Impure Altruism in Dictators' Giving

Oleg Korenok, Edward L. Millner, and Laura Razzolini*

Department of Economics

Virginia Commonwealth University

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Abstract: We design an experiment to test whether the behavior of dictators can be rationalized by the impurely altruistic utility function. By giving the recipients an endowment of varying levels, we create an environment that allows for observable differences in behavior depending upon whether pure or impure altruism is the primary motivation. We find that the behavior of 66 percent of the dictators can be rationalized by the impurely altruistic utility function, while only 40 percent of the dictators make choices that are consistent with the purely altruistic utility function.

Keywords: Dictator Game, Impure Altruism, Incomplete Crowding Out

JEL Classifications: C91, D01, D64, H30, H41

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Corresponding author: Oleg Korenok, okorenok@vcu.edu, Richmond VA 23284-4000, (804) 828-3185.

1. Introduction

Andreoni and Miller (2002) studied the altruistic behavior of individuals and found a significant degree of rationality. They studied behavior in the context of the dictator game in which a subject – the dictator – has the opportunity to share her endowment with another subject – the recipient. They showed that subjects' choices can be rationalized by a well-behaved purely altruistic utility function. That is, the dictator's problem can be modeled as choosing the optimal amount to pass to maximize a utility function in which the two final payoffs are the only arguments.[1] To establish this result, Andreoni and Miller examined subjects' choices made on different budget sets and showed that the choices satisfied the Generalized Axiom of Reveal Preferences (GARP). This result, by Afriat's theorem (1967), is equivalent to establishing the existence of a well-behaved utility function.

The pure altruism model predicts that a \$1 transfer from the donor to the recipient by the experimenter, or by the government in case of a charity, completely crowds out the private donation; that is, the private donation decreases by exactly \$1. Suppose, for example, that equalizing final payoffs is the optimal choice for the dictator in a game in which the dictator's endowment is \$10 and the recipient's endowment is \$0. That is, passing \$5 maximizes the dictator's utility. Then, a \$1 transfer from the dictator's endowment to the recipient's endowment, which reduces the dictator's endowment to \$9 and increases the recipient's endowment to \$1, should not alter the dictator's optimal choice of equal payoffs, and the dictator should reduce the optimal amount passed to \$4. So, a \$1 transfer crowds out the dictator's giving by exactly \$1, leading to complete crowding-out.

Contrary to the dollar-for-dollar prediction of the pure altruistic model, evidence from empirical studies and experiments demonstrates that crowding out is incomplete. Many empirical studies (an incomplete list includes Kingma (1989), Okten and Weisbrod (2000), Khanna, Posnett and Sandler (1995), Ribar and Wilhelm (2002), Manzoor and

[1] The final payoffs of the dictator and the recipient are the only arguments in a number of other-regarding utility models including Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Charness and Rabin (2002), and Cox and Sadiraj (2010), among others.

Straub (2005), Hungerman (2005), Borgonovi (2006), Gruber and Hungerman (2007), and Andreoni and Payne (2009)) show that crowding out is quite small, ranging from 0 percent to 30 percent. Payne (1998) reports somewhat larger but still incomplete crowding out of about 50 percent after controlling for an endogeneity bias. In a public good game, Andreoni (1993, 1995) reports that, after a $2 transfer, the average contribution to a public fund decreased by $1.43, or 71percent of $2, even after controlling for possible subjects' confusion. Andreoni (1993) concludes that "…, the behavior in the experiment is broadly consistent with the hypothesis that people get pleasure from the act of contributing to the public good" (p. 1325). In a dictator game, Bolton and Katok (1998) report that, after a $3 transfer from the dictator to the recipient, the average pass decreased by 86 cents, or 29 percent of $3. Bolton and Katok conclude that incomplete crowding out "is direct evidence that donor preferences are incompletely specified by the standard [*pure altruistic*] model" (p. 315).

Incomplete crowding out is consistent with the impure altruism model which includes a third argument in the utility function, the amount passed by the donor (Andreoni 1989, 1990). Over ten years before his 2002 contribution, Andreoni (1990) had observed that "…the 'pure altruism' model is extremely special, and its predictions are not easily generalized. …The impure altruism model is consistent with observed pattern of giving" (p. 465). Adding the amount passed as an additional argument into the utility function implies that the donor has a taste for giving and derives utility from the very act of passing in addition to the final payoffs.[2] Consider again the situation in which the dictator's endowment is $10, the recipient's endowment is $0 and the dictator chooses to pass $5. After the $1 transfer, a $4 pass would again equalize final payoffs. However, the optimal pass now would exceed $4 because the dictator derives utility from passing. After a $1 transfer, the dictator decreases her pass by less than $1 because she enjoys passing.

In this paper, we test whether dictators' choices can be rationalized by the impure altruism utility function. To our knowledge, no existence result has been established for

[2] Palfrey and Prisbey (1996, 1997) report evidence of a taste for giving in linear public goods games. Also, in the context of the dictator game, Crumpler and Grossman (2008) report that participants donate 20 percent of their endowment even if the amount of money that the charity receives is preset and any contribution by the participant crowds out dollar-for-dollar the giving by the proctor.

the impure altruism model in an equivalent fashion to the Andreoni and Miller (2002) result for the pure altruism model. We fill this gap. We find that the behavior of 66 percent of the dictators can be rationalized by the impurely altruistic utility function, while only 40 percent of the dictators make choices that are consistent with the pure altruistic utility model. We also estimate the utility function for each individual and use the estimates to forecast successfully incomplete crowding-out for Bolton and Kartok's (1998) and List's (2007) experiments. Our study extends Andreoni and Miller's (2002) work by showing that altruistic behavior exhibits a significant degree of rationality in a more general setting that allows transfers to the recipient and, therefore, the possibility of crowding out.

2. Experimental Design

We modify the Andreoni and Miller experimental design to test whether dictators' choices can be rationalized by a well-behaved impure altruistic utility function, $U(\pi_D, \pi_R, P)$, when crowding out is possible. As in Andreoni and Miller we vary prices. We also vary the endowments given to both the dictator and the recipient, as in Korenok *et al.* (2010). The result is a dictator game in which the dictator chooses the amount to pass, P, and the final payoffs to the two subjects are

$$\begin{aligned} \pi_D &= (E_D - P) p_h \\ \pi_R &= E_R + P p_p. \end{aligned} \tag{1}$$

In (1), π_D is the dictator's final payoff, E_D is the dictator's endowment, π_R is the recipient's final payoff, E_R is the recipient's endowment, the hold price, p_h, multiplies the amount that dictator holds for herself and the pass price, p_p, multiplies the amount the recipient receives from the dictator.[3] Multiplying the amount passed to the recipient by a price introduces the possibility to tax ($p_p < 1$) or subsidize ($p_p > 1$) the altruistic donation of the dictator. The traditional dictator game occurs when $E_R = 0$ and $p_h = p_p = 1$.

[3] We choose not to attach a price to the recipient's endowment to simplify the dictator's decision with no loss of generality.

In the experiments, the subjects are given a menu of choices characterized by different endowments of tokens and different prices, as specified in the first five columns of Table 1. Each budget in Table 1 specifies the number of tokens to be divided by the dictator, the number of points each token is worth to each subject and the number of points already allocated to the recipient. Consider for example the budget in the second row where E_D = 17, E_R =11, p_h =3 and p_p =1. In this case, both the dictator and the recipient have a positive endowment, 17 tokens for the dictator and 11 points for the recipient. Also, given the prices, passing one token reduces by three points the dictator's final payoff and increases by 1 point the recipient's payoff, so that the relative price of giving is 3.

Table 1: Budgets and Average Dictators' Choices

Budget	Dictator's Token Endowment	Recipient's Points Endowment	Hold Value	Pass Value	Relative Price of Giving	Average Tokens Passed: Sessions 1-4	Average Tokens Passed: Sessions 5-6
1	40	0	1	3	0.33	7.37	11.47
2	17	11	3	1	3.00	3.32	2.44
3	21	2	2	2	1.00	4.39	5.48
4	60	0	1	3	0.33	10.93	16.65
5	24	12	3	1	3.00	4.42	4.16
6	31	2	2	2	1.00	6.46	7.69
7	40	0	1	4	0.25	6.25	10.60
8	13	12	4	1	4.00	2.60	1.76
9	21	2	2	3	0.67	3.56	5.52
10	60	0	1	4	0.25	10.72	17.50
11	18	12	4	1	4.00	3.26	2.76
12	21	3	3	2	1.50	4.61	4.24
13	80	0	1	4	0.25	13.14	23.23
14	23	12	4	1	4.00	4.54	2.95
15	43	6	2	3	0.67	6.79	10.55
16	80	0	1	3	0.33	14.77	18.11
17	32	16	3	1	3.00	5.47	3.52
18	42	4	2	2	1.00	8.46	10.29

The aim of this study is to determine if the choices made by the subjects when presented with the above 18 budget sets can be rationalized by a well-behaved utility function, $U(\pi_D, \pi_R, P)$. In the standard environment, Afriat's (1967) theorem can be applied to the observed data to establish the existence of well behaved preferences that generated those choices. Our budget set, however, differs substantially from budget set in the traditional utility theory framework. In the standard framework, given prices and income, a budget set with three goods defines a three-dimensional polyhedron, and the subject's choice of any two goods on the frontier completely identifies the choice of the third. In the context of dictator games, however, there is only one degree of freedom in the subjects' choices. Once P is chosen, then, given endowments and prices, the final payoffs, π_D and π_R, are completely determined by the system in (1), and satisfy the constraint: $\pi_D + \pi_R \frac{p_h}{p_p} = p_h E_D + \frac{p_h}{p_p} E_R \equiv m$. That is, the budget set corresponds to a line in a three-dimensional space, and the dictator's choice of P completely determines π_D and π_R (as shown in Figure 1). The constraints in (1) imply that only one degree of freedom exists in the subjects' choices and that the trade-offs between each pair of the three goods (π_D, π_R, P) are not well defined. This means that prices are not well defined, and that the standard application of Afriat's theorem to the observed data is not possible.

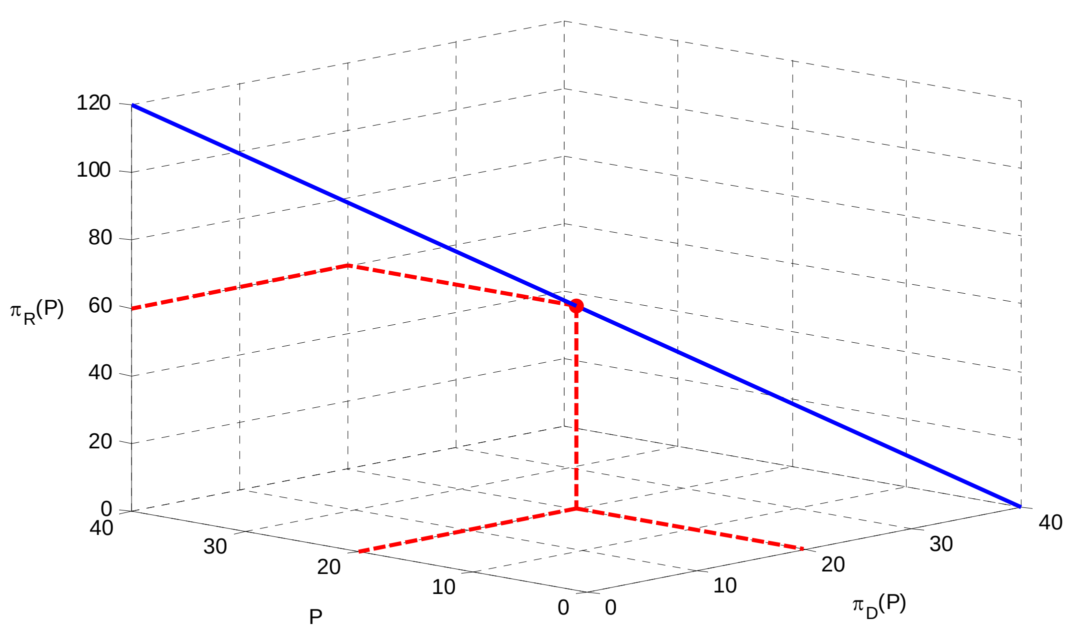

Figure 1: Budget Set in a Modified Dictator Game

3. Axioms and their Violations

We will develop in this section an alternative argument to establish that observed choices can indeed be rationalized by a well-behaved utility function. Let *x*, *y*, *z*,…. be distinct choices or bundles belonging to different budget sets. Using Varian's (1993) terminology, *x* is *directly revealed preferred* to *y* if *y* was available in the budget set when *x* was chosen; *x* is *strictly directly revealed preferred* to *y* if *y* was available and strictly inside the budget set when *x* was chosen; and *x* is *revealed preferred* to *z* if *x* is directly revealed preferred to *y* and *y* is directly revealed preferred to *z*.

In the context of our model, when there is one degree of freedom in the choices of the subjects, a trivial modification of the direct revealed preference relation allows us to test whether subjects' choices can be rationalized by a well-behaved utility function. We will say that *x* is *monotonically revealed preferred* to *y* when *x* is directly revealed preferred to y' and y' contains more of every good than *y*. Bundle *x* is *indirectly monotonically revealed preferred* to *y* when *x* is monotonically revealed preferred to *z* and *z* is monotonically revealed preferred to *y*. Choices *x* and *y* are *Monotonically Inconsistent* if *x* is monotonically revealed preferred to *y* and *y* is monotonically revealed preferred to *x*.

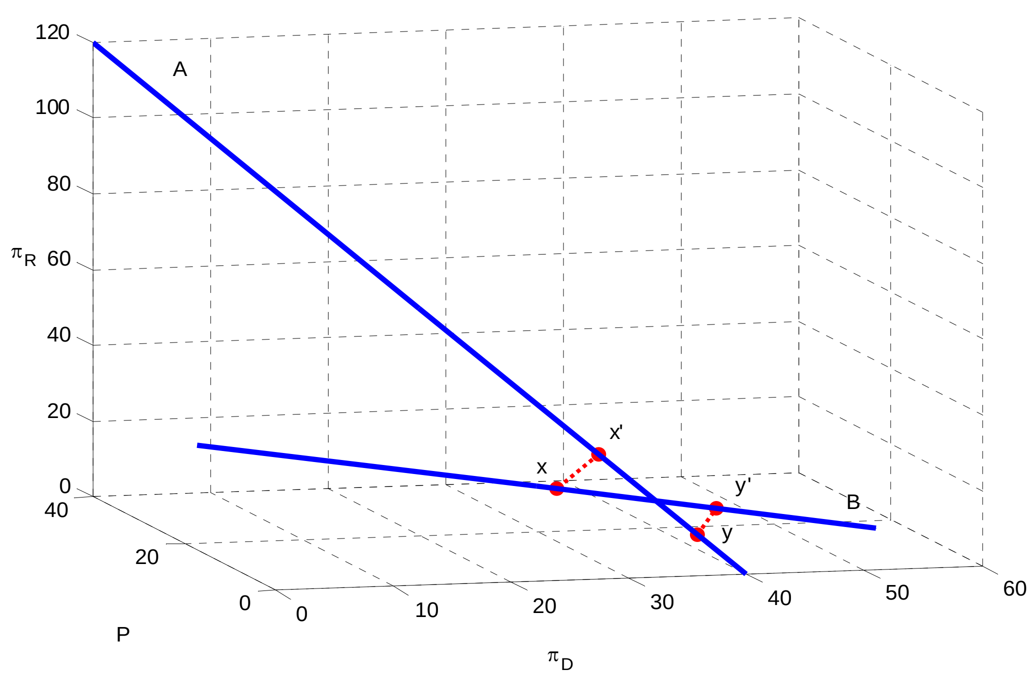

Figure 2: Monotonically Inconsistent Choices in the Space of Payoffs and Pass

Figure 2 provides an example of Monotonically Inconsistent choices in the three-dimensional space spanned by the final payoffs and the amount passed. Budget constraint A depicts the first budget in Table 1: $E_D = 40$, $E_R = 0$, $p_h = 1$, $p_p = 3$. Budget B corresponds to the second: $E_D = 17$, $E_R = 11$, $p_h = 3$, $p_p = 1$. Let the subject choose bundle *y* = (37, 9, 3) when facing budget line A. Since *y* is chosen, it is directly revealed preferred to bundle x' = (31, 27, 9), which is also available. Bundle x' has more of every good than bundle *x* = (27, 19, 8). Therefore, *y* is monotonically revealed preferred to *x*. Similarly, let the subject choose bundle *x* when facing budget line B. Since *x* is chosen, it is directly revealed preferred to y' = (39, 15, 4), another point on budget line B. Bundle y' has more of every good than *y*. Therefore, *x* is monotonically revealed preferred to *y*, which establishes that the choices *x* and *y* are *Monotonically Inconsistent*.

In what follows, we will classify the subjects in our experiment as making Monotonically Inconsistent choices or not. For subjects whose choices are Monotonically Inconsistent we will prove the following theorem:

Theorem: *If the observed choices are Monotonically Inconsistent, no non-satiated utility function exists that could rationalize the choices.*

For subjects whose choices are not Monotonically Inconsistent, we will use the following Result to establish that a well behaved utility function that rationalizes those choices exists:

Result: *If the observed choices are not Monotonically Inconsistent and there exists a set of artificial prices* $\overline{p}^i$ *so that the data are consistent with the Generalized Axiom of Revealed Preferences, then a non-satiated, continuous, concave, monotonic utility function that rationalizes the choices exists.*

A proof of the Theorem and the Result is in the Appendix.

We check whether subjects' choices are *Monotonically Inconsistent* under the budget scenarios listed in Table 1. If they are, then using our Theorem, we conclude that a well-behaved utility function, $U(\pi_D, \pi_R, P)$, that rationalizes these choices does not exist. If the observed choices are not *Monotonically Inconsistent*, then we find artificial prices such that the observed choices are consistent with the Generalized Axiom of

Revealed Preferences and, using our Result, conclude that a well-behaved utility function that rationalizes subjects' choices exists.

4. The Experimental Procedure

The experiment consisted of 6 sessions conducted in the Experimental Laboratory for Economics and Business Research at Virginia Commonwealth University in the Spring 2009. A total of 178 subjects recruited from introductory economics and business classes participated in the experiment. In sessions 1-4, subjects were randomly assigned by the computer the role of dictator (Blue player) or recipient (Green player). In these sessions, we had 57 dictators and 57 recipients. Subjects earned an average of $8.98. We added sessions 5 and 6, in which, as in Andreoni and Miller's design, each subject was both a dictator and a recipient. In these two sessions, we had 62 subjects who earned an average of $13.06.

Upon arrival, subjects were randomly seated at computer terminals and given a set of instructions (included in the Appendix), which were later read aloud by the experimenter. The instructions concluded with a quiz designed to help the participants become familiar with the type of choices involved in the dictator game. The monitor checked the answers to the quiz to make sure that all subjects clearly understood the nature of the choices. After the quiz, in sessions 1-4, the computer randomly determined the role of each subject, either dictator (Blue player) or recipient (Green player).

Throughout the session, no communication between subjects was permitted and all information and choices were transmitted through computer terminals, using the software program z-Tree (Fischbacher, 2007). Each dictator player made simultaneously all 18 decisions specified in Table 1. Next, the dictator's decisions were transmitted by the computer anonymously to the recipient randomly paired with that dictator. After the recipients recorded the 18 decisions on their own personal record sheets, the computer randomly determined which of the 18 decisions to implement and pay out. The subjects recorded their payoffs in a personal log sheet and proceeded to be paid privately by an assistant not involved with the experiment. At this time, the subjects also received a $5 participation fee.

5. Dictators' Rationality

Our primary goal is to determine whether or not the decisions of the dictators can be rationalized. Before doing so, we examine whether the data in our experiment is consistent with results reported by previous studies. We also examine whether the results in sessions 1-4 differ significantly from the results in sessions 5-6. The analysis provides some external validity to our experiments and suggests that sessions 1-4 and 5-6 may be pooled.

We begin by examining whether the data in our experiment are representative of other studies that use the standard dictator game. We find that the results are strikingly similar. Three budgets, 3, 6, and 18, are relatively close to budgets presented in the standard dictator game. Under these budgets, the relative price of giving equals 1 and the recipient's endowment is quite small, less than 10 percent of the dictator's endowment. The last two columns of Table 1 report the average number of tokens passed in sessions 1-4 and 5-6 for each budget set. The percentages of tokens passed in session 1-4 under budgets 3, 6, and 8 are 21 percent, 21 percent, and 22 percent, respectively. The percentages of tokens passed in session 5-6 under budgets 3, 6, and 8 are 26 percent, 25 percent, and 25 percent, respectively. The average across all three budgets and six sessions is 23 percent, which is quite close to the pass rates reported in the literature for the standard game.

Next we compare our results with those reported by Andreoni and Miller for two identical budgets. We again find similarity in the results. Budgets 1 and 7 in our experiment are identical to budgets 2 and 11 in Andreoni and Miller. The average amounts passed under budgets 1 and 7 in sessions 5-6 of our experiments are 11.47 and 10.60, respectively. The average amounts passed under budgets 2 and 11 of their experiments are 12.80 and 14.80, respectively.

Can sessions 1-4 be pooled with sessions 5-6? We are unable to find any significant differences in the choices using two different tests, and conclude that pooling the six sessions is appropriate. We use the Mann-Whitney test to compare the median amounts passed under each budget. We prefer to compare medians rather than means because heterogeneity of dictators' giving results in highly non-symmetric and multimodal distributions of the amount passed. The median amounts are identical for 8 budgets and they are never significantly different at the 5 percent level. We also compare the distribution of the amounts passed using the Kolmogorov-Smirnov test. Again, for all 18 budgets, the distributions in sessions 1-4 do not significantly differ from the distributions in sessions 5-6 at the 5 percent significance level.

We are now prepared to address directly the primary question in the paper: can dictators' giving be rationalized by a well-behaved impure altruism utility function of the form $U(\pi_D, \pi_R, P)$? We find that 78 (66 percent) of our 119 dictators never make Monotonically Inconsistent choices. We then identify artificial prices that make those choices consistent with the Generalized Axiom of Revealed Preference and, using our Result, conclude that a well-behaved utility function that rationalizes the subjects' choices exists.[4] Table 2 contains information about the 41 subjects whose choices are Monotonically Inconsistent. The first three columns of Table 2 list the sessions, the subjects with inconsistent choices and the number of inconsistent choices.

Table 2: Monotonically Inconsistent Choices (MIC)

	Subject	Number of MIC	Critical Cost Effic. Index*
Sessions 1-4:	1	1	0.99
	2	2	1.00*
	8	2	1.00*
	10	15	0.97
	15	22	0.87
	16	1	1.00*
	17	7	1.00*
	18	19	0.90
	19	7	0.97
	34	27	0.72
	36	1	1.00*
	37	14	0.83
	42	1	1.00*
	50	11	0.95
	51	1	1.00*

[4] The set of artificial prices is available upon request. Note that prices were found for each subject that did not make any monotonically inconsistent choices. Since the prices are not real, the choices satisfy GARP in an artificial sense.

	54	6	0.93
	57	4	0.95
Sessions 5-6:	60	24	0.90
	62	1	1.00*
	64	6	0.93
	66	10	0.97
	67	2	1.00*
	75	9	1.00*
	77	36	0.83
	78	5	0.95
	81	2	1.00*
	85	3	0.95
	87	14	0.92
	92	6	0.97
	93	16	0.77
	94	8	0.93
	99	3	1.00*
	101	17	0.92
	104	8	0.83
	105	31	0.83
	106	1	1.00*
	107	8	0.99
	109	1	0.96
	115	4	0.95
	117	1	1.00*
	119	13	0.90

Note: * Indicates that an ε-change eliminates all MIC choices.

Few dictators make severely Monotonically Inconsistent choices. As in Andreoni and Miller (2002), we use a modification of Afriat's (1972) Critical Cost Efficiency Index (CCEI) to measure the severity of inconsistencies. The index shows the lowest value by which the dictator's endowment has to be multiplied to eliminate all inconsistencies. The CCEI can be interpreted as the highest amount of the endowment that the dictator 'wastes' by making inconsistent choices. The last column in Table 2 reports the index. Only 15 (13 percent) of the dictators have a CCEI below 0.95 (the threshold adopted by Varian (1991)). These 15 subjects appear to be 'wasting' more than 5 percent of their endowment.

Our revealed preference tests are quite powerful according to Bronars' (1987) test. Ex-ante, our experiment offers many opportunities to display an inconsistent behavior. To show this, we generate artificial choices for 50,000 subjects by randomly drawing points from a uniform distribution over each budget set. The vast majority of these simulated subjects, 94.7 percent, make Monotonically Inconsistent choices at least once, with an average of 23.40 inconsistencies. Ex-post, dictators also make choices that could lead to many inconsistencies. To demonstrate this, we generate artificial choices for 50,000 subjects by randomly drawing from the set of actual choices made in the experiment. Even more of these bootstrapped subjects, 97.7 percent, make Monotonically Inconsistent choices at least once, with an average of 24.52 inconsistencies.

A natural question to ask is whether adding the amount passed as a third argument in the utility function is necessary. That is, can the behavior of the dictators be rationalized by the purely altruistic utility function, $U(\pi_D, \pi_R)$? If we limit our analysis to the final payoff space, (π_D, π_R), 71 (60 percent) of the 119 dictators violate GARP at least once, and 47 (40 percent) have severe violations with a CCEI below 0.95. On the other hand, 10 percent of Andreoni and Miller subjects violate the axiom at least once, and only 2 percent have severe violations. Thus, we find that the third argument is crucial when crowding out is possible.

The fact that in our design the recipients' endowments take positive values in 12 out of 18 decisions explains why our results differ so dramatically from Andreoni and Miller's results. Incomplete crowding out is possible only when the recipient's endowment varies and may lead to violations of the revealed preference axioms in the final payoffs' space. Andreoni and Miller do not detect violations of the axioms in the final payoff space due to incomplete crowding because they never gave recipients a positive endowment.

6. Estimating Individual Preferences to Predict Out-of-Sample Behavior

Having established that the impure altruism utility function, $U(\pi_D, \pi_R, P)$, rationalizes the choices for most of the dictators, we next determine its form and estimate its parameters to make out-of-sample predictions. We find that the impure altruism model provides fairly accurate predictions for experiments conducted by Bolton and Katok (1998) and List (2007).

Following Andreoni and Miller (2002) and the replication of their experiment by Fisman, Kariv, and Markovits (2007), we begin by estimating the parameters of a Constant Elasticity of Substitution utility function

$$U(\pi_D,\pi_R,P)=\left(\alpha\pi_D^{\rho}+\beta\pi_R^{\rho}+(1-\alpha-\beta)P^{\rho}\right)^{\frac{1}{\rho}} .$$

Parameters α and β are the relative weights on the payoff to the dictator and the recipient, respectively. The CES function incorporates a number of other utility functions as special cases as the parameter ρ varies. As ρ approaches -1, utility converges to perfect substitutes preferences: $U(\pi_D,\pi_R,P)=\alpha\pi_D+\beta\pi_R+(1-\alpha-\beta)P$; as ρ approaches $-\infty$, utility converges to Leontief preferences: $U(\pi_D,\pi_R,P)=\min\{\alpha\pi_D,\beta\pi_R,(1-\alpha-\beta)P\}$; and as ρ approaches 0, utility converges to the Cobb-Douglas preferences: $U(\pi_D,\pi_R,P)=\pi_D^{\alpha}\pi_R^{\beta}P^{(1-\alpha-\beta)}$.

Maximizing the CES function subject to the budget constraints in (1) yields the following first order condition:

$$\alpha\left(\left(E_D-P\right)p_h\right)^{\rho-1}-\beta\left(E_R+Pp_p\right)^{\rho-1}-\left(1-\alpha-\beta\right)P^{\rho-1}=0,$$

which we solve numerically for the optimal pass $P(E_D,E_R,p_h,p_p;\alpha,\beta,\rho)$. As in Fisman, Kariv, and Markovits (2007), we specify the econometric model for individual dictators in terms of budget shares:

$$\frac{\pi_{D,i}^n}{m^n}=\frac{\left(E_D^n-P_i\left(E_D^n,E_R^n,p_h^n,p_p^n;\alpha_i,\beta_i,\rho_i\right)\right)p_h^n}{m^n}+\epsilon_i^n,\quad n=1,...,18$$

where $P_i(E_D^n,E_R^n,p_h^n,p_p^n;\alpha_i,\beta_i,\rho_i)$ is the optimal pass for subject i under budget n, ϵ_i are i.i.d. normally distributed errors with mean zero and variance σ_i^2, and $m^n=\pi_D^n+\frac{p_h^n}{p_p^n}\pi_R^n$.

Since $0\le\frac{\pi_{D,i}^n}{m^n}\le 1$, the distribution for ϵ_i is truncated. We estimate α_i, β_i, ρ_i and σ_i^2 via a non-linear two-limit Tobit maximum likelihood. Prior to estimation we omit 30 subjects with uniformly selfish choices, 1 subject who chose to equalize final payoffs in all 18 decisions (Leontief), and 2 subjects that uniformly chose to maximize the sum of final payoffs (perfect substitutes).

For the remaining 86 subjects (72 percent), we estimate the parameters using the CES specification. For 53 subjects, the sum $\hat{\alpha}_i + \hat{\beta}_i$ is approximately one; for 52 of these 53 subjects $\hat{\rho}_i < -0.5$. A small Monte-Carlo study we conducted confirmed that parameters α_i and β_i are poorly identified when the true $\rho < -0.5$. To address this problem we re-estimated the parameters for all 52 subjects with $\hat{\rho}_i < -0.5$ restricting the CES to Leontief preferences. We also re-estimated the parameters for 32 subjects for whom $\hat{\rho}_i$ was within three standard deviations from 0, restricting the CES to Cobb-Douglas preferences. For those subjects for whom we estimated both a Leontief and a Cobb-Douglas function, we use estimates for the specification with the smallest root-mean squared error.

The estimates of the subjects' preferences allow us to predict the Bolton and Katok (1998) results with an impressive accuracy. Bolton and Katok (1998) examined dictators' giving under two treatments: treatment 18-2 in which $E_D = \$18$, $E_R = \$2$, $p_h = \$1$, $p_p = \$1$, and treatment 15-5, in which $E_D = \$15$, $E_R = \$5$, $p_h = \$1$, $p_p = \$1$. Compared to treatment 18-2, in treatment 15-5 the experimenter transfers \$3 from the dictator to the recipient. If the transfer completely crowds out private giving the average amount passed should fall by \$3. Our estimates, however, suggest that many dictators care not only about final payoffs, but also about the amount passed and, thus, crowding out will be incomplete. We predict the amount passed for each of our 119 dictators under both treatments. The average amount passed falls from \$3.70 in the 18-2 treatment to \$2.53 in the 15-5 treatment. Thus, we predict crowding out to be incomplete, about one-third (\$1.17) of the \$3 transfer. Our prediction is close to Bolton and Katok's (1998) results, as they found that the average amount passed fell by \$0.86 from \$3.48 in the 18-2 treatment to \$2.62 in the 15-5 treatment.

We consider next List's (2007) experiment. It involved a taking game in which the dictator is not only allowed to give to the recipient, but also may take part of the recipient's endowment. In addition to the standard 10-5 treatment, in which $E_D = \$10$,

$E_R = \$5$, $p_h = \$1$, $p_p = \$1$ and the dictator can only give, List conducted two additional treatments. In the 'take-1' treatment, the dictator was allowed to take up to \$1 from the recipient, and in the 'take-5' treatment, the dictator was allowed to take up to \$5 from the recipient. List compares giving across these three treatments and finds substantial differences in giving.

List's taking treatments are isomorphically equivalent in payoffs to treatments where taking is not allowed. The take-1 treatment corresponds to the 11-4 case in which $E_D = \$11$, $E_R = \$4$, $p_h = \$1$, $p_p = \$1$ and taking is not allowed, In both cases, the maximum final payoff to the dictator is \$11, the maximum final payoff to the recipient is \$4, and every dollar added to the recipient's payoff reduces the dictator's payoff by one. Similarly, the take-5 design can be represented as the 15-5 treatment in which $E_D = \$15$, $E_R = \$0$, $p_h = \$1$, $p_p = \$1$.

The predictions based on our estimates mimic closely the changes in final payoffs observed by List. Based on our estimates, we predict that the average amount passed should fall from \$3.58 in the 15-0 treatment to \$1.72 in the 11-4 treatment and to \$1.43 in the 10-5 treatment. These results imply that the average payoff to the recipients would fall from \$6.43 in the 10-5 treatment, to \$5.72 in the 11-4 treatment, and to \$3.58 in the 15-0 treatment. List (2007) reports that the average final payoff to the recipients falls from \$6.33 in the 10-5 and take-1 treatments to \$2.52 in the take-5 treatment. We conclude that our reinterpretation of List's treatments, together with incomplete crowding out, accounts for most of the differences in dictators' behavior observed by List (2007).

7. Conclusion

Few economic models incorporate altruism despite overwhelming evidence of unselfish behavior. Our research extends the work of Andreoni and Miller (2002) and Fisman, Kariv, and Markovits (2007) in establishing that unselfish behavior meets economists' definition of rationality and that a standard, testable utility maximization model fits well the evidence from the laboratory and from the field. Following the approach of Andreoni and Miller's seminal paper, we show that dictator's choices can be rationalized by the impure altruism utility function, $U(\pi_D, \pi_R, P)$. Such utility function can rationalize incomplete crowding out "…the oldest and the most important question in public economics" (Andreoni and Payne, 2009, p.1). Our results suggest that models of giving that fail to incorporate the utility the donor derives from giving are incomplete. The behavior of 66 percent of the dictators in our experiment can be rationalized with the impurely altruistic utility function, while only 40 percent of the dictators make choices that are consistent with the purely altruistic utility function.

Our results confirm the importance of recognizing that individuals attach value to the act of giving. If the government were to reduce its contributions to charitable organizations and simultaneously decrease taxes by the same amount with a balanced budget fiscal policy, incomplete crowding out predicts a decrease in charitable giving, while complete crowding out predicts no change in charity revenue. Alternatively, if the government were to increase its contributions with a balanced budget fiscal policy, charity revenue will increase. More importantly, we establish that such incomplete crowding out behavior is rational.

Appendix

Let the vector x denote the triple (π_D, π_R, P) of observed choices. Let x^i be a chosen triple under given values of $E_D^i, E_R^i, p_H^i, p_P^i$, for $i = 1,...,n$. Let the set of all x such that $x \in R_3^+$: $x < x^j$ or $x = x^j$, where $x^j \in R_3^+ : \pi_D^i + \frac{p_h^i}{p_p^i}\pi_R^i = \pi_D^j + \frac{p_h^i}{p_p^i}\pi_R^j$ define a polyhedron S^i as depicted in blue in Figure 3. We will say that the utility function $U(\pi_D, \pi_R, P) = U(x)$ *rationalizes* the set of n observations $\left(x^i\right)$ if $U(x^i) \geq U(x)$ for all $x \in S^i$.

***Theorem**: If the observed choices are Monotonically Inconsistent, no non-satiated utility function exists that could rationalize the choices.*

Proof: Let x^i and x^j be two monotonically inconsistent choices. By definition of Monotonically Inconsistency, x^i is monotonically revealed preferred to x^j and x^j is monotonically revealed preferred to x^i. This implies that x^i is directly revealed preferred to $\hat{x}^j$ and $\hat{x}^j$ contains more of every good than x^j, or $x^j \in S^i$. Similarly x^j is directly revealed preferred to $\hat{x}^i$ and $\hat{x}^i$ contains more of every good than x^i, or $x^i \in S^j$.

Assume to the contrary that a nonsatiated utility function exists and it rationalizes the observed choices x^i and x^j. By definition of rationalization, $x^j \in S^i$ implies that $U(x^i) \geq U(x^j)$. If $U(x^i) = U(x^j)$, by local nonsatiation there exists an $\overline{x}$ such that $\overline{x} \in S^i$ and $U(\overline{x}) > U(x^j) = U(x^i)$. But then $U(x)$ cannot rationalize x^i because there is $\overline{x} \in S^i$ such that $U(\overline{x}) > U(x^i)$. Then, it must be $U(x^i) > U(x^j)$. Similarly, we can show that $x^i \in S^j$ implies that $U(x^j) > U(x^i)$. This contradicts our previous claim that $U(x^i) > U(x^j)$. □

To establish the Result, given any triple x^i we construct an artificial set of strictly positive prices $\overline{p}^i$ such that $\overline{p}^i x^i = \pi_D^j + \frac{p_h^i}{p_p^i}\pi_R^j$, where $p^i = \left(1, \frac{p_h^i}{p_p^i}, 0\right)$ and $x^j \in R_3^+ : \pi_D^i + \frac{p_h^i}{p_p^i}\pi_R^i = \pi_D^j + \frac{p_h^i}{p_p^i}\pi_R^j$. Let the set $\overline{S}^i$ be defined as $\overline{S}^i = \left\{\overline{x} \in R_3^+ : \overline{p}^i x^i \geq \overline{p}^i \overline{x}\right\}$, depicted in green in Figure 3. Notice that by construction $S^i \subset \overline{S}^i$.

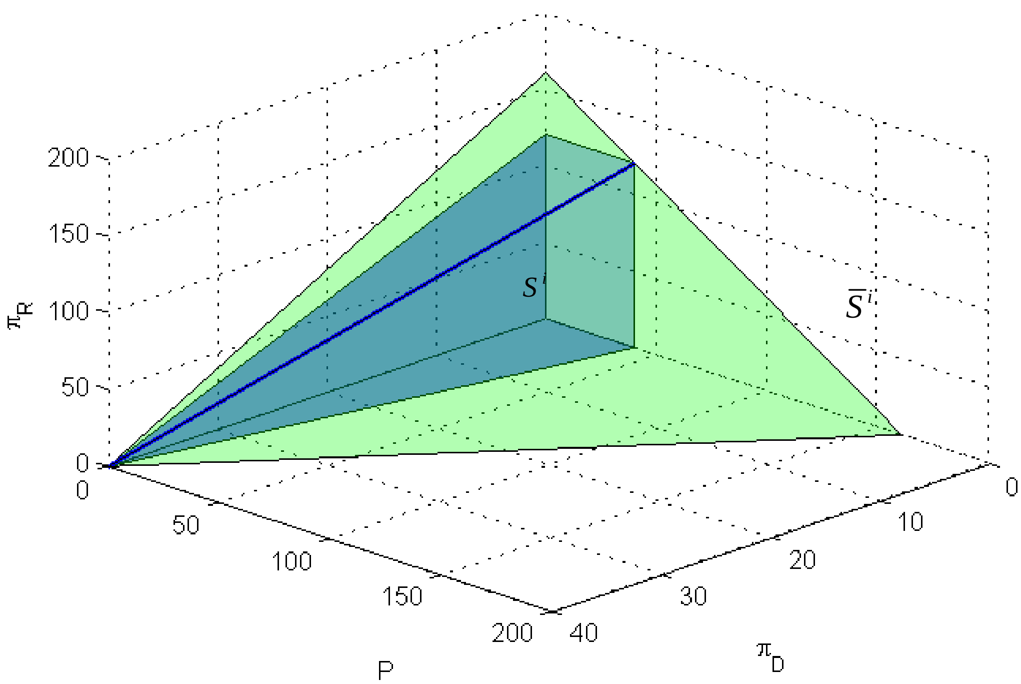

Figure 3: Geometry of S and $\overline{S}$

Result: *If the observed choices are not Monotonically Inconsistent and there exists a set of artificial prices* $\overline{p}^i$ *so that the data are consistent with the Generalized Axiom of Revealed Preferences, then a non-satiated, continuous, concave, monotonic utility function that rationalizes the choices exists.*

Proof: Let $x^i \quad i = 1,...,n$ be a set of observations that are not Monotonically Inconsistent, $x^i \in S^i \subset \overline{S}^i$ for all *i*. Afriat's theorem can be applied to the set $\overline{S}^i$. If the observations x^i satisfy GARP, then by Afriat's theorem there exists a well behaved utility function $U(x)$ that rationalizes the choices, so that $U(x^i) \geq U(x)$ for all x such that $\overline{p}^i x^i \geq \overline{p}^i x$ or $x \in \overline{S}^i$. Since $S^i \subset \overline{S}^i$, $U(x^i) \geq U(x)$ for all $x \in S^i$. This implies that the same utility function rationalizes the individual's choices over the polyhedron S^i. □

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INSTRUCTIONS (1-4)

Welcome

This is an experiment about decision making. You will receive a $5 show-up fee for participating. You may also earn additional money depending on the decisions that you and the other participants will make. The entire experiment should be completed within an hour. You may discontinue your participation in the experiment at any time. At the end of the experiment you will be paid privately and in cash for your decisions. A research foundation has provided the funds for this experiment.

Your identity

You will never be asked to reveal your identity to anyone during the course of the experiment and your name will never be linked to any of your decisions. In order to keep your decisions private, *please do not reveal your choices to any other participant.*

The experiment

You will be either a Blue player or a Green player in this experiment. At the beginning of the experiment, the computer will randomly determine whether you are Blue or Green. The computer will also randomly pair each Blue player with a Green player. You **will not** be told each other's identity.

Blue will be asked to make a series of 18 choices about how to divide a set of tokens between herself and the Green player. How Blue chooses in each decision is entirely a question of personal preference—there is no right or wrong answer. As Blue divides the tokens, Blue and Green will earn points. Every point that subjects earn will be worth 10 cents. For example, if you earn 58 points, you will make $5.80 in the experiment.

Each choice that Blue makes is similar to the following:

Green has 15 points. Divide 50 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 2 point(s) each.

In this choice Green starts with 15 points. Blue must divide 50 tokens. Blue can keep all the tokens, keep some and pass some, or pass all the tokens. In this example, Blue will receive 1 point for every token she holds, and Green will receive 2 points for every token Blue passes. For example:

- If Blue holds 50 and passes 0 tokens:
    - Blue will receive 50 points, or earn 50 × $0.10 = $5.00.
    - Green will receive no points. Since Green started with 15 points, she will earn (0+15) × $0.10 = 15 × $0.10 = $1.50.
- If Blue holds 0 tokens and passes 50:
    - Blue will receive 0 points, or earn $0.
    - Green will receive 50 × 2=100 points. Since Green started with 15 points, she will earn (100 + 15) × $0.10 = 115 × $0.10 = $11.50.

However, Blue could choose any number between 0 and 50 to hold. For instance,

- If Blue chooses to hold 29 tokens and pass 21:
  - Blue would receive 29 points, or earn 29 × $0.10 = $2.90.
  - Green would receive 21× 2 = 42 points, and earn (42 + 15) × $0.10 = 57 × $0.10 = $5.70.

Here is another example:

Green has 9 points. Divide 40 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

In this example, Green starts with 9 points, every token Blue holds earns her 3 points, and every token Blue passes to Green earns Green 1 point.

- Suppose Blue holds 24 tokens and passes 16.
  - Blue will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - Green will receive___ × ___ = ___ points and earn (___ + ____) × $0.10 = $____

To check your understanding, fill in the blanks above. You are free to use your own calculator, or one provided by the experimenter. Please raise your hand if you have questions. Also raise your hand when you are finished.

- Now, suppose Blue holds 40 and passes 0 tokens in the above example.
  - Blue will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - Green will receive___ × ___ = ___ points and earn (___ + ____) × $0.10 = $____

Please fill in the blanks above. Please raise your hand if you have questions. Also raise your hand when you are finished.

Here is another example for you to check your understanding:

Green has 9 points. Divide 40 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 2 point(s) each.

- Suppose Blue holds 24 tokens and passes 16.
  - Blue will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - Green will receive___ × ___ = ___ points and earn (___ + ____) × $0.10 = $____

- Suppose Blue holds 0 tokens and passes 40.
  - Blue will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - Green will receive___ × ___ = ___ points and earn (___ + ____) × $0.10 = $____

Please fill in the blanks above. Please raise your hand if you have questions. Also raise your hand when you are finished.

Blue will be asked to make the 18 allocation decisions listed below. Note that these decisions will appear in a different, random order on the computer screen.

Green has 0 points. Divide 40 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 3 point(s) each.

Green has 11 points. Divide 17 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

Green has 2 points. Divide 21 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 2 point(s) each.

Green has 0 points. Divide 60 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 2 point(s) each.

Green has 12 points. Divide 24 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

Green has 2 points. Divide 31 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 2 point(s) each.

Green has 0 points. Divide 40 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 4 point(s) each.

Green has 12 points. Divide 13 tokens: HOLD______ @ 4 point(s) each, and PASS _____ @ 1 point(s) each.

Green has 2 points. Divide 21 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 3 point(s) each.

Green has 0 points. Divide 60 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 4 point(s) each.

Green has 12 points. Divide 18 tokens: HOLD______ @ 4 point(s) each, and PASS _____ @ 1 point(s) each.

Green has 3 points. Divide 21 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 2 point(s) each.

Green has 0 points. Divide 80 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 4 point(s) each.

Green has 12 points. Divide 23 tokens: HOLD______ @ 4 point(s) each, and PASS _____ @ 1 point(s) each.

Green has 6 points. Divide 43 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 3 point(s) each.

Green has 0 points. Divide 80 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 3 point(s) each.

Green has 16 points. Divide 32 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

Green has 4 points. Divide 42 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 2 point(s) each.

Important Note: In all 18 decisions Blue can choose any number to hold and any number to pass. How Blue chooses in each decision is entirely a question of personal preference—there is no right or wrong answer. The only restriction on your choices is that the number of tokens held by Blue plus the number of tokens passed to Green MUST equal the number of tokens to divide.

Earnings

The computer will randomly select one of the 18 decisions to carry out. The number of points Blue and Green receive on the decision selected will determine the earnings for each player for the experiment. Again, every point will be worth 10 cents. Each decision has an equal chance of being selected. Because no one knows which decision will be used, it is in Blue's best interest to make all 18 decisions carefully.

The experiment is about to begin. Please raise your hand if you have any questions.

Fill the claim check below and raise your hand when you are done.

CLAIM CHECK (Blue)

The computer randomly selected for payment the game in which:

GREEN had __ points
and you had _____ tokens to divide.

You passed _____ tokens to GREEN
at _____ point(s) each.

You held _____ tokens
at _____ point(s) each.

As a result, you receive ____ points
and earn $____.

Fill the claim check below and raise your hand when you are done.

CLAIM CHECK (Green)

The computer randomly selected for payment the game in which:

You started with _____ points
and BLUE had _____ tokens to divide.

BLUE Passed _____ tokens to you
at _____ point(s) each.

As a result, you receive ___ points from Blue,
you end the game with ___ total points
and earn $ ____ .

INSTRUCTIONS (5-6)

Welcome

This is an experiment about decision making. You will receive a $5 show-up fee for participating. You may also earn additional money depending on the decisions that you and the other participants will make. The entire experiment should be completed within an hour. You may discontinue your participation in the experiment at any time. At the end of the experiment you will be paid privately and in cash for your decisions. A research foundation has provided the funds for this experiment.

Your identity

You will never be asked to reveal your identity to anyone during the course of the experiment and your name will never be linked to any of your decisions. In order to keep your decisions private, *please do not reveal your choices to any other participant.*

The experiment

You will be asked to make a series of 18 choices about how to divide a set of tokens between yourself and another participant in the room. We will refer to the person with whom you will be paired as OTHER. You and OTHER will be paired randomly and will not be told each other's identity.

As you divide the tokens, you and OTHER will each earn points. These points will be worth 10 cents each. For example, if you earn 58 points, you will make $5.80 in the experiment.

Each choice that you make is similar to the following:

OTHER has 15 points. Divide 50 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 2 point(s) each.

In this choice OTHER starts with 15 points and you must divide 50 tokens. You can keep all the tokens, keep some and pass some, or pass all the tokens. In this example, you will receive 1 point for every token you hold, and OTHER will receive 2 points for every token you pass. For example:

- If you hold 50 and pass 0 tokens:
    - You will receive 50 points, or earn 50 × $0.10 = $5.00.
    - OTHER will receive no points. Since OTHER started with 15 points, she will earn (0+15) × $0.10 = 15 × $0.10 = $1.50.
- If you hold 0 tokens and pass 50:
    - You will receive 0 points, or earn $0.
    - OTHER will receive 50 × 2=100 points. Since OTHER started with 15 points, she will earn (100 + 15) × $0.10 = 115 × $0.10 = $11.50.

However, you could choose any number between 0 and 50 to hold. For instance,

- If you choose to hold 29 tokens and pass 21:
    - You would receive 29 points, or earn 29 × $0.10 = $2.90.
    - OTHER would receive 21× 2 = 42 points, and earn (42 + 15) × $0.10 = 57 × $0.10 = $5.70.

Here is another example:

OTHER has 9 points. Divide 40 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

In this example, OTHER starts with 9 points, every token you hold earns you 3 points, and every token you pass to OTHER earns OTHER 1 point.

- Suppose you hold 24 tokens and pass 16.
  - You will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - OTHER will receive___ × ___ = ___ points and earn (___ + __) × $0.10 = $____

To check your understanding, fill in the blanks above. You are free to use your own calculator, or one provided by the experimenter. Please raise your hand if you have questions. Also raise your hand when you are finished.

- Now, suppose you hold 40 and pass 0 tokens in the above example.
  - You will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - OTHER will receive___ × ___ = ___ points and earn (___ + __) × $0.10 = $____

Please fill in the blanks above. Please raise your hand if you have questions. Also raise your hand when you are finished.

Here is another example for you to check your understanding:

OTHER has 9 points. Divide 40 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 2 point(s) each.

- Suppose you hold 24 tokens and pass 16.
  - You will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - OTHER will receive___ × ___ = ___ points and earn (___ + __) × $0.10 = $____

- Suppose you hold 0 tokens and pass 40.
  - You will receive ___ × ___ = ___ points and earn ___ × $0.10 = $____
  - OTHER will receive___ × ___ = ___ points and earn (___ + __) × $0.10 = $____

Please fill in the blanks above. Please raise your hand if you have questions. Also raise your hand when you are finished.

You will be asked to make the 18 allocation decisions listed below. Note that these decisions will appear in a different, random order on the computer screen.

OTHER has 0 points. Divide 40 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 3 point(s) each.

OTHER has 11 points. Divide 17 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

OTHER has 2 points. Divide 21 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 2 point(s) each.

OTHER has 0 points. Divide 60 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 2 point(s) each.

OTHER has 12 points. Divide 24 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

OTHER has 2 points. Divide 31 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 2 point(s) each.

OTHER has 0 points. Divide 40 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 4 point(s) each.

OTHER has 12 points. Divide 13 tokens: HOLD______ @ 4 point(s) each, and PASS _____ @ 1 point(s) each.

OTHER has 2 points. Divide 21 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 3 point(s) each.

OTHER has 0 points. Divide 60 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 4 point(s) each.

OTHER has 12 points. Divide 18 tokens: HOLD______ @ 4 point(s) each, and PASS _____ @ 1 point(s) each.

OTHER has 3 points. Divide 21 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 2 point(s) each.

OTHER has 0 points. Divide 80 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 4 point(s) each.

OTHER has 12 points. Divide 23 tokens: HOLD______ @ 4 point(s) each, and PASS _____ @ 1 point(s) each.

OTHER has 6 points. Divide 43 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 3 point(s) each.

OTHER has 0 points. Divide 80 tokens: HOLD______ @ 1 point(s) each, and PASS _____ @ 3 point(s) each.

OTHER has 16 points. Divide 32 tokens: HOLD______ @ 3 point(s) each, and PASS _____ @ 1 point(s) each.

OTHER has 4 points. Divide 42 tokens: HOLD______ @ 2 point(s) each, and PASS _____ @ 2 point(s) each.

<u>Important Note:</u> In all 18 decisions you can choose any number to hold and any number to pass. How you choose in each decision is entirely a question of personal preference—there is no right or wrong answer. The only restriction on your choices is that the number of tokens you hold plus the number of tokens you pass MUST equal the number of tokens to divide.

Any of the 18 decisions has an equal chance of being selected. Because no one knows which decision will be used, it is in your best interest to make all 18 decisions carefully.

Earnings
After everyone has made their decisions, the computer will randomly select one of the 18 decisions to carry out for payment.

The computer will randomly pair you with another subject in this experiment. You will then get the points you allocated in the HOLD portion of your decision, and other subject will get the points you allocated in the PASS portion of your decision plus the points with which she started.

Next, you will be paired again with a different subject in the experiment. This time we will use the other subject's decision to carry out. You will earn the points allocated in the PASS portion plus the points with which you started in this decision.

Your earnings will equal the sum of the points you earn. These points will be worth 10 cents each.

In the end of the experiment, you will bring your claim check to the assistant not involved in the experiment, and she will pay you your earnings in cash. This will help to guarantee privacy of your decisions.

The experiment is about to begin. Please raise your hand if you have any questions.

Fill the claim check below and raise your hand when you are done.

CLAIM CHECK

The computer randomly selected the following decision:

OTHER has ___points. Divide ___tokens: HOLD______@ __ point(s) each, and PASS _____@ __ point(s) each.

IN THE FIRST RANDOM PAIRING:

You held _____ tokens
at _____ point(s) each.

As a result, you receive ____ points.

IN THE SECOND RANDOM PAIRING:

You started with _____ points.
OTHER passed _____ tokens to you
at _____ point(s) each.

You receive _____ additional points.

As a result, you end the game with _____ total points

Your final earning is $________