Impure Altruism or Inequality Aversion?: An Experimental Investigation Based on Income Effects*

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Abstract

We investigate the consequences of a pure income effect on the altruistic behavior of donors. Inequality aversion theories predict either no effect or a decrease in giving, whereas impure altruism theory predicts an increase in giving with an increase in the common income of donor and receiver. Theoretical predictions being contradictory, we run a dictator game in which we vary the common show-up fee of both the dictator and the recipient, while keeping an extra amount to be shared the same. The results are in line with the prediction of the impure altruism theory.

JEL Classifications: C91; D03; D64
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1. Introduction.

The literature on social preferences, since its inception, has displayed a significant interest in understanding altruism – defined as the principle or practice of concern for the welfare of others. Both theoretical and experimental studies continue to analyze and explain the possible components that affect altruistic decisions. It is intuitive that along with other factors, one's altruistic behavior can be influenced by income effects. Except a few recent developments, the existing literature, however, has abstracted away from this issue. Specifically, how altruistic behavior is affected by a change in income – that has no effect on inequality – has never been investigated. In this paper we aim to fill this gap. We modify relevant existing theoretical models and run a simple dictator game to answer this question. It turns out that in cases where inequality is not salient, income effects are explained with impure altruism.

In a standard dictator game a subject (the dictator) decides how much money to allocate between himself and another passive subject (the recipient). Both the dictator and the recipient are given a show-up fee, and the dictator is then asked to divide an extra amount between himself and the recipient. It is observed that a substantial proportion of dictators allocate a non-trivial share (Kahneman et al., 1986; Forsythe et al., 1994; Camerer, 2003; List and Cherry, 2008; Oxoby and Spraggon, 2008). Since its introduction in the present form, this game has often been used to understand altruism, as the dictator does not otherwise have any incentive to share the money with the recipient. Altruism and social preference theories (Andreoni and Miller, 2002; Charness and Rabin, 2002; Fehr and Schmidt, 2006) such as pure altruism (Becker, 1974), inequality aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), impure altruism (Andreoni, 1989, 1990) and conditional altruism (Konow, 2010) explain this seemingly non-rational behavior of dictators. Whereas pure altruism assumes that the donor gets utility purely from the well-being of the receivers, inequality aversion theories hypothesize that donors incur disutility from inequality and that, in turn, motivates altruism. Impure altruism theory, on the other hand, hypothesize that donors incur utility from the wellbeing of the recipient, but also earn a 'warm-glow' utility from the giving itself. Conditional altruism theory, in addition, incorporates social norms and includes social preference theories. Please see Konow (2010) for a broader discussion and comparison of each of these theories.

We are interested in analyzing the relationship between a pure income effect and altruism, and in understanding the underlying theoretical mechanism behind the relationship.

To study this in a dictator game, one needs to vary the common show-up fee equally for both the dictator and the recipient. Interestingly enough, the effects of show-up fees in dictator game has seldom been the focus of analyses.[1] Whereas a small number of existing studies are interested in understanding the effects of show-up fee inequality (between the dictator and the recipient) on altruism, this particular design has never been studied in the literature. In this study, in different treatments we vary a show-up fee common to both the dictator and the recipient (£0.5, £5, £10, £15, and £20), but keep an extra amount (£10) – that is to be allocated by the dictator – the same across treatments. This frame is also a stylized representation of situations in which an economic agent has the opportunity to be generous to another agent of the same social or income stratum – be it rich to rich, or poor to poor. It resembles circumstances in the field such as sending remittances to family of similar income status (Rapoport and Docquier, 2006), comparison of local charities in high income and low income geographical areas (countries or states), family transfers (Laferrere and Wolff, 2006), inter-generational benevolent behavior such as behaving in an eco-friendly manner to leave a better environment for future generations (Popp, 2001) etc.

Theoretical and behavioral predictions of this framing can be derived from the standard social preference theories and from the observations in the meta-analysis of Engel (2010). In the course of this paper we derive that the inequality aversion theories suggest a non-increasing and sometimes strictly decreasing relationship between the common show-up fee and dictator giving, whereas the impure altruism theory suggests the opposite. Combining the existing experimental studies, Engel (2010, pp. 595), in his meta-analysis, observes

> *"In the standard dictator game, the recipient is poor while the dictator is rich. If the recipient also receives an endowment upfront ... this strongly reduces giving… if the recipient has received a positive endowment at the start of the interaction, the reduction is almost perfectly proportional to the size of the endowment..."*

Complying with the impure altruism theory, and contrasting with the inequality aversion theories (or the results stated in the meta-analysis above), we observe a monotone increase in dictator giving with an increase in the common show-up fee.

[1] Income/endowment effect in the ultimatum game (Knetsch, 1989; Bolton et al., 1998; Armantier, 2006) is well observed. In dictator game, dictators are more self-interested if they earn the amount to be allocated, and are more generous if recipients earn it (Ruffle, 1998; Cherry et al., 2002; Oxoby and Spraggon, 2008). The stake of giving also exhibits a significant effect on giving behavior (List and Cherry, 2008; Johansson-Stenman et al., 2005; Carpenter et al., 2005). The effect of different initial split of the pie has also been investigated (starting with Bolton and Katok, 1998) and it is found that with higher initial share to the recipient, dictator giving decreases. However, only Konow (2010) and Korenok et al. (2012) explicitly introduce the saliency of show-up fees in a dictator game.

This analysis is closely related to the research by Korenok et al. (2012). They employ a strategy method in which each dictator makes eight decisions for varying show-up fees. When the show-up fee of the dictators is constant but that of the recipients' increase from zero to the same amount of dictator's, dictators steadily decrease the amount passed to the recipients. It is concluded, hence, that the main motivation of altruism is other-regarding preferences and not warm-glow. This is extended in Korenok et al. (2013). Introducing a price of giving and an endowment to the recipient, they show that a vast majority of the behavior of the dictator can be explained with a theory of impure altruism. The current study is also related to the idea of conditional altruism (Konow, 2010) that incorporates disutility out of deviation from moral norms, and effects similar to warm-glow that relates to long term utility such as prestige or social approval. Konow (2010) employs a subsidy frame among others and shows, again, that the recipient show-up fee has significant effects on the dictator giving. He concludes support for conditional altruism.

2. Experimental Design

We ran 5 treatments with 3 sessions under each treatment. 16 subjects participated in each session. All the subjects were students at the University of East Anglia, UK, recruited through the online recruitment system ORSEE (Greiner, 2004). Our design is a variant of the Forsythe et al. (1994) Dictator game. The only difference is that the subjects were given a common show-up fee and that was common and salient knowledge. The treatments differed only in the show-up fees given to the subjects. Dictators were then given an additional £10 and were allowed the choice to allocate the additional amount between him/herself and his/her co-participant (i.e., the recipient). Table 1 summarizes the treatment description.

Table 1. Treatment description

Treatment	Common show-up fee	Additional amount to be divided	Number of subjects per session	Number of sessions	Number of independent observations
Treatment 1	£0.50	£10	16	3	24
Treatment 2	£5	£10	16	3	24
Treatment 3	£10	£10	16	3	24
Treatment 4	£15	£10	16	3	24
Treatment 5	£20	£10	16	3	24

Although our designs are similar, there also are several differences between Korenok et al. (2012) or Konow (2010) and the current study. First, the existing studies focus on the effects of the dictator-recipient show-up fee difference on dictator giving, but our focus is on the effect of the change in common show-up fee on dictator giving. Thus, whereas those frames are appropriate to study giving behavior when inequality is salient, ours is more appropriate to understand the impact of a pure income effect on altruism. We employ a between-subject design, whereas Korenok et al. (2012) use a strategy method. Our design also differs with that of Konow (2010) in terms of decision space, and we find that the experimental results can be explained by the theory of impure altruism.

In each session, subjects were randomly and anonymously placed into one of 8 pairs and were assigned the role of either a dictator or a recipient. They then received information about their show-up fees, which was the same for all participants in a particular session. Each session consisted of two parts. In the first part, dictators were asked to allocate the additional £10 between themselves and the recipient, up to a fraction of 1 penny. In the second part, recipients had to guess the amount they would receive from the dictator. The instruction of the second part was given only after the decisions of the first part were made, and it was mentioned beforehand, in the instruction of the first part, that recipient's decision is payoff irrelevant to the dictator. This was done to ensure no strategic interaction between dictators' choices with recipient's guesses. Demographic information such as age, gender, nationality, study area of each participating subjects were collected after the experiment. The experiment was run manually and each subject's decision was anonymous to the experimenters. Subjects could participate in only one session. On average, each session took about 45 minutes and the average earnings of subjects (dictator and recipient together) across treatments were £15.10. However, average earnings varied over treatments between £5.5 (Treatment 1) and £25 (Treatment 5). The instructions are included in the Appendix.

3. Theoretical predictions

In this section we derive analytical predictions regarding dictator giving with the theories of inequality aversion and impure altruism, proofs of which are given in the Appendix. We also briefly discuss the theory of pure altruism, and compare the results of conditional altruism with impure altruism theory, but do not provide corresponding proofs.

According to the theory of pure altruism (Becker, 1984; Andreoni, 1989), the utility of a donor depends only on the final payoffs of himself and the receiver. However, the predictions of this model are often not clear. In the current context, it can easily be shown that the pure altruism theory does not provide a specific prediction for an income effect. Giving may stay the same, go up, or go down as a result of an increase in the common show-up fees. Moreover, the predictions of the pure altruism theory are tested and rejected in the literature by Andreoni (1993) and several others over the course of time; and hence we focus on the alternative theories in the current study.

3.1. Linear form inequality aversion

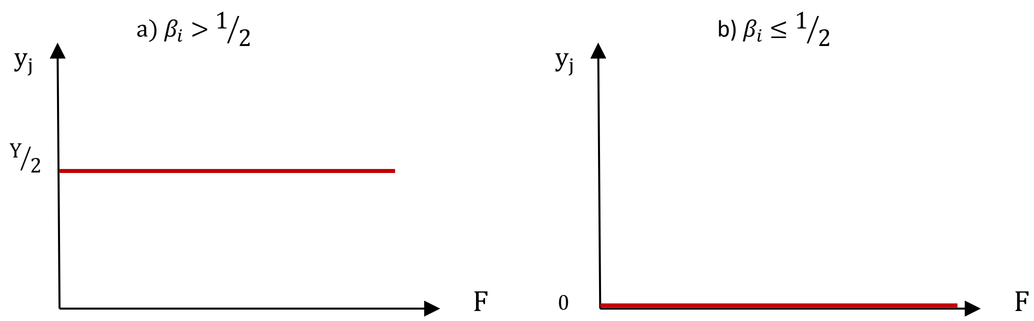
Inequality aversion theories capture the preference of the agents for fairness and defiance to inequality. Fehr and Schmidt (1999) suggest a linear model of inequality aversion in which a donor's utility decreases with the difference in donor and receiver payoff. For a two-player case, this model can be described as

$$u_i = x_i - \alpha_i max[x_j - x_i, 0] - \beta_i max[x_i - x_j, 0], \quad i \neq j \tag{1}$$

Where u_i is the utility of subject i; x_i, x_j are payoffs of i and j respectively; and α_i, β_i are inequality aversion parameters with $\alpha_i \geq \beta_i$, and $1 > \beta_i \geq 0$. Let F_i and F_j be the show-up fees and y_i and y_j be the allocations of the pie, Y, for a dictator and a recipient respectively. Hence, $y_i + y_j = Y$, $x_i = F_i + y_i$ and $x_j = F_j + y_j$. We further impose $Y > F_j - F_i$. For a common show-up fee $F_i = F_j = F$, Lemma 1 states the predicted relationship between the equilibrium amount given and the show-up fee. Figure 1 summarizes this in a diagram.

Proposition 1. According to the hypothesis of the linear form inequality aversion, the amount given remains the same across treatments ($\frac{dy_j{}^*}{dF} = 0$).

Figure 1. Show-up fee- Dictator giving relationship: Linear form inequality aversion



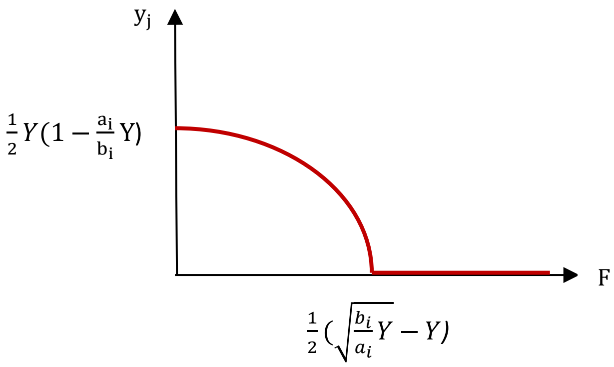
3.2. Ratio form inequality aversion

Bolton and Ockenfels (2000)'s ratio form model assumes a decrease in donor's utility with the asymmetry in the ratio in donor and receiver payoff. Following the same notation as earlier, for a two-player case with $F_i = F_j = F$, this model turns out to be

$$u_i = a_i x_i - b_i\left[x_i/(x_j + x_i) \ - 1/2\right]^2 \tag{2}$$

Where $a_i \geq 0$ and $b_i > 0$ are inequality aversion parameters, $y_i + y_j \ = Y$, $x_i = F + y_i$ and $x_j = F + y_j$. Proposition 2 and Figure 2 summarize the show-up fee – giving relationship.

Figure 2. Show-up fee-Dictator giving relationship: Ratio form inequality aversion



Proposition 2. According to the hypothesis of the ratio form inequality aversion, the dictator gives a positive amount at zero common show-up fees. However, giving decreases with an increase in the show-up fee ($\frac{dy_j^*}{dF} < 0$), until a point after which the dictator keeps the whole amount for himself.

3.3. The theory of Impure Altruism

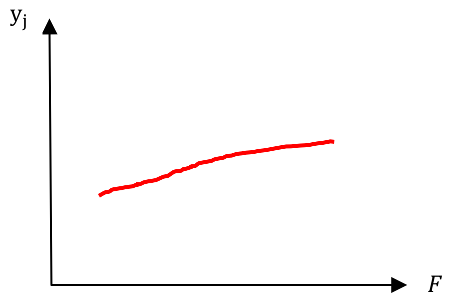
The theory of impure altruism (Andreoni, 1989, 1990) considers dictator utility with components of own wellbeing, wellbeing of the recipient, and a warm-glow component (that reflects the joy of giving) through the amount given. For two players, specify this model as

$$u_i = u_i\left(F_i + Y - y_j, F_j + y_j, y_j\right) \tag{3}$$

Assume that the utility function $u_i(.)$ to be strictly quasi-concave and strictly increasing in all arguments. Proposition 3 and Figure 3 describe the derived relationship between equilibrium giving and the common show-up fee for this model.

Proposition 3. According to the theory of impure altruism an increase in the show-up fee strictly increases dictator giving ($\frac{dy_j{}^*}{dF} > 0$).

Figure 3. Show-up fee-Dictator giving relationship: Impure altruism



It is to be noted that the prediction of a positive relationship between the dictator giving and the common show-up fees can also be derived from models introduced later in the literature with structure similar or richer to the theory of impure altruism. Here we discuss one of such richer models. The theory of conditional altruism (Konow, 2010) considers moral norms in donor decisions and also provides a refined structure of effects that a warm-glow component supposed to capture. When the moral norm is considered to be the half of the total wealth, then under $F_i = F_j = F$ the utility function should be

$$u_i = f_i(F + Y - y_j) - g_i\left(F + y_j - \frac{1}{2}(2F + Y)\right) + w_i(y_j)$$

Where the first component of the function represents own wellbeing, the last component is the warm-glow part, and the middle one shows disutility coming through the deviation of recipient's payoffs from the moral norm. It is easy to show that under appropriate assumptions this model's prediction is qualitatively similar to Proposition 3, and we do not provide a formal proof of the same.

4. Results

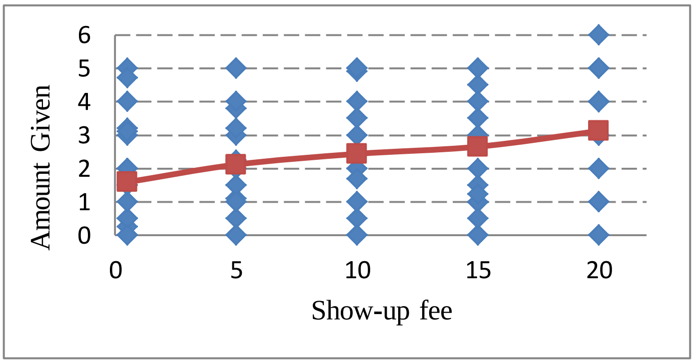
As the treatments are run between-subjects, there are 24 independent observations in each treatment. We run standard non-parametric tests and regressions to assess the conflicting hypotheses arising from the theoretical models.

We start with Table 2, which describes the mean and median of giving in each treatment. It also shows the number of subjects giving zero and giving £5 as a measure of pure selfish or pure egalitarian behavior. Only one subject in the whole experiment allocated more than £5 to a recipient. The proportion of pure selfish subjects varies between 12.5% to around 20%, whereas the proportion of egalitarian subjects varies from 4% to 1/3 over treatments. If we consider giving less than £1, too, as selfish behavior, then the total number of selfish subjects goes up to 32, and becomes 42% in the 50p treatment. Given the sessions were run manually, these observations are in line with the results from the existing experiments (Engel, 2010).

Table 2. Descriptive statistics of amount given: total

	Show-up fee					
# of obs: 120	0.5	5	10	15	20	Total
Mean	1.59	2.12	2.44	2.66	3.12	2.39
Median	1.25	2	2.25	3	3.50	2
Zero	5	5	5	3	3	21
0<giving<half	18	15	14	15	12	74
Half	1	4	5	6	8	24

Figure 4. Show-up fee - amount given scatter plot



One immediate observation from Table 2 is that the central tendency of the amount given is steadily increasing with an increase in the show-up fee. This is true for both mean and median giving. Figure 4, showing the scatter plot of giving with the average giving per treatment, further supports this observation. However, it is still to be confirmed if this increase in giving is statistically significant.

To test the same, we first run non-parametric tests on the hypothesis of same distribution of amount given over different show-up fees. This hypothesis is rejected at 10% level with a Kruskal and Wallis (1952) test. Moreover, with two-sided Wilcoxon rank-sum (Mann and Whitney, 1947) tests it is rejected that giving in treatments with high show-up fees is same as giving in treatments with lower show-up fees.

To test whether the increase in amount given across treatments is significant and robust to other controls, we first run a linear regression with amount given as the dependent variable and show-up fee as the explanatory variable. The first column in Table 3 shows the result of the regression. The coefficient for show-up fee is positive and significant at 1% level. It shows that a £1 increase in show-up fee increases giving by 7.3 pence on average. In the second model we control for gender, nationality and study areas but show-up fee remains significant with similar impact (6.8 pence increase in giving for a £1 increase in the show-up fee). Out of all the control variables only gender turns out to be significant and females on average are more generous than their male counterparts. Because almost a sixth of the dictators gave nothing, the third and fourth regressions are run with a left-censored Tobit model.[2] However, the direction and significance of the results still remain the same.

Table 3. Regression of amount given on show-up fee, gender and other controls

Dependent variable :amount given	(Linear 1)	(Linear 2)	(Tobit 1)	(Tobit 2)
Intercept	1.647***	1.563**	1.366***	1.352
	(0.293)	(0.765)	(0.350)	(0.889)
Show-up Fee	0.073***	0.068***	0.082***	0.076***
	(0.024)	(0.024)	(0.028)	(0.028)
Female		0.745**		0.873**
		(0.338)		(0.393)
Age		-0.007		-0.012
		(0.024)		(0.028)
UK Dummy		0.034		0.057
		(0.355)		(0.413)
Econ Dummy		-0.127		-0.119
		(0.563)		(0.652)
# of Observations	120	120	120	120
Adjusted R^2	0.066	0.076	0.017	0.028

Standard errors are in parentheses; ***,** and * indicates significance at the 1%, 5%, and 10% level

The results confirm that the average amount given increases robustly with the common show-up fee. Other variations of the controls (such as other country / study area dummies, age brackets, interaction variables), non-linear effects of the show-up fee, and other regression procedures such as a hurdle-model (Mullahy, 1986) did not come out to be significant, did not change the direction of the results and hence are not reported. In

[2] The reported values under the Tobit regressions are the coefficients, i.e., the marginal effects on the latent dependent variable. The signs are the same for the marginal effects on the expected values.

conclusion, a pure income effect – with no implication on income inequality – positively affects altruism. This result is in contradiction with Propositions 1 and 2, but not with Proposition 3. Hence, we conclude that the consequence of pure income effect on giving can be explained by the theory of impure altruism.

5. Discussion

We investigate how a pure income effect influences altruistic behavior. In a dictator game we vary the common show-up fee of the dictator and the recipient, but keep the amount to be shared the same. Contrary to the predictions of the standard inequality aversion models and derived results from existing experiments, but in line with the theory of impure altruism, the dictators give more with an increase in the common show-up fee.

If our results from the laboratory generalize to the world at large, then we would expect charity donations to be significantly lower at the time of a recession.[3] In addition, according to our results, (ceteris paribus) one would expect a higher amount of overall charity giving within a richer country compared to a poorer country, more family transfers within wealthier families compared to poorer families, and citizens from the richer countries to be more eco-friendly than their poorer counterparts (supporting the empirical observation by Popp (2001) about impure inter-generational altruism in terms of environmental issues). The current study is also in line with the result obtained by Holland et al. (2012) in their Anthropology field experiment. They left sealed and stamped letters in the streets of 50 neighborhoods in London and found that the likelihood of someone posting the letter in a nearby mailbox is positively correlated with the income-level of the neighborhood. Finally, the current results match, in spirit, with the empirical observation by Hoffmann (2011). He finds that even after controlling for various factors including abilities, richer German citizens saved more Jews people at the time of the holocaust compared to the poorer German citizens.

The main result of our analysis is of interest because existing experimental results to date (such as Korenok et al., 2012 and Konow, 2010) have shown that in a standard dictator game, results can be explained with inequality aversion or conditional altruism theories. Crumpler and Grossman (2008) among others, on the other hand, have shown that impure altruism can explain results in dictator games with a charity frame. Our results imply that impure altruism theory can explain results even in a standard dictator game frame, when income inequality is less salient.

[3] See http://news.bbc.co.uk/2/hi/uk_news/7946518.stm and the NCVO/CAF (2009) report on the effects of recession on charitable giving in the UK. Also see the *Giving USA* (2009) report regarding the same in the USA.

Finally, several studies (Bolton and Katok, 1998; Branas-Garza, 2006; Engel, 2010; Konow, 2010; Korenok et al., 2012) show that an increase in the recipient's income marks a negative impact on the amount given by the dictator, and explain the same through inequality aversion. We observe that if the increase in recipient income is accompanied by an increase in dictator income, then it can even increase giving. Presenting it in another way, unlike the existing studies, we observe that the dictator may even give less to the recipient if the recipient (and common) income is lower. In many of the existing designs, the warm-glow part of impure altruism and the inequality aversion components work in opposite ways in determining giving. If one of the effects is made less salient then it is offset by the other effect and the outcome changes. Hence, to conclude, in some settings inequality aversion may serve as a better underlying model than impure altruism, whereas in some other settings impure altruism may fit better. While, as we find, impure altruism works better in explaining income effects, the scope for exhaustive investigations in this broader topic remains open.

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Appendix I

1. Linear form inequality aversion: Proof of Proposition 1

Equation (1) can be rewritten as:

$$u_i = (y_i + F) - \alpha_i max\big[(y_j + F) - (y_i + F), 0\big] - \beta_i max\big[(y_i + F) - (y_j + F), 0\big]$$
$$= (Y - y_j + F) - \alpha_i max\big[2y_j - Y, 0\big] - \beta_i max\big[Y - 2y_j, 0\big]$$

The dictator would try to maximize utility with respect to the giving decision. There can be 2 cases: $y_j > Y/2$ and $y_j \leq Y/2$. It is easy to show that the first case does not arise. Hence the dictator's optimization problem boils down to:

$max_{y_j}\ u_i = (Y - y_j + F) - \beta_i(Y - 2y_j)$ subject to $Y/2 \geq y_j \geq 0$

Let λ_1 and λ_2 be Lagrangian multipliers. The Lagrangian equation and the corresponding first order conditions are given below.

$$L_i = (Y - y_j + F) - \beta_i\big(Y - 2y_j\big) + \lambda_1 y_j + \lambda_2\big(Y/2 - y_j\big)$$

$$\frac{\partial L_i}{\partial y_j} = -1 + 2\beta_i + \lambda_1 - \lambda_2 = 0 \tag{5}$$

$$\frac{\partial L_i}{\partial \lambda_1}: y_j \geq 0; \lambda_1 \geq 0;\ \lambda_1 y_j = 0$$

$$\frac{\partial L_i}{\partial \lambda_2}: \big(Y/2 - y_j\big) \geq 0; \lambda_2 \geq 0; \lambda_2\big(Y/2 - y_j\big) = 0$$

<u>Case a</u>: $\lambda_1 = 0, \lambda_2 = 0$. This implies $\beta_i = 1/2$, i.e., the dictator is indifferent between giving any amount between 0 and Y/2. But the second order condition does not hold.

<u>Case b</u>. $\lambda_1 > 0$, $\lambda_2 = 0$ and hence $Y/2 > y_j = 0$. In this case dictator keeps the whole amount. The required condition from (4) is $\beta_i < 1/2$.

<u>Case c</u>. $\lambda_1 = 0$, $\lambda_2 > 0$ and hence $y_j > 0$. Here the dictator gives $Y/2$. The required condition for this is $\beta_i > 1/2$.

Consequently, the equilibrium y_j is independent of F. Therefore under Fehr and Schmidt (1999) structure: $\frac{dy_j{}^*}{dF} = 0$; an increase in the common show-up fee does not have any effect on the giving behavior. □

2. Ratio form inequality aversion: Proof of Proposition 2

Equation (2) can be rewritten as

$$u_i = a_i\big(F + Y - y_j\big) - b_i\big[\big(F + Y - y_j\big)/\big[\big(F + y_j\big) + \big(F + Y - y_j\big)\big] - 1/2\,\big]^2$$

The dictator would try to maximize u_i with respect to the giving decision (y_j) subject to $Y \geq y_j \geq 0$. Denote μ_1 and μ_2 as Lagrangian multipliers. The Lagrangian equation and the corresponding first order conditions are given below.

$$£_i = a_i\left(F + Y - y_j\right) - b_i\left[\frac{\left(F + Y - y_j\right)}{\left\{\left(F + y_j\right) + \left(F + Y - y_j\right)\right\}} - 1/2\right]^2 + \mu_1 y_j + \mu_2\left(Y - y_j\right)$$

$$\frac{\partial £_i}{\partial \mathrm{y_j}} = -\frac{2b_i}{(2\mathrm{F}+\mathrm{Y})^2}\mathrm{y_j} + \left[b_i\left\{\frac{\mathrm{Y}}{(2\mathrm{F}+\mathrm{Y})^2}\right\} - a_i\right] + \mu_1 - \mu_2 = 0 \qquad (6)$$

$$\frac{\partial £_i}{\partial \mu_1}: y_j \geq 0; \mu_1 \geq 0;\ \mu_1 y_j = 0$$

$$\frac{\partial £_i}{\partial \mu_2}: \left(\mathrm{Y} - y_j\right) \geq 0; \mu_2 \geq 0; \mu_2\left(\mathrm{Y} - y_j\right) = 0$$

Case a. $\mu_2 = 0, \mu_1 > 0$ and hence $y_j = 0$, i.e., the dictator gives nothing. From (6) observe that $\mu_1 > 0$ implies $a_i(2F + Y)^2 > b_i Y$. Hence, the required restriction becomes $F \geq \left[(b_i Y/a_i)^{1/2}/2 - Y\right]$.

Case b. $\mu_1 = 0, \mu_2 > 0$ and hence $y_j = Y$, i.e., the dictator gives the whole pie. From (6) observe that $\mu_2 > 0$ implies $0 > Y + a_i\left(F_i + F_j + Y\right)^2/b_i$. This is not possible.

Case c. $\mu_1 = \mu_2 = 0$, i.e., an interior solution. Solving we get $y_j = \frac{1}{2b_i}\left[b_i Y - a_i(2F + Y)^2\right]$ $= \frac{1}{2}Y - \frac{a_i}{2b_i}(2F + Y)^2$. Hence, this boils down to $y_j = \frac{1}{2}Y - \frac{a_i}{2b_i}(2F + Y)^2$, with required restrictions $F < \left(\sqrt{(b_i/a_i)Y} - Y\right)/2$ and $(a_i/b_i) > Y$. It is easy to check that the SOC holds. The equilibrium giving implies $\frac{d{y_j}^*}{dF} < 0$; i.e., an increase in the common show-up fee will result in a lower giving in the interior. □

3. The theory of Impure Altruism: Proof of Proposition 3

Following Andreoni (1989), define total payoff of the recipient as $x_j = F_j + y_j$. Then equation (3) can be rewritten as:

$$u_i = u_i\left(F_i + F_j + Y - x_j, x_j, x_j - F_j\right)$$

Assuming interior solution, the optimum level of x_j can be solved by differentiating the above equation with respect to x_j and setting it equal to zero. Hence, the solution can be written as the following implicit function:

$$x_j = f_i\left(F_i + F_j + Y, F_j\right)$$

Where the first argument reflects the altruism component and the second argument reflects the warm-glow component of the utility function. Subtracting F_j from both sides we get

$$y_j^* = f_i\left(F_i + F_j + Y, F_j\right) - F_j \qquad (4)$$

When both own consumption and charity are normal goods, then one can argue following Andreoni (1989, pp. 1451) that for the case of non-neutral transfers: $1 \geq \frac{dy_j^*}{dF_i} \geq -\frac{dy_j^*}{dF_j} \geq 0$.

Now differentiating (4) with respect to F we find:

$$\frac{dy_j^*}{dF} = f_{i1}\frac{dF_i}{dF} + f_{i1}\frac{dF_j}{dF} + f_{i2}\frac{dF_j}{dF} - \frac{dF_j}{dF}$$

Where f_{i1} is the partial derivative of the function f_i with its first argument, and f_{i2} is the partial derivative for the second argument. So if both $F_i = F_j = F$, then $\frac{dF_i}{dF} = \frac{dF_j}{dF} = 1$. Given this and imposing the condition $1 \geq \frac{dy_j}{dF_i} \geq -\frac{dy_j}{dF_j} \geq 0$, we get:

$$\frac{dy_j^*}{dF} = 2f_{i1} + f_{i2} - 1 \geq 0$$

Hence, y_j^* is increasing in F; i.e., an increase in the common show-up fee will result in a higher giving in the interior. □

APPENDIX II

Instructions for the experiment (Baseline case: £10 participation fee)

General Instruction

This is an experiment in the area of economic decision making. Various research agencies have provided funds for this research. The instructions are simple. If you follow them closely, then depending on your decision and the decision of the others, you can earn an appreciable amount of money. The experiment has two parts. At the end of today's experiment, you will be paid in private and in cash. Your identity and your decisions will also remain private. 16 participants are in today's experiment.

It is very important that you remain silent and do not look at other people's work. If you have any questions, or need assistance of any kind, please raise your hand and an experimenter will come to you. If you talk, laugh, exclaim out loud, etc., you will be asked to leave and you will not be paid. We expect and appreciate your cooperation.

Your Decisions

You have already received a £10.00 participation fee. This experiment contains the decision problem that requires you to make economic choices that determine your earnings over and above your participation fee.

At the beginning of the experiment, you will be randomly and anonymously placed into one of 8 groups (groups 1, 2, 3, 4, 5, 6, 7, and 8). Each group consists of 2 types of participants '**Participant A**' and '**Participant B**'. Again you will be randomly assigned either as a '**Participant A**' or a '**Participant B**' in your group. Both the group name and your type will be written in a card given to you at the start of the experiment. Other participants will not know your group number or your type (A or B).

Both '**Participant A**' and '**Participant B**' are paid £10 each as their respective participation fee. Every Participant A will receive an additional amount of £10.

Part I. Participant A

Participant A will make the decision to allocate this additional £10 between himself / herself and the Participant B in his/her group. Participant A can decide to give any amount in British Pounds, between 0.00 and 10.00 (up to two decimal points), to Participant B. Suppose Participant A gives X to Participant B. Then Participant A will have the remaining Y= £10.00 **-** X. The total earnings of Participant A will be the participation fee plus the share of the additional £10. Hence, earnings of Participant A = £10 + Y. Earnings of Participant B = £10 + X. See the following examples for clarification. All the numbers are in British Pounds:

Example 1. Suppose Participant A decides to give 7.29 to Participant B. Then the total earnings of Participant B is (participation fee + share of the additional amount) = 10 + 7.29 = 17.29. And the total earnings of the Participant A is = 10 + (10 **-** 7.29) = 10 + 2.71 = 12.71.

Example 2. Suppose Participant A decides to give 3.37 to Participant B. Then the total earnings of Participant B is (participation fee + share of the additional amount) = 10 + 3.37 = 13.37. And the total earnings of the Participant A is = 10 + (10 **-** 3.37) = 10 + 6.63 = 16.63.

Every participant will get a card at the start of the experiment. **Line 1** of the card indicates your group number. **Line 2** indicates your role in the experiment. **Line 3** shows your participation fee. **Line 4** shows the participation fee of the other participant in your group. **Line 5** shows the additional amount (£10.00) given to Participant A to be allocated between himself/herself and the Participant B in the same group. The next lines are different for Participant A and Participant B.

Participant A's card looks like the one given below. In **Line 6**, Participant A will write a number between £0.00 and £10.00 (up to 2 decimal points) in the blank space. This is the amount given to Participant B. In **Line 7**, Participant A will calculate the amount left for him/her. To calculate this, Participant A will subtract the amount written in line 6 from £10. **Line 8** shows Participant A's total earnings. This will be the participation fee plus the share of the additional £10. Hence, Participant A will **add line 3 and line 7 and write the number in line 8**. Finally, in **line 9**, Participant A calculates the total earnings of Participant B, which is the **sum of line 4 and line 6**.

1. Your group number: **8**
2. Your role: **Participant A**
3. Your participation fee: £**10**
4. Participation fee of Participant B: £**10**
5. Additional amount to be allocated: £**10**
6. Amount given to Participant B (between 0.00 and 10.00): X =______
7. Amount left for you: £10 - X = ______
8. Your total earnings: **£10 + _____ = _____**
9. Participant B total earnings: **£10 + ____ = ____**

Here is an **example** that draws numbers from Example 1 in page 2.

1. Your group number: **8**
2. Your role: **Participant A**
3. Your participation fee: £**10**
4. Participation fee of Participant B: £**10**
5. Additional amount to be allocated: £**10**
6. Amount given to Participant B (between 0.00 and 10.00): X = £7.29
7. Amount left for you: £10 **-** X = £2.71
8. Your total earnings: **£10 +** £2.71 **=** £12.71
9. Participant B total earnings: **£10 +** £7.29 **=** £17.29

Here is another **example** that draws numbers from Example 2 in page 2.

1. Your group number: **8**
2. Your role: **Participant A**
3. Your participation fee: £**10**
4. Participation fee of Participant B: £**10**
5. Additional amount to be allocated: £**10**
6. Amount given to Participant B (between 0.00 and 10.00): X = £3.37
7. Amount left for you: £10 **-** X = £6.63
8. Your total earnings: **£10 +** £6.63 **=** £16.63
9. Participant B total earnings: **£10 +** £3.37 **=** £13.37

Participant A will get 2 minutes to make his/her decision. After making the decision, each Participant A will put his/her card inside the envelope given and seal the envelope.

To summarize, if you are Participant A, make your decision and fill out the card. But if you are Participant B, you do not have to do anything in this part of the experiment. The total earnings of Participant A will be the sum of the participation fee, and the residual amount from the additional £10 (after giving an amount to Participant B), as calculated in **line 8**. Participant A's earnings will not be affected by the decisions of participant B in the next round. This will conclude the first part of the experiment. **Are there any questions?**

Part II. Participant B

Participant B's card looks like the one given below. **Line 6** indicates participant B's guess about the amount offered to Participant B by Participant A. Line 7 shows the total guessed earnings of Participant B, which is the sum of line 3 and line 6.

1. Your group number: **8**
2. Your role: **Participant B**
3. Your participation fee: £**10**
4. Participation fee of Participant A: £**10**
5. Total amount to be divided: £**10**
6. Your guess about the amount offered to you (between 0.00 and 10.00): **____**
7. Your guess about your total earnings: **£10** + **____** = **____**

In the previous part of the experiment, Participant A decided to give any amount between £0.00 and £10.00 (up to two decimal points) to Participant B. In this part of the experiment, Participant B will have to guess the amount Participant A has given to him/her. If the guess is close enough to the actual amount given by Participant A, then Participant B will get an extra reward of £1.

Suppose Participant A has given X to Participant B. Participant B guesses that the amount is Z. If the difference between X and Z is less than or equal to 50 Pence, then Participant B will get the £1 reward over and above the participation fee and the amount given by Participant A.

Example 1. Suppose Participant A decides to give £7.29 to Participant B. If Participant B rightfully guesses an amount which is in between £6.79 and £7.79, then Participant B will get the reward of £1. This is because £7.29 - £0.5 = £6.79 and £7.29 + £0.5 = £7.79. If Participant B guesses numbers outside this range, then he/she will not get the reward.

Example 2. Suppose Participant A decides to give £3.37 to Participant B. If Participant B rightfully guesses an amount which is in between £2.87 and £3.87, then Participant B will get the reward of £1. This is because £3.37 - £0.5 = £2.87 and £3.37 + £0.5 = £3.87. If Participant B guesses numbers outside this range, then he/she will not get the reward.

Participant B will write the guess in **Line 6**. He/she will also need to write the total earnings in **line 7**. This will be the **sum of line 3 and line 6**. Participant B will get 2 minutes to make his/her decision. After making the decision, each Participant B will put his/her card inside the envelope given and seal the envelope. The total earnings of Participant B will be the sum of the participation fee, amount given to him/her by Participant A, and the £1 reward (if won). This will conclude the second part of the experiment. **Are there any questions?**