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WHY DO PEOPLE GIVE? TESTING PURE AND IMPURE ALTRUISM

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ABSTRACT

The extant experimental design to investigate warm glow and altruism elicits a single measure of crowd-out. Not recognizing that impure altruism predicts crowd-out is a function of giving-by-others, this design's power to reject pure altruism varies with the level of giving-by-others, and it cannot identify the strength of warm glow and altruism preferences. These limitations are addressed with a new design that elicits crowd-out at a low and at a high level of giving-by-others. Consistent with impure altruism we find decreasing crowd-out as giving-by-others increases. However warm glow is weak in our experiment and altruism largely explains why people give.

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1. Introduction

Early economic theory of giving proposed pure altruism as the motivation that explains why people give to charity (Becker 1974). A donor gets utility from the charity's output, for example from helping children in need. Donations are modeled as contributions to a public good because the donor gets utility from the charity's increased output even if giving-by-others causes the increase. While a priori compelling, the pure altruism model generates strong predictions that have been contradicted by field evidence. For example, because pure altruism implies that a donor's contribution and giving-by-others are perfect substitutes, a one dollar lump-sum tax on a donor used to increase the public good by one dollar is predicted to cause the donor to contribute one dollar less to the public good (Warr 1982). In contrast to this complete crowd-out prediction, the field evidence is that crowd-out is much less-than-complete.[1] To reconcile the theory–evidence incongruity, Andreoni (1989) proposed impure altruism: in addition to an altruistic/public good utility component, an impurely altruistic donor also gets "warm glow" utility that comes from the amount she herself gives to the charity. Warm glow is a private good because only the donor gets this additional benefit from her contribution. Because impure altruism implies that a donor's contribution and giving-by-others are not perfect substitutes, an assumption that warm glow is perceived as a normal good delivers the less-than-complete crowd-out prediction needed to reconcile theory with the field evidence.

Much recent work on the relative strengths of altruism and warm glow motives for giving uses crowd-out measured in laboratory settings. Lab experiments eliminate fundraising responses to giving-by-others (Andreoni and Payne, 2011), and offer the potential to control the information each donor has about the level of giving-by-others (Vesterlund, 2006). The recent experimental work has produced a wide range of crowd-out estimates from zero to complete, though the majority of experiments find less than complete crowd-out and reject pure altruism (Andreoni 1993; Bolton and Katok 1998; Chan, Godby, Mestelman, and Muller 2002; Sutter and Weck-Hannemann 2004; Eckel, Grossman, and Johnston 2005; Gronberg, Luccasen, Turocy, and Van Huyck 2012). Rejecting pure altruism, impure altruism has been accepted as the standard model of charitable giving.

However, we argue that the experimental approach in this literature has two fundamental limitations. First, previous experiments measure crowd-out around one, and only one, exogenous level of giving-by-others. However, theoretical analysis of the impure altruism model indicates that the degree of crowd-out depends on the level at which it is measured. In the limit as giving-by-others moves from a low level to a sufficiently high level, motives at the margin shift from impure altruism toward pure warm glow. Equivalently, in the limit crowd-out decreases toward zero (Ribar and Wilhelm 2002; Yildirim 2014). Hence,

[1] For reviews of the literature on crowd-out measures see Steinberg (1991), Khanna, Posnett, and Sandler (1995), Kingma (1989), Okten and Weisbrod (2000), Payne (1998), Ribar and Wilhelm (2002), Vesterlund (2006, 2014). Andreoni (1988), Bergstrom, Blume, and Varian (1986), and Warr (1983) provide additional examples of the discrepancies between the theoretical predictions of the pure altruism model and field evidence.

whether or not a crowd-out test rejects pure altruism depends on the level of giving-by-others at which the test is conducted. Furthermore, although the warm glow preference component is the source of incomplete crowd-out, a single measure of the magnitude of incomplete crowd-out cannot identify the strength of warm glow preferences. It is necessary to measure crowd-out around more than one level of giving-by-others to identify warm glow and altruism preferences.

Second, because impure altruism was intentionally designed to generate the prediction of incomplete crowd-out, and thereby reconcile theory with the pre-existing evidence of incomplete crowd-out, it is not convincing to produce additional evidence of incomplete crowd-out and conclude that the additional evidence establishes impure altruism as the "correct" model. In short, impure altruism has been accepted as the standard model of giving because it predicts the comparative static it was designed to predict. With impure altruism being the accepted model of charitable giving it is essential that it be subjected to a test that at least in principle it can fail.

In this paper we address both limitations. We introduce a new experimental design, use it to estimate crowd-out at a low and at a high level of giving-by-others, and demonstrate that the power to reject pure altruism depends on the level of giving-by-others at which the hypothesis is tested. We also develop a set of conditions on preferences sufficient to imply that as giving-by-others increases, crowd-out decreases monotonically, not just in the limit. Under these conditions the impure altruism model generates a testable prediction, a prediction that it was not intentionally designed to have. Using our two measures of crowd-out we can directly test the decreasing crowd-out prediction of the impure altruism model.

The innovation in the new experimental design is to carefully control the exogenous level of giving-by-others, as theory suggests is necessary to identify altruism and warm glow preferences. We do this by creating an individualized charity: each participant is paired with a child between 1 and 12 years old whose house has suffered extensive fire damage. The participant can give through the experiment to the American Red Cross of Southwestern Pennsylvania which will use the donation to buy books for the child. The books will be used by volunteers at the scene of the fire as a bridge to begin helping the child cope with the disaster. We as the experimenters are the only exogenous source of giving-by-others to provide books for the child. By carefully controlling the level of the public good exogenously given-by-others while at the same time examining contributions to an actual charity, the individualized charity design closely captures the theoretical framework of impure altruism.

Finally, we use the crowd-out measurements at the two levels of giving-by-others, along with income effects measured at the two levels and an additional measure of unfunded crowd-out, to estimate a structural model of impure altruism. The structural model yields estimates of preference parameters, one for altruism and one for warm glow, and we use the preference parameters to assess the relative strengths of altruism and warm glow on average for the participants in the experiment. Furthermore, we estimate the structural model for each individual to describe the heterogeneity in motives across the participants.

There are four results from the experiment. First, the experiment provides the first evidence that crowd-out depends on the level of giving-by-others at which crowd-out is measured. At the low level of exogenous giving-by-others to provide books for the child crowd-out is 97 percent, essentially complete, but at the high level of giving by others crowd-out is 82 percent. Had we followed the previous literature and measured crowd-out only at the low level of giving-by-others, we would have concluded that people give because of pure altruism. If, however, we had set giving-by-others at the high level, we would have concluded that people give because of impure altruism.[2] Second, the decrease in crowd-out from 97 to 82 percent is statistically significant, and hence the impure altruism model passes the test based on the new comparative static prediction. Third, although impure altruism passes the new test—specifically, that in addition to the altruism component the warm glow component of utility is necessary to explain the experimental data—the structural model indicates that the warm glow motive is relatively weak: on average the warm glow parameter is less than one-twentieth the size of the altruism parameter. Fourth, the individual-specific preference parameters indicate that nine percent of the participants were motivated only by pure warm glow, while the remaining participants were roughly equally split between pure and impure altruists. Among most of the impure altruists, altruism is stronger than warm glow. Consequently, altruism accounts for the large majority of contributions in the experiment.

The findings are significant for four reasons. First, although there likely are several reasons why previous experiments have generated a range of different crowd-out estimates, our results provide an experimental validation of a theoretically-grounded reason for the differences. More importantly, because the results demonstrate that crowd-out depends on the level of giving-by-others, experiments using crowd-out measurements to identify the relative strengths of altruism and warm glow preferences need to measure crowd-out around more than one level of giving-by-others. Second, the results enable the first test of the standard economic theory of charitable giving based on a prediction that was not intentionally designed into the model to begin with. Third, the results are the first describing heterogeneity across individuals in their dual altruism and warm glow motives to give. Finally, the evidence indicating the strength of altruism is important not only because the existence of altruism is a fundamental question about human behavior, but also because results from some previous experiments have been taken to imply that warm glow is the predominant motivation of giving (e.g., Eckel, Grossman and Johnston 2005; Crumpler and Grossman 2008). To be sure, we do not interpret our findings to suggest that altruism motivates giving to all types of non-profit organizations, but rather as a demonstration that there are charitable giving environments where altruism is the predominant explanation of why people give.

[2] Or because of pure warm glow, as we will explain in the next section.

2. Theory and Background

We follow Becker (1974), Bergstrom, Blume, and Varian (1986), and Andreoni (1990) in deriving demand curves of giving from the pure and impure altruism models. Understanding how the two models work is facilitated by focusing on their income effects. For each model the demand curve contains two income effects, one with respect to own income and one with respect to giving-by-others. The central prediction of pure altruism is that the two income effects are equal, which implies that balanced-budget crowd-out is complete. Impure altruism's warm glow component creates a difference between the two income effects, which implies that balanced-budget crowd-out is incomplete.

This section makes three points. First, previous experiments test pure altruism's central prediction that balanced-budget crowd-out is complete by measuring balanced-budget crowd-out around a single level of giving-by-others. Although a single measure of crowd-out is sufficient to test pure altruism, we will show that the power to reject pure altruism will depend on the level of giving-by-others at which the test is conducted. Furthermore, a single measure of crowd-out cannot identify the relative strengths of altruism and warm glow preferences. Second, experimental findings of incomplete crowd-out are akin to the incomplete crowd-out evidence from field studies that motivated the design of the impure altruism model. As such, previous experiments do not provide qualitatively new evidence supporting impure altruism, other than evidence of the comparative static impure altruism was designed to have. Third, using insights from impure altruism's asymptotic properties, we derive a new test of the impure altruism model. The test is direct—meaning that it positions impure altruism as the null, rather than as the alternative—and is based on a prediction that impure altruism was not intentionally designed to have.

In the pure altruism model individual i derives utility $U(x_i, G)$ from private consumption x_i, and from the charity's output G, a public good (Becker 1974). $G = \sum_{i=1}^{n} g_i$ is the sum of the charitable gifts by all individuals. Setting prices to one, individual i's budget constraint is $x_i + g_i \leq w_i$, where g_i is her gift to the charity and w_i is her own income. Giving-by-others to the public good, $G_{-i} = \sum_{j \neq i} g_j$, added to both sides of the budget constraint yields: $x_i + G \leq w_i + G_{-i}$. The term on the right-hand side of the budget constraint, own income plus giving-by-others, is i's social income: $Z_i \equiv w_i + G_{-i}$. Assuming that $U(\cdot,\cdot)$ is continuous and strictly quasi-concave, and that i's optimal gift $g_i^* > 0$, results in the binding first-order condition: $-U_x(x_i, G) + U_G(x_i, G) = 0$. *i's* preferred provision of the public good is given by the following continuous demand function:

$$G^* = q\,(w_i + G_{-i}) \qquad (1)$$

The demand function q (.) is the Engel curve for the public good, and is a function of only one argument (social income) implying that i's own income and giving-by-others are perfect substitutes. The two income effects with respect to own income and giving-by-others are therefore equal: $\mathrm{d}G^*/\mathrm{d}w_i = \mathrm{d}G^*/\mathrm{d}G_{-i} \triangleq q_1$.[3]

Pure altruism's $\mathrm{d}G^*/\mathrm{d}w_i = \mathrm{d}G^*/\mathrm{d}G_{-i}$ prediction has been subjected to extensive experimental testing. Testing has typically been conducted in terms of the individual's giving:

$$g_i^* = -G_{-i} + G^* = -G_{-i} + q(w_i + G_{-i}) \qquad (2)$$

which implies:

$$\mathrm{d}g_i^* = -\mathrm{d}G_{-i} + q_1[\mathrm{d}w_i + \mathrm{d}G_{-i}]. \qquad (3)$$

A one dollar decrease in own income accompanied by a one dollar increase in giving-by-others, $\mathrm{d}w_i = -\mathrm{d}G_{-i}$, is balanced-budget from i's perspective because social income is unchanged. With no change in social income there is no change in i's preferred provision of the public good (G^*), but because giving-by-others has increased by one dollar, i's optimal gift to decrease by exactly one dollar. In other words, balanced-budget crowd-out is complete: $\kappa|_{dw_i=-dG_{-i}} \triangleq \frac{\mathrm{d}g_i^*}{\mathrm{d}G_{-i}}|_{dw_i=-dG_{-i}} = -1$, a direct implication of pure altruism's prediction that the two income effects are equal.

The first crowd-out tests were not experimental, but rather econometric field studies that estimated how much giving by individuals to charities decreases in response to changes in government spending targeted towards the same purpose as the charity output. Extensive econometric evidence of what may be seen as a measure of unfunded crowd-out— $\kappa|_{dw_i=0} \triangleq \frac{\mathrm{d}g_i^*}{\mathrm{d}G_{-i}}|_{dw_i=0} = -1 + q_1$ — was so much less than complete that no reasonable magnitude of the own income effect q_1 could reconcile the econometric evidence with pure altruism (see the work cited in the Introduction).

The econometric field studies' rejection of pure altruism led Andreoni (1989) to propose the impure altruism model, specifically to produce a model that would be "consistent with empirical observations" (also see Corners and Sandler, 1984 and Steinberg, 1987). Impurely altruistic utility is $U(x_i, G, g_i)$, where now g_i affects utility both from increasing provision of the public good G, and from generating a private warm glow benefit for the donor. The warm glow component produces a second marginal-benefit-of-giving term in the first-order condition (and using $g_i = G - G_i$):

$$-U_x(x_i, G, G - G_{-i}) + U_G(x_i, G, G - G_{-i}) + U_{g_i}(x_i, G, G - G_{-i}) = 0. \qquad (4)$$

The Engel curve for the public good derived from the first-order condition is now a function of two arguments, social income and giving-by-others:

[3] This statement holds as long as i's gift is strictly positive, as we assume to be the case. Bergstrom, Blume, and Varian (1986) derive the comparative statics when some individuals are at corner solutions $g_i^* = 0$.

$$G^* = q(w_i + G_{-i}, G_{-i}) \quad (5)$$

In the impure altruism model the two income effects with respect to own income $\mathrm{d}G^*/\mathrm{d}w_i \triangleq q_1$ and giving-by-others $\mathrm{d}G^*/\mathrm{d}G_{-i} \triangleq q_1 + q_2$ are not equal. q_2 is the difference between the two income effects = $\mathrm{d}G^*/\mathrm{d}G_{-i} - \mathrm{d}G^*/\mathrm{d}w_i$.

In terms of the individual's giving, predictions of crowd-out in the impure altruism model are changed accordingly. Equation (5) implies:

$$g_i^* = -G_{-i} + q(w_i + G_{-i}, G_{-i}) \quad (6)$$

and

$$\mathrm{d}g_i^* = -\mathrm{d}G_{-i} + q_1[\mathrm{d}w_i + \mathrm{d}G_{-i}] + q_2\,\mathrm{d}G_{-i} \quad (7)$$

The balanced-budget crowd-out test where $\mathrm{d}w_i = -\mathrm{d}G_{-i}$ still neutralizes the own-income effect, q_1, but does not neutralize the difference between the two income effects q_2: $\kappa|_{dw_i=-dG_{-i}} = -1 + q_2$. A one dollar decrease in own income accompanied by a one dollar increase in the giving-by-others changes *i's* preferred provision level of the public good by the amount q_2. To secure the prediction of incomplete crowd-out seen in the field studies, q_2 is assumed to be positive.

If $q_1 > 0$, $q_2 > 0$ and $q_1 + q_2 < 1$, then at the margin both altruism and warm glow influence giving (Andreoni 1989). The model reduces to the pure altruism model if $q_1 > 0$ and $q_2 = 0$. The model reduces to a pure warm glow model if *i's* preferred level of the public good increases dollar-for-dollar with the unfunded amount provided by others: $\mathrm{d}G^*/\mathrm{d}G_{-i} = q_1 + q_2 = 1$; hence, if individuals are motivated at the margin by warm glow only (no altruism), crowd-out in response to an unfunded increase in G_{-i} is $\kappa|_{dw_i=0} = -1 + q_1 + q_2 = 0$.

Previous experiments test pure altruism's prediction that balanced-budget crowd-out is complete (H_0: $\left|\kappa|_{dw_i=-dG_{-i}}\right| = 1 \Leftrightarrow H_0$: $q_2 = 0$). As a representative example, in a dictator game where both decision maker and recipient are laboratory participants, Bolton and Katok (1998) use two treatments to measure balanced-budget crowd-out: (1) the initial experimental endowment is \$18 for the decision maker and \$2 for the recipient, and (2) the endowment is \$15 for the decision maker and \$5 for the recipient. Hence, balanced-budget crowd-out is being measured at G_{-i} = \$2. The results are that balanced-budget crowd-out is incomplete ($\left|\kappa|_{dw_i=-dG_{-i}}\right|$ = .737), and Bolton and Katok conclude that the participants in their study are impure altruists. Other experiments have also measured crowd-out at a single level of giving-by-others and have produced a wide range of balanced-budget crowd-out estimates. Most, though not all, reject pure altruism.[4]

[4] Andreoni (1993) finds .715 balanced-budget crowd-out, and rejects pure altruism. Gronberg, Luccasen, Turocy, and Van Huyck obtain a larger magnitude crowd-out (.90), but still reject pure altruism. Chan, Godby, Mestelman, and Muller (2002) obtain .96 crowd-out or .67 crowd-out depending on the size of the lump-sum tax used to measure crowd-out. Eckel, Grossman and Johnston (2005) obtain zero crowd-out or complete crowd-out

Our first point is that the power to reject pure altruism, under an impure altruism alternative hypothesis, depends on the level of giving-by-others around which crowd-out is measured. Furthermore, because previous experiments have measured crowd-out around one, and only one, level of giving-by-others, their crowd-out measures cannot be used to identify the relative strengths of altruism and warm glow preferences. Understanding why begins with the asymptotic comparative statics of impure altruism: under fairly weak conditions on preferences (concave utility and strictly operative warm glow at all levels of G) as giving-by-others $G_{-i} \to \infty \Rightarrow q_1 + q_2 \to 1$; that is, the impure altruism model converges to a model where, at the margin, giving is motived by pure warm glow (Ribar and Wilhelm 2002).[5] An implication is that crowd-out asymptotically decreases and, obviously, that crowd-out is a function of G_{-i}. To illustrate consider the Cobb-Douglas impure altruism utility function:

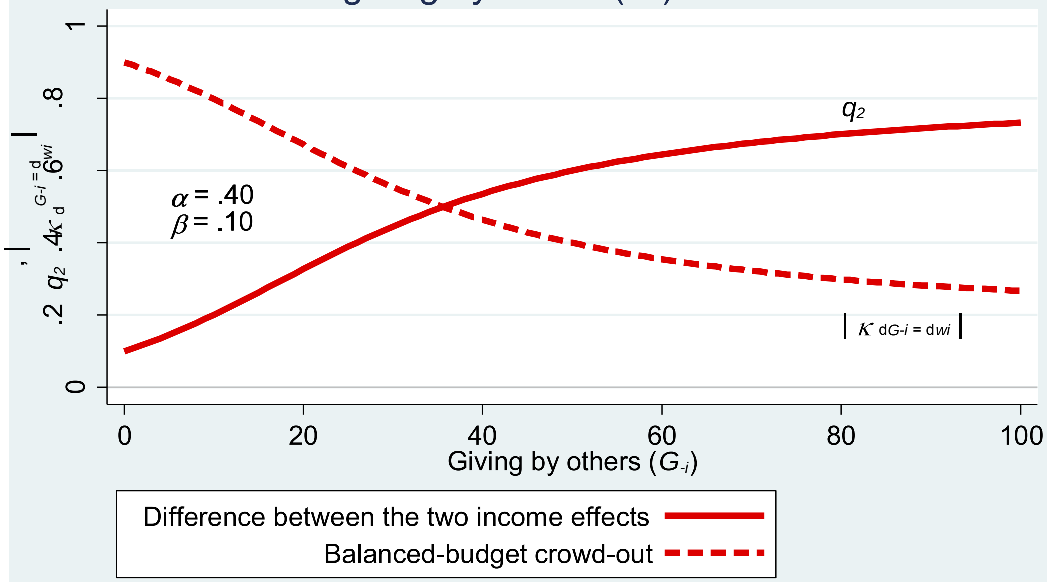
$$U(x_i, G, g_i) \;=\; (1 - \alpha - \beta) \ln x_i \;+\; \alpha \ln G \;+\; \beta \ln g_i. \qquad (8)$$

Figure 1 plots q_2 ($= \mathrm{d}G^*/\mathrm{d}G_{-i} - \mathrm{d}G^*/\mathrm{d}w_i$) and balanced-budget crowd-out ($\left|\kappa|_{dw_i=-dG_{-i}}\right| = \left|\frac{\mathrm{d}g_i^*}{\mathrm{d}G_{-i}}|_{dw_i=-dG_{-i}}\right|$) as functions of G_{-i} for Cobb-Douglas impure altruism parameterized so that altruism is relatively strong compared to warm glow: $\alpha = .40$ and $\beta = .10$. As Figure 1 makes clear, as giving-by-others increases the gap between the two income effects (q_2) increases and crowd-out decreases. Because the crowd-out effect size depends on G_{-i}, the power to reject pure altruism (H_0: $\left|\kappa|_{dw_i=-dG_{-i}}\right| = 1 \Leftrightarrow H_0$: $q_2 = 0$) also depends on G_{-i}.

depending on how the lump-sum taxation is framed to the participants, and interpret their results as supporting pure warm glow. Sutter and Weck-Hannemann (2004) obtain complete crowd-out and cannot reject pure altruism. Experiments using the linear voluntary contribution mechanism have produced a similar range of results (Anderson, Goeree and Holt 1998; Goeree, Holt and Laury 2002; cf. Palfrey and Prisbrey 1996, 1997).

5 In addition there are several technical conditions: utility is twice continuously differentiable, has strictly positive first derivatives, U_G is finite for all $g_i > 0$, the second derivatives of $U(.,.,.)$ with respect to the two private goods x_i and g_i are finite for all levels of G, and $U_{xx} - 2U_{xg} + U_{gg}$ is bounded away from zero (again, for all levels of G). The assumption that warm glow is operative also is needed to secure that the impure altruism model, in contrast to the pure altruism model, can predict individual giving in a large economy (Andreoni, 1989). As in Andreoni (1989) it is also assumed that the giving-by-others is addressing a need, through the charity, that itself remains constant.

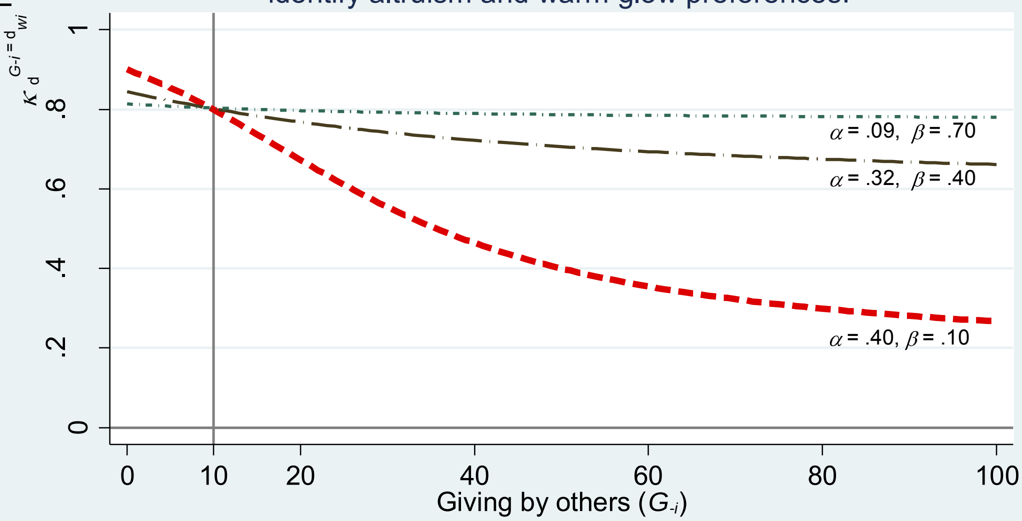
Figure 1. Cobb-Douglas q_2 and balanced-budget crowd-out as giving by others (G_{-i}) increases.



Notes: The Cobb-Douglas parameters are α = .40 and β = .10.
$U = \alpha \log(G) + \beta \log(g_i) + (1 - \alpha - \beta) \log(x_i)$. Income is held constant at w_i = \$40.

To see that a single crowd-out measure cannot identify the relative strengths of altruism and warm glow preferences, consider an experiment that takes a single measure of crowd-out around one level of giving-by-others, say G_{-i} = \$10, and finds crowd-out out to be $\left|\kappa|_{dw_i=-dG_{-i}}\right|$ = .80. This result would be consistent with the α = .40, β = .10 preferences that generated Figure 1. However, this result is also consistent with infinitely many α, β parameterizations of Cobb-Douglas impure altruism. Of these infinitely many parameterizations, Figure 2 plots balanced-budget crowd-out as a function of G_{-i} for three: the relatively strong altruism from Figure 1 (α = .40, β = .10), altruism and warm glow at roughly the same strength (α = .32, β = .40), and relatively strong warm glow (α = .09, β = .70). All three have $\left|\kappa|_{dw_i=-dG_{-i}}\right|$ = .80 at G_{-i} = \$10. Hence, altruism and warm glow preferences cannot be identified from a single measure of crowd-out. The underlying reason is that one measure of crowd-out—equivalently, one income effect—is insufficient to identify two preference parameters.

Figure 2. A single measure of balanced-budget crowd-out cannot identify altruism and warm glow preferences.



Notes: $U = \alpha \log(G) + \beta \log(g_i) + (1 - \alpha - \beta) \log(x_i)$. Income is held constant at w_i = \$40. From the single measure of crowd-out $|\kappa_{dG_{-i} = dw_i}|$ = .80 at G_{-i} = \$10 it is possible to make multiple inferences about the relative strengths of altruism (α) and warm glow (β) preferences. Three such inferences are displayed: altruism strong relative to warm glow (α = .40, β = .10), altruism and warm glow at roughly the same strength (α = .32, β = .40), and altruism weak relative to warm glow (α = .09, β = .70).

Our second point is that although most of the previous experimental evidence warrants rejection of the pure altruism null hypothesis, there are two reasons why the evidence does not offer qualitatively new support of impure altruism. First, a pure warm glow model is also consistent with incomplete crowd-out. Continuing the example in Figure 2 pure warm glow preferences (α = 0, β = .80) would be consistent with evidence that $\left|\kappa|_{dw_i=-dG_{-i}}\right|$ = .80 at G_{-i} = \$10. More generally, rejection of a null hypothesis does not imply acceptance of any specific alternative. Second, to reconcile theory with pre-existing field evidence of incomplete crowd-out it was assumed in the impure altruism model that $q_2 > 0$ (implying $\left|\kappa|_{dw_i=-dG_{-i}}\right| <$ 1), hence it is not convincing to produce additional evidence of incomplete crowd-out and claim that the additional evidence is a qualitatively new test of the theory.[6]

Our third point is that impure altruism's asymptotically decreasing crowd-out prediction suggests a qualitatively new test of impure altruism. Going from asymptotically decreasing crowd-out as $G_{-i} \rightarrow \infty$ to a comparative static testable in an experiment requires conditions on preferences such that decreasing crowd-out is monotonic. Under the following conditions impure altruism predicts decreasing crowd-out when increasing G_{-i} between two finite levels G_{-i}^{Low} and G_{-i}^{High}:

[6] The evidence of incomplete crowd-out generated by experiments adds to our knowledge by confirming that incomplete crowd-out is an attribute of preferences. Although the evidence of incomplete crowd-out generated by field studies could be attributed, at least in part, to other phenomena (e.g., institutional features, donors' lack of information, or unobserved influences on giving), the field evidence was deemed sufficiently informative about preferences to lead theorists to propose impure altruism.

PROPOSITION 1. Consider a concave impurely altruistic utility function, with strictly operative warm glow, and that satisfies the technical conditions described in footnote 5. Further, if utility is additively separable with positive third derivatives, then q_2 is monotonically increasing in G_{-i}.[7]

Proof: Differentiating the first-order condition (4) with respect to G_{-i} yields:

$$q_2 = (U_{gG} + U_{gg} + U_{gx}) / (U_{xx} + U_{gg} + U_{GG} - 2\, U_{Gx} - 2\, U_{gx} + 2\, U_{gG}) \tag{9}$$

which for additively separable utility functions reduces to:

$$q_2 = U_{gg} / (U_{xx} + U_{gg} + U_{GG}). \tag{10}$$

Differentiating the second derivatives with respect to G_{-i} yields:

$$\frac{dU_{xx}}{dG_{-i}} = U_{xxx}\frac{dx^*}{dG_{-i}} = U_{xxx}\,(1 - q_1 - q_2) > 0 \tag{11}$$

$$\frac{dU_{GG}}{dG_{-i}} = U_{GGG}\frac{dG^*}{dG_{-i}} = U_{GGG}\,(q_1 + q_2) > 0 \tag{12}$$

$$\frac{dU_{gg}}{dG_{-i}} = U_{ggg}\frac{dg^*}{dG_{-i}} = U_{ggg}\,(q_1 + q_2 - 1) < 0 \tag{13}$$

where the inequalities follow from the assumed positive third derivatives. Now differentiating (10) with respect to G_{-i}:

$$\frac{dq_2}{dG_{-i}} = \frac{\frac{dU_{gg}}{dG_{-i}}(U_{xx} + U_{GG}) - U_{gg}\left(\frac{dU_{xx}}{dG_{-i}} + \frac{dU_{GG}}{dG_{-i}}\right)}{(U_{xx} + U_{GG} + U_{gg})^2}. \tag{14}$$

Concavity combined with the signs in (11)–(13) imply that $\frac{dq_2}{dG_{-i}}$ is positive. $\blacksquare$

Cobb-Douglas preferences meet the conditions in Proposition 1; therefore the balanced-budget crowd-out plots in Figures 1 and 2 are monotonically decreasing. Appendix A shows that Cobb-Douglas preferences also have monotonically decreasing unfunded crowd-out ($\left|\kappa|_{dw_i=0}\right| \to 0$), and presents a set of conditions on preferences such that decreasing unfunded crowd-out is monotonic—hence the marginal motive for giving monotonically moves from impure altruism to warm glow ($q_1 + q_2 \to 1$).

[7] In the analysis of risk, a positive third derivative corresponds to prudence, which can be interpreted as the disutility of being faced with a specified risk decreasing as wealth gets higher (Eeckhoudt and Schlesinger, 2006).

A test of impure altruism's decreasing crowd-out prediction that can be carried out in a finite–G_{-i} experiment must be conducted jointly with some restrictions on preferences. We offer three perspectives. First, absent placing some restrictions on preferences the impure altruism model is void of testable predictions, other than $q_2 > 0$, the assumption built into the model so that it could match pre-existing evidence of incomplete crowd-out. Second, previous empirical and experimental analyses of the impure altruism model commonly assume separability.[8] Third, beyond some level of G_{-i}, monotonically increasing q_2 becomes applicable to non-separable impurely altruistic utility functions satisfying the weak preference conditions in Ribar and Wilhelm (2002). As $G_{-i} \rightarrow \infty$ these utility functions become asymptotically separable (i.e., $U_{gG} \rightarrow 0$ and $U_{xG} \rightarrow 0$).

In the next section we introduce a new experimental design that addresses the limitations in the previous experimental work by carefully controlling the level of giving-by-others and measuring balanced-budget crowd-out around two levels of G_{-i}: one at a low level and one at a higher level of giving-by-others. We use the two balanced-budget crowd-out measures to demonstrate that rejection of pure altruism depends on the level of giving-by-others at which the hypothesis is tested, and to test impure altruism's decreasing crowd-out prediction. We repeat the test of impure altruism using unfunded crowd-out because testing for increasing $q_1 + q_2$ allows us to determine if the marginal motive for giving is shifting from impure altruism to pure warm glow. Additional caution is required when interpreting the results from a test of decreasing unfunded crowd-out because a pure altruism model also predicts decreasing unfunded crowd-out if q_1 increases a lot; therefore before considering unfunded crowd-out we must first examine own income effects q_1 in isolation. Finally, we use the two measures of balanced-budget crowd-out, combined with own income effects measured at the two levels of G_{-i} plus an additional measure of unfunded crowd-out, to identify the relative strengths of altruism and warm glow preferences to give.

3. Experimental Design

To conduct the crowd-out tests and identify the relative strengths of altruism and warm glow in motivating charitable giving we wanted to create an experimental environment that mirrored as closely as possible the theoretical analysis of impure altruism. It was therefore essential that we control the level of giving-by-others to the charity, and that the participant's gift secured the final and total charity output. We also wanted to work with an actual charity so that the experimental results remained relevant to actual charitable giving. Unfortunately, one cannot simply have the participant give to an existing charity because people outside the experiment would be giving to that same charity, and thereby we would lose control over the level of giving-by-others.

[8] Andreoni (1990) notes the need to make a functional form assumption to assess the relative strength of altruism, and uses Cobb-Douglas preferences. The voluntary contribution mechanism experiments use separable utility functions to financially-induce public goods (Andreoni 1993; Chan, Godby, Mestelman, and Muller 2002; Gronberg, Luccasen, Turocy, and Van Huyck 2012; Sutter and Weck-Hannemann 2004).

To control the level of giving-by-others while at the same time working with an actual charity we joined with the Southwestern Pennsylvania chapter of the American Red Cross to create an individualized charity for each of our participants: the opportunity to help a child in need in a way no other donors outside the experiment were doing. In the event of a fire in Southwestern Pennsylvania the chapter helps the affected families find temporary shelter, provides them with clothing and a meal, and gives them essential toiletries. However, prior to our study no items were given to the children affected by the fire. We joined with the chapter to collect funds to buy books for the affected children.

Each participant in the study was paired with a child (1-12 years old) whose family home had suffered extensive fire damage. Each participant was given an endowment and asked to allocate it between him/herself and the child. The participants were told that in addition the research foundation funding the study would donate a fixed amount of money towards the child independent of the participant's allocation. Therefore, the total amount to be spent on books for the child would be the sum of their allocation and the foundation's fixed donation. The books purchased with the total amount would be given to the child by the American Red Cross immediately after the child had been affected by a severe fire. Participants were informed that "Each participant in this study is paired with a different child . . . Only you have the opportunity to allocate additional funds [additional to the foundation's fixed donation] to the child. Neither the American Red Cross nor any other donors provide books to the child."

In explaining why the American Red Cross was seeking the participant's contribution for books, participants were informed that the chapter's Emergency Preparedness Coordinator Sandi Wraith had made the following statement: "Children's' needs are often overlooked in the immediate aftermath of a disaster because everyone is concerned primarily with putting the fire out, reaching safety, and finding shelter, food and clothing...just the basics of life. So many times, I've seen children just sitting on the curb with no one to talk to about what's happening...for this reason I've found trauma recovery experts in the community to work with us to train our volunteer responders in how to address children's needs at the scene of a disaster.......being able to give the children fun, distracting books will provide a great bridge for our volunteers to connect with kids and get them talking about what they've experienced."

A total of 85 undergraduates at the University of Pittsburgh participated in one of six sessions. There were between 13 and 20 participants in each session. Participants were seated in a large class room. They were given a folder with a set of instructions, a quiz, an envelope, a calculator, and a pen. The instructions were then read out loud, and the participants were given a brief quiz to make sure that they could calculate the payoffs of a sample decision. After they received answers to the quiz, participants proceeded to the decision task.

To identify individual heterogeneity in altruism and warm glow the study used a within–subject design. Each participant made six decisions. For each decision there was a budget that indicated the participant's endowment and the foundation's fixed donation. The endowment and fixed donation varied across the six budgets. For each budget the participant was told that she or he was free to allocate any portion of the endowment to the child. The child would receive books purchased with the sum of the fixed donation and the allocation made by the participant.

The study was double-blind: each decision sheet was identified only by a Claim Check number, and this number was used for the participant's anonymous payment. However, participants had the option of relinquishing their anonymity if they wanted to receive an acknowledgement directly from the Red Cross. Once the decision task was completed the participant placed the decision sheet in the envelope, and from that point onward the decisions were identified only by a Claim Check number (with the exception of the participants who requested acknowledgement forms). While one set of experimenters prepared the participants' payments in sealed envelopes, another experimenter who did not oversee the payment was in charge of distributing the envelopes by Claim Check number.

To assure participants that the experimental procedures were followed we used a verification procedure similar to that in Eckel et al. (2005). During the instruction phase we randomly selected one participant to be the monitor. The monitor's job was to oversee the procedures of the experiment. The monitor followed the experimenters throughout the study, oversaw that the payment procedures were as described in the instructions and that for each child a check was issued to the American Red Cross for the amount determined by sum of the participant's allocation and the relevant fixed donation. At the end of the experiment the monitor made a statement indicating whether the experimenters had followed the procedures described in the instructions. Participants were then shown the acknowledgements and checks that were to be sent to the American Red Cross. These were shown from a distance where no details could be determined. Once the participants had received their payment and left the study, the monitor walked with the experimenter to the nearest mailbox, and dropped the envelopes with the checks into the mail. The monitor then signed a statement to certify that all procedures had been followed, and the statement was subsequently posted in the Economics Department at the University of Pittsburgh. Finally the American Red Cross sent a receipt to any participant who requested it, and a receipt for the total amount received. The latter receipt was also posted in the Department. At the request of the Red Cross, the experimenters handled the purchase of 85 sets of books, each costing the amounts generated by the experiment.

During the decision task participants were presented with the six budgets shown in Table 1. For example, for Budget 1 the participant was informed that the foundation paying for the study had donated $4 toward books for the child, and that the participant had an endowment of $40 which she could allocate between herself and the child. Any amount allocated to the child would be added to the $4 fixed donation and the sum used to buy books. Table 1 shows how the fixed donation and the endowment varied across the budgets. Each participant received the six budgets in one of six randomized orders. At the end of the decision task the monitor randomly selected a number between 1 and 6, and the decision for the selected budget was carried out.

Table 1: Experimental budgets.

Budget	Foundation's fixed donation (G_{-i})	Participant's endowment (w_i)
1	4	40
2	10	40
3	28	40
4	34	40
5	4	46
6	28	46

The six budgets in Table 1 allow us to examine the participant's demand for giving books to the child and the altruism and warm glow motives for such giving. At the low level of giving-by-others (G_{-I} = 4) Budgets 5 and 2 effect a \$6 balanced-budget increase in giving-by-others funded through a \$6 lump-sum tax. At the high level of giving-by-others (G_{-i} = 28) Budgets 6 and 4 effect the same \$6 balanced-budget increase in giving-by-others. Hence at a low and at a high level of giving-by-others we can measure balanced-budget crowd-out ($|\kappa|_{\mathrm{d}G-i\,=\,-\mathrm{d}wi}| = |1 - q_2|$). Likewise, Budgets 1 and 5 and Budgets 3 and 6 allow measurement of own income effects (q_1) at a low and at a high level of giving-by-others, respectively. Unfunded crowd-out ($\left|\kappa|_{dw_i=0}\right| = |1 - q_1 - q_2|$) can be measured with Budgets 1 and 2 and Budgets 3 and 4.

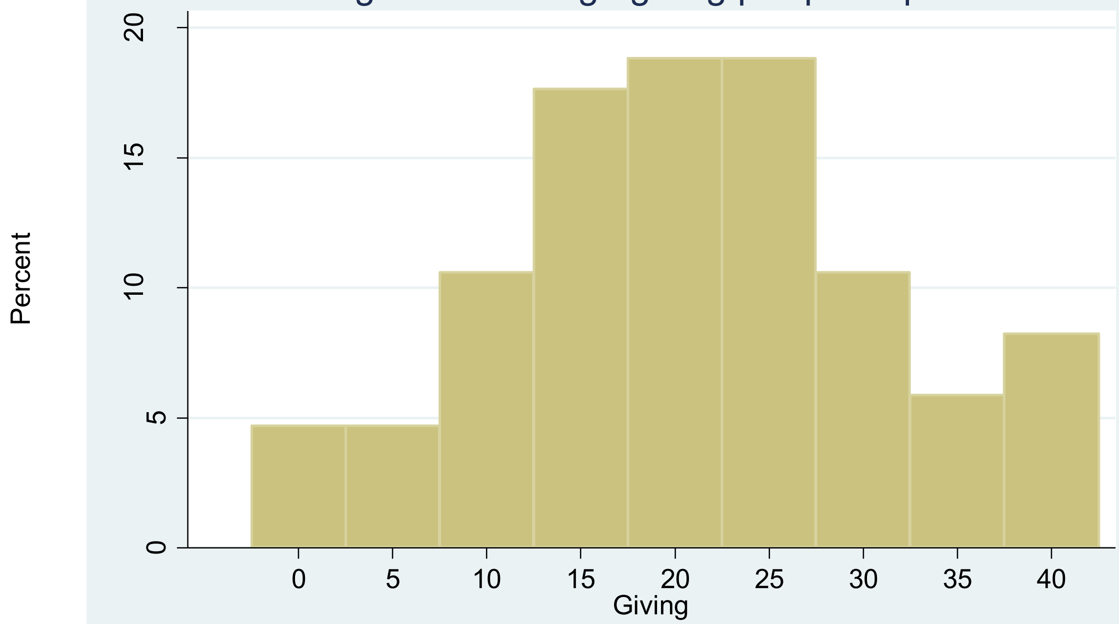
4. Results

This section begins with a descriptive analysis of the participants' giving to buy books for the child. Then we present estimates of average balanced-budget crowd-out, own income effects, and unfunded crowd-out, and compare the estimates from when giving-by-others is low to the estimates from when giving-by-others is high. All of these estimates are reduced-form. Next we estimate the altruism and warm glow preference parameters in a structural, Cobb-Douglas model of impure altruism. We estimate the structural model assuming first that the participants' motives can be represented by a single set of preferences, and then that preferences are heterogeneous. We use the structural estimates to assess the relative strengths of altruism and warm glow.

4.1. Descriptive statistics

Our individualized charity design was successful in creating an environment in which participants give, as seen in the per-participant average giving histogram in Figure 3. Only one of the participants stuck to a contribution of zero for each of the six budgets, another three had average giving of $2.50 or less. At the upper corner there were five participants who gave their entire endowment for each of the six budgets, and another two participants who on average gave $37.50 or more. Average giving across the six budgets (6 x 85 decisions) was $20.82 and the standard deviation was $12.11. Hence there was a large amount of variation across participants.

Figure 3. Average giving per-participant.



Note: Includes one person who gave $0 in all six decisions, and five people who gave the maximum in every decision. *N* = 85.

4.2. Crowd-out and income effects

We begin by examining the extent to which balanced-budget crowd-out is complete and whether it decreases as giving-by-others increases. We then show that the own income effect changes little as giving-by-others increases. Finally, we examine changes in unfunded crowd-out.

4.2.1 Balanced-budget crowd-out

The balanced-budget crowd-out test positions pure altruism as the null. Table 2 presents the results. Column 1 presents the crowd-out estimate at the low level of giving-by-others ($4), and column 2 presents the crowd-out estimate at the high level ($28). Columns 1 and 2 are linear regressions with individual fixed-effects. These estimates are not adjusted for corner decisions. Even if pure altruism is the correct model, decisions at corners would be less than dollar-for-dollar responsive to a lump sum tax and transfer. Hence, by not taking corner decisions into account the results in columns 1 and 2—like those from previous experiments—are biased against pure altruism. Therefore columns 3 and 4 re-estimate crowd-out appropriately taking into account the corner decisions using the two-sided fixed effects censored estimator of Alan, Honoré, Hu and Leth-Petersen (2014).

Table 2. Change in balanced-budget crowd-out between a low and a high level of giving-by-others.

	Linear model		Account for corner decisions		
	Giving-by-others		Giving-by-others		
	Low	High	Low	High	Low/High
	(1)	(2)	(3)	(4)	(5)
Giving-by-others (G_{-i})	-.94 [a]	-.77 [b]	-.97 [c]	-.82 [d]	-.99 [e]
	(.09)	(.08)	(.09)	(.09)	(.09)
Giving-by-others interacted with a dummy indicator that giving-by-others is high	-	-	-	-	.18 [f]
					(.12)
Budgets	2, 5	4, 6	2, 5	4, 6	2, 5, 4, 6

Notes: The dependent variable is the number of dollars a participant contributes to the Red Cross to buy books for the child. The estimates in columns 1 and 2 are from linear regressions with individual fixed effects. The estimates in columns 3–5 are marginal effects from the two-side estimator by Alan, Honoré, Hu and Leth-Petersen (2014) that accounts for the corner solutions at $0 and $40 or $46 with individual fixed effects. For column 5, the row 2 coefficient (giving-by-others interacted with a dummy indicator that giving-by-others is high) estimates the change in crowd-out between the low and high levels of giving-by-others, and indicates that at the high level of giving-by-others crowd-out is a smaller negative number. Standard errors are in parentheses. Standard errors in columns 3–5 are bootstrapped. N = 85 participants. Tests of complete crowd-out (H_0: $\left|\kappa|_{dG_{-i} = -dw_i}\right| \geq 1$) have p-values: [a] $p = .255$. [b] $p = .002$. [c] $p = .390$. [d] $p = .034$. [e] $p = .477$.
[f] Test of no decrease in balanced-budget crowd-out has $p = .07$.

Column 1 indicates that every dollar increase in giving-by-others from $4 to $10, while at the same time own income decreases from $46 to $40, causes a $0.94 reduction in participants' giving—94 percent crowd-out. Comparing Budget 5 ($4, $46) to Budget 2 ($10, $40), the $6 balanced-budget increase in giving-by-others causes participants on average to decrease giving by .94 x $6.00 = $5.64. Crowd-out is very close to complete, so close that we cannot reject complete crowd-out at any reasonable level of significance (H_0: $\left|\kappa|_{dG_{-i} = -dw_i}\right| \geq 1$ has $p = .255$). Had we followed the procedures of previous experiments and examined only one crowd-out measure, this result would have led us to conclude that on average participants are motivated to give by pure altruism.

Column 2 leads to a different conclusion. At the higher level of giving-by-others crowd-out is 77 percent, and we can reject complete crowd-out (p = .002). In other words, had we measured crowd-out at only one level of giving-by-others, and that level had been the higher level, we would have reached the conclusion that participants are impure altruists motivated by both altruism and warm glow. Clearly, the power to reject a pure altruism null depends on the level of giving-by-others at which the hypothesis is tested.

The measures of crowd-out in columns 1 and 2 do not take into account that 12.6 percent of the decisions (out of 6 x 85 = 510 decisions) were at a lower or upper corner. Columns 3 and 4 take corner decisions into account, and indicate that crowd-out is somewhat larger in magnitude. Estimated at a low level of giving-by-others, crowd-out is nearly complete: 97 percent. Although crowd-out at a higher level of giving-by-others increases (relative to column 2) to 82 percent, we still reject complete crowd-out (p = .034). As expected, by not taking corner decisions into account the results in columns 1 and 2 are biased against pure altruism, but columns 3 and 4 indicate that correcting the bias does not shift our qualitative conclusions.

The estimates moving from column 3 to column 4 suggest that crowd-out is decreasing. Column 5 directly examines the decrease in balanced-budget crowd-out by combining the data from the $6 balanced-budget increases in giving-by-others at the low and high levels of giving-by-others, and including an interaction term to indicate that the data are from the budgets where giving-by-others is high. The .18 (SE = .12) point estimate on the interaction term means that the magnitude of crowd-out is 18 percentage points smaller at the high level of giving-by-others. Obviously because crowd-out decreased, impure altruism's prediction that balanced-budget crowd-out decreases as giving-by-others increases cannot be rejected. To assess the strength of the evidence in support of impure altruism, we test the opposite hypothesis—that the magnitude of crowd-out did not decrease: that hypothesis can be rejected at p = .07. This evidence offers qualitatively new, and statistically significant, support for the impure altruism model. [9]

Random effects Tobit is an alternative estimation approach that can account for the corner decisions, under the additional assumption that the errors are normally distributed. Random effects Tobit estimates of the models in columns 3-5 are similar to the two-sided fixed effects censored estimates presented in the table. For instance, random effects Tobit estimation of the model in column 5 indicates that crowd-out at the low level of giving-by-others is −.95 (SE = .09), the magnitude of crowd-out is .19 (SE = .11) smaller at the high level of giving-by-others, and the hypothesis that the magnitude of crowd-out did not decrease can

[9] Comparing the estimates of balanced-budget crowd-out implied by column 5 with the estimates from columns 3 and 4 indicates slight differences that are due to the nonlinear estimation method: the nonlinear method applied to two separate samples (columns 3 and 4) generates slightly different estimates than the nonlinear method applied to the two samples combined into a single model with an interaction term (column 5). Estimates from the linear model are, of course, identical whether generated using separate samples or one combined sample in an empirical model with an interaction term.

be rejected at p = .044. Hence, the random effects Tobit estimates offer slightly stronger support for the impure altruism model. The similarity of the random effects Tobit and the two-sided fixed effects censored estimates implies that the errors are approximately normal.[10]

4.2.2 Own income effects

This section provides evidence that, on average, giving to the individualized charity is a normal good, and that the own income effect q_1 is essentially constant when moving from the low to the high level of giving-by-others. Normality is important to establish because it is a maintained assumption of the predictions derived from both the pure and impure altruism models. Constant q_1 implies that the pure and impure altruism models have different predictions for unfunded crowd-out ($\kappa|_{dw_i=0} = -1 + q_1 + q_2$ will be estimated in the next section). With constant q_1, pure altruism predicts no change in unfunded crowd-out. The evidence from Section 4.2.1 that q_2 is increasing implies that if q_1 is constant (or increasing) then impure altruism predicts that unfunded crowd-out will decrease.

Table 3 column 1 shows that the own income effect at the low level of giving-by-others is .40: with an additional $6 income participants on average increase giving by $2.40. Column 2 shows that the income effect is virtually the same at the higher level of giving-by-others. Column 3 takes the corner decisions into account, and indicates slightly smaller income effects: .32 at the low level of giving-by-others, and .36 at the high. Each of the estimated income effects is significantly larger than zero and less than one (ps < .001), establishing that on average both giving and own consumption are normal goods.

Table 3. Own income effects.

	Linear model Giving-by-others		Account for corner decisions Giving-by-others
	Low	High	Low/High
	(1)	(2)	(3)
Income (w_i)	.40	.41	.32
	(.07)	(.06)	(.06)
Income interacted with a dummy indicator that giving-by-others is high	-	-	.04 [a]
			(.08)
Budgets	1, 5	3, 6	1, 5, 3, 6

Notes: See the notes to Table 2. Tests of each income effect being zero (or less) have p < .001. Likewise, tests of each income effect being one (or more) have p < .001.

[a] Test of no change in the income effect has p = .583.

[10] A histogram of the within-participant variation (available upon request) also suggests that the data are approximately normal.

The .32 and .36 estimates of the income effect in column 3 indicate at most a minor increase when moving from the low to the high level of giving-by-others; the hypothesis that the two income effects are the same cannot be rejected (p = .583). Hence, the results indicate that q_1 remains constant as giving-by-others increases.

4.2.3 Unfunded crowd-out

Accounting for the evidence of constant own income effects generates the following predictions for the change in unfunded crowd-out when moving from the low to the high level of giving-by-others: (a) decrease under impure altruism and (b) stay constant under pure altruism. Regardless of the own income effect, unfunded crowd-out is predicted to (c) stay constant at zero under pure warm glow. Table 4 presents the unfunded crowd-out results. Own income is held constant at \$40 and giving-by-others is increased from \$4 to \$10 (column 1) and then again from \$28 to \$34 (column 2). Unfunded crowd-out is 55 and 36 percent, respectively. These measures enable a test of the hypothesis that on average participants are motivated by pure warm glow ($\kappa|_{dw_i=0} = 0$). At both the low and the high level of giving-by-others, the zero crowd-out prediction of pure warm glow can be rejected (ps < .001).

Knowing that q_1 stays constant between the low and high levels, the 19 percentage point (SE = 9 percentage points) decrease in unfunded crowd-out from 55 to 36 percent provides additional support for the impure altruism model. The hypothesis that the magnitude of crowd-out did not decrease can be rejected (p = .016). Taking corner decisions into account, and continuing to include individual fixed effects, in column 3, the decrease in crowd-out is estimated to be slightly larger, 22 percentage points, and the hypothesis of no decrease in crowd-out is likewise rejected (p = .013).

To further check the conclusion that the decreasing unfunded crowd-out supports the impure altruism model, rather than being consistent with pure altruism plus an increasing own income effect, we re-estimate the change in unfunded crowd-out setting aside the N = 15 participants whose motives are pure altruism, or possibly pure altruism, and whose income effect increases as giving-by-others increases.[11] As seen in column 4, the result is that the change in unfunded crowd-out is smaller for the restricted sample, 12 percentage points, but still statistically significant (p = .062). In short, pure altruists who have an increasing own income effect do contribute via their increasing q_1 to the Table 4 column 3 result that $q_1 + q_2$ is increasing, but even without them $q_1 + q_2$ still increases. This indicates that relatively speaking the marginal motive for giving is shifting from impure altruism to pure warm glow.

[11] We excluded participants (1a) who behaved as pure altruists at both low and high margins (i.e., at both the low and high level of giving-by-others) or (1b) who behaved as a pure altruist at the low margin but whose motives at the high margin cannot be determined (or vice versa) <u>and</u> (2) whose change in the own income effect either was an increase or cannot be determined. See the notes to Table 4 for additional detail. For some participants motives at a margin cannot be determined either because the participant makes corner decisions or because her/his income effect at the margin is so large that it masks motives at that margin. In some cases a participant's income effect at a margin could not be determined because of corner decisions.

Table 4. Change in unfunded crowd-out between a low and a high level of giving-by-others.

	Linear model Giving-by-others		Account for corner decisions Giving-by-others	
	Low	High	Low/High (full sample)	Low/High (restricted sample) [c]
	(1)	(2)	(3)	(4)
Giving-by-others (G_{-i})	-.55 [a]	-.36 [a]	-.64	-.53
	(.07)	(.07)	(.08)	(.07)
Giving-by-others interacted with a dummy indicator that giving-by-others is high	–	–	0.22 [b]	0.12 [d]
			(.09)	(.08)
Budgets	1, 2	3, 4	1, 2, 3, 4	1, 2, 3, 4
N	85	85	85	70

Notes: See the notes to Table 2.
[a] Test of pure warm glow H_0: $\kappa \geq 0$ vs. H_a: $\kappa < 0$ has $p < .001$.
[b] Test of no decrease in crowd-out has $p = .013$.
[c] Excluded are (i) $N = 4$ participants who behaved as pure altruists at both low and high giving-by-others, and who had an increasing income effect, (ii) $N = 6$ participants who may have behaved as pure altruists at both low and high giving-by-others, and who had an increasing income effect (e.g., behaved as a pure altruist at low giving-by-others but motives could not be determined at high giving-by-others), (iii) $N = 1$ participant who behaved as a pure altruist at both low and high giving-by-others, but whose change in income effect could not be determined, and (iv) $N = 4$ participants who may have behaved as pure altruists at both low and high giving-by-others, and whose change in income effect could not be determined because of corner decisions.
[d] Test of no decrease in crowd-out has $p = .062$.

4.2.4 Summary

The reduced-form results—that balanced-budget crowd-out is not complete ($q_2 > 0$) when giving-by-others is high, that balanced-budget crowd-out decreases ($q_2 \uparrow$) as giving-by-others increases, and that unfunded crowd-out decreases ($q_1 + q_2 \rightarrow 1$) as giving-by-others increases—suggest that on average the participants are motivated by impure altruism. At the same time, when giving-by-others is low complete balanced-budget crowd-out cannot be rejected ($q_2 \approx 0$), and even when giving-by-others is high, q_2 = .18-to-.19 (as implied by Table 2, columns 4 and 5) appears to be small relative to the own income effect q_1 = .36 (Table 3, column 3). Hence, even though impure altruism cannot be rejected, the warm glow component of the model appears small.

4.3. A structural model of preferences: Cobb-Douglas impure altruism

To more rigorously investigate the relative strength of warm glow and altruism this section estimates the parameters of the Cobb-Douglas impure altruism utility function from equation (8). The optimal gift g_{ib}^* derived from this utility function is:

$$g_{ib}^* = -G_{-i,b} + \tfrac{1}{2}\left[(1-\beta)\,G_{-i,b} + (\alpha+\beta)\,Z_{ib} + \{[(1-\beta)\,G_{-i,b} + (\alpha+\beta)\,Z_{ib}]^2 - 4\,\alpha\,G_{-i,b}\,Z_{ib}\}^{1/2}\right] + e_i + u_{ib} \quad (15)$$

where $i = 1,...,85$ indexes the participants, $b = 1,...,6$ indexes the six decisions each participant faces with corresponding budgets of giving-by-others and own income, $Z_{ib} \equiv w_{ib} + G_{-i,b}$, e_i is an individual-specific random effect, and u_{ib} is the randomness in each participant's giving that is not correlated across her/his decisions. Using the data from all 85 participants to estimate the two parameters α and β in (15) is a representative agent approach to estimation.

Estimation of (15) presents three econometric problems: non-linearity in the parameters α and β, the within-participant correlation in random departures of giving from the Cobb-Douglas specification (the random effect e_i), and the corner decisions that can occur at $0 and at two different upper amounts, $40 and $46. Handling each problem one at a time is straightforward, but handling all three at the same time is non-trivial. Therefore, we construct a non-linear random effects Tobit estimator permitting both lower and upper corner solutions, and use it to estimate (15).[12]

Table 5 reports the estimates. The .021 estimate on the warm glow component (β) is significantly greater than zero, implying rejection of the pure altruism model. However, the warm glow component is relatively small. At .594 the estimate on the altruism component (α) is about thirty times larger.

Table 5. Non-linear random effects Tobit estimates of a Cobb-Douglas impure altruism utility function.

	Coefficient	Standard error	p-value
α	.594	.025	.000
β	.021	.009	.022
ρ	.902	.016	.000

Notes: α and β are the Cobb-Douglas parameters in equation (8). ρ is the correlation coefficient of the error term across decisions within-individuals. The log-likelihood is –1466.9. N = 85 participants, six decisions per participants.

[12] We calculate the estimates of α and β using maximum likelihood, assuming that u_{ib} and e_i are normally distributed. To calculate the multivariate normal probabilities when $g_{ib} = 0$ and when $g_{ib} = w_{ib}$ we use STATA's maximum simulated likelihood routines (Cappellari and Jenkins 2006), adapting Barslund's (2007) multivariate Tobit program.

Another way to assess the strength of warm glow is to examine predicted giving at a particular budget and determine what share of giving is accounted for by the warm glow component. Consider for example Budget 5 ($4, $46). Predicted giving at this budget is $26.81. However if at this budget α were zero, then a pure warm glow giver with β = .021 would give only $0.97. Thus using a Cobb-Douglas specification, at this budget warm glow accounts for 3.6 percent of predicted giving.

The .902 estimate of the correlation coefficient ρ indicates that there is substantial heterogeneity in participants' random deviations from the Cobb-Douglas model. Hence, there is likely substantial heterogeneity across participants in their α and β parameter values.

4.4. Heterogeneous preferences

In this section we investigate the heterogeneity in altruistic and warm glow preferences across the participants. The main point to be made is that, even though the evidence from Sections 4.2 and 4.3 reveals behavior that is, on average, consistent with impure altruism but with weak warm glow, behind the average behavior is considerable heterogeneity of motives.

We investigate preference heterogeneity by estimating the Cobb-Douglas specification of impure altruism separately for each individual participant. Specifically, for each individual we estimate the altruism and warm glow parameters in equation (15) using constrained maximum likelihood Tobit, with the parameter estimates constrained such that α_i, β_i, $\in [0,1]$. Binding constraints indicate pure altruism ($0 < \alpha_i < 1$, $\beta_i = 0$) or pure warm glow ($\alpha_i = 0$, $0 < \beta_i < 1$).

Figure 4 is a scatter diagram presenting the distribution of the altruism and warm glow preference parameters. The magnitude of altruism is shown along the vertical axis, and the magnitude of warm glow along the horizontal. Points on the vertical axis represent participants motivated to give by pure altruism, points in the interior of the plot represent the impure altruists, and points on the horizontal axis represent participants motivated to give by pure warm glow. The majority of the participants were motivated to give by pure altruism (43.5 percent; N = 37) or impure altruism (38.8 percent; N = 33). Only nine percent (N = 8) were motivated by pure warm glow. Among those motivated by impure altruism, most attach a greater weight to altruism than to warm glow: there are only two participants with α_i, $\approx \beta_i$, and only three with $\alpha_i < \beta_i$.[13]

The sum $\alpha_i + \beta_i$ in Figure 4 is a measure of participant i's generosity. It is not uncommon for the term "altruistic" to be used interchangeably with the term "generous," but it is not the case in Figure 4 that participants motivated solely by warm glow are less generous than those who are motivated by altruism. Looking along the horizontal axis we see that all but two of the pure warm glow participants give very large amounts. The average amount

[13] Estimates of α_i and β_i cannot be obtained for the six participants who chose corner solutions for all six of their decisions, and for a seventh participant who chose the upper corner for four decisions and was close to the upper corner for his other two decisions.

given among the pure warm glow participants was $21.54, and among the pure altruists $20.43.

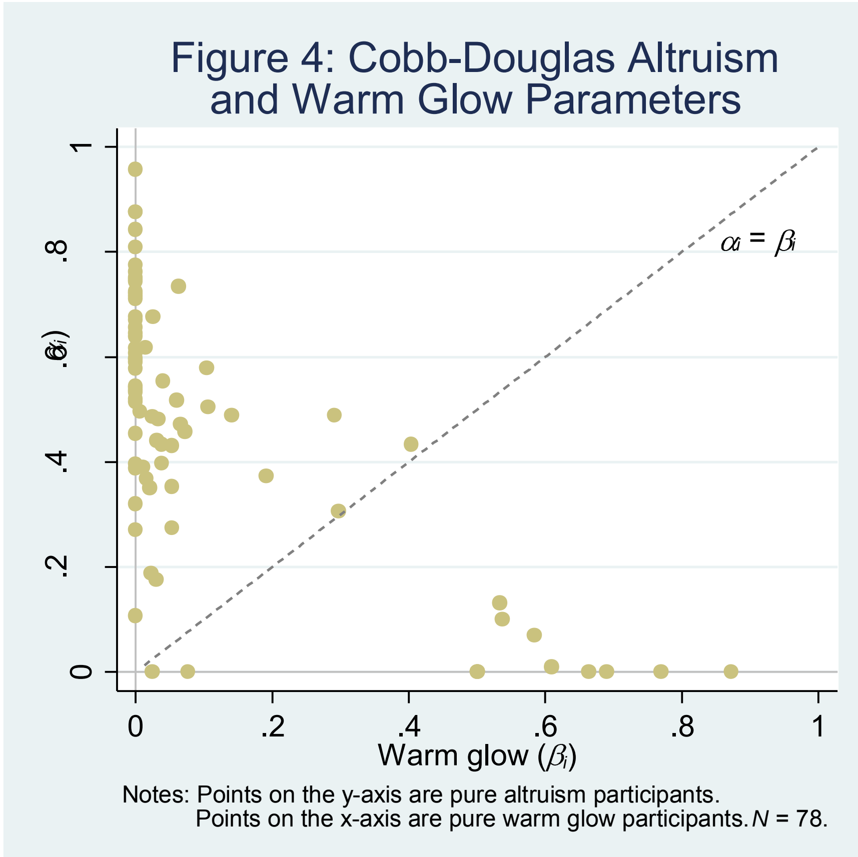


Figure 4: Cobb-Douglas Altruism and Warm Glow Parameters

Notes: Points on the y-axis are pure altruism participants. Points on the x-axis are pure warm glow participants. N = 78.

4.5. Relative strength of warm glow

We assess the strength of warm glow relative to the $\alpha + \beta$ measure of generosity using an index of warm glow defined as:

$$\gamma \equiv \frac{\beta}{\alpha + \beta}. \quad (16)$$

The warm glow index in (16) is a structural analogy to Andreoni's (1990) marginal index.[14] γ ranges from zero (pure altruism) to one (pure warm glow). Based on the representative preference model in Table 5, the warm glow index for the sample is $\gamma = .034$.

From Figure 4 it is clear that the distribution of γ_i is heavily skewed toward low values. The skewed distribution of the strength of warm glow has an important implication for calculating the share of giving accounted for by warm glow. There are two approaches to the calculation: the representative preference approach used in Section 4.3, and a heterogeneous

[14] Andreoni's (1990) index $\frac{q_1}{q_1 + q_2}$ is the ratio of the own income effect to the giving-by-others income effect, and measures the relative strength of altruism at the particular margin (i.e., level of giving-by-others) at which it is evaluated. The warm glow index γ in (16) is a structural analogy to $1 - \frac{q_1}{q_1 + q_2}$. γ is inframarginal.

preferences approach based on the distribution of α_i and β_i in Figure 4. The representative preference calculation is based on first combining the individual data during estimation, estimating the representative α and β, and then implementing the counterfactual $\alpha = 0$. This will differ from first estimating the heterogeneous α_i and β_i and then combining the individual counterfactuals $\alpha_i = 0$, because the estimation is non-linear and the distribution of the strength of warm glow is heavily skewed. Table 6 reports the share of giving accounted for by warm glow using each approach.

Rows 1 and 2 in Table 6 present the representative preference approach. Row 1 uses all $N = 85$ participants and $\alpha = .594$ and $\beta = .021$ from Table 5. The warm glow index $\gamma = .034$. Using these α and β estimates, the predicted giving for Budgets 1–4 begins at \$23.12 and falls to \$12.99 as giving-by-others increases from \$4 to \$40. The actual average giving at Budgets 1–4 = \$24.84, \$21.56, \$17.01, and \$14.84 (not shown in the table). Setting $\alpha = 0$, a pure warm glow giver with $\beta = .021$ would give \$0.84 regardless of the level of giving-by-others. As a share of predicted giving, the \$0.84 increases from 3.6 to 6.5 percent of predicted giving, moving from Budgets 1 to 4.

To set up the comparison to the heterogeneous preferences approach in Row 3, Row 2 repeats the representative preference approach for the $N = 78$ participants for whom α_i and β_i could be estimated in Section 4.4. Estimating the representative preference model for these $N = 78$ participants yields $\alpha = .569$ and $\beta = .026$. Although warm glow is a little stronger than in Table 5, and altruism a little weaker, the change in estimates is very small. Consequently, the counterfactual pure warm glow giver would give \$1.04, just a little more than in Row 1. As a share of predicted giving in Budgets 1 to 4, the \$1.04 from warm glow increases from 4.7 to 8.6 percent[15]

Row 3 presents the heterogeneous preferences approach to calculating the share of giving accounted for by warm glow. The α_i and β_i are from Figure 4. Because of the skewness of the γ_i, the median γ_i (.026, and not much different than the representative preference γs) is much smaller than the average γ_i, .211. Setting the $N = 70$ non-zero α_is from Figure 4 to zero, and leaving the $N = 41$ non-zero β_is at their values from Figure 4, counterfactual pure warm glow giving would be \$4.70. In Budgets 1 to 4 this increases from 21.6 to 32.8 percent of predicted giving, again in line with the asymptotic comparative statics of impure altruism.

[15] For the $N = 78$, actual average giving at Budgets 1–4 = \$23.99, \$20.42, \$15.46, and \$13.16.

Table 6. Share of predicted giving accounted for by warm glow.

	γ	Predicted giving at Budget (G_{-i},w_i)				Warm glow amount and share at Budget (G_{-i},w_i)			
		1 (4,40)	2 (10,40)	3 (28,40)	4 (34,40)	1 (4,40)	2 (10,40)	3 (28,40)	4 (34,40)
Representative α, β									
N = 85	.034	23.12	20.94	14.82	12.99	\$0.84 3.6%	\$0.84 4.0%	\$0.84 5.7%	\$0.84 6.5%
N = 78	.044	22.26	20.01	13.84	12.07	\$1.04 4.7%	\$1.04 5.2%	\$1.04 7.5%	\$1.04 8.6%
Heterogeneous α_i, β_i									
N = 78 Median γ_i Average γ_i	.026 .211	21.76	19.95	15.49	14.34	\$4.70 21.6%	\$4.70 23.5%	\$4.70 23.5%	\$4.70 32.8%

Although both approaches indicate that a large majority of giving in the experiment is motivated by altruism, the relative strength attributed to warm glow is larger in the heterogeneous approach than in the representative approach. Not surprisingly, the heterogeneous approach provides more accurate individual–level predictions. And note that the range from 21.6 to 32.8 percent of predicted giving accounted for by warm glow is qualitatively similar to the 17 percent of individuals who have large warm glow (e.g., $\gamma_i \geq .80$). However, the representative approach provides a more accurate prediction of the crowd-out seen at the level of each of the six budgets: the root-mean square errors of the crowd-out predictions derived from the predictions in Table 6 are \$1.17 in Row 2 and \$1.56 in Row 3. Including the two measures of balanced-budget crowd-out, the root-mean square errors are \$0.78 from the representative approach and \$0.99 from the heterogeneous approach. If the objective is to predict the response to policy changes—such as, "How much will the average response be to a change in government funding (giving-by-others)?"—then the representative approach is more accurate. Although the results support impure altruism, from the perspective of the better prediction of response to policy, warm glow accounts for only around five percent of giving.

5. Conclusion

Impure altruism was developed in the 1980s to deliver the prediction that pure altruism could not: incomplete crowd-out. Since then the extant experimental approach has been to position pure altruism as the null hypothesis, and directly test its prediction of zero balanced-budget crowd-out. Most, though not all, balanced-budget crowd-out experiments reject pure altruism. The alternative hypothesis of impure altruism has not, until now, been directly tested.

The present research leads to four conclusions about testing pure and impure altruism. First, the power of the extant experimental approach to reject pure altruism depends on the level of giving-by-others at which pure altruism is tested. This follows theoretically from the asymptotic comparative statics of impure altruism, and empirically from our experimental results: only at the higher level of giving-by-others does the balanced-budget crowd-out test have power to reject pure altruism. Second, even if the balanced-budget crowd-out test has enough power to reject pure altruism, its single measure of balanced-budget crowd-out cannot identify the strength of warm glow preferences. Third, impure altruism can be positioned as the null hypothesis, and its prediction that balanced-budget crowd-out decreases as giving-by-others increases directly tested. Doing so, our results provide statistically significant support for the impure altruism model. Fourth, despite the rejection of pure altruism and statistically significant support for impure altruism, estimates of altruism and warm glow preference parameters from a structural model indicate that warm glow is weak relative to altruism. Our representative preference approach to estimating the structural model yields an altruism parameter that is about thirty times larger than the warm glow parameter. Our heterogeneous preferences approach indicates that altruism is stronger than warm glow for 83 percent of the participants. Although the precise amount of giving accounted for by warm glow—five percent to around one-quarter—depends on the approach taken to estimate the structural preference parameters, regardless of approach altruism accounts for the large majority of giving observed in the experiment.

The strength of altruism found in this experiment is an important finding, but caution is warranted, as it would be with any empirical result, when thinking about whether the finding can be extended to other domains. Although, it is reasonable to conjecture that preferences for humanitarian public goods—similar to the type we examine in our experiment—may be strongly altruistic, it would not be safe to casually extend the preferences estimated here to all types of charity, such as non-humanitarian public goods like giving to one's alma mater.

That said, the present research provides evidence that there are instances of charitable giving in which not only does altruism exist, but it is strong. In the charitable giving environment we established in the lab, altruism is the predominant explanation of why people give.

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Appendix A: Monotonically decreasing unfunded crowd-out.

In this appendix we derive two results. First, we show that the Cobb-Douglas impure altruism utility function has monotonically decreasing unfunded crowd-out for $\alpha + \beta < 1$, $\alpha > 0$, and $\beta > 0$. Second, we present necessary and sufficient conditions for separable impure altruism utility functions to have monotonically decreasing unfunded crowd-out.

For the Cobb-Douglas result, begin by differentiating (15) in the text with respect to G_{-i} to get unfunded crowd-out $\kappa|_{dw_i=0} = -1 + q_1 + q_2$, yielding:

$$q_1 + q_2 = \frac{1}{2}\left[1 + \alpha + \frac{N}{S^{1/2}}\right] \tag{A.1}$$

where:

$$N \equiv (1-\alpha)^2 G_{-i} + [(\beta - \alpha) + (\alpha + \beta)\alpha]w_i \tag{A.2}$$

$$S \equiv (1-\alpha)^2 G_{-i}^2 + 2[(\beta - \alpha) + (\alpha + \beta)\alpha]G_{-i}w_i + (\alpha + \beta)^2 w_i^2. \tag{A.3}$$

Differentiating (A.1) with respect to G_{-i} indicates that:

$$sign\left[\frac{d(q_1+q_2)}{dG_{-i}}\right] = sign\left[S\frac{dN}{dG_{-i}} - N\left(\frac{1}{2}\right)\frac{dS}{dG_{-i}}\right] \tag{A.4}$$

Noting that $\frac{dN}{dG_{-i}} = (1-\alpha)^2$ and $\frac{dS}{dG_{-i}} = 2N$, the term in square brackets on the right-hand side of (A.4) reduces to $S(1-\alpha)^2 - N^2$, and (A.2) and (A.3) used to show:

$$\begin{aligned} S(1-\alpha)^2 - N^2 &= \{(\alpha+\beta)^2(1-\alpha)^2 - [(\beta-\alpha) + (\alpha+\beta)\alpha]^2\}w_i^2 \\ &= 4\alpha\beta(1-\alpha-\beta)w_i^2 \end{aligned} \tag{A.5}$$

If (and only if) $\alpha + \beta < 1$, $\alpha > 0$, and $\beta > 0$, the right-hand side of (A.5) is strictly positive, implying $\frac{d(q_1+q_2)}{dG_{-i}}$ is positive and $\kappa|_{dw_i=0}$ monotonically decreases as G_{-i} increases. ∎

PROPOSITION 2. Consider a concave impurely altruistic utility function, with strictly operative warm glow, that satisfies the technical conditions described in footnote 5, and further is additively separable. $q_1 + q_2$ is monotonically increasing in G_{-i} if and only if $\frac{U_{GGG}}{U_{GG}^2} > \frac{U_{xxx} - U_{ggg}}{(U_{xx} + U_{gg})^2}$.

Proof: In fashion parallel to obtaining equation (9) in the text, partially differentiating the first-order condition (4) with respect to social income Z_i yields:

$$q_1 = (U_{xx} - U_{xG} - U_{xg}) \, / \, (U_{xx} + U_{gg} + U_{GG} - 2\, U_{Gx} - 2\, U_{gx} + 2\, U_{gG}) \tag{A.6}$$

which for additively separable utility functions reduces to:

$$q_1 = U_{xx} \, / \, (U_{xx} + U_{gg} + U_{GG}), \tag{A.7}$$

which adding to (10):

$$q_1 + q_2 = (U_{xx} + U_{gg}) / \, (U_{xx} + U_{gg} + U_{GG}), \tag{A.8}$$

Differentiating (A.8) with respect to G_{-i}:

$$\frac{d(q_1 + q_2)}{dG_{-i}} = \frac{U_{GG}\left(\frac{dU_{xx}}{dG_{-i}} + \frac{dU_{gg}}{dG_{-i}}\right) - (U_{xx} + U_{gg})\frac{dU_{GG}}{dG_{-i}}}{(U_{xx} + U_{GG} + U_{gg})^2}. \tag{A.9}$$

Using equations (11)–(13), the numerator of the right-hand side reduces to:

$$Numerator\left\{\frac{d(q_1 + q_2)}{dG_{-i}}\right\} = U_{GG}\,(U_{xxx} - U_{ggg})(1 - q_1 - q_2) - (U_{xx} + U_{gg})\, U_{GGG}(q_1 + q_2)$$

$$= \frac{1}{U_{xx} + U_{gg} + U_{GG}}\left[U_{GG}^2(U_{xxx} - U_{ggg}) - (U_{xx} + U_{gg})^2 U_{GGG}\right]. \tag{A.10}$$

The (A.10) right-hand side term in square brackets is negative, and hence $\frac{d(q_1 + q_2)}{dG_{-i}}$ positive, if and only if $\frac{U_{GGG}}{U_{GG}^2} > \frac{U_{xxx} - U_{ggg}}{(U_{xx} + U_{gg})^2}$. ∎

Remark: Positive third derivatives and $U_{ggg} > U_{xxx}$ would satisfy the condition in Proposition 2 and therefore lead to $q_1 + q_2$ monotonically increasing in G_{-i}. Positive third derivatives ensure that the (negative) second derivatives monotonically move toward zero as G_{-i} increases, and the condition and $U_{ggg} > U_{xxx}$ ensures that the second derivative with respect to giving moves toward zero faster than does the second derivative with respect to own consumption.

Appendix B: Instructions

Claim Check___________

Welcome

Thank you for agreeing to participate in our study on decision making. There are two parts of the study today. In the first part you are asked to make six decisions and in the second part you are asked to fill out a survey. When you have completed your decisions we will randomly select one of your six decisions for payment. Your total payment from the study will be the sum of the payment that results from your decision and $5 for showing up to the study. The entire study should take about an hour, and at the end you will be paid privately and in cash. A research foundation has provided the funds for this study.

We ask that you do not speak to each other or make comments, except to ask questions about the procedures of the study. We also ask that you do not discuss the procedures of the study with others outside this room.

Your Identity

Your identity is secret. You will never be asked to reveal it to anyone during the course of the study. Your name will never be associated with your decisions or with your answers on the survey. Neither the assistants nor the other participants will be able to link you to any of the decisions you make. In order to keep your decisions private, *please do not reveal your choices to any other participant.*

Claim Check

Attached to the top of this page is a yellow piece of paper with a number on it. This is your Claim Check. Each participant has a different number. We use claim checks to maintain secrecy about your decisions, payment, and identity. You will present your Claim Check to an assistant at the end of the study to receive your cash payment.

Please remove your claim check now, and put it in a safe place.

Decision Tasks

For the decision tasks you will be paired with a child in Southwestern Pennsylvania (Allegheny, Washington, Greene, and Fayette Counties). The child is between 1 and 12 years old, and the child's family home has suffered extensive fire damage. Most or all of the family's possessions have been lost. For each of your decisions you will be given an amount of money which you will be asked to allocate between the child and yourself. The money allocated towards the child will be spent on children's books. These books will be distributed to the child by the American Red Cross of Southwestern Pennsylvania, immediately after the child has been affected by a severe fire.

As soon as a fire is reported in Southwestern Pennsylvania, the American Red Cross is contacted and volunteers are dispatched to the site. They help the affected families find temporary shelter, provide them with clothing, a meal, and give them a comfort bag with essential toiletries. Each day an average of one family in Southwestern Pennsylvania experiences a severe fire. These families depend on the American Red Cross for emergency help to cope with the sudden loss of their home and belongings. Unfortunately the American Red Cross only has funds to provide these families with the bare essentials, and they do not provide any "comfort" items for the children of the affected families.

For the study today we have joined the American Red Cross of Southwestern PA to collect funds to buy books for the affected children. In each of the six decisions you will be given an amount of money which you are asked to allocate between the child you are paired with and yourself. In addition the foundation has agreed to donate a fixed amount of money towards the child independent of your allocation. Thus the total amount to be spent on the child is the sum of the foundation's fixed donation and the allocation you make to the child. The amount of money that you can allocate between the child and you, as well as the foundation's fixed donation to the child, will vary across the six decisions.

The American Red Cross will use the funds collected from your allocation and that of the foundation to purchase the child books. Each participant in this study is paired with a different child. If you choose not to allocate any funds to the child, then the money to be spent on the child will be limited to the research foundation's fixed donation. Only you have the opportunity to allocate additional funds to the child. Neither the American Red Cross nor any other donors provide books to the child. Your decision alone determines how much will be spent on the child.

In explaining why the American Red Cross is seeking funds for books, their Emergency Preparedness Coordinator Sandi Wraith states "Children's needs are often overlooked in the immediate aftermath of a disaster because everyone is concerned primarily with putting the fire out, reaching safety, and finding shelter, food and clothing...just the basics of life. So many times, I've seen children just sitting on the curb with no one to talk to about what's happening...for this reason I've found trauma recovery experts in the community to work with us to train our volunteer responders in how to address children's needs at the scene of a disaster.......being able to give the children fun and distracting books will provide a great bridge for our volunteers to connect with kids and get them talking about what they've experienced."

Once we are ready to proceed to the decisions, you will be given a decision folder and a calculator. The folder contains a decision task with six decisions on it, and an envelope. For each decision you will have to enter your preferred allocation. If you wish to receive a receipt from the American Red Cross for your allocation to the child, you will need to fill out the acknowledgment form. Note however that by doing so you will relinquish your anonymity. If you wish to remain anonymous, leave the acknowledgment form blank. When you have completed the decision form please place it in the envelope along with the acknowledgment form, instructions and the calculator.

When we have collected all the envelopes we will draw a number between 1 and 6 to determine which one of the decisions counts for payment. Since one decision is randomly selected for payment, you should be making your decision as if every decision counts.

Sample Decisions

Here is an example of the type of decision you will have to make. This is just an example to demonstrate how everything is calculated. The example is not meant to guide your decision in any way. On the actual decision sheets we want you to select the allocation that you like best.

Example: You have been given $20 to allocate between the child and yourself. The research foundation's fixed donation towards the child is $5. You must choose how much money to allocate towards the child and yourself.

You may choose to allocate nothing towards the child's books and $20 to yourself. If this decision is selected for payment the foundation's fixed donation of $5 is spent on the child and your payment from the decision will be $20.

Alternatively you may choose to allocate $20 towards the child and nothing to yourself. The money to be spent on the child's books will be $20+$5 = $25, and your payment from the decision is $0.

Finally, you may choose to allocate any amount between $0 and $20 to the child and the remainder to yourself. Suppose you choose to allocate $8 towards the child and $12 to yourself. If selected for payment the American Red Cross will receive $8+$5 = $13 to spend on the child's books and your payment for the decision will be $12.

Monitor Role

To verify that all the procedures of this study are followed we will select a participant to be the monitor of the study. If your Claim Check number is 8 you will be the monitor. The monitor will follow the assistants around to see that everything takes place as explained in these instructions. The monitor will receive a fixed payment for his or her time.

Once all decision forms have been collected all participants will be given a survey. While you are completing the survey the monitor will walk with two assistants to a separate room to oversee that the calculation of the funds for the child and you are performed as described in the instructions. Your payment will be placed along with a receipt in an envelope that has your claim check number on the face of it. The assistant will make out a check to the American Red Cross of Southwestern PA for the amount corresponding to the funds for the child determined by your allocation. One check will be made out for each child. This check as well as any relevant acknowledgment form will be placed in an addressed and stamped envelope to the American Red Cross. Once all the calculations have been completed an assistant will walk the monitor back to this room. A box of envelopes with your payments will be given to an assistant who has not seen your decision sheets. The monitor will then make a statement to you on the extent to which the instructions were followed as described in the instructions. Once you have completed your survey you may come to the front to collect your payment by showing your claim check. An assistant who has not seen your decision form will hand you the sealed envelope with your payment.

After the study is completed the monitor and an assistant will walk to the nearest mailbox (on Forbes next to the Hillman Library) where the monitor will drop the envelope in the mailbox. To prove that all procedures are followed the monitor will be asked to sign a certificate to that effect. This certificate will be posted outside 4916 Posvar Hall.

Upon receipt of the check and acknowledgment form the American Red Cross will send a letter affirming that the check has been used to buy books for the child according to the description above. This letter will be posted outside 4916 Posvar Hall.

If you are the monitor of this study please identify yourself by coming to the front of the room now.

If you have any questions about the procedures, please raise your hand now and one of us will come to your seat to answer your question.

Before we proceed to the decision task we want you to complete a brief quiz, to make sure you know how everything will be calculated.