{s,*} - u^{a,*} =^{sign} w_i - w^*$*.*

Proposition 3 follows because all else equal, the less wealthy have lower demand for the public good, making them especially vulnerable to pressure giving. The more wealthy, on the other hand, are less worried about meeting the social norm but they would enjoy the increased giving by the less wealthy. The comparison of donor welfare in Proposition 3 is facilitated by a well-known neutrality result due to Bergstrom et al. (1986): as recorded in part (a), if individuals possess identical preferences and they are all anonymous contributors, i.e., $g_i^{a,*} > 0$, then they have the same public and private good consumption, resulting in the same utilities, irrespective of income heterogeneity; formally, $x^{a,*} = w_i - g_i^{a,*} = \phi^a(G^{a,*}) - G^{a,*}$ and $u_i^{a,*} = u(x^{a,*}, G^{a,*})$. The presence of social pressure breaks such neutrality: the richer the donor the (weakly) better off he is.[21] Combining the two findings, the welfare comparison takes the form of a cutoff wealth, which is reported in part (c).[22]

4. Comparative statics

Armed with the equilibrium characterization, we now examine how giving behavior, solicitation strategy, and donor welfare might vary with the cost of avoiding the solicitor, social norm, income distribution, and population size, respectively.

4.1. Avoiding the ask

Propositions 2 and 3 suggest an important donor behavior identified in the experimental literature: sorting in and out of facing the solicitor. To examine this choice, suppose that upon being notified by the fundraiser, donor i has the opportunity to avoid solicitation at a (utility) cost c_i and donate, if he wishes, by alternative, impersonal means such as via direct mail or online. Suppose also that donors make such decisions (as well as how much to give) simultaneously. The following result shows that the two polar regimes of all giving through the fundraiser and all giving anonymously can indeed be equilibrium outcomes of endogenous sorting.

[19] This assumption is reasonable also because fundraisers often know their donor profiles (as assumed in our model) and would not approach them unless they anticipate an increase in giving.

[20] By the same logic, such a donor would favor fundraising only if there were other social givers he could free ride on.

[21] The neutrality result is restored if the source of social norm is suggested donations and the fundraiser could personalize them. To see this, note from (7) that if everyone gives under pressure, then, in equilibrium, $g_i^{s,*} = w_i + G^{s,*} - \phi^s(G^{s,*}; s)$ and thus $x^{s,*} = \phi^s(G^{s,*}; s) - G^{s,*}$. It is revenue-maximizing for the fundraiser to suggest $g_i^r = g_i^{s,*}$ since it generates the total $G^{s,*}$.

[22] Whether or not w^* is interior, however, depends on the specific income distribution (and preferences). As implied by Proposition 2, w^* is interior if incomes and therefore altruistic gifts are sufficiently heterogeneous.

Proposition 4. *If the cost of avoiding the ask is large enough, namely $c_i > s_i g^r$, for all i, then every donor giving through the fundraiser is the unique equilibrium, yielding $G^{s,*}$. If, on the other hand, c_i is positive but sufficiently small for all i, then donors who altruistically give below the norm, $g_i^{a,*} < g^r$, avoid the fundraiser and those who give above the norm, $g_i^{a,*} \geq g^r$, seek the fundraiser, yielding the altruistic provision $G^{a,*}$ as the unique equilibrium.*

Intuitively, each donor chooses to face the fundraiser if avoiding her is costlier than social pressure. On the other hand, if the fundraiser can be easily avoided, then those who consider giving a small amount and thus expect social pressure will sort out for alternative means of giving whereas those who consider giving significantly will seek the fundraiser. Since, in equilibrium, no donor gives in to social pressure, the purely altruistic provision obtains.

Clearly, if the fundraiser anticipated no increase in the total giving, she would not spend any resources contacting people. Proposition 4 therefore points to a tradeoff between fundraising and donor sorting it induces. To explore this tradeoff, consider again the case of identical preferences and assume $c < sg^r$ so that some donors may sort out. Also in order to rule out the trivial strategy of contacting all donors, assume that the fundraiser incurs a positive but negligible cost, $\varepsilon > 0$, at each contact, e.g., sending a flyer.[23] Note that for a cost-saving fundraiser, soliciting everyone may not be optimal because, as implied by Proposition 3, anticipating a greater social pressure cost, the least wealthy are likely to avoid her. Soliciting the very rich may not be optimal either, because their giving is immune to social pressure. Consequently, the fundraiser would target the middle income individuals!

To formalize this observation, consider the following modified game of fundraising, which is consistent with the field experiment by DellaVigna et al. (2012):

- The fundraiser privately notifies a subset of donors for a face-to-face solicitation, each costing $\varepsilon > 0$.
- The contacted donors simultaneously decide whether or not to avoid the fundraiser at a (utility) cost c.
- Finally, without observing the sorting decisions of others, everyone contributes – either through the fundraiser or through impersonal means, if he wants to.

The equilibrium characterization of this game is more involved than that of Proposition 3 because both the solicitation set and donors' decisions to remain anonymous are endogenized. We assume that donors hold "passive" beliefs: each attributes a (off-equilibrium) solicitation or nonsolicitation by the fundraiser to a "mistake" that is limited to him.[24] To facilitate the analysis, we also assume additively separable utility, i.e., $u_{xG} = 0$, to ensure that the incentive to remain anonymous is monotonically weaker for wealthier donors and that no two donors have equal wealth to avoid a trivial multiplicity in the solicitation set.

Proposition 5. *Consider the fundraising game just described and assume identical preferences. In equilibrium, there exist two unique cutoff wealths $w_l \leq w_h$ such that donor i is solicited if and only if $w_i \in [w_l, w_h]$. Moreover, as the cost of avoidance increases from c to c', **(a)** more donors are solicited: $[w_l, w_h] \subseteq [w_{l'}, w_{h'}]$; and **(b)** the total contribution increases: $G^{s,*} \leq G^{s,*\prime}$.*

Proposition 5 confirms our prediction that a cost-saving solicitor will approach only the middle income donors[25]; and in response, these donors will give more generously. Compared to anonymous giving, all unsolicited donors are better off at the expense of the solicited.[26] Not surprisingly, the solicited donors would prefer a higher avoidance cost for others since this would motivate the solicitor to contact a larger group of donors. This implies that the fundraiser will collect the highest amount when the cost of avoidance is sufficiently large and the lowest amount when it is negligible, which is in line with Proposition 4.[27]

Propositions 4 and 5 suggest that donors are likely to receive uninvited solicitations that raise their cost of avoidance. To alleviate their exposure to social pressure, several researchers have recommended a "Do-Not Call" or "Do-Not Solicit" list for charities (e.g., DellaVigna et al., 2012; Lazear et al., 2012). Indeed, if donors could limit direct charitable appeals through such a list at a minimal cost, we know from Proposition 4 that no donor would give due to social pressure – the less generous donors would opt out and the more generous would at worst be indifferent.[28] Interestingly though, the U.S.

[23] See Name-Correa and Yildirim (2013) and Name-Correa (2014) for an analysis of charitable fundraising that involves significant solicitation costs but no social pressure or sorting decisions for donors.

[24] Passive beliefs are commonly used in bilateral contracting in which one party privately contracts with several others (e.g., McAfee and Schwartz 1994). One justification in our context is that different solicitors contact different donors so that solicitation mistakes are perceived to be uncorrelated.

[25] If, unlike in our model, there were no alternative, impersonal means to give, the solicitor would also approach the high income donors and expand her list of contacts, setting $w_h = \max_i w_i$ and reducing w_l in Proposition 5; however, the total provision may or may not increase since those opting out would now give nothing.

[26] Not all solicited donors are necessarily worse off, however, due to the increased provision.

[27] From the proof of Claim A.2 in the Appendix, it follows that donor i avoids the solicitor if and only if $c_i < c_i^*$ where $c_i^* = u_i^*(S^*) - u_i^d(S^*)$ – the payoff difference between opting in and unilaterally opting out when the equilibrium solicitation set is S^*. Using $u_{xG} = 0$, it is verified that c_i^* is decreasing in w_i. It can also be verified that fixing c, w_l is increasing in s – more avoidance by the lower income donors – but w_h is ambiguous due to s's positive effect on social giving and negative effect on the number of social givers.

[28] In particular, the rich are expected to vote against such a list whereas the poor are expected to vote for it.

laws have exempted charities from Do Not Call registries (see Footnote 5). One argument in favor of such leniency could be that personal appeals by fundraisers mitigate the free-rider problem and improve donors' collective welfare as a result. We evaluate the merit of this argument next.

4.2. Social norm and donor welfare

For ease of exposition, we consider identical donors in this subsection and illustrate its main point first by a Cobb–Douglas example where

$$u(x, G) = (1-\alpha)\ln x + \alpha \ln G.$$

Suppose that the cost of avoiding the solicitor is large enough so that donors do not sort out of facing the solicitor. Also suppose $s > \frac{1-\alpha}{w-g^r}$. Then, the equilibrium gift under fundraising is found to be

$$g^{s,*} = \begin{cases} g^{a,*} = \frac{\alpha w}{\alpha+(1-\alpha)n} & \text{if} \quad g^r < g^{a,*} \\ g^r & \text{if} \quad g^r \geq g^{a,*}. \end{cases} \tag{10}$$

To compare, we determine the efficient gift by maximizing the utilitarian welfare:[29]

$$g^e = \arg\max_g nu(w-g, ng),$$

which yields $g^e = \alpha w$. Clearly, $g^e > g^{a,*}$ so there is the usual underprovision without direct solicitations. If the social norm is sufficiently low, $g^r < g^{a,*}$, solicitations are inconsequential in that $g^{s,*} = g^{a,*}$, which implies too low donor welfare, $u^{a,*} < u^e$. If the norm is sufficiently high, $g^r \geq g^{a,*}$, donors conform with the norm and incur no cost of social pressure in equilibrium. The increased giving improves donor welfare as long as the norm is not too high: $u^{a,*} < u^{s,*} \leq u^e$ if $g^{a,*} < g^r \leq g^e$. If, however, $g^r > g^e$, there will be overprovision of the public good! This also leads to too low donor welfare, $u^{s,*} < u^e$; in fact, it is possible that $u^{s,*} < u^{a,*}$.[30] That is, when the norm is too demanding, donors end up giving too much to the solicitor and become worse off than voluntary giving. Proposition 6 confirms these observations more generally.

Proposition 6. *Suppose that donors are identical and that the cost of avoiding the solicitor is large enough. Then, there exists a cutoff social norm $g^o(s) > g^{a,*}$ such that equilibrium gift under fundraising is*

$$g^{s,*} = \begin{cases} g^{a,*} & \text{if} \quad g^r < g^{a,*} \\ g^r & \text{if} \quad g^{a,*} \leq g^r < g^o(s) \\ g^o(s) & \text{if} \quad g^o(s) \leq g^r < w. \end{cases}$$

Moreover, for a sufficiently large s, there is another cutoff $g^c \in (g^e, g^o(s))$ such that $u^{s,*} > u^{a,*}$ if $g^{a,*} < g^r < g^c$; and $u^{s,*} < u^{a,*}$ if $g^r > g^c$.

Proposition 6 adds to the Cobb–Douglas example that in general, very low and very high social norms do not change giving behavior even though the latter raises social cost for donors. This implies that a revenue-maximizing solicitor should suggest a moderate donation.[31] To the extent that her suggested amount alleviates the problem of underprovision, it will also improve donor welfare. Nevertheless, Proposition 6 indicates that the solicitor may induce donors with intense social motive to give too much.

4.3. Income redistribution and public good provision

A major policy issue in public economics is to understand the impact of an income redistribution on public good provision. Within the standard model, Warr (1983) was the first to show that a small redistribution of income among the contributors (or among the noncontributors) leaves the provision unchanged. Extending this neutrality result, Bergstrom et al. (1986) proved that with identical preferences, a small wealth transfer from contributors to noncontributors strictly diminishes the supply of the public good (see their Theorem 5(v)). The intuition is that by strict normality, the original contributor reduces his gift by more than the transfer whereas the original noncontributor increases his gift by less than the transfer by allocating some to his private consumption. The presence of social pressure can reverse this prediction as the following proposition demonstrates.

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[29] Andreoni (2006, pp. 1224–7) contains a compelling argument as to why nonpecuniary motives for giving such as social pressure should not be included in social welfare.

[30] Indeed, $u^{s,*} < u^{a,*}$ for $\alpha < \frac{1}{2}$ and $g^r > w - g^{a,*}$.

[31] Implicit in this moderation is the (reasonable) assumption that raising the same total, the fundraiser would not want to pressure donors unnecessarily. Based on a fairness-based equilibrium concept, Dale and Morgan (2010) also find that asking for too much giving can be as discouraging for donors as asking for too little and that moderate suggested donations produce modest positive gains.

Proposition 7. *Suppose that preferences are identical and that individuals i and j in the population have wealths $w_i > w_j$ and altruistic gifts $g_j^{a,*} = 0 < g_i^{a,*} < g^r$. Then, a wealth-equalizing transfer $\Delta \in (0, \frac{w_i - w_j}{2}]$ from i to j strictly lowers the public good (Bergstrom et al., 1986). Under the social pressure setting, however, the same transfer can never decrease the public good if social pressure is sufficiently intense, i.e., $s > s_l$, and strictly increases it if $s \in (s_l, s_h)$ for some cutoffs $0 < s_l < s_h$.*

Proposition 7 follows because the presence of social pressure makes contributions imperfect substitutes and thus less responsive to each other. In particular, if he cares enough about the pressure, the richer individual continues to give at the norm after the transfer – rather than reducing his gift; see Fig. 1 and recall that $R^s(G)$ shifts upward with a higher s.[32] The significance of Proposition 7 is that the direct ask is considered by both charities and donors to be the most powerful fundraising technique (Andreoni, 2006; Edwards and List, 2014). Indeed, as we examine next, social pressure is likely to be the predominant motive in large fundraising campaigns such as those run by the Salvation Army.

4.4. Limit economies and pure pressure giving

It is well established in the literature that under purely altruistic giving, individual contribution becomes negligible in a limit economy even though the total contribution remains significant (Andreoni, 1988). This means that in a limit economy, personal appeals to give are bound to create mixed charitable motives. The natural question then is: does social pressure become the sole charitable motive? Rephrasing, can a donor still carry *some* altruism or concern for the charitable output in a large economy?

Almost by definition, the answer to the latter question is "no" if individual giving grows to be unresponsive to the level of the public good; that is, if $\partial g_i(G)/\partial G \to 0$ as $G \to \infty$. The following lemma indicates that this must be the case for a donor who continues to contribute a positive amount.

Lemma 2. *Suppose that* $\lim_{G\to\infty} g_i(G) > 0$. *Then,* $\lim_{G\to\infty} \partial g_i(G)/\partial G = 0$.

Lemma 2 reveals that in a limit economy, any significant contribution must be dictated purely by social pressure.[33] Conversely, in a limit economy, any residual altruism must cause severe enough free-riding to discourage giving – a point also made by Ribar and Wilhelm (2002) and Yildirim (2014).[34]

To complete our understanding of Lemma 2, we next determine the limit contribution. Recall from Proposition 1 that if an altruistic gift is below the norm (which is necessarily the case in a large economy), it will at most meet the norm due to social pressure. From Lemma 1, equilibrium gift is therefore either g^r or $\max\{w_i + G - \phi_i^s(G; s_i), 0\}$, whichever is lower, leading us to define the following limit gift:

$$g_i^\ell = \min\{\ell_i, g^r\}, \tag{11}$$

where $\ell_i = \lim_{G\to\infty} \max\{w_i + G - \phi_i^s(G; s_i), 0\}$. Clearly, $\ell_i = \max\{w_i - \overline{x}_i(s_i), 0\}$ where $\overline{x}_i(s_i)$ represents the individual's demand for private consumption. It can be verified from the properties of inverse demand ϕ_i^s that $\overline{x}_i'(s_i) < 0$, $\overline{x}_i(0) = \infty$, and $\lim_{s_i\to\infty} \overline{x}_i(s_i) = 0$. Consequently, g_i^ℓ can be expressed more explicitly as:

$$g_i^\ell = \begin{cases} 0 & \text{if} \quad s_i \le \overline{x}_i^{-1}(w_i) \\ w_i - \overline{x}_i(s_i) & \text{if} \quad \overline{x}_i^{-1}(w_i) < s_i \le \overline{x}_i^{-1}(w_i - g^r) \\ g^r & \text{if} \quad \overline{x}_i^{-1}(w_i - g^r) < s_i. \end{cases} \tag{12}$$

To understand (12), observe that a purely altruistic donor, i.e., $s_i = 0$, will free ride at very high levels of the public good. Eq. (12) says that this behavior persists so long as social pressure is not too concerning for the donor. Otherwise, even in a limit economy, the donor will make a positive contribution that is increasing in s_i until it reaches the norm. To demonstrate, consider the Cobb–Douglas example in Section 4.2. It is easily verified that $\phi^s(G; s) = G + \frac{(1-\alpha)G}{\alpha + sG}$ and hence $\overline{x}(s) = \frac{1-\alpha}{s}$ and $g^\ell = \min\{\max\{w - \frac{1-\alpha}{s}, 0\}, g^r\}$. In particular, $g^\ell = g^r$ whenever $w - \frac{1-\alpha}{s} \ge g^r$, as assumed in that example.[35]

Armed with the limit gift, we are now ready to characterize limit economies. To do so, we call donor i of type t if, under fundraising, his free-riding level of the public good is $G^{s,0}(t)$. Note that two donors with different preferences and incomes can have the same free-riding levels.

[32] Within the altruistic model, Cornes and Hartley (2007, Corollary 4.1) also show the nonneutrality of an income redistribution if the price of giving varies across donors. Their result relies on a substitution effect whereas, assuming identical preferences and the same price of giving, ours exploits an income effect.

[33] This does not mean, of course, that the individual has no altruistic motive; it just ceases to be effective.

[34] These authors study a canonical model of warm-glow giving a la Andreoni (1990) to identify the dominant motive (altruism vs. warm-glow) and crowding out in a limit economy, but they do not characterize the limit gift itself, which is important here to assess the norm-conformity.

[35] Maximizing utility without altruism: $\max_g (1-\alpha)\ln(w-g) - s(g^r - g)$, we indeed obtain the pure social gift: $g = w - \frac{1-\alpha}{s}$.

Proposition 8. *Without loss of generality, let $G^{s,0}(1) > G^{s,0}(2) > \ldots > G^{s,0}(T)$ be donor types and $\gamma_t \neq 0$ be the fixed proportion of type t in the economy. Then, as population size increases to infinity,* ***(a)*** *only type 1 donors contribute, and* ***(b)*** *$g_i^{s,*} \to g_i^{\ell}$ for type 1 donors.*

Part (a) of Proposition 8 states that only the most "willing" donors will make a positive contribution in a limit economy – a fact that was first established by Andreoni (1988) in a purely altruistic model. Part (b) says that individual contribution for the most willing converges to the limit gift, g_i^{ℓ}, in (12). Consequently, social pressure must be the sole motive behind positive contributions in a large economy. Note that depending on donors' aversion to social pressure, heterogeneous contributions may be observed in a large economy, with a concentration at the social norm. In particular, it is possible that all contributing donors conform with the norm if each cares sufficiently about social pressure, i.e., if $s_i > \overline{x}_i^{-1}(w_i - g^r)$ for all type 1 donors.

5. Endogenous social norm

Up to now, we have assumed social norm is exogenous; perhaps, it is based on past contributions or suggestion by the fundraiser. There are, however, many charitable appeals with no obvious norms. This might be because past contributions are not publicized; the solicitor adopts a strategy that "every penny counts"; or the charitable cause is simply new. Even so, the solicited donors are likely to form expectations about the socially acceptable level of giving since their contributions are observed at least by the fundraiser – if not announced later. In this section, we consider one such expectation: the average donation, $\frac{G}{n}$. Specifically, we assume that a donor feels social pressure to the extent that his gift falls short of the average. Formally, we write donor i's social cost:

$$\overline{v}_i(g_i) = s_i \max\{\frac{G}{n} - g_i, 0\}. \tag{13}$$

Comparing (13) with (1), two differences from the case of exogenous norm seem immediate. First, a single donor never incurs a social cost as his contribution becomes the norm. More generally, contributing one more dollar reduces the social cost by less than a dollar since it also moves the average up. Thus, we predict that the endogenous norm discourages giving. Second, endogenous norm introduces complementarity between contributions since one's social pressure is exacerbated by others' increased contribution. As such, we also predict that unlike in the case of exogenous norm, equilibrium gifts need not be unique. To make these points precise, we modify (4) by substituting $g^r = \frac{G}{n}$:

$$\max_{G \geq G_{-i}} u_i(w_i + G_{-i} - G, G) - s_i(\frac{G}{n} + G_{-i} - G).$$

Differentiating with respect to G at an interior solution, we have the first-order condition for the pressure gift:

$$\frac{d}{dG}u_i(.) + \frac{n-1}{n}s_i = 0. \tag{14}$$

Eq. (14) coincides with (5) except that with endogenous norm, the marginal cost of social pressure is discounted by $\frac{n-1}{n}$, reflecting the donor's concern for raising the norm. Therefore, letting $\overline{s}_i \equiv \frac{n-1}{n}s_i$, the solution to (14) readily obtains from (7):

$$g_i = w_i + G - \phi_i^s(G; \overline{s}_i) \equiv \overline{R}_i^s(G). \tag{15}$$

Clearly, $\overline{R}_i^s(G) < R_i^s(G)$, confirming that the endogenous norm discourages social giving. On the other hand, if the social norm is nonbinding for an individual, i.e., $g_i > \frac{G}{n}$, his sole motive is altruism, in which case his gift remains as in (8). Using (15) and (8), we find individual i's reaction function; see Fig. 2.

Lemma 3. *Given the total provision G, person i's optimal gift is given by:*

$$\overline{g}_i^s(G) = \begin{cases} R_i^a(G) & \text{if} \quad f_i(w_i) \leq G < \overline{G}_i^a \\ \frac{G}{n} & \text{if} \quad \overline{G}_i^a \leq G < \overline{G}_i^s \\ \overline{R}_i^s(G) & \text{if} \quad \overline{G}_i^s \leq G < \overline{G}_i^{s,0} \\ 0 & \text{if} \quad \overline{G}_i^{s,0} \leq G, \end{cases} \tag{16}$$

where the unique critical levels of the public good solve the norm-conformity and free-riding conditions: $R_i^a(G) - \frac{G}{n} = 0 = \overline{R}_i^s(G) - \frac{G}{n}$ and $R_i^a(G) = 0 = \overline{R}_i^s(G)$, implying $\overline{G}_i^a < \overline{G}_i^0, \overline{G}_i^s \leq \overline{G}_i^{s,0}$. Moreover, $\overline{g}_i^s(G)$ is continuous; ***(a)*** *non-monotonic in G; and* ***(b)*** *weakly increasing in the marginal cost of pressure, s_i, and in the number of donors, n.*

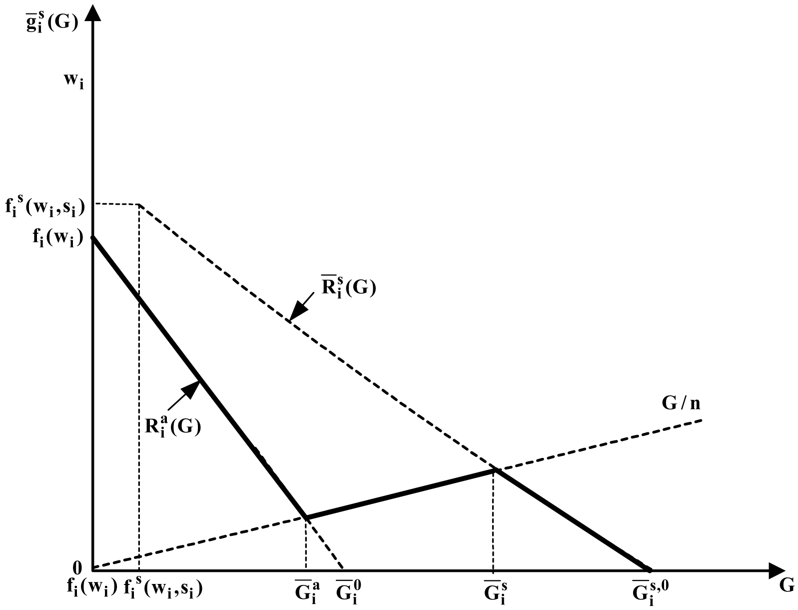

Fig. 2. Average donation as the norm.

The qualitative difference between Lemmas 1 and 3 arises for the levels of the public good at which the donor gives according to the norm. Under the endogenous norm, an increase in G in this region also increases the individual gift in order to match the rising average. As noted above, such complementarity between contributions create the potential for multiple equilibria and in turn multiple norms, as we establish next.

Proposition 9. *Under fundraising with an endogenous norm, **(a)** if* $\max_i \overline{G}_i^a \leq \min_i \overline{G}_i^s$, *then every equilibrium is characterized by each person giving the same – average – amount:* $\overline{g}_i^{s,*} = \frac{\overline{G}^{s,*}}{n}$ *and the total provision:* $\overline{G}^{s,*} \in [\max_i \overline{G}_i^a, \min_i \overline{G}_i^s]$*; **(b)** if* $\max_i \overline{G}_i^a > \min_i \overline{G}_i^s$, *then the unique equilibrium involves at least one donor giving strictly above and another giving strictly below the average.*

From Lemma 3 and Fig. 2, it is evident that giving exactly the average amount is a best response for everyone if G lies in between $\overline{G}_i^a$ and $\overline{G}_i^s$ for all i – hence the condition $\max_i \overline{G}_i^a \leq \min_i \overline{G}_i^s$ in part (a). In fact, any G that satisfies this criterion must be an equilibrium, explaining its multiplicity. To see why no other type of equilibrium can arise under the condition in part (a), suppose, for instance, that $G < \max_i \overline{G}_i^a$ were an equilibrium. Then everyone would be giving above the average, with at least one exceeding it, which would be inconsistent with the definition of the average. More intuitively, multiple norm-conforming equilibria exist when donors are not too heterogeneous across preferences and incomes. Otherwise, among sufficiently heterogeneous donors, it is not surprising that there will be a unique expectation as to who gives above and who gives below the average, which accounts for the equilibrium uniqueness in part (b).[36]

Two major insights can be gleaned from Proposition 9. First, heterogeneous donors may all choose to give the same (average) amount in equilibrium. Thus, much like in Bernheim's (1994) theory of conformity but in a very different setting, an endogenous social norm for giving emerges.[37] Second, in order to prevent donors from coordinating at a low average, the fundraiser has a clear incentive to suggest a donation as a focal point. Proposition 9 predicts that such suggestions are more likely to be observed for the fundraiser whose donor base is not too heterogeneous; e.g., universities and religious organizations.[38]

[36] The norm-conformity identified in Proposition 9(a) would also be less pronounced if, as mentioned in Footnote 12, there were some positive utility from giving above the norm, which, by weakening the free-riding incentive, would cause an upward shift in the altruistic reaction $R_i^a(G)$ and thus an increase in the threshold $\overline{G}_i^a$ in Fig. 2.

[37] In his extension of Bernheim, Gillen (2015) assumes the social norm to be the average action. Interestingly, no such assumption is needed in our setting because if a social norm is to emerge in equilibrium, it must, by definition, be the average donation.

[38] Another commonly suggested social norm for giving, especially by religious organizations, is a fixed percentage of income, e.g., "tithing" or the ten percent rule. By personalizing the suggested gift, a percentage rule is likely to increase social giving and the total contribution (as argued in Footnote 21) but it is unlikely to emerge endogenously among heterogeneous donors. To see this, let the social cost for person i be: $\widehat{v}_i(g_i) = s_i \max\{\lambda w_i - g_i, 0\}$, for some $\lambda \in (0, 1)$. If $\lambda w_i > g^r$ for all i, then, by Proposition 1, $G^{s,*}$ is higher than that for a fixed norm, g^r. Next, suppose that in equilibrium, $g^{s,*} = \lambda^* w_i$ for all i. Then, from (7), we must have that

$$\lambda^* = 1 - \frac{\phi_i^s(G^{s,*}; s_i) - G^{s,*}}{w_i},$$

6. Conclusion

To summarize, our investigation has produced the following testable hypotheses (some of which are already corroborated by evidence):

1. Compared to anonymous giving, direct solicitations yield less heterogeneous gifts, concentrated around the norm. [Propositions 1 and 9]
2. The most generous donors prefer direct solicitations while the least generous prefer anonymity. [Proposition 3]
3. As the suggested donation increases, more people give and the total donation increases up to some limit. [Propositions 1]
4. Very high and very low suggested donations have no marginal effect on giving. [Proposition 6]
5. Under social pressure, an equalizing income redistribution may increase the total donation. [Proposition 7]
6. If the number of donors is large (as in empirical and field studies), most donors will avoid the solicitor if they can. [Proposition 8]
7. Without an explicit norm, the majority of donors give the same – average – amount if they are not too different. [Proposition 9]

Our analysis points out that regulation of charitable solicitations is likely to be light-handed since they also help mitigate the free-rider problem. This is consistent with mild IRS registration requirements for charities and their exemption from the popular Do Not Call list. More broadly, our theory provides a possible microfoundation for Andreoni's (1990) warm-glow giving. In particular, whether or not a donor is a pure altruist and/or social giver is determined in equilibrium – rather than assumed in preferences. Our analysis also contributes to theories of conformity by showing that an endogenous norm for giving can emerge despite no social disapproval for high generosity. The difference in our context is that agents are strategic not only to the audience but also to each other.

We believe that our model of voluntary giving may be fruitfully extended to evaluate the role of social incentives in tax compliance, as recently evidenced by Dwenger et al. (2016) In particular, whether social and legal sanctions are substitutes or complements is worth investigating. Since fundraisers often compete for limited donor resources, it would also be interesting to establish the link between charity competition and social pressure.

Appendix A. Proofs

Proof of Lemma 1. Directly follows from preceding arguments in the text. □

Proof of Proposition 1. Summing optimal gifts in (9) over all i, $\sum_i g_i^s(G) = G$. Define $\Psi(G) = \sum_i g_i^s(G) - G$. Since $g_i^s(G)$ is continuous and weakly decreasing, $\Psi(G)$ is continuous and *strictly* decreasing in G. Letting $k = \arg\max_i f_i^a(w_i)$ and $l = \arg\max_i G_i^{s,0}$, note that

$$\Psi(f_k(w_k)) = \underbrace{g_k^s(f_k^a(w_k)) - f_k^a(w_k)}_{=0} + \sum_{i \neq k} g_i^s(f_k^a(w_k)) \geq 0.$$

Moreover, $\Psi(G_l^{s,0}) = -G_l^{s,0} < 0$. Hence, there is a unique solution $G^{s,*}$ to $\Psi(G) = 0$. Given $G^{s,*}$, the profile $g_i^{s,*} = g_i^s(G^{s,*})$ is uniquely determined and constitutes an equilibrium by construction.

Next we prove part (b). Suppose $g_1^r > g_2^r$ but $G_1^{s,*} < G_2^{s,*}$. Then, since, from (9), g_i^s is weakly increasing in g^r and weakly decreasing in G, it must be that $g_{i,1}^{s,*} \geq g_{i,2}^{s,*}$ for all i, which implies $G_1^{s,*} \geq G_2^{s,*}$ – a contradiction. Hence, $G_1^{s,*} \geq G_2^{s,*}$. As a corollary, since $g^r = 0$ refers to the altruistic giving, we have $G^{s,*} \geq G^{a,*}$.

To prove part (a), suppose $g_i^{a,*} < g_i^{s,*}$ but $g_i^{s,*} > g^r$. Then, part (b) and (9) reveal that $G^{a,*} \leq G^{s,*} < G_i^{a,r}$ and in turn, $g_i^{a,*} \geq g_i^{s,*}$ – a contradiction. Hence, $g_i^{s,*} \leq g^r$. Finally, suppose $g_i^{a,*} \geq g^r$. From Lemma 1, $G^{a,*} \leq G_i^{a,r}$. Since $G^{s,*} \geq G^{a,*}$ and $g_i^s(G)$ is weakly decreasing, it follows that $g_i^{a,*} \geq g_i^{s,*}$, as desired. □

Proof of Corollary 1. From Proposition 1(a), $g_i^{a,*} \geq g^r$ implies $g_i^{a,*} \geq g_i^{s,*}$. Summing over all i, $G^{a,*} \geq G^{s,*}$. From Proposition 1(b), $G^{s,*} \geq G^{a,*}$, implying $G^{s,*} = G^{a,*}$. Next suppose $0 < g_i^{a,*} < g^r$ for some i. Then $G_i^{a,r} < G^{a,*} < G_i^{a,0}$. Since $G_i^{a,0} \leq G_i^{s,0}$ by Lemma 1, it follows that $G_i^{a,r} < G^{a,*} < G_i^{s,0}$, implying $g_i^s(G^{a,*}) > g_i^{a,*}$. By the equilibrium uniqueness, this means $G^{s,*} \neq G^{a,*}$ or equivalently, $G^{s,*} > G^{a,*}$. □

Proof of Proposition 2. Suppose $g_i^{a,*} \geq g^r$ but, to the contrary, $u_i^{s,*} \leq u_i^{a,*}$. Then, by Proposition 1(a), $g_i^{a,*} \geq g_i^{s,*}$. If $g_i^{s,*} \geq g^r$, then $v_i^* = 0$, which, together with the fact that $G^{s,*} > G^{a,*}$, implies $u_i^{s,*} > u_i^{a,*}$ – a contradiction. If, on the other hand,

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which is unlikely to be satisfied for all i. For instance, if donors have identical preferences, i.e., $\phi_i^s = \phi^s$, then they must also have identical incomes. The issue of which giving norm is more likely to be adopted in a society is interesting and deserves further research.

$g_i^{s,*} < g^r$, we show that person i can do strictly better by choosing $g_i^s = g^r$. To see this, note that $g^r + G_{-i}^{s,*} > G^{s,*}$ and therefore $u_i(w_i - g^r, g^r + G_{-i}^{s,*}) > u_i(w_i - g_i^{a,*}, G^{a,*}) = u_i^{a,*}$ as we also know $G^{s,*} > G^{a,*}$ and $g_i^{a,*} \geq g^r$. Recalling $u_i^{s,*} \leq u_i^{a,*}$ by hypothesis, it follows that $u_i(w_i - g^r, g^r + G_{-i}^{s,*}) > u_i^{s,*}$, contradicting $g_i^{s,*}$ being an equilibrium gift. Hence, $u_i^{s,*} > u_i^{a,*}$, as claimed in part (a).

To prove part (b), suppose $g_i^{a,*} < g^r$ and $g_j^{a,*} \geq g^r$, $\forall j \neq i$. From Proposition 1(a), this implies $g_j^{a,*} \geq g_j^{s,*}$, $\forall j \neq i$ and thus $G_{-i}^{a,*} \geq G_{-i}^{s,*}$. Since $G^{s,*} > G^{a,*}$, this also implies $g_i^{a,*} < g_i^{s,*}$; in particular, $g_i^{a,*} \neq g_i^{s,*}$. From here, note that

$$u_i^{s,*} \leq u_i(w_i - g_i^{s,*}, G^{s,*}) \leq u_i(w_i - g_i^{s,*}, G_{-i}^{a,*} + g_i^{s,*}) < u_i(w_i - g_i^{a,*}, G_{-i}^{a,*} + g_i^{a,*}) = u_i^{a,*},$$

where the last inequality follows from Nash behavior. Hence, $u_i^{s,*} < u_i^{a,*}$. $\square$

Proof of Proposition 3. As noted in the text, part (a) follows because $g_i^{a,*} > 0$ implies $g_i^{a,*} = w_i + G^{a,*} - \phi^a(G^{a,*})$, which in turn implies $x_i^{a,*} = \phi^a(G^{a,*}) - G^{a,*} = x^{a,*}$ and $u_i^{a,*} = u(x^{a,*}, G^{a,*}) = u^{a,*}$.

To prove part (b), define the cutoff wealths $w^{s,*} = \phi^a(G^{s,*}) - G^{s,*}$ and $w^{s,**} = \phi^s(G^{s,*}, s) - G^{s,*}$. Clearly, $w^{s,*} > w^{s,**}$ since $\partial\phi^s(.,s)/\partial s < 0$ and $s > 0$. Then, using Lemma 1, person i's equilibrium gift and utility can be respectively written:

$$g_i^{s,*} = \begin{cases} w_i - w^{s,*} & \text{if} \quad w_i > g^r + w^{s,*} \\ g^r & \text{if} \quad g^r + w^{s,**} < w_i \leq g^r + w^{s,*} \\ w_i - w^{s,**} & \text{if} \quad w^{s,**} < w_i \leq g^r + w^{s,**} \\ 0 & \text{if} \quad w_i \leq w^{s,**}, \end{cases} \tag{A.1}$$

and

$$u_i^{s,*} = \begin{cases} u(w^{s,*}, G^{s,*}) & \text{if} \quad w_i > g^r + w^{s,*} \\ u(w_i - g^r, G^{s,*}) & \text{if} \quad g^r + w^{s,**} < w_i \leq g^r + w^{s,*} \\ u(w^{s,**}, G^{s,*}) - s[g^r - (w_i - w^{s,**})] & \text{if} \quad w^{s,**} < w_i \leq g^r + w^{s,**} \\ u(w_i, G^{s,*}) - sg^r & \text{if} \quad w_i \leq w^{s,**}. \end{cases} \tag{A.2}$$

From (A.2), it is obvious that $u_i^{s,*} \geq u_j^{s,*}$ if and only if $w_i \geq w_j$. Part (c) is immediate from (a) and (b). $\square$

Proof of Proposition 4. Suppose $c_i > s_i g^r$ for all i and that G^{**} is a sorting equilibrium in which donor i avoids the fundraiser. Then, $g_i^{**} < g^r$. Letting g_i^s be i's best response to G_{-i}^{**} under social pressure, the following must hold

$$\begin{aligned} u_i(w_i - g_i^{**}, G^{**}) - c_i &\geq u_i(w_i - g_i^s, g_i^s + G_{-i}^{**}) - \max\{s_i(g^r - g_i^s), 0\} \\ &\geq u_i(w_i - g_i^{**}, G^{**}) - \max\{s_i(g^r - g_i^{**}), 0\}. \end{aligned}$$

Since $g_i^{**} < g^r$, this implies $s_i(g^r - g_i^{**}) \geq c_i$, which contradicts $c_i > s_i g^r$. Thus, it is a dominant strategy for each donor to give through the fundraiser, yielding $G^{**} = G^{s,*}$.

To prove the second part, suppose that $g_i^{a,*} < g^r$ and that donor i avoids the fundraiser and contributes g_i^{**} in a sorting equilibrium. Then, $g_i^{**} < g^r$ and he is better off than contributing $g_i^s \leq g^r$ by seeking the fundraiser, i.e., $u_i(x_i^{**}, G^{**}) - c_i \geq u_i(w_i - g_i^s, G_{-i}^{**} + g_i^s) - s_i(g^r - g_i^s)$. Re-arranging terms,

$$c_i \leq u_i(x_i^{**}, G^{**}) - u_i(w_i - g_i^s, G_{-i}^{**} + g_i^s) + s_i(g^r - g_i^s) \equiv \Delta_i \tag{A.3}$$

Note that $\Delta_i > 0$ because the difference in u_i's on the r.h.s. of (A.3) is nonnegative due to strict quasi-concavity and because either $g_i^s = g^r (\neq g_i^{**})$ or $g_i^s < g^r$. Hence, there is a sufficiently small $c_i > 0$ such that it is indeed a best response for donor i to avoid the fundraiser. Suppose this is the case for all donors whose voluntary gifts satisfy $g_i^{a,*} < g^r$. Then, the sorting equilibrium cannot yield a higher total contribution, i.e., $G^{**} \leq G^{a,*}$. If $g_i^{a,*} \geq g^r$ for some donor, then $G^{**} \leq G_i^s$. This would imply an optimal pressure gift $g_i^{**} \geq g^r$ and in turn $g_i^{**} = g_i^*$. For any $c_i > 0$, such a donor is strictly better off seeking the fundraiser. Since social pressure is not binding for any donor, $G^{a,*}$ is the resulting provision in equilibrium. $\square$

To prove Proposition 5, we first prove two claims for a *publicly observable* S and then define and establish equilibrium for an unobservable S.

As in the text, suppose $u(x, G)$ is additively separable, i.e., $u_{xG} = 0$. Then, the strict quasi-concavity of $u(.)$ and the strict normality of public and private goods require that $u_{xx} < 0$ and $u_{GG} < 0$. Let $S \subseteq N$ be the set of donors that the fundraiser solicits. Each solicitation costs $\varepsilon > 0$ to the fundraiser. Let $g_i^*(S)$ and $G^*(S) = \sum_{i \in N} g_i^*(S)$ be the individual and aggregate gifts in equilibrium.

Claim A.1. *Fix S. Then $G^*(S) \leq G^*(S \cup \{i\})$.*

Proof. Fix S and let $S' = S \cup \{i\}$. For $i \in S$, the result is trivial. Suppose $i \notin S$ and by way of contradiction, $G^*(S) > G^*(S')$. We exhaust two possibilities. The first is that $g_i^*(S') \le g^r$. Then, by Lemma 1, $g_i^*(S') = \min\{R_i^s(G^*(S')), g^r\}$. Moreover, since $i \notin S$, person i makes a purely altruistic gift when the set of solicitations is S; namely $g_i^*(S) = R_i^a(G^*(S))$. Note that $R_i^a(G^*(S)) \le \min\{R_i^s(G^*(S)), g^r\} \le \min\{R_i^s(G^*(S')), g^r\} = g_i^*(S')$ and hence $g_i^*(S) \le g_i^*(S')$. On the other hand, for $j \in S$, we have $g_j^*(S) = \min\left\{R_j^s(G^*(S)), g^r\right\} \le \min\left\{R_j^s(G^*(S')), g^r\right\} = g_j^*(S')$ if $g_j^*(S) \le g^r$, and $g_j^*(S) = R_i^a(G^*(S)) < R_i^a(G^*(S')) \le g_j^*(S')$ if $g_j^*(S) > g^r$. Summing up the contributions in the two sets, we find $G^*(S) \le G^*(S')$ – a contradiction. The second possibility is that $g_i^*(S') > g^r$. Then $g_i^*(S') = R_i^a(G^*(S'))$, which, given $G^*(S) > G^*(S')$, implies $g_i^*(S) < g_i^*(S')$. Again summing up contributions, we find $G^*(S) < G^*(S')$ – a contradiction. Hence, $G^*(S) \le G^*(S')$. □

Claim A.2. *Fix S and suppose that $g_k^*(S) > 0$ for every $k \in S$ who does not avoid the fundraiser. If $i \in S$ does not avoid the fundraiser, then neither does a richer individual $j \in S$.*

Proof. Consider individual $i \in S$ who does not avoid the fundraiser. If $g_i^*(S) > g^r$, then a richer individual $j \in S$ will contribute altruistically whether or not he avoids the fundraiser. To save on the cost of avoidance, however, $j \in S$ will give through the fundraiser. Next suppose that $g_i^*(S) \le g^r$ and let

$$u_i^*(S) \equiv u(w_i - g_i^*(S), G^*(S)) - v(g_i^*(S))$$

and

$$u_i^d(S) \equiv \max_{g_i} u(w_i - g_i, g_i + G_{-i}^*(S)) - c,$$

be i's respective equilibrium utilities from giving through the fundraiser and through unilaterally sorting out. To establish the claim, it suffices to show that the incentive to sort out is weakly decreasing in income, i.e., $\frac{\partial}{\partial w_i}\left[u_i^*(S) - u_i^d(S)\right] \ge 0$. First suppose, in addition, that $g_i^*(S) \ne g^r$. Then, by Lemma 1,

$$g_i^*(S) = w_i + G^*(S) - \phi^s(G^*(S), s). \tag{A.4}$$

Hence,

$$u_i^*(S) = u(\phi^s(G^*(S), s) - G^*(S), G^*(S)) - s(g^r - (w_i + G^*(S) - \phi^s(G^*(S), s))).$$

Clearly, $\frac{\partial}{\partial w_i} u_i^*(S) = s$. Now we determine $\frac{\partial}{\partial w_i} u_i^d(S)$. Suppose that individual i contributes some after sorting out. From (A.4), we know that $G_{-i}^*(S) \equiv G^*(S) - g_i^*(S) = \phi^s(G^*(S), s) - w_i$. Therefore, i's deviation – and purely altruistic – contribution is $g_i^d = f^a(w_i + G_{-i}^*(S)) - G_{-i}^*(S) = f^a(\phi^s(G^*(S), s)) - [\phi^s(G^*(S), s) - w_i]$, yielding utility:

$$u_i^d(S) = u(\phi^s(G^{s,*}, s) - f^a(\phi^s(G^{s,*}, s)), f^a(\phi^s(G^{s,*}, s)).$$

Note that $\frac{\partial}{\partial w_i} u_i^d(S) = 0$ and in turn, $\frac{\partial}{\partial w_i}\left[u_i^*(S) - u_i^d(S)\right] = s \ge 0$. Now suppose that individual i contributes nothing after sorting out. Then, $\frac{\partial}{\partial w_i} u_i^d(w_i, \phi^s(G^*(S), s) - w_i) = u_x - u_G < \frac{\partial}{\partial w_i} u_i^*(S)$, where the inequality is due to strict quasi-concavity of $u(x, G)$. Hence, $\frac{\partial}{\partial w_i}\left[u_i^*(S) - u_i^d(S)\right] \ge 0$, as required. To complete the proof, suppose finally that $g_i^*(S) = g^r$. Then $u_i^*(S) = u(w_i - g^r, g^r + G_{-i}^*(S))$ and by definition, $u_i^d(S) = \max_{0 \le g_i \le w_i} u(w_i - g_i, g_i + G_{-i}^*(S)) - c$. Together, $\frac{\partial}{\partial w_i}\left[u_i^*(S) - u_i^d(S)\right] = u_x(w_i - g^r, g^r + G_{-i}^*(S)) - u_x(w_i - g_i^d, g_i^d + G_{-i}^*(S))$, where the second term follows from the first-order condition if $g_i^d = 0$ or from the Envelope Theorem if $g_i^d > 0$. Since $u_{xG} = 0$, $u_{xx} < 0$ and $g_i^d \le g^r$, we have that $\frac{\partial}{\partial w_i}\left[u_i^*(S) - u_i^d(S)\right] \ge 0$, as desired. □

Definition A.1 *(Equilibrium).* We say that $(S^*, \{g_i^*(S^*)\}_{i \in N}, S^{off})$ is a Bayesian–Nash equilibrium if:

1. (**Donors**) Donor i in S^* has no unilateral incentive to sort out: $u_i^*(S^*) \ge u_i^d(S^*)$.
2. (**Fundraiser**) The fundraiser has no incentive to solicit $S \ne S^*$ – either because $G^*(S) < G^*(S^*)$ or because $G^*(S) = G^*(S^*)$ and $|S| > |S^*|$.
3. (**Off-equilibrium beliefs**) If $i \notin S^*$ and solicited, then he believes that the solicitation set is $S^{off} = S^* \cup \{i\}$. If $i \in S^*$ and not solicited, then he believes that $S^{off} = S^* \setminus \{i\}$.

Remark. As discussed in the text, we adopt "passive" off-equilibrium beliefs that are commonly adopted in the bilateral contracting literature (e.g., McAfee and Schwartz, 1994).

Lemma A.1. *There is a Bayesian–Nash equilibrium. The solicitation set S^* is such that (**a**) $i \in S^*$ if and only if $0 < g_i^*(S^*) < g^r$, (**b**) if $i, j \in S^*$, then $l \in S^*$ whenever w_l is between w_i and w_j, and (**c**) individual i who is less wealthy than those in S^* would avoid the fundraiser if solicited.*

Proof. Suppose that the solicitor publicly commits to soliciting from the set S that satisfies the properties (a), (b), and (c). We show that $S = S^*$. Let k be the lowest income individual in S. By definition of S, k does not sort out and by Claim A2, neither will others in S. Thus, the proposed set S satisfies equilibrium Condition 1. To verify equilibrium Condition 2, note that the fundraiser has no incentive to solicit $i \notin S$ for whom $g_i^*(S) \geq g^r$ as social pressure is nonbinding for such a person and each solicitation costs $\varepsilon > 0$. By the same token, the fundraiser has no incentive to solicit $i \notin S$ who is a free-rider, i.e., $g_i^*(S) = 0$. Conversely, if $0 < g_i^*(S) < g^r$, then $i \in S$ because $\varepsilon > 0$ is assumed to be sufficiently small.

Next, we argue that the fundraiser has no incentive to expand the set S and solicit a lower income individual. Suppose, to the contrary, that individual i with $w_i < w_k$ is solicited. Under the passive beliefs specified in Condition 3, he conjectures $G^*_{-i}(S)$, which would precisely be the total contribution to which individual i would react if the fundraiser publicly announced the solicitation set $S \cup \{i\}$. Since individual i would sort out in that case, he would also sort out when the solicitation set is unobserved. The fundraiser would, however, not solicit i to save cost $\varepsilon > 0$ – a contradiction. Finally, we rule out nonsolicitation of $i \in S$ in equilibrium. Note that $i \in S$ implies that $g_i^*(S) = \min\left\{R_i^s(G^*(S)), g^r\right\} > 0$. If individual i were not solicited, he would give according to $R_i^a(G^*(S))$ while other individuals would not alter their giving. Since $g_i^*(S) > R_i^a(G^*(S))$, the public good provision strictly decreases. Hence, $S = S^*$. □

Proof of proposition 5. The existence of income cutoffs w_h and w_l follows from Lemma A.1 (equilibrium properties (b) and (c)). To prove part (a), suppose, as in the proof of Lemma A.1, that the solicitation set is publicly observable and that the cost of avoiding the fundraiser increases from c to c'. Since S is an equilibrium, $u_i^*(S) - u_i^d(S) \geq 0$ for all $i \in S$. This implies that donors in S would not sort out under c' and by Claim A.2, they remain in the (new) solicitation set S', i.e., $S \subseteq S'$, proving part (a). Part (b) of Proposition 5 is immediate from part (a) and Claim A.1. □

Proof of Proposition 6. To characterize $g^{s,*}$, first note from Lemma 1 that $G^s = G^s(g^r, s)$ and it is readily established that $G^s(g^r, s)$ is continuous in its arguments; strictly decreasing in g^r; and strictly increasing in s. Second, observe that $G^{a,*} < G^s(g^{a,*}, s)$ since $s > 0$, and $G^s(f(w,s), s) = f(w,s)$. Therefore $G^s(g^r, s) - ng^r = 0$ admits a unique solution $g^o(s) \in (g^{a,*}, f(w,s))$, which is strictly increasing in s. By construction, $g^{s,*} = g^r$ for $g^{a,*} \leq g^r < g^o(s)$. Next, we show that $g^{s,*} = g^o(s)$ for any $g^r \geq g^o(s)$. Suppose $g^r \geq g^o(s)$ but, to the contrary, $g^{s,*} > g^o(s)$ (since $G^{s,*} = ng^{s,*}$ is increasing in g^r by Proposition 1). Then,

$$G^{s,*} = ng^{s,*} > ng^o(s) = G^s(g^o(s), s) \geq G^s(g^r, s).$$

Thus, $G^{s,*} > G^s(g^r, s)$. From Lemma 1, this implies $g^{s,*} < g^o(s)$ – a contradiction. Hence, $g^{s,*} = g^o(s)$, completing the characterization.

To prove the welfare comparison, recall that the efficient gift solves: $g^e = \arg\max_{0 \leq g \leq w} nu(w - g, ng)$. By strict quasi-concavity of $u(.)$, g^e is unique and $g^e \in (g^{a,*}, w)$. Moreover, $u^e > u^{a,*}$. Next, note that the indifference equation: $u(w - g, ng) = u^{a,*}$ has exactly two solutions, $g = g^{a,*}$ and $g = g^c \in (g^e, w)$ such that $u(w - g, ng) > u^{a,*}$ if and only if $g \in (g^{a,*}, g^c)$. By continuity, we know that $g^o(s) \to g^{a,*}$ as $s \to 0$, and $g^o(s) \to w$ as $s \to \infty$. This means that we can find a sufficiently large s such that $g^o(s) \in (g^c, w)$. For such an s, it follows that $g^{s,*} = g^r$ and thus $u^{s,*} = u(w - g^r, ng^r)$ if $g^{a,*} \leq g^r < g^o(s)$. Furthermore, $u^{s,*} > u^{a,*}$ if $g^{a,*} < g^r < g^c$, and $u^{s,*} < u^{a,*}$ if $g^c < g^r$, as claimed. □

Proof of Proposition 7. We first state and prove a claim. As in the proof of Proposition 3, let $w^{s,*} = \phi^a(G^{s,*}) - G^{s,*}$ and $w^{s,**} = \phi^s(G^{s,*}, s) - G^{s,*}$. Then, $g_i^{s,*}$ is as expressed in (A.1).

Claim A.3. *Suppose $w_i > w_j$ and consider a wealth-equalizing transfer $(w_i', w_j') = (w_i - \Delta, w_j + \Delta)$, where $\Delta \in (0, \frac{w_i - w_j}{2})$. Then, (**a**) if $w_i, w_j \in [g^r + w^{s,**}, g^r + w^{s,*}]$, then the supply of public good is neutral to the transfer; (**b**) if $w_i \in \left(g^r + w^{s,**}, g^r + w^{s,*}\right]$ and $w_j \in (w^{s,**}, g^r + w^{s,**})$, then the supply of the public good strictly increases.*

Proof. Part (a) is immediate from (A.1) because both i and j continue to give g^r after the transfer. To prove part (b), first observe that if individual j increased his contribution by Δ and no one other than i reacted, then by normality, individual i would not reduce his gift by exactly Δ. That is, $g_i^{s,*'} - g_i^{s,*} > -\Delta$, which implies $G^{s,*\prime} \neq G^{s,*}$. Suppose $G^{s,*\prime} < G^{s,*}$. Then, any individual other than i and j would weakly increase his contribution after the transfer. If $w_i' \geq g^r + w^{s,**\prime}$, then $g_i^{s,*'} = g_i^{s,*} = g^r$, in which case either $g_j^{s,*'} - g_j^{s,*} = g^r - g_j^{s,*} > 0$ if $w_j' \geq g^r + w^{s,**\prime}$ or $g_j^{s,*'} - g_j^{s,*} = (w_j' - w_j) + (w^{s,**} - w^{s,**\prime}) > 0$ otherwise. Thus $g_j^{s,*'} - g_j^{s,*} > 0$. Combining we have $g_i^{s,*'} + g_j^{s,*'} > g_i^{s,*} + g_j^{s,*}$, which implies $G^{s,*\prime} > G^{s,*}$ – a contradiction. If, on the other hand, $w_i' < w^{*\prime}$, then $g_i^{s,*'} - g_i^{s,*} = w_i' - (g^r + w^{s,**}) + (w^{s,**} - w^{s,**\prime})$. Notice that $w_i' - (g^r + w^{s,**}) > -\Delta$ and that $g_j^{s,*'} - g_j^{s,*} = \Delta + (w^{s,**} - w^{s,**\prime})$. Thus, $g_i^{s,*'} + g_j^{s,*'} > g_i^{s,*} + g_j^{s,*}$, a contradiction. As a result, it must be that $G^{s,*\prime} > G^{s,*}$, as claimed in part (b). □

Suppose that preferences are identical and that individuals i and j in the population have wealths $w_i > w_j$ such that their altruistic gifts are $g_j^{a,*} = 0 < g_i^{a,*} < g^r$. Then, it follows from Bergstrom et al. (1986; Theorem 5(v)) that under altruistic giving, a wealth-equalizing transfer $\Delta \in (0, \frac{w_i - w_j}{2}]$ from i to j strictly lowers the public good.

Next consider the social pressure setting. It readily follows that for $s' > s$, (1) $g_i^{s,*} < g^r$ implies $g_i^{s',*} \geq g_i^{s,*}$, with strict inequality if $g_i^{s',*} > 0$; and (2) $G^{s',*} > G^{s,*}$. Now consider the same wealth transfer between individuals i and j as in altruistic giving. Then, there exist s^1 and s^2 such that (1) $g_j^{s,*} = 0$ for $s < s^1$ and $g_j^{s,*} > 0$ for $s \geq s^1$; (2) $g_i^{s,*} < g^r$ for $s < s^2$ and $g_i^{s,*} = g^r$ for $s \geq s^2$. Let $s^L = \max\{s^1, s^2\}$. For $s = s^L + \epsilon$, the continuity of $g_i^{s,*}$ in s implies that w_i is in $(g^r + w^{s,**}, g^r + w^{s,*}]$ and w_j is in $(w^{s,**}, g^r + w^{s,**})$. Thus, by the part (b) of Claim A3, the supply of the public good strictly increases after the transfer. Finally, there clearly exist $s_h > s_l$ such that $g_j^{s,*} = g^r$ for any $s \geq s_h$; in fact, $g_j^{s,*} = g_i^{s,*} = g^r$ for any $s \geq s_h$. Thus, by part (a) of Claim A3, the supply of the public good is neutral to the transfer. □

Proof of Lemma 2. The limit contribution exists because $g_i(G)$ is decreasing and bounded below by 0. Since the limit is assumed strictly positive, Lemma 1 implies that $g_i(G) = \min\{w_i + G - \phi_i^s(G; s_i), g^r\}$ for all $G \geq G'$ where G' is sufficiently large but finite. Evidently if $g_i(G) = g^r$, the conclusion trivially follows. Suppose that $g_i(G) = w_i + G - \phi_i^s(G; s_i)$. Since $0 \leq g_i(G) \leq w_i$, it must be that $\lim_{G\to\infty} \frac{g_i(G)}{G} = 0$. This requires $\lim_{G\to\infty} \frac{\phi_i^s(G;s_i)}{G} = 1$ and by l'Hospital's rule, that $\lim_{G\to\infty} \partial\phi_i^s(G; s_i)/\partial G = 1$. Hence, $\lim_{G\to\infty} \partial g_i(G)/\partial G = 0$, as desired. □

Proof of Proposition 8. From the definition of $G^{s,0}(t)$, note first that for any n, type t donors are contributors if and only if $G^{s,*} < G^{s,0}(t)$. To prove part (a), suppose, to the contrary, that as $n \to \infty$, some type $t \neq 1$ donors remain contributors. Then $\lim_{n\to\infty} G^{s,*} \leq G^{s,0}(t)$. This implies that type $t = 1$ donors contribute a strictly positive amount in a limit economy and thus $G^{s,*} \to \infty$. But this means type $t \neq 1$ donors would contribute nothing, yielding a contradiction. By the same logic, type 1 donors must be contributors. To prove part (b), we consider two cases. If $G^{s,0}(1) < \infty$, then it must be that as $n \to \infty$, $G^{s,*} \to G^{s,0}(1)$, which implies $g_i^{s,*} \to 0$. If, on the other hand, $G^{s,0}(1) = \infty$, it must be that $G^{s,*} \to \infty$; otherwise, $G^{s,*} < \infty$ would mean type 1 donors contribute positive amounts, generating $G^{s,*} \to \infty$. From here, it is immediate that $g_i^{s,*} \to g_i^\ell$. □

Proof of Lemma 3. Analogous to Lemma 1. □

Proof of Proposition 9. As in the proof of Proposition 1 but now summing optimal gifts in (16), we define $\overline{\Psi}(G) = \sum_i \overline{g}_i^s(G) - G$. Clearly, any G that solves $\overline{\Psi}(G) = 0$ is an equilibrium. It readily follows from Lemma 1 that (1) $\overline{\Psi}(G) = 0$ for $G \in [\max_i \overline{G}_i^a, \min_i \overline{G}_i^s]$; (2) $\overline{\Psi}(G)$ is strictly decreasing for all $G \notin [\max_i \overline{G}_i^a, \min_i \overline{G}_i^s]$; and (3) $\overline{\Psi}(f_k^a(w_k)) = \sum_{i\neq k} \overline{g}_i^s(f_k^a(w_k)) > 0$ and $\overline{\Psi}(G_{\max}^{s,0}) = -G_{\max}^{s,0} < 0$, where $f_k^a(w_k) = \max_i f_i^a(w_i)$ and $G_{\max}^{s,0} = \max_i G_i^{s,0}$. From here, both parts (a) and (b) are immediate. □

Appendix B. Social cost

In this appendix, we argue that all of our results would continue to hold under a nonlinear and differentiable social cost function:

$$v_i(g_i) = z_i(\max\{g^r - g_i, 0\}), \tag{B.1}$$

where $z_i'(y) > 0$ and $z_i''(y) > 0$, with $z_i(0) = z_i'(0) = 0$. As in (4), person i solves

$$\max_{G\geq G_{-i}} u_i(w_i + G_{-i} - G, G) - z_i(g^r - (G - G_{-i})).$$

For $G > G_{-i}$, the first-order condition is

$$\frac{d}{dG} u_i(w_i + G_{-i} - G, G) + z_i'(g^r + G_{-i} - G) = 0. \tag{B.2}$$

The second-order condition is satisfied because $u_i(.)$ is strictly quasi-concave and $z_i''(.) > 0$. Let the solution to (B.2) be

$$G = f_i^s(w_i + G_{-i}, g^r + G_{-i}), \tag{B.3}$$

where normality of public and private goods imply partial derivatives: $0 < f_{i1}^s \leq \theta < 1$ and $f_{i2}^s > 0$.[39] Similar to Andreoni (1990), assume that $0 < f_{i1}^s + f_{i2}^s < 1$ so both altruistic and social pressure motives for giving are present. Inverting (B.3), we have that $G_{-i} = \phi_i^s(G, w_i, g^r)$, implying the social gift:

$$g_i = G - \phi_i^s(G, w_i, g^r) \equiv R_i^s(G).$$

Using (B.3),

[39] As noted in Footnote 9, the existence of parameter θ is for technical convenience.

$$\frac{\partial \phi_i^s}{\partial G} = \frac{1}{f_{i1}^s + f_{i2}^s} > 1,$$
$$\frac{\partial \phi_i^s}{\partial w_i} = -\frac{f_{i1}^s}{f_{i1}^s + f_{i2}^s} \in (-1, 0),$$
$$\frac{\partial \phi_i^s}{\partial g^r} = -\frac{f_{i2}^s}{f_{i1}^s + f_{i2}^s} \in (-1, 0),$$

and in turn,

$$\frac{\partial R_i^s}{\partial G} < 0, \frac{\partial R_i^s}{\partial w_i} > 0, \text{and } \frac{\partial R_i^s}{\partial g^r} > 0.$$

As mentioned above, all of our results would hold under (B.1). Specifically, Propositions 1 and 2 would follow because $\partial R_i^s/\partial G < 0$ and $\partial R_i^s/\partial g^r > 0$. In the proof of Proposition 3, simply define wealth cutoffs: $G^{a,*} - \phi^s(G^{a,*}, w^a, 0) = g^r$ and $G^{s,*} - \phi^s(G^{s,*}, w^s, g^r) = g^r$. Under the linear social cost, these cutoffs reduce to: $w^a = g^r + w^{s,*}$ and $w^s = g^r + w^{s,**}$ in (A.1). The proof of Proposition 4 would obtain because $z_i(0) = 0$ and $z_i'(y) > 0$ for $y > 0$ so that $g_i^{s,*} < g^r$ implies a positive social cost and a lower donation, the higher the social cost is. This guarantees that avoiding the fundraiser is optimal if the avoidance cost is small. The key to proving Proposition 5 is Claim A.2, which would hold given that $z_i(0) = 0$ and $z_i'(y) > 0$ for $y > 0$ as well as the assumption of additively separable utility. For Propositions 6 and 7, it would be more convenient to parametrize so that $z_i(y) = s_i z(y)$. Finally, the proof of Proposition 9 exploits the fact that $\partial R_i^s/\partial G < 0$ for $G \notin [\overline{G}_i^a, \overline{G}_i^s]$.

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