Income Effect and Altruism

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We investigate the consequences of a pure income effect on the altruistic behavior of donors. Inequity aversion theories predict either no effect or a decrease in giving, whereas warm-glow 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, but keep an extra amount to be shared the same. The prediction of the warm-glow theory is supported.

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1. Introduction.

The literature on social preferences, since its inception, observed a significant interest to understand altruism, which is defined as "*a form of unconditional kindness; that is, a favor given does not emerge as a response to a favor received*" (Fehr and Schmidt, 2006). 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. Other than some recent developments, the existing literature, however, abstract 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 in this gap. We modify existing theoretical models and run a simple dictator game experiment to answer this question. It turns out that in case inequality is not salient, warm-glow or joy of giving drives altruism.

In a standard dictator game a subject (the dictator) decides upon how much money to allocate between himself and a 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, 2007; 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. Social preference theories (Andreoni and Miller, 2002; Charness and Rabin, 2002; Fehr and Schmidt, 2006) such as inequity aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), and warm-glow (Andreoni, 1990) explain this seemingly non-rational behavior of dictator.

We are interested in analysing the relationship between a pure income effect and altruism. 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 in the focus of analyses.[1] Whereas a small number of existing studies are interested in understanding the effects of the extent of the show-up fee inequality (between the dictator and the recipient) on altruism, this particular design has never been

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[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, 2001; 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). However, Korenok et al. (2012) and Konow (2010), for the first time, explicitly introduce the effects of show-up fees in a dictator game.

studied in the literature. Hence, we vary the common show-up fee of both players, but keep the amount to be shared the same. 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 charity 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 the 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-study run by Engel (2010). In the course of this paper we derive that the inequity aversion theories suggest a non-increasing and sometimes strictly decreasing relationship between the common endowment and dictator giving, whereas warm-glow theory suggests the opposite. Combining the existing experimental studies, Engel (2010, pp. 595), in his meta-study, 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 a warm-glow model, and contrasting with the inequity aversion theories or the results stated in the meta-study above, we observe a monotone increase in dictator giving with an increase in a show-up fee common to the dictator as well as to the recipient.

The current 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 preference and not warm-glow. Korenok et al. (2011) is an extension of an earlier version of Korenok et al. (2012). Introducing a price of giving and an endowment to the recipient, they show that the behavior of the dictator can be explained with a theory of impure altruism.

Konow (2010) argues that both conditional altruism and unconditional altruism can explain dictator giving. Conditional altruism includes social preference model such as inequity aversion, efficiency, and reciprocity. Unconditional altruism includes pure and

impure altruism. To alienate possible mix of motivations, he employs frames such as recipient endowment, charity and familiarity. It is again shown that the recipient show-up fee has significant effects on the dictator giving. This supports mainly conditional altruism and some unconditional altruism, but not warm-glow, as motivations of 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. They were recruited through the CBESS Experimental 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 a 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 given 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 table

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 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 in 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 support for warm-glow.

In each treatment, subjects were randomly and anonymously placed into one of 8 pairs and assigned as either a dictator or a recipient. Then they 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 dictator's decision was anonymous to the experimenters. Subjects could participate in only one session. On an average, each session took about 45 minutes and the average earnings of subjects (dictator and recipient together) varied between £5.5 and £25. The instructions are included in the Appendix.

3. Theoretical predictions

In this section we derive analytical predictions about giving with warm-glow, inequity aversion, and pure altruism theories, proofs of which are given in the Appendix.

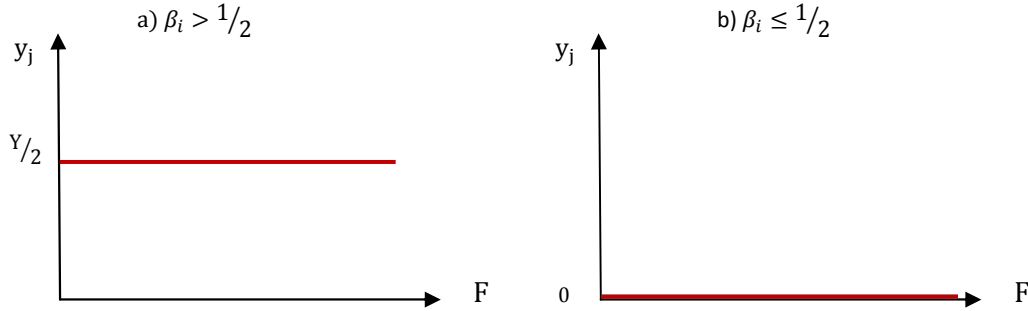### 3.1. Linear form inequity aversion

Inequity aversion theories capture the preference of the agents for fairness and defiance to inequality. Fehr and Schmidt (1999) suggest a linear model of inequity 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

$$u_i = x_i - \alpha_i max[x_j - x_i, 0] - \beta_i max[x_i - x_j, 0], \quad i \neq j \qquad (1)$$

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 inequity 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 $x_j = F_j + y_j$. By experimental restrictions, $Y > F_j - F_i$. Lemma 1 states the predicted relationship between the equilibrium amount given and the show-up fee. Figure 1 summarizes this in a diagram.

Lemma 1. When $F_i = F_j = F$, then according to the hypothesis of the linear form inequity aversion, the amount given remains the same across treatments $(\frac{dy_j^*}{dF} = 0)$.

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

a) $\beta_i > 1/2$

b) $\beta_i \leq 1/2$

3.2. Ratio form inequity 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 from the previous sub-section, for a two-player case, this model turns out to be

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

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

Figure 2. Show-up fee-Dictator giving relationship: Ratio form inequity aversion
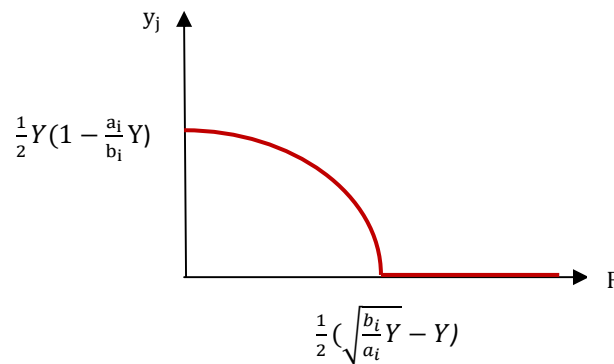
Lemma 2. When $F_i = F_j = F$, then according to the hypothesis of the ratio form inequity aversion, the dictator gives a positive amount at zero common show-up fees. However, giving decreases with an increase in the show-up fee $(\frac{dy_j^*}{dF} < 0)$, until a point after which the dictator keeps the whole amount to be shared to himself.
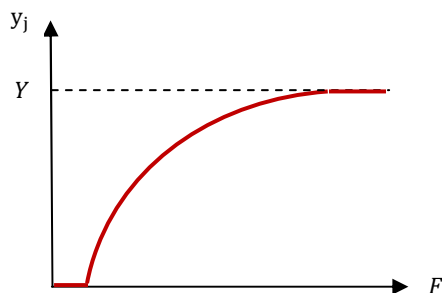
3.3. Warm-glow theory

Warm-glow theory (Andreoni, 1990) explains dictator giving with impure altruism. In this model the utility of the giver depends on the amount given and not on the income inequality between the giver and the receiver. For two players, we specify this model as

$$u_i = u_i(F_i + y_i, y_j) = u_i(F_i + (Y - y_j), y_j) \qquad (3)$$

Assume that the utility function $u_i(.,.)$ to be continually increasing, concave and twice differentiable on both arguments; and that the marginal utility from consumption does not decrease with an increase in giving. Lemma 3 and Figure 3 describe the derived relationship between the equilibrium giving and show-up fee for this model.

Lemma 3. When $F_i = F_j = F$, then according to the warm-glow theory – for very low show-up fees, dictator keeps the whole amount to himself. As the show-up fee increases, after a certain point, an increase in the show-up fee strictly increases giving ($\frac{dy_j^*}{dF} > 0$), until a point after which the dictator gives the whole amount to be shared to the recipient.

Figure 3. Show-up fee-Dictator giving relationship: Warm-glow

3.4. Pure altruism

According to the theory of pure altruism the utility of a donor depends on the final payoffs of himself and the receiver. Modifying the warm-glow model specified above, the utility function with pure altruism becomes

$$u_i = u_i(F_i + y_i, F_j + y_j) = u_i(F_i + (Y - y_j), F_j + y_j) \qquad (4)$$

It is shown in the appendix that the pure altruism theory does not provide a clear prediction for an income effect. Specifically, giving may stay the same, go up, or go down as a result of an increase in the common show-up fees.

4. Results

As the treatments are run between-subjects, they are not correlated and there are 24 independent observations from 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. 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. Only one subject allocated more than £5 to recipient. 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 same line with the results from the existing experiments (Engel, 2010).

Table 2. Descriptive statistics of amount given: total

# of obs: 120	Show-up fee					
	0.5	5	10	15	20	Total
Mean	1.59	2.12	2.44	2.66	3.12	2.387
Median	1.25	2	2.25	3	3.495	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
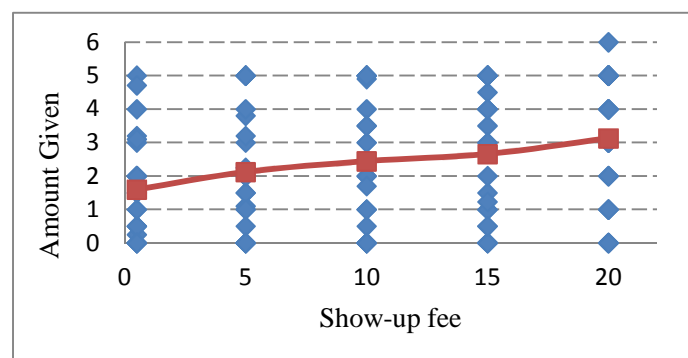
One immediate observation from Table 2 is that the central tendency of the amount given is steadily increasing with an increase in the show-up fee. This is true for both mean and median giving. Figure 4, showing the scatter plot of giving with the average giving per treatment, further supports this observation. However, it is still to be confirmed if this increase in giving is statistically significant.

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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 a two-sided Wilcoxon rank-sum (Mann and Whitney, 1947) test it could not be rejected that giving in treatments with high show-up fees is higher than giving in treatments with lower show-up fees.

To test whether the increase in amount given across treatments is significant and robust of 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 on an average by 7.3 pence. 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 counterpart. Because almost a sixth of the dictators gave nothing, the third and fourth regressions are run with a left censored Tobit model. But 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	1.64724***	1.563275**	1.366071***	1.351753
	(0.2930246)	(0.7653842)	(0.3502785)	(0.8890581)
Show-up Fee	0.0732353***	0.0682052***	0.0815733***	0.0757163***
	(0.0239214)	(0.0241749)	(0.0283397)	(0.0281078)
Female		0.7452838**		0.8727873**
		(0.3381713)		(0.3925583)
Age		-0.0073455		-0.0122488
		(0.024454)		(0.028431)
UK Dummy		0.0341708		0.0572679
		(0.3554196)		(0.4134645)
Econ Dummy		-0.1272524		-0.1185901
		(0.5630066)		(0.6525361)
# of Observations	120	120	120	120
Adjusted R^2	0.0657	0.0759	0.0166	0.0280

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 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 conclusion, supporting the warm-glow theory we specify, a pure income effect – with no implication on income inequality – is positively correlated with altruism.

5. Discussion

We investigate how an 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 to be the same. Contrary to the predictions of the inequity aversion models and derived results from existing experiments, but abiding with the warm-glow theory, the dictator gives more with an increase in the show-up fee. This result has broader implications. For example, ceteris paribus one should expect a higher amount of overall charity giving within a richer country compared to a poorer country, or more family transfers within wealthier families compared to poorer families. On another context, this result implies that one should expect citizens from the richer country to be more eco-friendly than their poorer counterpart. The last implication also supports empirical observation by Popp (2001) about impure inter generational altruism in terms of environmental issues.

The main result of our analysis is both surprising and of interest because existing experimental results till date (such as Korenok et al., 2012 and Konow, 2010) have shown that in a standard dictator game, results can be explained with inequity aversion or impure altruism theories. Crumpler and Grossman (2008) among others, on the other hand, have shown that warm-glow theory holds for a charity framing in a dictator game. Our results imply that Crumpler and Grossman (2008)'s result can be extended even in a standard dictator game framing. If the experimental design of the game makes income inequality less salient, then giving is driven by warm-glow.

Furthermore, Branas-Garza (2006), Korenok et al. (2012) and Engel (2010) show that an increase in recipient's income marks a negative impact on the amount given by the dictator. We observe that if the increase in recipient income is accompanied by an increase in dictator income, then it may actually increase giving. Putting 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 most of the existing designs, warm-glow and inequity aversion theories work in opposite ways in determining giving. Once again, if one of the effects is made less salient then it is offset by the other effect and the prediction gets changed. Hence, our results show the importance of framing a charity campaign in the right direction such that the income effect is prominent in increasing giving. Also, in the line of Bardsley (2008) and List (2007),[2] this study shows the effects of framing for which inequity aversion theories may not explain giving behavior. Whereas those studies frame the strategy set differently, we only make income effect salient to observe the sensitivity of inequity aversion theories in specific dictator games.

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[2] Bardsley (2008) and List (2007) introduce a taking game in which a dictator is allowed not only to give an amount to a recipient but also to take from recipient's endowment. Bardsley (2008) shows that allowing the taking causes the reversed generosity of a dictator and that previous social preference literatures do not work anymore. List (2007) also shows the similar results and argues that social norms affect the decision of dictators.

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Appendix I

1. Linear form inequity aversion: Proof of Lemma 1

Equation (1) can be rewritten as:

$$u_i = (y_i + F_i) - \alpha_i max\big[(y_j + F_j) - (y_i + F_i), 0\big] - \beta_i max\big[(y_i + F_i) - (y_j + F_j), 0\big]$$

$$= (Y - y_j + F_i) - \alpha_i max\big[2y_j + F_j - F_i - Y, 0\big] - \beta_i max\big[F_i + Y - 2y_j - F_j, 0\big]$$

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

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

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

$$L_i = (Y - y_j + F_i) - \beta_i(F_i + Y - 2y_j - F_j) + \lambda_1 y_j + \lambda_2 \left((Y + F_i - F_j)/2 - y_j\right)$$

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

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

$$\frac{\partial L_i}{\partial \lambda_2} : \left((Y + F_i - F_j)/2 - y_j\right) \geq 0; \lambda_2 \geq 0; \lambda_2 \left((Y + F_i - F_j)/2 - y_j\right) = 0$$

<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 $(Y + F_i - F_j)/2$. But the second order condition does not hold.

<u>Case b</u>. $\lambda_1 > 0$, $\lambda_2 = 0$ and hence $(Y + F_i - F_j)/2 > y_j = 0$. 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 $(Y + F_i - F_j)/2$. The required condition for this is $\beta_i > 1/2$.

Consequently, when $F_i = F_j = F$, then the equilibrium y_j is independent of F. Therefore under Fehr and Schmidt (1999) structure: $\frac{dy_j^*}{dF} = 0$.

2. Ratio form inequity aversion: Proof of Lemma 2

Equation (2) can be rewritten as

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

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.

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

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

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

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

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 $a_i(F_i + F_j + Y)^2 > b_i(F_i - F_j + Y)$. For a common show-up fee ($F_i = F_j = F$), the needed 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. This can arise only when the show-up fee difference is high enough. From (6) observe that $\mu_2 > 0$ implies $(F_i - F_j) > Y + a_i(F_i + F_j + Y)^2 / b_i$. This case is not relevant for a common show-up fee.

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

3. Warm-glow theory: Proof of Lemma 3

Equation (3) can be rewritten as

$$u_i = u_i(F_i + y_i, y_j) = u_i(F_i + (Y - y_j), y_j)$$

To save on the notations, denote $u_i(.) = U(.)$, $y_j = y$, $F_i = F$. Hence, the equation becomes

$$U = U(F + Y - y, y)$$

Now denote the first partial derivative of the function U with the ith argument as U_i, the second partial derivative as U_{ii}, and the cross partials as U_{ij}. Assume diminishing marginal utility, i.e., $U_i > 0$ and $U_{ii} < 0$. Further assume that the marginal utility of consumption does not decline with an increase in giving, i.e., $U_{ij} \geq 0$.

The dictator would try to maximize his utility with respect to the giving decision. Hence the dictator's optimization problem boils down to: $max_y \, U = U(F + Y - y, y)$ subject to $Y \geq y \geq 0$. Let η_1 and η_2 be Lagrangian multipliers. The Lagrangian equation and the corresponding first order conditions are given below.

$$L = U(F + Y - y, y) + \eta_1 y + \eta_2(Y - y)$$

$$\frac{\partial L}{\partial y} = -U_1 + U_2 + \eta_1 - \eta_2 = 0 \tag{7}$$

$$\frac{\partial L}{\partial \eta_1} : y \geq 0; \eta_1 \geq 0; \eta_1 y = 0$$

$$\frac{\partial L}{\partial \eta_2} : (Y - y) \geq 0; \eta_2 \geq 0; \eta_2(Y - y) = 0$$

<u>Case a.</u> $\eta_1 > 0, \eta_2 = 0$, i.e. $U_1 = U_2 + \eta_1$ at $y = 0$, i.e. $U_1(F + Y, 0) > U_2(F + Y, 0)$.

<u>Case b.</u> $\eta_2 > 0, \eta_1 = 0$, i.e. $U_2 = U_1 + \eta_2$ at $y = Y$, i.e. $U_1(F, Y) < U_2(F, Y)$.

<u>Case c.</u> $\eta_1 = 0, \eta_2 = 0$, is the case with an interior solution. Imposing this in (7) we get $U_1 = U_2$, i.e., the dictator is indifferent between giving an extra unit and keeping it. The sufficient condition for the second order condition to hold is $U_{12} > (U_{11} + U_{22})/2$. Hence, the assumption of non-negative cross partial suffices this condition. One can solve for the unique giving amount y^* from equation (7) and then run the comparative statics of the equilibrium giving with show-up fee.

However, we show the results with the help of a diagram. In Figure 5 we draw the recipient payoff, $F + y$, in the X axis, and U_1 and U_2 in the Y axis. It is easy to show that $\frac{\partial U_1}{\partial y} = -U_{11} + U_{12} > 0$ and $\frac{\partial U_2}{\partial y} = -U_{12} + U_{22} < 0$. Hence, given this, U_1 is upward rising and U_2 is downward sloping. From cases a, b, conditions needed for an interior solution are $U_1(F + Y, 0) < U_2(F + Y, 0)$ and $U_1(F, Y) > U_2(F, Y)$. The distance between F and $F + y^*$ is the equilibrium giving.

Now, note that $\frac{\partial U_1}{\partial F} = U_{11} < 0$ and $\frac{\partial U_2}{\partial F} = U_{12} \geq 0$. Hence, an increase in F will shift the U_1 curve strictly downwards to the dotted curve $\widetilde{U}_1$ and the U_2 curve weakly upwards to the dotted curve $\widetilde{U}_2$.[3] The new equilibrium giving, $\tilde{y}$, will consequently be strictly higher than the one with a lower F, hence, $\frac{\partial y^*}{\partial F} > 0$. It is easy to show that this comparative statics will still hold in case of the possible corner solution case in which $y^* = 0$. Obviously an increase in the show-up fee will have no effect in the other corner solution.

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[3] Of course, there will also be a scale shift in the *X*-axis, but we abstract away from that in the diagram as that will not change any qualitative result.

Figure 5. Equilibrium and comparative statics in Warm-glow
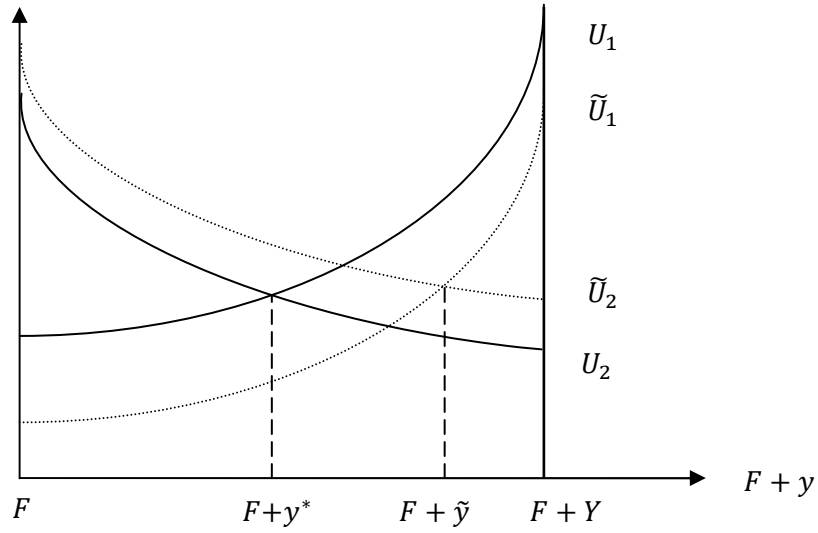
4. Theory of pure altruism

For a common show-up fee, following the notations in previous sub-section, equation (4) can be rewritten as

$$U = U(F + Y - y, F + y)$$

The procedure to solve for equilibria described in the previous sub-section still holds. An interior solution, if exists, is unique. However, now an increase in the common show-up fee does not have a definitive effect on the U_1 and U_2 curves, because now $\frac{\partial U_1}{\partial F} = U_{11} + U_{12} \lesseqgtr 0$ and $\frac{\partial U_2}{\partial F} = U_{12} + U_{22} \lesseqgtr 0$. Hence, the curves may shift either upward or downwards as a result of an increase F. Consequently, an increase in the common show-up fee may increase, decrease or have no effect on equilibrium giving (y^*).

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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**.

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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.

<div style="border:1px solid black; padding:10px;">

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

</div>

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

<div style="border:1px solid black; padding:10px;">

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

</div>

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 the amount offered to Participant B by Participant A. Line 7 shows the total earnings of Participant B, which is the sum of line 3 and line 6.

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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?**