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Inequality Aversion vs Altruism: Experimental Evidence*

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Abstract

The literature on dictator games has long debated whether inequality aversion or altruism is the motivation behind giving, but generally assumes the two preferences are mutually exclusive. This paper proposes an alternative theory suggesting subjects can express both altruism and inequality aversion. To test this theory a novel version of a three-player dictator game is introduced. The dictator chooses how to distribute a fixed endowment between two recipients, and is able to earn a private return based on the amount of inequality resulting from the allocation decision. To ensure inequality averse preferences can be separately identified from self-regarding behavior, the domain of decision environments is restricted to those in which the dictator receives the highest payout. Results show more than half of subjects express behavior in line with both altruism and inequality aversion. Furthermore, the results suggest the social preferences displayed can be influenced by the order of decision environments. The implications of these findings stress the importance of accounting for interactions between social preferences as well as a counterbalanced experimental design.

JEL Code: C91, D31, D60

Key Words: Experiment, Altruism, Inequality Aversion, Dictator Game

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1 Introduction

It has long been documented within experimental research that subjects are more benevolent than self-regarding theories predict.¹ Early researchers were able to account for this benevolence by incorporating other-regarding preferences into the theory. Since then contemporary experimental research has used the dictator game framework as a primary decision setting to determine why and how individuals account for others. While many theories of social preferences have been proposed to explain other-regarding behavior, this paper chooses to focus on the two prevailing theories, inequality aversion² and altruism³.

The existing literature regards these two theories as mutually exclusive. This view results from the assumption that subjects are motivated by a single social preference; subjects are limited to expressing either altruism or inequality aversion, but not both. Though this assumption is prevalent throughout the literature, little explanation is provided for why the assumption is made or why it should hold.

Results from Engelmann and Strobel (2004) challenge this assumption. Their results show a linear combination of social preferences to be the best fit of their data. Thus, the conclusions they reached substantiate a theory that subjects can express multiple social preferences. Given the support for an alternative theory where social preferences can coexist, the conclusions reached by prior literature should be reexamined.

Because subjects have generally been assumed to exhibit a single social preference, earlier dictator game environments were designed in a manner that allowed interactions between social preferences to occur. The intent of this design was to provide researchers with the ability to test multiple social preferences within a single decision environment. The allocation decision made by a dictator could be compared to the decision(s) predicted by each social preference theory of interest. Whichever social preference theory best fit the observed behavior was concluded to be the single social preference motivating dictator giving. However, because social preferences were not tested in isolation, the observed behavior being in line with the behavior predicted by a specific social preference does not remove the possibility the dictator was also motivated by other social preferences.

Table 1 provides an example of this type of decision environment used by Cox and Sadiraj (2012). Within the table altruism and inequality are allowed to interact.⁴ A dictator who chooses the first budget set is exhibiting behavior in line with altruistic preferences, while a dictator who chooses the second budget set is exhibiting behavior in line with inequality averse preferences. Though choosing one of these extreme budget sets supports a dictator exhibiting altruism or inequality aversion, it does not eliminate the possibility the dictator could also exhibit the other social preference.

Table 1 Cox and Sadiraj Decision Environment

Budget Sets					
m	y_1	y_2	y_3	Inequality ^a	Altruism ^a
15	5	7	38	41	50
15	5	11	11	18	27
15	5	20	20	20	45

$$^a \text{Inequality} = \sum |m - y_i|. \text{ Altruism} = \sum y_i$$

For example, a purely altruistic dictator chooses the first budget set simply because it maximizes

¹See Cooper and Kagel (2017).

²Fehr and Schmidt (1999); Bolton and Ockenfels (2000); Korenok et al. (2012)

³Eckel and Grossman (1996); Korenok et al. (2013); Chowdhury and Jeon (2014)

⁴Efficiency is also allowed to vary; however, efficiency is equivalent to a utility function that places equal weight on own payout and the payouts of others (i.e. altruism).

the total payout to the other players. However, a dictator who exhibits both altruism and inequality aversion could also find it optimal to choose this allocation. Although the level of inequality is the largest among the three budget sets lowering the level of inequality would mean also lowering the total payout to the other players. If the dictator's loss in utility from lowering the total payout to the other players outweighed the gain in utility from lowering inequality then the first budget set would be the optimal choice.⁵ In this case, the dictator's preference for altruism dominated his aversion to inequality. Therefore, even though a dictator may display behavior in line with purely altruistic preferences, it cannot be determined from the observed behavior alone whether the dictator is purely altruistic or exhibits both altruism and inequality aversion.

Reexamining existing literature under the theory that social preferences can coexist reveals the results of prior literature do not find the sole social preference that motivates a subject but rather the subject's *dominant* social preference. Under this theory a subject is still allowed to be motivated by a single social preference, but finding the dominant social preference does not remove the possibility that a subject exhibits other social preferences as well. Consequently, as long as subjects face tradeoffs between multiple social preferences within a single decision environment the results will be limited to concluding which preference is dominant.

Testing social preferences is, therefore, more about disentangling the social preference rather than simply testing whether a particular preference is exhibited. Doing this effectively is not easy. A decision environment needs to be created such that a dictator's decision is only influenced by the single social preference of interest. In this paper, I present a novel version of the dictator game that attempts to better control for altruism and, therefore, provide a purer test for inequality averse preferences. Instead of asking the dictator to decide how much to give to the recipients, a task that confounds inequality averse and altruistic motives, a dictator is simply tasked with choosing how to distributed a fixed endowment between the recipients.⁶

Using this decision environment, the results of this study show more than half of dictators display both inequality aversion and altruism. Moreover, if the dictators express inequality aversion it is most likely due to non-self centered inequality rather than the more commonly attributed self-centered inequality.⁷ The results of this paper are closely aligned with the work of Cox and Sadiraj (2012) in which they develop a model of egocentric altruism to explain observed behavior.

Their model is based on three assumptions. The first assumption is that preferences are egocentric which is simply defined as having a preference for receiving the larger payout, $u(b, a) > u(a, b)$ for all a and b such that $b > a \geq 0$. The other two assumptions are that the indifference curves are positively monotonic and convex.⁸ Positive monotonicity implies subjects are altruistic, and convexity implies altruism is increasing with respect to own payout.⁹ Cox and Sadiraj (2012) show the CES functional form satisfies the properties of egocentric altruism.¹⁰ However, depending on how the exponent is incorporated with respect to the payouts of other players this functional form can also capture a subject's preference for a more equal distribution among recipients, non-self centered inequality aversion.

Two possible versions of the utility function are $u_i(x) = \frac{1}{\alpha} \left[x_i^\alpha + \sum x_j^\alpha \right]$ and $u_i(x) = \frac{1}{\alpha} \left[x_i^\alpha + (\sum x_j)^\alpha \right]$, where x_j represents the payoff to recipient j . The first, which is used by Cox and Sadiraj (2012), places weight on each individual payout, which creates indifference curves between the other players' payouts that are convex. In contrast, when the weight is placed on the sum payout to the

⁵The specific gains and losses from moving between bundles depends on the unique weights a subject places on each social preference. Therefore there will not be a optimal bundle for all preferences, but instead an optimum that depends on these weights.

⁶More details about the decision environment are provided in the next section.

⁷A more specific definition of non-self centered and self-centered inequality will be provided later.

⁸These conditions were first introduced in Cox and Sadiraj's 2007 working paper.

⁹See Cox and Sadiraj (2012) for a full discussion of the properties of egocentric altruism.

¹⁰This result is based on work by Andreoni and Miller (2002).

other players the indifference curves are linear.¹¹ When the indifference curves between others are convex a more equal distribution of payouts, holding own payout fixed, results in higher utility. This property does not hold with linear indifference curves. Therefore, when the CES exponent is placed on the individual payouts the model will also capture a subject’s aversion towards non-self centered inequality.

By choosing to place the exponent on individual payouts, Cox and Sadiraj are inadvertently capturing non-self centered inequality aversion. When tested against other popular social preference models including the Fehr-Schmidt model of inequality aversion and quasi maxmin model, their model is shown to fit the data better than the alternative models. Cox and Sadiraj use this result to advocate for their theory of egocentric altruism, but it is not egocentric altruism alone that brought about the model’s success. A model of pure egocentric altruism, without non-self centered inequality aversion, (i.e. $(\sum y_i)^\alpha$) does not fit the data.¹² Therefore, their parameterized model fit the data well because it captures subjects’ aversion to non-self centered inequality in addition to their preference for egocentric altruism.

The next section of the paper provides details about the decision-making environments. Section 3 lays out four conditions that the decision environment needs to satisfy, describes the experimental design, provides predictions about subject behavior, and details the experimental protocol. Section 4 presents the results, and Section 5 concludes.

2 Decision Environment

Subjects are presented with two decision environments. The first environment is a three-player dictator game where the dictator receives an endowment and is tasked with allocating that endowment among himself and two recipients. Herein, this decision environment will be referred to as the *dictator game*.

The second environment, which will be referred to as the *distribution game*, is a modified three-player dictator game similar to what was played in Cox and Sadiraj (2012) and Engelmann and Strobel (2004). In the distribution game the dictator receives two endowments. The first endowment is kept, and cannot be allocated to the recipients. This endowment can be thought of as a fixed payment to the dictator and will be referred to as the “dictator endowment.” The second endowment, referred to as the “recipient endowment,” is required to be allocated entirely to the recipients. The decision of how to distribute the recipient endowment will be made by selecting from a menu of possible allocations.

By fixing the total payout to the recipients any potential for the dictator’s decision to be influenced by altruistic preferences are eliminated; thus allowing the allocation decision to be solely motivated by inequality aversion. If a dictator is inequality averse and the allocation decision is not costly then he should choose to distribute the allocation endowment equally between the recipients. However, if a dictator is not inequality averse and allocating the recipient endowment is costless then all allocations yield the same utility and any choice would be inherently random. Consequently, a non-inequality averse dictator could choose to equally distribute the allocation endowment between the recipients which means the observed behavior may overstate the prevalence of inequality aversion.

To prevent this bias the allocation decision needs to be made costly. The dictator will earn a private return that is inversely related to the level of inequality resulting from the allocation decision. When the dictator chooses to allocate the entire recipient endowment to a single recipient, thus maximizing inequality, the private return will also be maximized. As the allocation decision becomes more equal between the two recipients the private return decreases. Finally, when the recipient endowment is split evenly between the recipients the dictator will earn no private return.

¹¹Note both functional forms have convex indifference curves with respect to own and a recipient’s payout.

¹²See Appendix A for detailed argument.

By structuring the return in this manner dictators who are not inequality averse are incentivized to select the allocation with the largest amount of inequality. conversely, dictators who are inequality averse will choose to forego some or all of the private return in order to reduce inequality. The amount of private return the dictator is willing to forego will depend on the severity of his aversion to inequality. An example of the distribution game is provided in Table 2.

Table 2 Distribution Game

Dictator's Endowment	Recipients'		Private Return
	Payout		
x	y_1	y_2	R
10	10	0	1
10	9	1	0.8
10	8	2	0.6
10	7	3	0.4
10	6	4	0.2
10	5	5	0

In this example, both the dictator and recipient endowments are 10 units and the maximum private return is 1 unit.¹³ A dictator who is inequality averse is able to reallocate the recipient endowment at a rate of 1 unit from y_1 to y_2 per 0.2 units of private return. For example, an allocation of (8, 2) transfers 2 units from y_1 to y_2 and costs the dictator 0.4 units of the private return. Selecting this allocation yields a total payout of 10.6 to the dictator. In contrast, a dictator who is not inequality averse will be unwilling to forego any of the private return, and therefore, will choose to allocate the entire recipient endowment to one recipient, (10, 0). Selecting this allocation maximizes the private return and results in a total payoff to the dictator of 11.¹⁴

The private return and endowments for both the dictator and distribution game are varied. A specific combination of parameter values will be referred to as an “environment”. Additionally, dictators make only one allocation decision in each environment, and all dictators make a decision in every environment.

3 Experimental Design

The Experimental Design is divided into four subsections. The first subsection discusses the treatment conditions that need to be met in order for the decision environment to isolate inequality aversion. The next subsection describes the experimental design followed by a subsection that presents predictions about dictator behavior. Finally, the fourth subsection details the experimental protocol.

¹³Payouts are restricted to $y_1 \geq y_2$ to reduce the size of the allocation menu, but should have no effect on the dictator's decision. Dictators receive no information about the recipients other than the recipients begin each environment with no money. Since no identifying information about the recipients is given, dictators should view the two recipients identically, and therefore, should be indifferent between the allocation (a, b) and (b, a) , where $a > b$.

¹⁴There is a fixed minimum price the dictator will have to pay in order to reduce inequality. This minimum price is the difference between the private return when the recipient endowment is allocated to only one recipient and the private return for the allocation that generates the next most inequality. In Table 2 the minimum price would be 0.2, which is the difference between 1, the private return for the allocation (10, 0), and 0.8, the private return for the allocation (9, 1). For a dictator to be willing to pay the minimum price his preferences for inequality aversion would need to be sufficiently strong. Dictators whose preference for inequality aversion is not sufficiently strong will choose the inequality maximizing allocation, and therefore, be misidentified as not having inequality averse preferences. To reduce the chance a dictator is misidentified the minimum price needed to reduce inequality will be varied. However, there is the possibility not all inequality averse dictators will be identified. Therefore results presented in this paper can be thought of as a lower bound estimate of the prevalence of inequality aversion.

3.1 Treatment Conditions

This subsection discusses the conditions necessary for the decision environment to isolate inequality aversion. The organization for describing the conditions will be to state the condition followed by an explanation about why it is needed.

Condition 1. *A multi-recipient environment is necessary to separate Self-Centered and Non-Self Centered Inequality.*

The form of inequality proposed by Fehr and Schmidt (1999) measures the difference between the payouts to the dictator and the recipient(s), $\sum_{i \neq j} |x_i - x_j|$. Since this type of inequality is measured from the perspective of the dictator it will be referred to as Self-Centered Inequality (SCI). In a two-player environment SCI is the only type of inequality that can occur. However, when a dictator is allowed to allocate to multiple recipients inequality between payouts can not only occur between the dictator and the recipients (SCI), but also between recipients. Inequality that results from recipients receiving different payouts will be referred to as Non-Self Centered Inequality (NSCI), $\sum_{\substack{i \neq j, l \\ j \neq k}} |x_j - x_k|$.

Much of the early research with dictator games was limited to two-player environments which restricted the study of inequality aversion to only SCI. More recent research has implemented multi-recipient frameworks opening up the possibility of incorporating NSCI into the study of inequality aversion, but researchers continue to narrowly define inequality with respect to only SCI. Consequently, little is understood about preferences towards NSCI. By utilizing a multi-player environment this research is able to provide a more complete understanding of inequality averse preferences by separately identifying preferences for SCI and NSCI.

Condition 2. *Disentangling the effects of inequality aversion and altruism requires either inequality or the total payout to the recipients to be fixed.*

Altruism is defined as a preference to increase the total payout to recipients, $\sum_{i \neq k} x_k$. The total payout to recipients will be referred to as the Social Efficiency of Others (SEO). In a two-player dictator game both inequality aversion and altruism provide the same predictions about dictator behavior, and both can explain dictator giving (Andreoni and Miller, 2002; Korenok et al., 2012). Therefore, the results from a two-player dictator game alone are unable to identify the preference(s) exhibited by dictators. Other research has tried separating the two preferences by implementing a dictator game with multiple recipients and having the dictator make the allocation decision by selecting from a menu of possible allocations (Engelmann and Strobel, 2004; Cox and Sadiraj, 2012). The menu is designed in such a way that the optimal choice for a dictator who is purely inequality averse will be different from one who is purely altruistic.

If the dictator is motivated by either altruism or inequality aversion then this type of decision environment can identify the underlying social preference motivating the observed behavior. However, the literature provides no arguments for why social preferences would exist in isolation. Moreover, the widely accepted belief that humans are complex social creatures suggests social preferences could coexist within an individual. When the single motivating social preference assumption is relaxed and inequality aversion is allowed to coexist with altruism the behavior observed in a decision environment where both inequality and SEO (altruism) vary is only able to conclude the existence of a dominate preference. The results cannot be used to argue dictators exhibit only inequality aversion or only altruism.

Alternatively, if the total payout to recipients was fixed, SEO held constant, and inequality was varied then altruistic preferences would have no influence over the allocation decision. Since the

observed behavior is influenced only by a subjects preference towards inequality the results can be used to draw conclusions about whether or not a subject’s behavior is in line with inequality averse preferences. Table 3 provides an example environment.

Table 3 Distribution Game Decision Environment

Dictator’s Endowment	Recipients’ Payout		Private Return	SCI	NSCI	SEO
x	y_1	y_2	R			
10	10	0	1	12	10	10
10	9	1	0.8	11.6	8	10
10	8	2	0.6	11.2	6	10
10	7	3	0.4	10.8	4	10
10	6	4	0.2	10.4	2	10
10	5	5	0	10	0	10

The right three columns of the table show how SCI, NSCI, and SEO vary across the allocation menu. Both SCI and NSCI decrease as the private return decreases, while SEO is held constant across the allocations. Dictators are able to determine the level of inequality through their allocation decision, but are unable to affect the total payout received by the recipients. Therefore, the allocation decision will be motivated solely by the trade off between the dictator’s own payoff and the aversion towards inequality. Since all other social preferences are being controlled for the observed behavior can be used to conclude whether or not the dictator exhibits inequality aversion.

Condition 3. *The dictator receives the highest payout.*

By controlling for altruism, only self-regarding and inequality averse preferences are left to motivate the dictator’s allocation decision. To identify those dictators who are inequality averse from those who are self-regarding the optimal allocations for each type needs to be different. The allocation yielding the largest payout, the optimal allocation for the self-regarding dictator, needs to also be the allocation with the largest amount of inequality thus making it the least desirable choice for an inequality averse dictator. Since the dictator endowment is fixed, the dictator’s payout is varied through a private return which increases with the level of inequality generated by the allocation decision. Specifically, the payout to the dictator will be maximized, the private return is the largest, when NSCI is maximized, the difference between the recipient’s payouts is the largest.

Within the context of the decision environment, the level of NSCI resulting from an allocation decision is independent of the dictator’s payoff relative to the recipients’ payoff. A dictator who is averse to NSCI will be willing to forego a portion of the private return in order to lower NSCI, and any dictator who chooses to maximize the private return does not NSCI aversion. Since NSCI depends only on the recipients’ payoffs, it does not matter whether the payoff to the dictator is high or lower relative to the recipients.

In contrast, the level of SCI is intimately linked to a dictator’s relative payout. Assume the dictator receives the highest payout ($x + R_j \geq y_1 \geq y_2$) decreasing the private return decreases the dictator’s payout, which in turn decreases SCI. The payout to the dictator is maximized when SCI is the largest, and therefore self-regarding behavior can be differentiated from behavior in line with SCI aversion.

Now assume instead the dictator receives the lowest payout ($y_1 \geq y_2 \geq x + R_j$). Decreasing the private return still decreases the dictator’s payout, but now leads to an increase SCI. When the dictator receives the lowest payout increasing the private return will also lead to a decrease in SCI. As a result, the optimum allocation decision is the same for a self-regarding dictator and

SCI averse dictator. To ensure inequality aversion and self-regarding behavior can be differentiated the domain of the decision environments will be restricted to only those environments whether the dictator receives the highest payout.¹⁵

Condition 4. *Disentangling the preferences towards SCI and NSCI requires one to be fixed while the other is varied.*

So far the conditions on the decision environment allow for inequality averse preferences to be identified, but it is not clear whether aversion to SCI, NSCI, or both is motivating the allocation decision. To identify which type of inequality aversion a dictator exhibits a similar methodology as the one described in Condition 2 will be implemented. In addition to the version of the distribution game described in the Decision Environment section, subjects will also play a modified version of the game where NSCI is held fixed.¹⁶ Table 4 provides an example of the decision environment.

Table 4 Fixed NSCI Decision Environment

Dictator's Endowment	Recipients' Payout		Private Return	SCI	NSCI	SEO
X	y_1	y_2	R			
10	7.5	2.5	1	12	5	10
10	7.5	2.5	0.8	11.6	5	10
10	7.5	2.5	0.6	11.2	5	10
10	7.5	2.5	0.4	10.8	5	10
10	7.5	2.5	0.2	10.4	5	10
10	7.5	2.5	0	10	5	10

For NSCI to be held constant the distance between the recipient payouts needs to be constant, and since SEO is also constant, the recipient payouts are fixed. Thus, the dictator's decision is reduced to determining how much of the private return to forego, which would lower the level of SCI. Any dictator who is averse to SCI will choose to forego a portion of the private return, while dictators not averse to SCI will choose to maximize the private return. The behavior observed in this version of the distribution game reflects a dictator's aversion towards SCI alone. When compared to the decisions made in the distribution game where both SCI and NSCI vary the choices in this modified version of the distribution game reveal whether a dictator exhibits aversion to SCI, NSCI, or both.¹⁷

3.2 Design

As previously discussed, the experiment consists of two treatments, the dictator game and distribution game. The distribution game is then split into two sub-treatments. In the first sub-treatment, both SCI and NSCI vary. In the second sub-treatment, NSCI is held fixed and only SCI is allowed to vary. At the start of each decision environment dictators are informed of the

¹⁵See Appendix B for a more detailed argument. It should also be noted this restriction is implemented purely for purpose of identification. The relationship between inequality aversion, self-regarding, and the relative payout is an interesting theoretical and philosophical question worth studying. Moreover, it is not clear whether the results of this study would hold if the dictator's relative payout was different.

¹⁶Ideally, aversion to SCI and NSCI would be disentangled by playing two version of the distribution game where if one SCI is varied while NSCI is held fixed and another where SCI is fixed while NSCI is allowed to vary. However, holding SCI fixed requires a constant payout to the dictator, which implies the private return cannot vary across the allocation menu. If this was the case, any choice made by these dictators would be essentially random, and the results would potentially overstate the prevalence of NSCI aversion.

¹⁷Details about how the decision in the two versions of the distribution game will be compared are provided in the section discussing predictions about dictator behavior.

size of the dictator endowment and allocation endowment. Additionally, in the distribution game environments a menu of allocation choices is displayed, which shows the allocation options and the corresponding private return that can be earned.

The dictator and allocation endowments take on values $x, Y \in \{5, 10, 20\}$. Additionally, the maximum private return takes on values $R \in \{1, 2.5, 5\}$. In distribution game environments were NSCI is held fixed NSCI takes on values $NSCI \in \{0, \frac{Y}{2}, Y\}$. Recall, the experiment only tests environments where the dictator receives at payout as least as large as the recipients, $x \geq Y$. Therefore, the distribution game consists of 72 unique decision environments, 18 environments where NSCI and SCI vary and 54 were NSCI is held fixed and only SCI is allowed to vary. Finally, the dictator game consists of 18 unique environments, where the endowment for each environment is determined by summing the 18 unique combinations of the dictator endowment, allocation endowment, and private return used in the first sub-treatment of the distribution game. Table 15 in Appendix F shows the parameterizations for each decision environment.

3.3 Predictions

This section provides predictions about dictator behavior, and is divided into two parts. The first part discusses the predicted behavior within each treatment for all relevant preference types. The second part discusses how the observed behavior in the distribution game should respond to changes in the dictator endowment, allocation endowment, and private return using a neoclassical framework.

3.3.1 Within Treatment

Table 5 provides predictions about dictator behavior in each treatment for each relevant social preference. By comparing the observed behavior in the dictator game and the two versions of the distribution game dictators will be able to be classified into one of four preference categories: self-regarding, purely altruistic, purely inequality averse, or a combination of altruism and inequality aversion.

Table 5 Predicted Behaviors

Preference	Dictator		Distribution			
	Give = 0	Give > 0	ΔSCI & $\Delta NSCI$	Forego PR ^a	ΔSCI & \overline{NSCI}	Forego PR ^a
Self-Regarding	X		X		X	
Altruistic & not IA		X	X		X	
IA & not Altruistic						
NSCI	X			X	X	
SCI		X		X		X
NSCI and SCI		X		X		X
Altruistic & IA						
NSCI		X		X	X	
SCI		X		X		X
NSCI and SCI		X		X		X

^aPR stands for Private Return.

Dictators who are self-regarding will always take the action that maximizes their own payout. In the dictator game this means allocating nothing to the recipients. In the distribution game self-regarding dictators will select the allocation that maximizes the private return. Dictators observed making these decisions are exhibiting behavior in line with self-regarding preferences.

Dictators who are solely altruistic are willing to increase the total payout to the recipients at some cost to themselves. In the dictator game the payout to the recipients can be increased by allocating a portion of the endowment to one or both recipients. However, when playing the distribution game these dictators will choose to maximize their own payout. Since the total payout to recipients is constant in the distribution game purely altruistic dictators have no incentive to forego any of the private return.

Inequality averse dictators can be divided into three subcategories: averse to only NSCI, averse to only SCI, and averse to both NSCI and SCI. Dictators who are averse to only NSCI are concerned with the difference between recipients' payouts, but not with the inequality between their own payout and the payouts to the recipients. At the start of the dictator game both recipients have the same payout, zero. Since NSCI is zero at the start of the decision environment the dictator has no incentive to give to either recipient. Therefore, a dictator averse to only NSCI will retain the entire endowment.

Similarly, when playing the version of the distribution game where only SCI varies a dictator averse to only NSCI is not incentivized to forego any private return since NSCI will be unaffected. Conversely, when playing the distribution game where both SCI and NSCI vary a dictator averse only to NSCI is incentivized to forego a portion of the private return. By foregoing some of the private return the dictator is able to decrease the level of NSCI.

A dictator who is altruistic and averse to NSCI has the same predicted behavior in the two sub-treatments of the distribution game as a dictator whose is only averse to NSCI; however, behavior in the dictator game will be different. Dictators who are also altruistic are incentivized to give in the dictator game because it will increase SEO.¹⁸

In contrast, dictators who are averse to SCI will give in the dictator game regardless of their preference towards altruism since giving in the dictator game decreases SCI. Additionally all dictators adverse to SCI will forego private return in both versions of the distribution game. The predicted behavior for dictators averse to SCI are the same regardless of the preference towards altruism. Consequently, dictators who are averse to SCI and those who are averse to SCI and altruistic cannot be separately identified. Altruism cannot be ruled out as a motivating factor; therefore, dictators exhibiting behavior in line with aversion to SCI will be classified as exhibiting both aversion to SCI and altruism.

Finally, dictators who exhibit aversion to both SCI and NSCI have predicted behavior similar to dictators who exhibit aversion to SCI. These dictators will give in the dictator game, and will forego private return in both versions of the distribution game. However, the variation in willingness to forego return between the two sub-treatments of the distribution will depend on whether the dictator is averse to both SCI and NSCI or only SCI. It is this variation that allows the two types to be identified.

A dictator who is willing to forego more private return in the distribution game when both SCI and NSCI vary than when only SCI varies is displaying behavior in line with aversion towards both SCI and NSCI.¹⁹ Because only SCI can be reduced in the distribution game where NSCI is fixed the total amount of inequality that is reduced by foregoing a portion of the private return has gone down. In other words, the price of reducing inequality has gone up, which will cause the subject to purchase less inequality reduction, forego less of the private return. A subject who is willing to forego the same amount of private return is unaffected by the price change, and there, must not be adverse to NSCI.²⁰ Therefore, by comparing the variation of foregone return in the two versions of the distribution game aversion to only SCI and aversion to both SCI and NSCI can be separately

¹⁸As long as the payouts to the recipients are kept the same there will be no change in NSCI. However, if the payouts to recipients are different NSCI will increase, which suggests the dictator is not averse to NSCI.

¹⁹Implicitly assuming the maximum private return, dictator endowment, and allocation endowment are the same in both sub-treatments.

²⁰See Appendix C for details about why the variation in willingness to pay for the two preference types will be different.

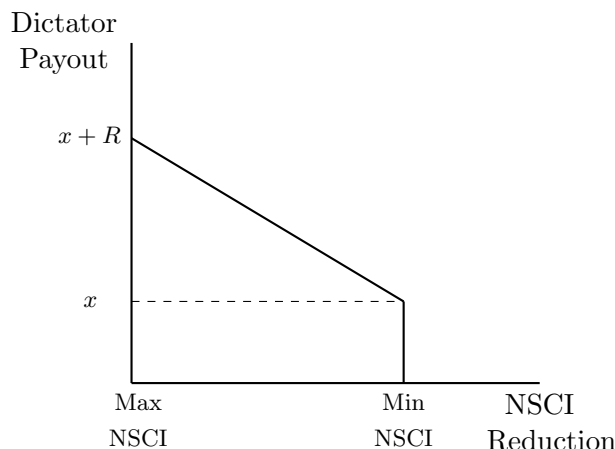
identified.

It should also be noted the predicted behavior for dictators averse to SCI and NSCI is independent of the preference towards altruism. Altruistic preferences are identified only through giving in the dictator game, which also occur if the dictator is averse to SCI. Therefore, the same solution that was applied to dictators averse to only SCI will be applied to dictators averse to both SCI and NSCI. Altruistic behavior cannot be ruled out as a motivating factor; therefore, any dictator exhibiting behavior in line with aversion to both SCI and NSCI will be classified as also exhibiting altruism.

3.3.2 Response to Changes in Parameterization

The predicted response to parameter changes discussed in this subsection focus on the reduction in NSCI, but a similar analysis can be done for the reduction of SCI. Figure 1 provides a depiction of the distribution game using the neoclassical framework. The x-axis represents NSCI reduction, and the y-axis represents the dictator's payout. The reduction in NSCI is zero when the entire recipient endowment is allocated to a single recipient, which is equivalent to maximizing NSCI.²¹ When a dictator selects this allocation the private return is maximized and he receives a payout of $x + R$. NSCI can be reduced until both recipients receive equal payouts, $NSCI = 0$, at which point the dictator have foregone the entire private return and receives a payout of x . This point is represented by a kink in the budget constraint. The slope of the budget constraint (the price of reducing NSCI) will be determined by the size of the private return and the size of the allocation endowment.

Figure 1 Neoclassical Model



Dictator Endowment

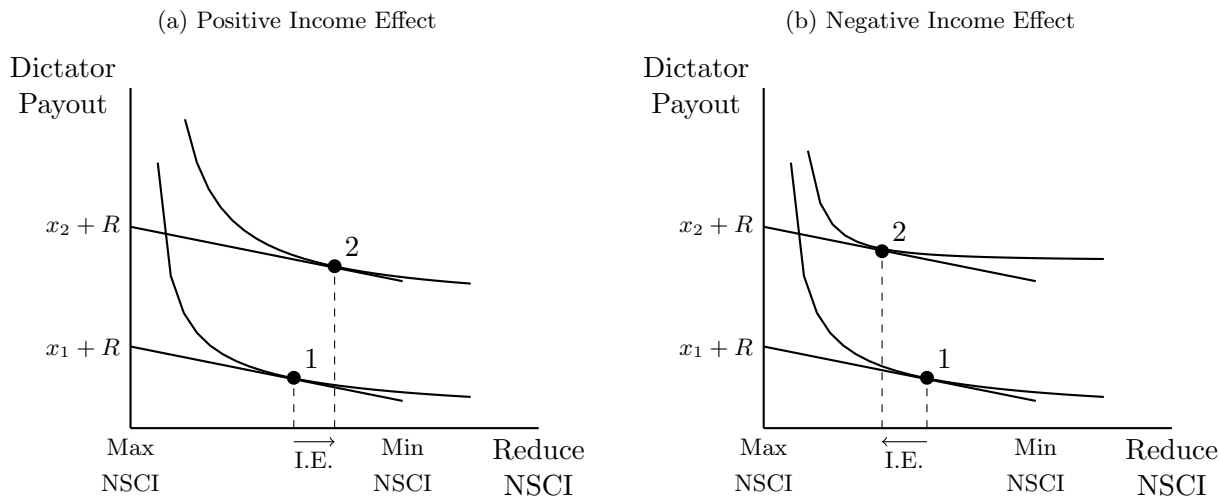
First, let us consider an increase in the dictator endowment from x_1 to x_2 . Figure 2 shows the results of this change as a parallel increase in the budget constraint. Increasing the dictator endowment will also have no effect on the price of reducing NSCI so any change in the allocation decision can be interpreted as a pure income effect. Furthermore, since the allocation endowment does not change the point along the x-axis at which the kink in the budget constraint occurs will not change. However the increase in dictator endowment will increase the minimum payout the dictator can receive to x_2 .

Figure 1a depicts a positive income effect, NSCI reduction increases, and Figure 1b depicts a negative income effect, NSCI reduction decreases, in response to an increase in the dictator endowment. Though there exists no empirical foundation suggesting whether or not NSCI is a normal

²¹The maximum value of NSCI reduction, “Min NSCI”, is equal to the recipient endowment, Y .

good, Chowdhury and Jeon (2014) show that giving in dictator game increases with income. Additionally, research has shown pro-social behavior increases with income (Hoffman, 2011; Xenikaki, 2013), which suggests aversion to NSCI will increase when the dictator endowment increases.

Figure 2 Increase in Dictator Endowment



Private Return

Next consider the effect changing the private return has on the reduction of NSCI. Assuming a positive income effect, Figure 3 shows the effect increasing the private return from R_1 to R_2 has on the allocation decision.²² As the private return increases the maximum payout a dictator can receive increases from $x + R_1$ to $x + R_2$. The dictator endowment and allocation endowments do not change so the minimum payout a dictator can receive remains at x , and the maximum amount NSCI can be reduced does not change. Consequently, the slope of the budget constraint increases implying the price of reducing NSCI has gone up. The dictator now has to forego more private return to reduce NSCI by the same amount.

By increasing the private return dictators are wealthier, but also face a higher price of reducing NSCI.²³ Therefore, changes in the allocation decision can be decomposed into an income effect and substitution effect. The income effect is represented by the movement from point one to point two. The substitution effect is represented by the movement from point two to point three.

Although the individual effects are known there is no empirical foundation for whether the total effect will be positive or negative. Figure 2a, provides an example of a negative total effect, and Figure 2b provides an example of a positive total effect. What will be observed will depend on the shape of the indifference curves which will be unique to each subject. Therefore, no clear prediction can be made about how dictators will respond to an increase in the private return. However, if the data shows a similar pattern of response across subjects then general statements about similarities between subjects might be able to be drawn.

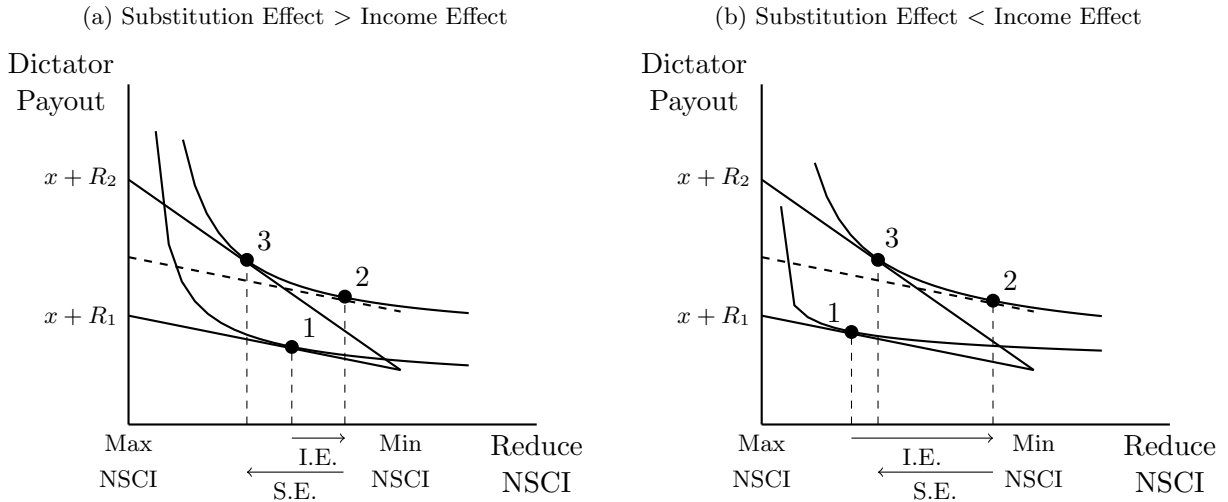
Allocation Endowment

Finally, we can analyze a change in the allocation endowment from Y_1 to Y_2 . When the size of the allocation endowment increases the amount of NSCI that can occur within a decision environment also increases. Thus, the amount NSCI can be reduced increases. The increase in the amount NSCI can be reduced is shown in Figure 4 as a counterclockwise rotation of the budget constraint around

²²If the income effect was negative then NSCI reduction would decrease. Dictators would exhibit behavior in line with lower levels of aversion towards NSCI. Results do not suggest subjects reduce NSCI less when the private return increases.

²³This problem is similar to a wage increase in the labor-leisure problem.

Figure 3 Increase in Private Return

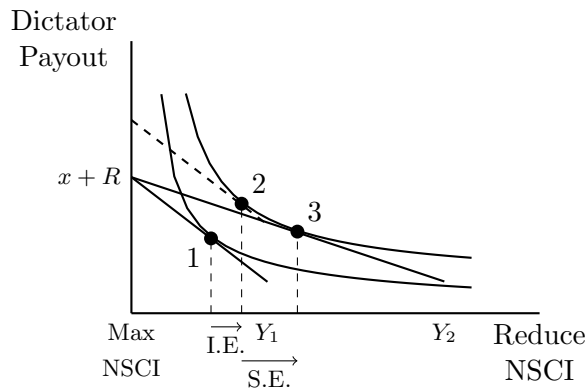


the point $x + R$. Furthermore, increasing the amount NSCI can be reduced decreases the slope of the budget constraint since the maximum payout a dictator can receive is unchanged.

The decreased slope implies the price of reducing NSCI has decreased even though the private return has not changed. Dictators still have to forego the same amount of private return in order to reduce NSCI, but the amount NSCI is reduced for each unit of private return foregone has increased. The return on foregoing private return has increased, which can be interpreted as a reduction in the real price of reducing NSCI.

Similar to a change in the private return, a change in the allocation endowment can be decomposed into an income effect and substitution effect. See Figure 4. Again the income effect is assumed to be positive, and shown as a movement from point one to point two.²⁴ Since the price has decreased the substitution effect will also be positive, point two to point three. The net effect of an increase in the allocation endowment will be an increase in the reduction of NSCI. As the allocation endowment increases the prevalence of behavior in line with aversion to NSCI is predicted to increase.

Figure 4 Increase in Allocation Endowment



²⁴If the income effect were negative then the total effect of increasing the allocation endowment on the reduction of NSCI could be positive or negative depending on the curvature of the indifference curves (i.e. the subject's preference parameter).

3.4 Protocol

Four sessions were conducted with a total of 69 subjects.²⁵ In two sessions the dictator game was presented before the distribution game, and in two sessions the distribution game was presented before the dictator game. All sessions were conducted via computer using the Ztree program (Fischbacher, 2007) and lasted approximately one hour. Subjects received a show-up fee of \$5 in addition to any money earned during the experiment. Additionally, all endowments were denoted in experimental credit units (ECUs) and converted to dollars at a rate of 3 ECUs per dollar.

At the start of the experiment subjects were presented with instructions for either the dictator game or the distribution game.²⁶ Once subjects finished reading, the experimenter reviewed the instructions publicly. Subjects then completed a short quiz to test their understanding and were not allowed to proceed with the experiment until all questions had been answered correctly. The experiment began once all subjects completed the quiz.

Once all subjects completed every decision environment in the first treatment, instructions for the second treatment were presented. Again, the instructions are were presented privately via the computer and then reviewed publicly. Subjects were required to complete another short quiz to test their understanding of the new treatment, and the experiment continued once all subjects successfully completed the quiz.

Upon completing the second treatment subjects were privately informed of their payout. The experiment used a double-blind payoff procedure where neither the other subjects nor the experimenter could identify the decisions made by a specific subject.²⁷ The protocol was implemented by having subjects draw a key from a box of uniquely numbered mailbox keys. The number on the key was the only way subject's responses were identified in the experiment, and were private information of the subject. Subjects used their mailbox key to collect their payment, which was contained within an envelope placed in the mailbox at the conclusion of the experiment.

Payouts were calculated by randomly selecting one environment from each treatment in addition to the \$5 show-up fee. Subjects were randomly assigned to two sets of three groups of three, for a total of six groups of three. One set of three groups for each treatment. Within each set of groups a subject was assigned the role of dictator in one of the groups and the role of recipient in the other two groups. A subject's own decisions determined the earnings for the group in which he is the dictator. A subject's earnings for the groups in which he was the recipient were determined by the decision of the dictator. Earnings within a treatment were the sum of the earnings from each of the three groups to which a subject was assigned. By implementing a multi-group payout procedure every subject was able to be assigned as a dictator to one group, and therefore, every subject made decisions that affected earnings.

One potential drawback from using this payout methodology is potential bias in decision makings as a result of direct reciprocity. Decisions made within a single set of three groups can be thought of as a repeated dictator game where the role of dictator alternates between the group members. Consequently, the allocation decision may be influenced by a subject's expectation of other's behaviors. To reduce the potential for behavior to be biased by direct reciprocity each set of three groups were assigned in such a way that no subject made decisions over another subject who made a decision over them.²⁸

²⁵A table of summary statistics are provided in Appendix F.

²⁶Screenshots of the instructions for the dictator and distribution games are provided in Appendix D.

²⁷Extensive research has been done documenting increased giving in dictator games due to experimenter bias (Hoffman et al., 1996; Eckel and Grossman, 1996; Engel, 2011). Implementing a double-blind payoff allows all decisions to be made anonymously, and therefore, reduce the potential for bias.

²⁸A minimum of five subjects are needed to ensure this condition will hold. A detailed explanation of how the grouping was implemented can be found in Appendix E.

4 Results

The description of experimental results is divided into three subsections. The first subsection looks at within game decisions across all subjects. The second subsection conducts a within subject analysis to determine what effects changing environment parameters has on the distribution game allocation decisions. Finally, the third subsection presents a categorization of preferences based on a within subject analysis of decisions across both treatments. The organization for describing key results will be to present the evidence followed by a statement of the result.

4.1 Within game decisions

The results for each treatment will be presented separately with the dictator game results being presented first followed by the results of the distribution game.

4.1.1 Dictator Game

Table 6 presents the results of the dictator game. Overall about 47% of dictators allocated a portion of their endowment to at least one of the recipients with about 14% of the endowment being allocated on average. When compared to Hoffman et al. (1994), who also conducted a double-blind dictator game, the pooled results from this study are slightly higher than expected. Hoffman et al. found about one-third of dictators gave with an average rate of giving of about 9%, and among those who gave the average rate was about 25% of the endowment.

Table 6 Frequency and Rate of Giving

Treatment Order	Rate of Positive Giving	Average Giving ^b	Average Positive Giving ^b	Rate of Unequal Giving ^c
Dict-Dist ^a	35.62%	7.91%	22.21%	8.01%
Session 3	33.01%	8.10%	24.54%	5.23%
Session 4	38.24%	7.73%	20.21%	10.78%
Dist-Dict ^a	58.73%	19.32%	32.90%	9.52%
Session 1	71.18%	26.56%	37.31%	11.11%
Session 2	48.2%	13.23%	27.42%	8.19%
Total	47.34%	13.70%	28.94%	18.54%

^aDist-Dict represents the treatment order distribution then dictator game, and Dict-Dist represents the treatment order dictator then distribution game. ^bAll averages are reported as a percentage of total endowment. ^cRate of unequal giving is calculated using only those subjects who have a positive amount.

The source of the inconsistency is revealed by separating the pooled results by treatment order. When the dictator game is presented first dictator giving is more in line with the findings of Hoffman et al. (1994). The first line of Table 6 shows about 36% of dictators chose to give about 8% of their endowment on average.

Result 1. *Dictator giving is similar to previous research.*

In contrast, when the dictator game was presented after the distribution game, line four of Table 6, dictators gave a larger portion of their endowment and more frequently. About 60% of dictators gave almost 20% of their endowment on average. Using a Wilcoxon rank-sum test the hypothesis that the distributions of giving for the two treatment orders are equivalent is rejected at the 1% level. The difference in frequency and amount of giving between the two treatments suggests treatment

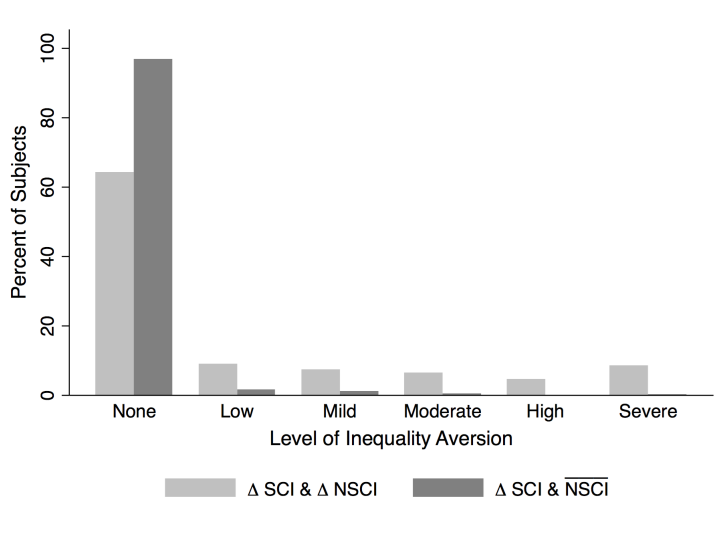
order matters, which could be explained by an anchoring effect. A more detailed explanation for why treatment order matters is discussed later.

4.1.2 Distribution Game

Figure 5 presents a side-by-side comparison of the decisions made in the two sub-treatments of the distribution game, where inequality aversion is measured via a dictator’s willingness to forego private return.²⁹ When a dictator chooses to maximize the private return he is also choosing to maximize inequality. Therefore, dictators who maximize the private return are displaying behavior in line with non-inequality averse preferences.

Alternatively, a dictator who is willing to forego a portion of the private return is displaying behavior in line with inequality averse preferences. By foregoing a portion of the private return a dictator is imposing a cost on himself in order to decrease the level of inequality within the decision environment. The more private return a dictator foregoes the more inequality is reduced. Hence, the level of SCI and NSCI aversion implied by a dictator’s decision increases in severity as the amount of foregone private return increases. When the dictator chooses to forego the entire private return the level of inequality aversion is coded as “Severe”.

Figure 5 Observed Inequality Aversion



When both SCI and NSCI vary about 35% of the decisions made by dictators display some level of aversion towards these measures of inequality. In contrast, when only SCI is varied and NSCI is held fixed less than 4% of the decisions made by subjects are in line with inequality averse preferences. The small fraction of dictators willing to forego private return suggests most dictators are not averse to SCI over the range of private returns tested.³⁰ Therefore, the high frequency of inequality averse decisions observed in the sub-treatment where both SCI and NSCI vary is most likely driven by aversion to NSCI.

Result 2. *Behavior consistent with inequality aversion is predominantly linked to NSCI.*

²⁹Inequality aversion is defined differently for the two versions of the distribution game. When both SCI and NSCI vary inequality aversion is referring to aversion towards both SCI and NSCI. When only SCI varies then inequality aversion is referring to only SCI.

³⁰It could be the case that if the maximum private return were significantly larger, the level of SCI that could occur within the decision environment was significantly higher, dictators would exhibit aversion to SCI. Due to limitations in funding and time a decision environment with a large private return is left for future work.

Result 2 appears to be robust to variations in the level of dictator endowment, x , allocation endowment, Y , and private return, R . See the Appendix F for additional figures. However, the strength of aversion to NSCI seems to fluctuate across parameterizations. The next subsection discusses how dictator behavior in line with NSCI aversion changes in response to variations in the environment parameters.

4.2 Within subject decisions

This subsection analyzes how the dictator’s allocation decision changes in response to changes in dictator endowment, private return, and allocation endowment. A Wilcoxon signed-rank test is used to determine whether or not a change in an environment parameter has a statistically significant effect on the allocation decision. This non-parametric test compares the allocation decisions at the individual level for two different values of a parameter to determine if the population mean ranks differ holding all other parameters constant.

4.2.1 Dictator endowment (x)

Table 7 presents the p-values of the Wilcoxon signed-rank test for a positive difference in means, which is equivalent to testing for a positive income effect, $H_a : [NSCI \text{ reduction for } x_2] > [NSCI \text{ reduction for } x_1]$ given $x_2 > x_1$. The first six rows of Table 7 show the results of the Wilcoxon signed-rank test when the initial level of dictator endowment is $x_1 = 5$. The next three rows of the table show the results of the Wilcoxon signed-rank test when the initial level of dictator endowment is $x_1 = 10$.

In general, an increase in dictator endowment from $x_1 = 5$ has no effect on a dictator’s decision to reduce inequality. However, when $x_1 = 10$ and the private return is $R \in \{2.5, 5\}$ there is a weakly positive relationship between income and the reduction of NSCI.³¹ This result suggest there is a weakly positive income effect when the dictator endowment is sufficiently large.

Table 7 Vary Dictator Endowment

Dictator Endowment		Private Return	Allocation Endowment	
x_1	x_2		5	10
		1	0.3318	-
5	10	2.5	0.0245**	-
		5	0.9616	-
		1	0.5000	-
5	20	2.5	0.1796	-
		5	0.1431	-
		1	0.5806	0.3388
10	20	2.5	0.9738 ^a	0.0262**
		5	0.0154**	0.0577*

* p-value < 0.10, ** p-value < 0.05,

*** p-value < 0.01

^a The Wilcoxon signed-rank test for a negative income effect has a p-value = 0.0669.

³¹It is likely there is no positive effect on the reduction in NSCI when the private return is $R = 1$ because the cost to reducing NSCI is so low subjects are willing to pay to reduce NSCI as much as they would like. Figures showing the distribution of the allocation decisions test in Table 7 are included in the Appendix.

Result 3. *The level of NSCI reduction increases with the dictator endowment when the dictator endowment is sufficiently large.*

4.2.2 Private return (R)

Table 8 reports the p-values for a negative difference in means using the Wilcoxon signed-rank test, $[H_a : NSCI \text{ reduction for } R_2] < [NSCI \text{ reduction for } R_1]$ given $R_2 > R_1$. When the private return is initially at $R = 1$ and then increased there is a statistically significant decrease in NSCI reduction. A net negative effect on NSCI reduction from an increase in the private return is in line with the weak, positive income effect shown in Result 3.

Table 8 Vary Private Return

Private Return		Dictator Endowment	Allocation Endowment		
R_1	R_2		5	10	20
1	2.5	5	0.0320**	-	-
		10	0.0758*	0.0005***	-
		20	0.0133**	0.0145**	0.0466**
1	5	5	0.0262**	-	-
		10	0.0000***	0.0011***	-
		20	0.0758*	0.0033***	0.0002***
2.5	5	5	0.8204	-	-
		10	0.0036**	0.4018	-
		20	0.5927	0.2122	0.0053***

* p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01

Following the predictions of the neoclassical model, an increase in the private return will lead to a decrease in NSCI reduction when the positive income effect is outweighed by the negative substitution effect. Result 3 suggests if a positive income effect exists it is small, and therefore, likely to be less than the substitution effect. Therefore, raising the private return will lead to a decrease in the severity of inequality aversion expressed by dictators.

Result 4. *Increasing the private return results in higher levels of NSCI.*

However, when the initial value of the private return is $R = 2.5$ the evidence supporting Result 4 is much weaker. The reduction in significance could be a result of a stronger income effect. Table 7 shows the strongest evidence of a positive income effect when $R \in 2.5, 5$. If the income effect is larger at higher levels of private return then more of the substitution effect will be offset, which would decrease the net effect raising the private return has on NSCI reduction. If the income effect is sufficiently large it could offset the substitution effect enough to result in no statistical difference in NSCI reduction when the private return is increased from $R_1 = 2.5$ to $R_2 = 5$.

Alternatively, the reduction in significance could be caused by a corner solution. When the private return increases from $R_1 = 1$ to $R_2 = 2.5$ many of the dictators choose to switch from foregoing a portion of the private return to keeping it entirely³² By choosing to keep the entire private return the dictators have expressed the least amount of inequality aversion possible. Therefore, when the

³²See Appendix F for figures depicting the allocation decisions.

private return increases from $R_1 = 2.5$ to $R_2 = 5$ though the dictators may be less inequality averse they are unable to express it because they have already chosen to keep the entire private return.³³

4.2.3 Allocation endowment (Y)

Table 9 reports the p-values for a positive difference in means using the Wilcoxon signed-rank test, $H_a : [NSCI \text{ reduction for } Y_2] > [NSCI \text{ reduction for } Y_1]$ given $Y_2 > Y_1$. Results of the test show increasing the allocation endowment has a statistically significant effect on the reduction of NSCI. However, this result could be driven by the change in size of allocation endowment directly rather than an increase in inequality averse behavior. When the allocation endowment increases more NSCI can occur within a decision environment which might be why the NSCI reduction was shown to increase. To control for this potential bias a relative, instead of absolute measure, of NSCI reduction can be used.³⁴

Table 9 Vary Allocation Endowment

Allocation Endowment		Private Return	Dictator Endowment	
Y_1	Y_2		10	20
		1	0.0001***	0.0000***
5	10	2.5	0.0610*	0.0000***
		5	0.0173**	0.0005***
		1	-	0.0000***
5	20	2.5	-	0.0000***
		5	-	0.0012***
		1	-	0.0000***
10	20	2.5	-	0.0002***
		5	-	0.0436**

* p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01

Table 10 reports the p-values for the Wilcoxon signed-rank test when NSCI is reported relative to the level of allocation endowment, $H_a : [NSCI \text{ reduction as a \% of } Y \text{ for } Y_2] > [NSCI \text{ reduction as a \% of } Y \text{ for } Y_1]$ given $Y_2 > Y_1$. If increasing the allocation endowment truly caused an increase in inequality averse behavior then the results shown in Table 10 should be the same those in Table 9, but the results of the test using relative NSCI reduction shows no effect.

Result 5. *Increasing the allocation endowment has no effect on the reduction of NSCI relative to the size of allocation endowment.*

Result 5 conflicts with Result 4. Based on the neoclassical analysis both a change in the private return and a change in the allocation endowment can be interpreted as a change in the price of

³³Removing the dictators who are at the lower bound when $R = 2.5$ decreases the p-value for all tests, and results in statistically significant results at the 10% level for $x = 10$ and $y = 10$ (p-value = 0.0730) and $x = 20$ and $y = 10$ (p-value = 0.0669).

³⁴For example, when $Y = 5$ a dictator could choose to reduce NSCI by four units, and when $Y = 10$ the dictator could choose to reduce NSCI by six units. In absolute terms it appears that inequality aversion has increased with the allocation endowment, but in relative terms, 80% when $Y = 5$ and 60% when $Y = 10$, the level of inequality aversion has decreased. The apparent increase in inequality averse behavior only occurred because a higher level of inequality could occur within the decision environment. To account for the increase in the level of inequality, NSCI reduction should be reported as a percentage of the allocation endowment. This rationale is identical to why giving in the dictator game is reported as a percentage of the endowment.

Table 10 NSCI Relative to Allocation Endowment

Allocation Endowment		Private Return	Dictator Endowment	
Y_1	Y_2		10	20
		1	0.6682	0.1050
5	10	2.5	0.9941 ^a	0.1050
		5	0.3238	0.8338
		1	-	0.0466**
5	20	2.5	-	0.0539*
		5	-	0.7383
		1	-	0.3145
10	20	2.5	-	0.3450
		5	-	0.6612
		1	-	-

* p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01

^a The Wilcoxon signed-rank test for negative effect has a p-value = 0.0207**

reducing NSCI. Increasing the allocation endowment implies a decrease in the price of reducing NSCI, which should cause dictators to reduce NSCI more. However, the data shows subjects are unaffected by a change in the allocation endowment.

A possible explanation for subjects not exhibiting higher levels of inequality aversion could be that subjects think about the allocation decision using a relative rather than absolute measure of earnings. Dictator game research has shown as the endowment increases dictator giving remains at about 20% of the endowment (Forsythe et al., 1994; Camerer, 2011), which suggests subjects approach the allocation decision with relative rather than absolute payouts in mind. When the distribution game is reframed in relative terms increasing the private return still increases the price of reducing NSCI, but increasing the allocation endowment has no effect on the price. The proportion with which NSCI is reduced has not changed. Since the price of reducing NSCI does not change and the dictator endowment is constant, the decision environment in relative terms does not change when the allocation endowment changes, so the observed behavior also should not change.

4.3 Categorization of preferences

Table 11 presents the estimated distribution of preferences suggested by the decisions made in both the dictator and distribution games as related to altruism and inequality aversion. The first column shows the estimated preferences pooling all decisions. The next two columns separate the pooled results by treatment order.

Looking at the pooled results, 34% dictators exhibited behavior in line with self-regarding preferences, which agrees with the findings of Engel's (2011) meta study. About 34% of subjects exhibited behavior in line with self-regarding preferences. 13% of subjects exhibited behavior in line with purely altruistic preferences, and less than 2% subjects exhibit exclusively inequality averse preferences.³⁵ Over half of subjects exhibit both inequality aversion and altruism with 42% of subjects expressing aversion to only NSCI.

Result 6: *Over half of the subjects exhibit both altruistic and inequality averse preferences.*

³⁵Recall, the experimental design is not able to separately identify behavior suggesting aversion to SCI from altruistic behavior. For that reason the percentage of dictators who exhibit purely inequality averse preferences could be as high as 12%.

Table 11 Observed Social Preferences

Preferent Type	Pooled ^a	Treatment Order	
		Dist-Dict	Dict-Dist
Self-Regarding	33.88%	25.71%	39.39%
Altruistic & not IA	13.04%	5.71%	21.21%
IA & not Altruistic			
NSCI	1.45%	2.86%	-
SCI	-	-	-
NSCI and SCI	-	-	-
Altruistic & IA			
NSCI	42.03%	54.29%	30.30%
SCI	-	-	-
NSCI and SCI	10.14%	11.43%	9.09%
# of Subjects	68	35	33

^aPercents sum to 98.54%, because Subject 41's choices were too inconsistent to fit with any of the preference types.

Turning to the right two columns of Table 11 it is clear the treatment order has an effect on subjects' behavior. By presenting the dictator game before the distribution game the fraction of subjects displaying behaviors in line with self-regarding preferences increases from 26% to 39%. Additionally, the prevalence of purely altruistic preferences increases from 6% to 21%, while the fraction of subjects displaying behaviors suggesting inequality averse preferences decreases from 68% to 39%. By presenting the dictator game first the number of subjects displaying both inequality aversion and altruism is drastically reduced, which is driven by both a reduction in giving in the dictator game (less altruistic behavior) and a reduction in willingness to forego return in the distribution game (less inequality averse behavior).

Result 6. *Treatment order affects the allocation decision.*

Both the reduction in altruistic and inequality averse behavior could be the result of an anchoring (or reference) effect. When subjects are presented the dictator game first they have no point of reference for how much should be allocated to the recipients, which is similar to previous dictator game studies and why the results are in line with each other.³⁶ Additionally, subjects may be using the allocation endowment and/or their allocation decision as an anchor. On average the allocation endowment is larger than the dictator endowment, which leads to higher payouts to the dictator in the dictator game than in the distribution game. By playing the dictator game first subjects could begin to expect a high payout, and therefore, when presented with a lower potential payout in the distribution game are less willing to forego the private return. Conversely, when subjects play the distribution game first they become accustomed to receiving a lower payout, and therefore, are more willing to give to the recipients when presented with the large allocation endowment.

Regardless of why the allocation decision depends on the treatment order, the behaviors exhibited by subjects, and the underlying preferences motivating the behaviors, appears to depend on previous experiences. Understanding how framing of a decision environment affects the behavior of subjects, and how to reduce the effects of framing have been an important area of research within experimental economics (Leibbrandt et al., 2015; Dreber et al., 2013; Ellingsen et al., 2012). However, little has been done to study how previous experiences effect subject behavior, and whether

³⁶Since there is no reference point the observed behavior could be interpreted as the "true" unbiased preference for giving in the dictator game.

or not there may exist spillover effects of a previous decision environment onto the next. Subjects may create reference points based on previous decision environments, which means decisions made in repeated one-shot games may not be independent of each other. The results presented in this paper provide motivation for further research on the history dependence of preferences as well as the need for implementing counterbalanced experimental designs.

5 Conclusion

This paper attempts to identify the extent to which dictators are inequality averse while controlling for the possibility that they are motivated by others social preferences, specifically altruism. To accomplish this goal a novel version of the dictator game, referred to as the distribution game, was introduced; allowing for a more pure test of inequality averse preferences. Subjects played two versions of the distribution game which allowed for testing aversion towards two types of inequality, self-centered and non-self centered. Subjects also played a three-player dictator game as a control.

Results were first analyzed within treatment. The decisions observed in the dictator game treatment agree with the findings of previous double-blind dictator game studies. Dictators gave, on average, about 14% of their endowment. Results of the distribution game show, when the dictator receives the highest payout, behavior consistent with inequality aversion is predominantly linked to non-self centered inequality. Additionally, aversion in NSCI was shown to increase as income increased, decrease as the private return increased, and be unaffected by changes in the allocation endowment.

The findings of the distribution game can be applied to the interpretation of giving in a two-player dictator game. The only type of inequality that can occur in a two-player dictator game is between the dictator and the recipient, self-centered inequality. Therefore, for inequality aversion to explain giving in a two-player dictator game subjects would have to be adverse to SCI. Results from the distribution game suggest, when subjects are receiving the largest payout, they are not adverse to SCI. Consequently, giving in a two-player dictator game is most likely due to altruism rather than inequality aversion.

It should be noted the absence of behavior in line with aversion to SCI was shown only for environments where the dictator received the highest payout, and may not hold for dictators in different relative payout positions. Fehr and Schmidt (1999) propose a model with separate coefficients for advantageous and disadvantageous self-centered inequality. Furthermore, what it means to be inequality averse is contingent on one's relative position within the income distribution.

For individuals at the top of the income distribution aversion to SCI implies lowering their relative payout. Aversion to SCI is costly, and therefore, not in the interest of the individual (Luttmer, 2005; Senik, 2009; Card et al., 2012). However, for individuals at the bottom of the income distribution aversion to SCI implies increasing their relative payouts. Being averse to SCI is now beneficial to an individual. Therefore, it is reasonable to think aversion to SCI will depend on the relative payout.

Finally, a within-subject analysis of decisions was conducted and revealed more than half of subjects displayed behavior in line with both altruistic and inequality averse preferences. This result stands in stark contrast with much of the previous social preference literature that assumes subjects are motivated by a single social preference. However, if subjects do in fact exhibit multiple social preferences this could explain the plethora of conflicting findings. By not controlling for the influences of multiple social preferences, previous research is only able to identify the dominant social preference within a decision environment, which depends on the unique tradeoffs faced in the environment.

Furthermore, finding subjects express both inequality aversion and altruism can help explain why the parameterized model of egocentric altruism proposed by Cox and Sadiraj (2012), which incorporated NSCI aversion, was such a good fit of the data. An alternative parameterized model of

egocentric altruism that does not account for aversion to NSCI was shown to be a poor predictor of subject behavior. So it is not egocentricity alone that explains subject's behavior, but egocentricity along with inequality aversion.

The within-subject analysis also showed the allocation decision depends heavily on the order with which the treatments were presented. When the distribution game was presented first 65% of subjects displayed behavior in line with both inequality aversion and altruism. Alternatively, when the dictator game was presented first only 39% of subjects expressed behavior in line with both preferences. The large variation in observed behavior suggests subjects' behavior is influenced by previous experiences.

Treatment order effects are usually a result of learning or decision fatigue. Since there is no strategic interaction between subjects in either treatment learning does not seem to fit as a possible explanation. Subjects are required to make a large number of decisions, so fatigue could be having an effect on the allocation decision. Research suggests as subjects fatigue they revert to self-regarding behavior (Xu et al., 2012). Thus if subjects are being affected by fatigue those who played the dictator game second should give less than those who played it first. However, the data shows giving is higher among subjects who played the dictator game second. Thus decision fatigue does not appear to explain the treatment order effect.

Alternatively, path dependent utility could be a possible explanation for the treatment order effect. A path dependent utility function is one where the functional form is constant, but the parameters within the function are themselves functions of the individual's history. By presenting the treatments in different orders the functions governing the parameters would yield different values. For example, a subject's reference point will be influenced by the treatment order. When a subject is presented the distribution game first this history develops a relative payout reference point much closer to recipients' payouts than if the subject was presented the dictator game first. As a result this subject behaves differently, giving more in the dictator game, even though he may have the same utility function as other subjects.

Irrespective of the cause, the results of this study suggest behaviors can be influenced by the order in which decision environments are presented. This result in conjunction with subjects exhibiting behavior in line with multiple social preferences have important methodological implications. When testing social preferences a counterbalanced experimental design should be implemented to account for treatment order effects, and the decision environment should be designed to account for possible interactions between social preferences.

Appendix A Alternative Egocentric Altruism Model

This section introduces an alternative model of egocentric altruism where the CES exponent is placed on the total payouts to recipients, $(\sum_{j \neq i} x_j)^\alpha$, and compares its performance to the egocentric model tested in Cox and Sadiraj (2012). The first part of this section shows the alternative model satisfies the properties of egocentric altruism and discusses how the two models differ. The second part of this section compares the performance of the two models using the decision environments tested in Cox and Sadiraj (2012).

A.1 Properties

An alternative parameterization of egocentric altruism is

$$\begin{aligned} u_i(x) &= \frac{1}{\alpha} \left[x_i^\alpha + \theta \left(\sum_{j \neq i} x_j \right)^\alpha \right], \quad \alpha \in \{-\infty, 1\} \setminus \{0\} \text{ and } \theta \in [0, 1), \\ &= x_i \left(\sum_{j \neq i} x_j \right)^\theta, \quad \alpha = 0. \end{aligned}$$

The above model satisfies the ‘‘egocentric’’ property. Assume there are two allocations (b, a, x) and (a, b, x) with $b > a$. The first term in each allocation represents the payout to player i , and assume the second term represents the payout to recipient j , where $j \neq i$. The final term represents a vector of payouts to all recipients that is constant between the two allocations. Then

$$\begin{aligned} u_i(b, a, x) &> u_i(a, b, x) \\ \frac{1}{\alpha} \left[b^\alpha + \theta \left(a + \sum_{j \neq i} x \right)^\alpha \right] &> \frac{1}{\alpha} \left[a^\alpha + \theta \left(b + \sum_{j \neq i} x \right)^\alpha \right] \\ \frac{b^\alpha - a^\alpha}{\left(b + \sum_{j \neq i} x \right)^\alpha - \left(a + \sum_{j \neq i} x \right)^\alpha} &> \theta \end{aligned}$$

The LHS is always greater than or equal to one and $\theta \in [0, 1)$; therefore, the inequality holds.

The parameterized model in Cox and Sadiraj’s paper also has additional properties regarding the marginal rate of substitution (MRS) between own payout (x_i) and the payout to a recipient (x_j), which are also satisfied by the alternative specification.

- The MRS is everywhere positive.

$$MRS = \frac{1}{\theta} \left(\frac{\sum_{j \neq i} x_j}{x_i} \right)^{1-\alpha} > 0$$

- The MRS is greater than one when the relative payout of recipient j with respect to player i is equal to 1, $\frac{x_j}{x_i} = 1$ (egocentricity).

$$\begin{aligned} MRS &= \frac{1}{\theta} \left(\frac{x_j}{x_i} + \frac{\sum_{k \neq i, j} x_k}{x_i} \right)^{1-\alpha} \\ MRS &= \frac{1}{\theta} \left(1 + \frac{\sum_{k \neq i, j} x_k}{x_i} \right)^{1-\alpha} > 1 \end{aligned}$$

- The MRS increases as $\frac{x_j}{x_i}$ increases (strict convexity).

$$MRS = \frac{1}{\theta} \left(\frac{x_j}{x_i} + \frac{\sum_{k \neq i, j} x_k}{x_i} \right)^{1-\alpha}$$

$$\frac{\partial MRS}{\partial \frac{x_j}{x_i}} = \frac{1-\alpha}{\theta} \left(\frac{x_j}{x_i} + \frac{\sum_{k \neq i, j} x_k}{x_i} \right)^{-\alpha} > 0$$

Although strict convexity holds for $\frac{x_j}{x_i}$, it does not hold for the indifference curves between recipients. The MRS between x_j and x_k is constant, which implies the indifference curves are linear.

$$MRS = \frac{\theta \left(\sum_{j \neq i} x_j \right)^{1-\alpha}}{\theta \left(\sum_{j \neq i} x_j \right)^{1-\alpha}} = 1$$

This is a divergence from the parametrized model tested by Cox and Sadiraj. Though the theory does not require it, convexity holds for the indifference curves between recipients. The MRS increases as the relative income, $\frac{x_j}{x_k}$, increases.

$$MRS = \left(\frac{x_j}{x_k} \right)^{1-\alpha}$$

$$\frac{\partial MRS}{\partial \frac{x_j}{x_k}} = (1-\alpha) \left(\frac{x_j}{x_k} \right)^{-\alpha} > 0$$

The alternative specification also diverges from the Cox and Sadiraj's model with respect to homotheticity. The MRS with respect to x_i and x_j is not constant when the relative income, $\frac{x_j}{x_i}$, is held constant. The MRS for the alternative model depends on income relative to the total payout to recipients, $\frac{\sum_{j \neq i} x_j}{x_i}$. Therefore, even though $\frac{x_j}{x_i}$ is held constant an increase in x_i reduces the relative income with respect to all other recipients, which will result in a lower MRS. However, homotheticity will hold when the relative income with respect to the total payout to recipients is held constant.

The differences discussed above originate from a single property that distinguishes the two models. The two models make different assumptions about subject's preferences towards the distribution of recipient payouts. The alternative model assumes subjects care only about the total payout to recipients and not about how the payouts are distributed. Conversely, Cox and Sadiraj's model assumes subjects prefer a more equal distribution among recipients, *ceteris paribus*.

A.2 Performance

If egocentric altruism alone captures subjects' social preferences then the alternative model proposed in this paper should fit the data as well as the model proposed by Cox and Sadiraj. However, if the alternative model does not perform as well then it can be concluded that egocentricity does not fully explain subject's behavior. Rather, egocentricity in conjunction with the preference for a more equal distribution of payouts to recipients is needed. The performance of the alternative model will be tested by comparing the predicted behavior of the decision environments tested in Cox and Sadiraj (2012) to what was actually observed. The alternative model's performance will then be compared to the performance of Cox and Sadiraj's model.

In the two-player dictator game run by Cox and Sadiraj both models predict the same behavior, because in two-player environments preferences over the distribution of recipient payouts is irrelevant. Therefore, the two models are identical and perform equally well. However, the behavior

predicted by, and as a result the performance of, the models diverge when there are more than two players.

Cox and Sadiraj have subjects participate in two decision environments where there are three-players. In both decision environments the subject is tasked with selecting an allocation from a menu of options.³⁷ Table 12 present the allocation menu for each environment.

Table 12 Cox and Sadiraj Decision Environments

		Budget Sets			
		m	x_1	x_2	x_3
Environment 1		15	5	7	38
		15	5	11	11
		15	5	20	20
Environment 2		15	5	20	20
		15	8	17	20
		15	9	10	26

For Environment 1 Cox and Sadiraj’s model predicts either the first or third row as the optimal allocation depending on the value of α . The alternative model predicts the first row as the unique optimal choice because it yields the largest total payout to recipients. Only 15% of subjects who participated in the experiment chose the first option while 70% chose the third. Though the alternative model could be used to explain 15% of the observed behavior it generally does not fit the data.

For Environment 2 Cox and Sadiraj’s model predicts the second row to be the optimal allocation. According to the alternative model all the allocation options yield the same utility since the total payout is constant. Therefore, any choice made by a subject should essentially be random. The results of the experiment show 88% of subjects select the second row. Although the second row is an optimal choice according to the alternative model it predicts a more uniform distribution of allocation choices, and therefore is not able to explain why one allocation is chosen overwhelming more often.

Comparing the predictive behavior of the models reveals Cox and Sadiraj’s model is a far better fit of the data than the alternative model presented in this paper. Since both models capture a subject’s preference for egocentric altruism this preference alone is not enough to explain subject behavior. Instead, subjects appear to exhibit egocentric preferences as well as a preference for a more equal distribution of recipient payouts; a feature not captured by the alternative model. Therefore, the model tested by Cox and Sadiraj is a good fit of the data because it captures egocentric altruism as well as a preference for a more equal distribution of recipient payouts.

Appendix B Highest Payout Restriction

To identify those subjects who exhibit inequality aversion from those subjects who are self-regarding both NSCI and SCI need to be maximized when the private return is the largest. This condition implies as the private return decreases both NSCI and SCI need to decrease, which will depend on the dictator’s relative position within the payout distribution. This section discusses how NSCI and SCI vary depending on whether the dictator is at the top, in the middle, or at the bottom of a three person payout distribution.

³⁷See Cox and Sadiraj (2012) for details about the design of the decision environments.

First, assume the dictator receives the smallest payout, $x_i + R_j \leq y_2 \leq y_1$. SCI is then

$$SCI = y_1 - (x_i + R_j) + y_2 - (x_i + R_j)$$

$$SCI = y_1 + y_2 - 2x_i - 2R_j$$

which can be rewritten as a function of the SEO.

$$SCI = SEO - 2x_i - 2R_j$$

The equation above reveals SCI and the private return (R) are inversely related. Holding constant the recipient endowment (SEO) and the dictator endowment (x_i), as R decreases SCI increases. Table 13 provides an example.

Recall that SCI measures the inequality between the dictator and recipients. Additionally, the dictator's payout increases as the private return increases. Therefore, when the dictator is at the bottom of the payout distribution increasing his payout decreases the distance between his payout and the payout of the recipients. SCI decreases as the private return increases. As a result both self-regarding subjects and those averse to SCI have the same utilize maximizing allocation decision, which means behavior in line with SCI aversion will not be able to be identified.

Table 13 Lowest Payout Decision Environment

Dictator's Endowment	Recipients' Payout		Return R	SCI	NSCI	SEO
	x	y_1				
1	15	5	1	16	10	20
1	14	6	0.8	16.4	8	20
1	13	7	0.6	16.8	6	20
1	12	8	0.4	17.2	4	20
1	11	9	0.2	17.6	2	20
1	10	10	0	18	0	20

Furthermore, NSCI and SCI move in opposite directions which makes it difficult to determine the optimal allocation for subjects who averse to both NSCI and SCI. The optimal allocation for a subject averse to NSCI and SCI will depend on the weight subjects place on NSCI relative to SCI. Since the relative weight can assume any value along the unit interval any allocation could be an optimal choice, and behavior in line with aversion to both SCI and NSCI will not be able to be identified. Therefore, this paper will not address the case where the dictator receives the lowest payout.³⁸

Next assume the dictator receives the second highest payout, $y_2 \leq x_i + R_j \leq y_1$, and SCI is

$$SCI = y_1 - (x_i + R - j) + x_i + R_j - y_2 = y_1 - y_2 = NSCI.$$

When the dictator is in the middle of the payout distribution $SCI = NSCI$. See Table 14 for an example. With SCI and NSCI both decreasing as the private return decreases individuals who are averse to SCI, NSCI or both will have a different optimal allocation than subjects who are self-regarding.³⁹ However, since SCI and NSCI are equal Condition 3 cannot be met, and the

³⁸The motivation to not address the poor case is purely methodological, and no way a comment on the importance of studying this case. Research analyzing taking in dictator games is related to this question since to decrease inequality when receiving the lowest payout the dictator would need to take from the recipient(s). Furthermore, there is no reason to believe preferences towards inequality will be the same across the income distribution. In fact, intuition leads one to believe preferences are likely to be different.

³⁹Subject who are inequality averse will choose to forego some of the return to lower inequality while subjects who

preferences over the individual types of inequality cannot be disentangled. Therefore, this paper will not consider environments where the dictator receives the second highest payout.

Table 14 Middle Payout Decision Environment

Dictator's Endowment	Recipients' Payout		Return	SCI	NSCI	SEO
	x	y_1				
5	10	0	1	10	10	10
5	9	1	0.8	8	8	10
5	8	2	0.6	6	6	10
5	7	3	0.4	4	4	10
5	6	4	0.2	2	2	10
5	5	5	0	0	0	10

Finally, assume the dictator receives the highest payout, $y_2 \leq y_1 \leq x_i + R_j$. SCI is then

$$SCI = x_i + R_j - y_1 + x_i + R_j - y_2$$

$$SCI = 2x_i + 2R_j - y_1 - y_2$$

$$SCI = 2x_i + 2R_j - SEO$$

While the equation above looks similar to the equation for SCI when the dictator receives the lowest payout, SCI and R are now positively related. Therefore, as the private return increases SCI, the distance between the dictator's payout and the recipient payouts, also increases. Table 3, in the main body of the paper, provides an example of this case. Furthermore, SCI is independent of NSCI so Condition 3 can be met and the preferences for SCI and NSCI can be disentangled.

By restricting the dictator to receive that highest payout the two primary goals of this paper can be achieved. Preferences for inequality aversion can be identified and can be further separated into aversion to SCI, NSCI, or both. Therefore, this paper will exclusively focus on decision environments where the dictator receives the largest payout.

Appendix C Difference in Willingness to Forego Return

Let MU_1 , MU_2 , and MU_3 represent the marginal utility for subjects who are averse to both SCI and NSCI, averse to only SCI, and averse to only NSCI, respectively, when both SCI and NSCI vary.

$$MU_1 = \beta\Delta SCI + \theta\Delta NSCI$$

$$MU_2 = \beta\Delta SCI + 0 = \beta\Delta SCI$$

$$MU_3 = 0 + \theta\Delta NSCI = \theta\Delta NSCI$$

Let MU'_1 , MU'_2 , and MU'_3 represent the marginal utility for subjects who are averse to both SCI and NSCI, averse to only SCI, and averse to only NSCI, respectively, when only SCI varies.

$$MU'_1 = \beta\Delta SCI$$

$$MU'_2 = \beta\Delta SCI$$

are not inequality averse will choose to maximize the return. For the example in Table 14 that results in individuals who are not inequality averse choosing the allocation (10, 0). Subjects who are inequality averse will choose a different allocation with the exact choice depending on their individual level of inequality aversion.

$$MU'_3 = 0$$

Let F_1 and F'_1 represent the amount of private return foregone by a dictator who is averse to both SCI and NSCI when SCI and NSCI vary and when only SCI varies, respectively. Let F_2 and F'_2 represent the amount of private return foregone by a dictator who is averse to only SCI when SCI and NSCI vary and when only SCI varies, respectively, and let F_3 and F'_3 represent the amount of private return foregone by a dictator who is averse to only NSCI when SCI and NSCI vary and when only SCI varies, respectively. At the optimal allocation the amount of private return a dictator is willing to forego should be equal to the marginal utility. Therefore, when both SCI and NSCI vary $F_i = MU_i$ and when only SCI varies $F'_i = MU'_i$ where $i \in \{1, 2, 3\}$.

Assume ΔSCI is the same regardless of whether both SCI and NSCI vary or just SCI varies. For subjects who are averse to both SCI and NSCI

$$MU_1 = \beta\Delta SCI + \theta\Delta NSCI > \beta\Delta SCI = MU'_1$$

$$F_1 > F'_1.$$

For subjects who are averse to only SCI

$$MU_2 = \beta\Delta SCI = MU'_2$$

$$F_2 = F'_2.$$

For subjects who are averse to only NSCI

$$MU_2 = \theta\Delta NSCI > 0 = MU'_2$$

$$F_2 > 0 = F'_2.$$

Based on the results above, the change in willingness to forego private return between the two distribution game sub-treatments will depend on whether a subject is averse to both SCI and NSCI, only SCI, and only NSCI. Therefore, amount of private return foregone in the distribution games can be used to determine which preferences a subject is exhibiting. A subject who is averse to both SCI and NSCI will be willing to forego private return in both sub-treatments, but will forego more when both SCI and NSCI are varied. A subject averse to only SCI will forego the same amount of private return both sub-treatments. Finally, subjects averse to only NSCI forego private return when both SCI and NSCI vary, but will choose to not forego any private return when only SCI varies.

Appendix D Instructions

Screen shots of the instruction pages from the Ztree program are provided below. The instructions are for the treatment order distribution game then dictator game. The instructions for the dictator game then distribution game treatment order are identical expect for the order.

Period 1 of 1 Remaining time (sec) 595

Stage One Instructions: 1 / 6

Welcome

Thank you for participating in our experiment! Before we begin, let's establish some ground rules:

- Please make sure that your cell phones are silent.
- We ask that you do not talk with one another.
- If you have a question after reading the instructions, please raise your hand and the experimenter will answer your question in private.
- During the experiment, please do not turn around or peer onto the screens of other participants.

Today's experiment will consist of three stages and a questionnaire. Each stage will have multiple decision making environments. The instructions that follow describe the task to be completed in Stage 1. Instructions about the other stages will be provided just before they begin. Please read these instructions carefully, as the amount of money you earn depends on your decisions.

IMPORTANT NOTE: Throughout the experiment payouts will be represented in Experimental Currency Units (ECUs). At the end of the experiment your payouts will be converted from ECUs to dollars at a rate of 3 ECU = 1 USD.

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Period 1 of 1 Remaining time (sec) 592

Stage One Instructions: 2 / 6

Stage One

During the first stage you will be presented with various environments where you will have to decide how to divide a fixed amount of money between two randomly selected players based on a menu of possible allocations.

Each environment will begin by presenting you with two endowments. The first endowment is yours to keep, and will not be able to be allocated to the other players. The second endowment is to be split between the other players. You will not be able to keep any of this endowment for yourself.

Your decisions are in no way hypothetical; they will affect your payment and the payments received by other players. The exact procedure to determine payouts will be explained later.

Important Note: Each environment is independent. Your decision in one environment will not affect or carry over to another environment. At the start of each round all players have only the money specified within the environment.

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Period 1 of 1 Remaining time (sec) 587

Stage One Instructions: 3 / 6

Example

Consider the following environment:

You are randomly paired with two other players (Recipient 1 and Recipient 2). You have an endowment of \$5, which is yours to keep. You also receive a second endowment of \$10, which you need to allocate to the other two players. The other players have no money.

Possible allocations and the associated returns are presented below.

	Recipient 1	Recipient 2	Return
Allocation 1	\$10	\$0	\$2.50
Allocation 2	\$9	\$1	\$2.00
Allocation 3	\$8	\$2	\$1.50
Allocation 4	\$7	\$3	\$1.00
Allocation 5	\$6	\$4	\$0.50
Allocation 6	\$5	\$5	\$0.00

Example: If you were to select Allocation 5 then Recipient 1 would receive \$6 and Recipient 2 would receive \$4. The payment (or return) for selecting Allocation 5 is \$0.50. Therefore, your payout for this environment would be \$5.50: your endowment, \$5, plus whatever return you receive, in this case \$0.50.

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Period 1 of 1 Remaining time (sec) 583

Stage One Instructions: 4 / 6

Double Blind

In hopes of removing any pressure you may feel from the experimenter to make a particular choice this experiment will be conducted as a double blind experiment. This means your answers to this experiment will be kept anonymous. At no point will the experimenter know or be able to figure out what decisions you made.

To ensure the experimenter is not able to connect you with your decision you received a randomly selected key with a number on it when signing in. This key corresponds to a mailbox in the IE Lab. Please DO NOT share your number with any other student or the experimenter. The anonymity of your answers is predicated on this number being kept private.

At the end of the experiment you will be prompted to enter the number on the key you received. It is important this number be entered correctly. If it is not, there is a chance your answers will have to be identified to ensure you are paid the correct amount.

The experimenter will then place the final payout for each subject in an envelope, in the mailbox corresponding to the number entered. Once the experiment is finished you will be able to collect your payment from the mailbox, return the key, and sign a sheet declaring you were paid the appropriate amount.

Period 1 of 1 Remaining time (sec) 580

Stage One Instructions: 5 / 6

Payment

Payout for this stage will be determined by the decisions made in ONE randomly selected environment. You will then be assigned to three different groups. Each group will have three members.

In the first group, you will be assigned the role of the dictator. As the dictator your decisions will determine the payouts for you and the other players in the group. In the other two groups you will be assigned the role of recipient, and your payouts will be determined by the choices of the dictator in each of the groups. Your payout for Stage 1 will be the sum of the payout from each group.

TOTAL payout for the experiment will be the sum of the payouts from each stage. The experimental payout plus the \$5 for showing up on time will be placed in an envelope, and the envelope will be placed into the mailbox with the number you submit at the end of the experiment.

IMPORTANT NOTE: You will NOT be in a group where the dictator of that group was a recipient in the group where you were a dictator. For example, if you are the dictator in Group 1 and Subject A is a recipient in that group then you will not be a recipient in any group where Subject A is the dictator. No subjects that you make decisions over will make decisions over you. Additionally, those subjects who are affected by your decisions will never know you were the one to make those decisions.

Period 1 of 1 Remaining time (sec) 576

Stage One Instructions: 6 / 6

End of Instructions

Before you begin, you will take a short quiz to test your understanding of these instructions. Please take some time to review the instructions now, as you will not be able to go back once you begin the quiz. If you have any questions, raise your hand and the experimenter will be with you as soon as possible.

Once you are confident that you understand the instructions, click the 'Continue' button to begin the quiz.

Period 1 of 1 Remaining time (sec) 298

Quiz: 1 / 2

Question 1

Consider the following environment:

You are randomly paired with two other players (Recipient 1 and Recipient 2). You have an endowment of \$5, which is yours to keep. You also receive a second endowment of \$10, which you need to allocate to the other two players. The other players have no money.

Possible allocations and the associated returns are presented below.

	Recipient 1	Recipient 2	Return
Allocation 1	\$10	\$0	\$2.50
Allocation 2	\$9	\$1	\$2.00
Allocation 3	\$8	\$2	\$1.50
Allocation 4	\$7	\$3	\$1.00
Allocation 5	\$6	\$4	\$0.50
Allocation 6	\$5	\$5	\$0.00

a) What is the most money you can allocate to any one player?

b) What is the maximum return you can receive?

c) What is the largest payout you can receive as the dictator?

Submit

Period 1 of 1 Remaining time (sec) 298

Quiz: 2 / 2

Question 2

a) How many groups will you be assigned to?

b) How many of the groups will your own decision determine the payout?

c) What is your roll for the groups where someone else's decision will determine your payout?
 Dictator
 Recipient

d) Assume you are placed into a group with Subject 2 and Subject 3, and you are the dictator for this group. Could Subject 3 be the dictator of a different group where you are one of the recipients?
 Yes
 No

e) Assume you are placed into a group with Subject 2 and Subject 3, and you are the dictator for this group. Could Subject 5 be the dictator of a different group where you are one of the recipients?
 Yes
 No

Submit

Period 1 of 1 Remaining time (sec) 587

Stage Two Instructions: 1 / 4

Stage Two

The next stage is a series of dictator games similar to those you played in the first stage. At the beginning of each environment you will again be randomly paired with two other players. You will be given an endowment, and need to decide how much you would like to allocate to the other players with which you are paired.

Payment for the environment will be determined based on your allocation decision. The players you are paired with will receive ONLY the money you allocate to them. Your payment for the game will be the amount of the endowment you choose to not allocate to the other players.

Please note, you are not required to allocate any money to the other players.

You can move to the next game or to a previous game by clicking on the "Next" button.

Important Note: Each environment is independent. Your decision in one environment will not affect or carry over to another environment. At the start of each round all players have only the money specified within the environment.

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Period 1 of 1 Remaining time (sec) 593

Stage Two Instructions: 2 / 4

Example

The following is an example of the three player dictator game you will play. You are randomly paired with two other players (Recipient 1 and Recipient 2). You are given an endowment of 10 ECUs. In increments of 0.5 ECUs you must decide how much you would like to allocate to the other players.

Please enter your decision below.

How much would you like to allocate to Recipient 1?
How much would you like to allocate to Recipient 2?

Assume you decide to allocate 1 ECU to Recipient 1 and 1 ECU to Recipient 2. Then Recipient 1 would receive 1 ECU, Recipient 2 would receive 1 ECU, and you would receive 8 ECUs, the endowment (10 ECUs) minus the allocation to Recipient 1 (1 ECU) and Recipient 2 (1 ECU).

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Period 1 of 1 Remaining time (sec) 590

Stage Two Instructions: 3 / 4

Payment

Payout for this stage will be determined by the decisions made from ONE randomly selected environment. You will then be assigned to three different groups of three. These groups are different than the ones you were assigned to during the first stage.

In the first group, you will be assigned the role of the dictator. As the dictator your decisions will determine the payouts for you and the other players in the group. In the other groups you will be assigned the role of recipient, and your payout will be determined by the allocation of the dictator in each group.

Your payout for the stage will be the sum of the payouts from each group.

IMPORTANT NOTE: You will NOT be in a group where the dictator of that group was a recipient in the group where you were a dictator. For example, if you are the dictator in Group 1 and Subject A is a recipient in that group then you will not be a recipient in any group where Subject A is the dictator. No subjects that you make decisions over will make decisions over you. Additionally, those subjects who are affected by your decisions will never know you were the one to make those decisions.

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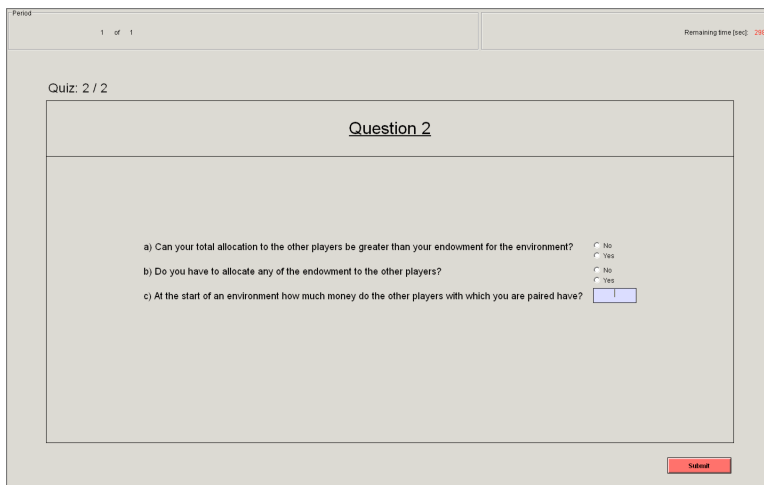
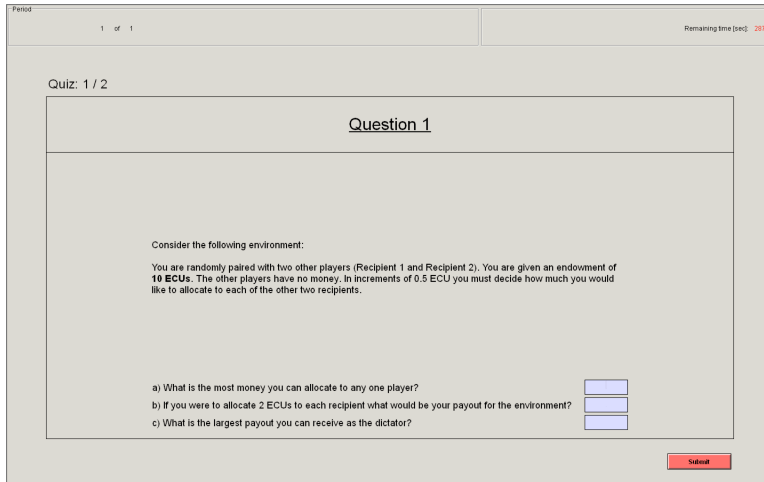
Period 1 of 1 Remaining time (sec) 585

Stage Two Instructions: 4 / 4

End of Instructions

Before you begin Stage Three, you will take a short quiz to test your understanding of these instructions. Please take some time to review the instructions now; as you will not be able to go back once you begin the quiz. If you have any questions, raise your hand and the experimenter will be with you as soon as possible.

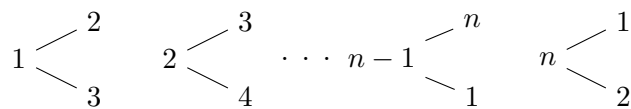
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Appendix E Payout Grouping

To ensure no bias from direct reciprocity subjects are assigned to the three groups of three, and no subject is placed into a group where they make a decision over someone who made a decision over them. To aid in understanding Figure 6 provides an example of how n -players could be grouped.

Figure 6



Each triad represents a group, and there are n -triads. Let the subject at the center of the triad represent the dictator and the two peripheral subjects represent the recipients. Since there are n triads every subject will play the role of dictator in one group and the role of recipient in two groups. For example, in the first triad Subject 1 is the dictator with Subjects 2 and 3 taking the role of recipients. Subject 1 is also assigned to the $n - 1^{th}$ and n^{th} triads as a recipient.

Now assume Subject 1 is also a recipient in the second group where the dictator is Subject 2. In the proposed scenario Subject 1 makes a decision over Subject 2 (group 1), and Subject 2 makes a decision over Subject 1 (group 2). Subject 1 and Subject 2 are making a decision over someone who will make a decision over them. Consequently, Subject 1 and Subject 2 may make their allocation

decision based on their belief about how the other will choose to allocate then endowment. This adjustment in behavior due to the actions of others is known as direct reciprocity, and has the potential to mask subjects' social preferences.

To avoid any bias from direct reciprocity subjects can only be a recipient for groups where the dictators are individuals the subject did not make a decision over. In the example above this means Subject 1 cannot be a recipient in any group where Subject 2 or Subject 3 is the dictator. Within Figure 6 Subject 1 is the recipient in groups $n - 1$ and n .⁴⁰ Since Subject $n - 1$ and Subject n were not recipients in the group where Subject 1 was the dictator direct reciprocity should not influence the allocation decision.

Appendix F Additional Tables and Figures

F.1 Experimental Environments

Table 15 shows the parameterizations for each treatment. The bracketed terms should be interpreted as cases for each term that appears to the left. For example, take the second row of the distribution game where both SCI and NSCI are allowed to vary (ΔSCI & $\Delta NSCI$). The dictator endowment is $x = 20$, the allocation endowment can take on values $Y \in \{5, 10\}$, and the private return takes on values $R \in \{1, 2.5, 5\}$. When the dictator receives an endowment $x = 10$ the allocation endowment can take a value of $Y = 5$ or $Y = 10$.⁴¹ Furthermore, for both combinations of dictator and allocation endowment the private return can be either $R = 1$, $R = 2.5$, or $R = 5$. Therefore, these parameter values constitute six different decision environments.

The endowments used for the dictator game were calculated by summing the dictator endowment, allocation endowment, and private return for each environment in the first three rows of Table 15.

⁴⁰Groups n and $n - 1$ are used in the example, but Subject 1 could be placed in any group except group 2 or 3. In both of these groups the dictator is a subject who Subject 1 made a decision over.

⁴¹In order to ensure the dictator always receives the highest payout the allocation endowment cannot be 20 when the dictator endowment is 10.

Table 15 Decision Environments

Treatment	Dictator Endowment	Allocation Endowment	Private Return	Fixed NSCI	# of Environments
<i>Distribution Game</i>					
ΔSCI & $\Delta NSCI$	5	5	$\begin{cases} 1 \\ 2.5 \\ 5 \end{cases}$	-	3
	10	$\begin{cases} 5 \\ 10 \end{cases}$	$\begin{cases} 1 \\ 2.5 \\ 5 \end{cases}$	-	6
	20	$\begin{cases} 5 \\ 10 \\ 20 \end{cases}$	$\begin{cases} 1 \\ 2.5 \\ 5 \end{cases}$	-	9
ΔSCI & \overline{NSCI}	5	5	$\begin{cases} 1 \\ 2.5 \\ 5 \end{cases}$	$\begin{cases} 0 \\ \frac{Y}{2} \\ Y \end{cases}$	9
	10	$\begin{cases} 5 \\ 10 \end{cases}$	$\begin{cases} 1 \\ 2.5 \\ 5 \end{cases}$	$\begin{cases} 0 \\ \frac{Y}{2} \\ Y \end{cases}$	18
	20	$\begin{cases} 5 \\ 10 \\ 20 \end{cases}$	$\begin{cases} 1 \\ 2.5 \\ 5 \end{cases}$	$\begin{cases} 0 \\ \frac{Y}{2} \\ Y \end{cases}$	27
<i>Dictator Game</i>	{11, 12.5, 15, 16, 17.5, 20, 21, 22.5, 25, 26, 27.5, 30, 31, 32.5, 35, 41, 42.5, 45}	-	-	-	18

F.2 Subject Summary Statistics

Table 16 Subject Summary Statistics

Summary	Session				Total
	1	2	3	4	
<i>Age</i>					
18	1	0	1	1	3
19	4	1	1	3	9
20	2	7	7	6	22
21	3	7	5	4	19
22	6	3	2	1	12
>22	0	1	1	2	4
Mean	20.6	21.1	20.6	20.4	20.7
<i>Female</i>	68.8%	36.8%	58.8%	82.3%	60.9%
<i>Experience^a</i>	62.5%	89.5%	76.5%	94.1%	81.2%
<i>Race</i>					
Caucasian	62.5%	73.7%	70.6%	76.5%	71.0%
African American	18.8%	5.3%	0.0%	11.8%	8.7%
<i>Class</i>					
Freshman	12.5%	5.3%	11.8%	11.8%	10.1%
Sophomore	25.0%	36.8%	35.3%	41.2%	34.8%
Junior	18.8%	21.1%	16.6%	35.3%	23.2%
Senior	43.8%	31.6%	29.4%	11.8%	29%
Graduate	0.0%	5.3%	5.9%	0.0%	2.9%
<i>Major</i>					
Econ/Business	0.0%	15.8%	5.9%	17.6%	10.1%
Finance/Accounting	18.8%	21.1%	35.3%	11.8%	21.7%
<i>Treatment Order</i>					
	Dist-Dict	Dist-Dict	Dict-Dict	Dict-Dict	
<i>n</i>	16	19	17	17	69

^aExperience is defined as having previous participated in an economics experiment.

F.3 Result 2 Additional Figures

Figure 7 : Vary X

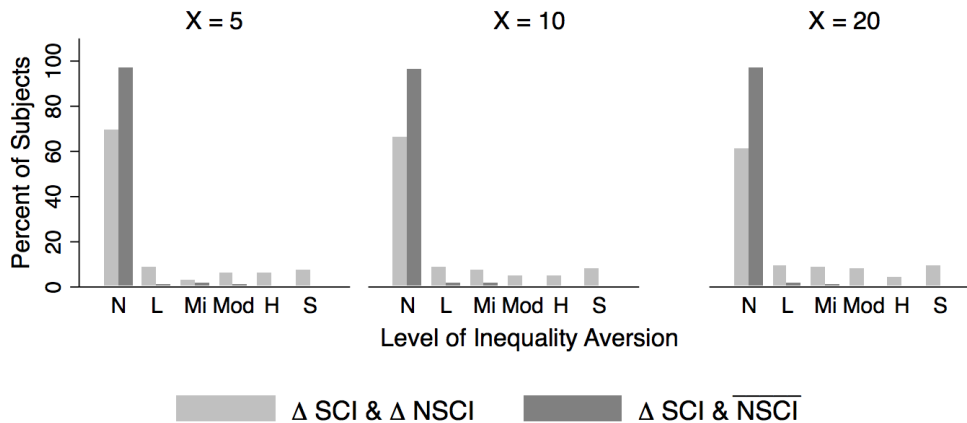


Figure 8 : Vary Y

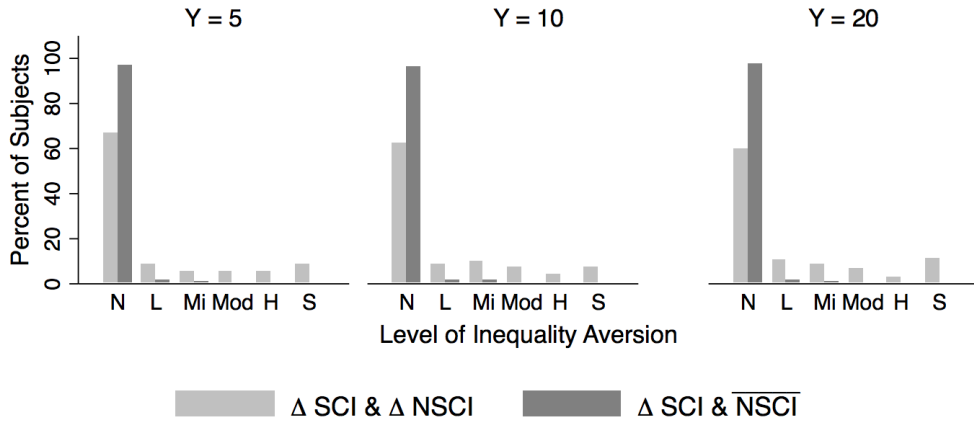
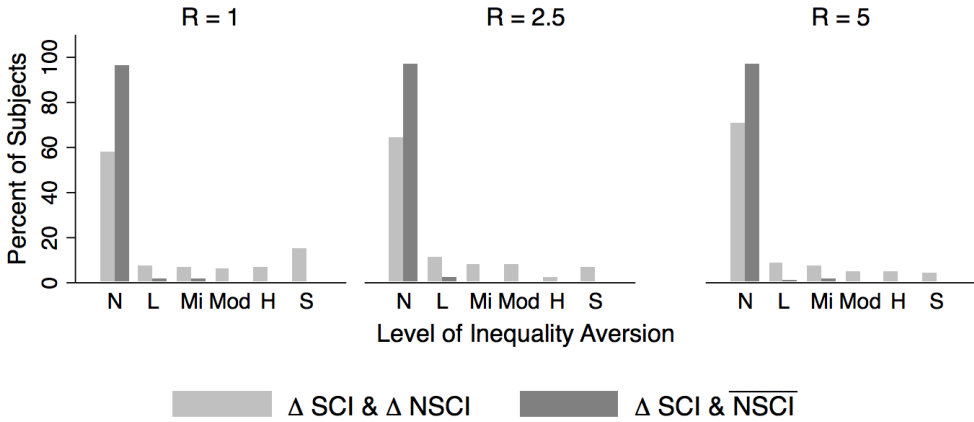


Figure 9 : Vary R



F.4 Result 3 Figures

Figure 10 : Vary R and $Y = 5$

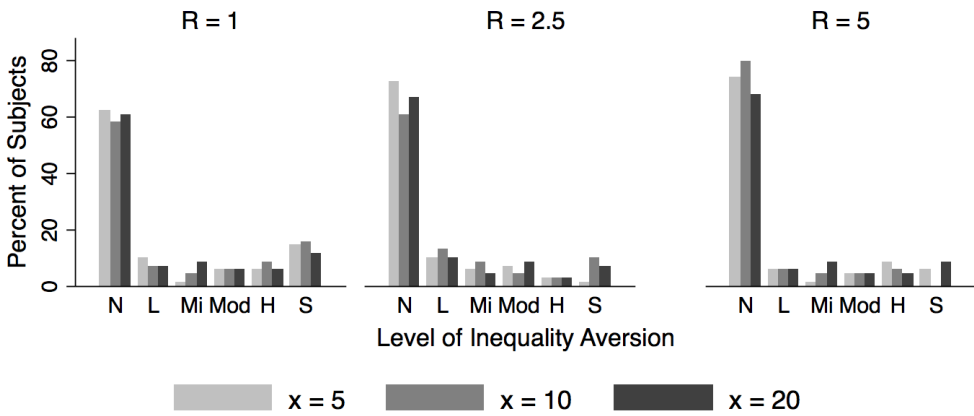
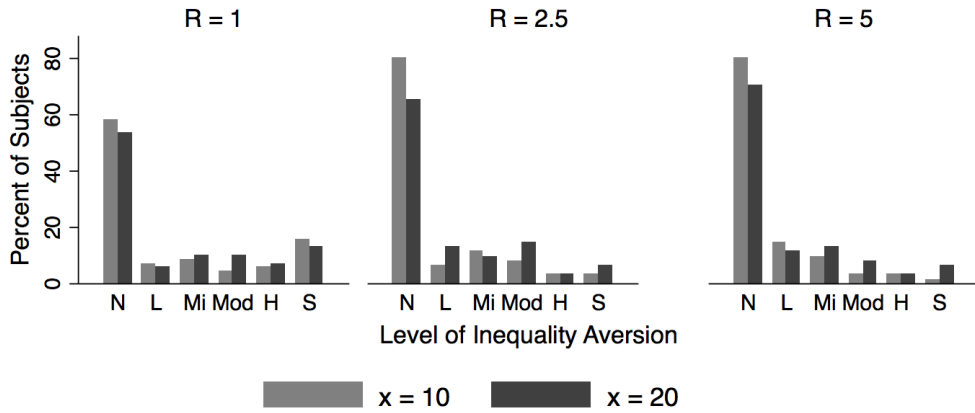


Figure 11 : Vary R and $Y = 10$



F.5 Result 4 Figures

Figure 12 : Vary X and $Y = 5$

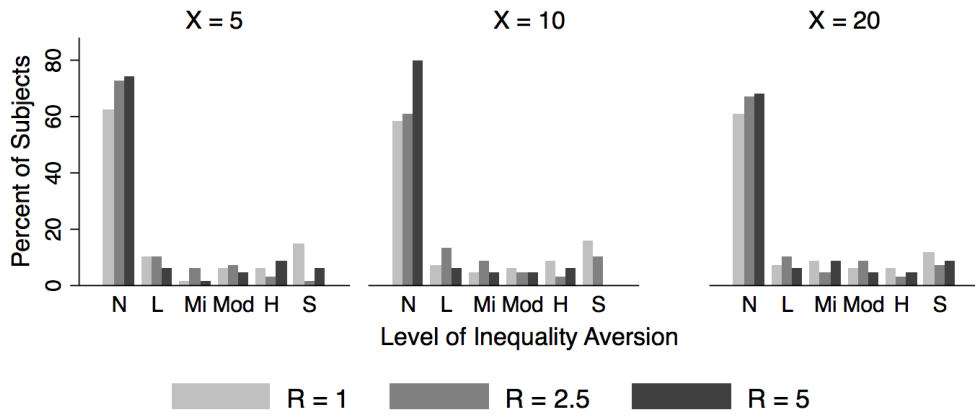
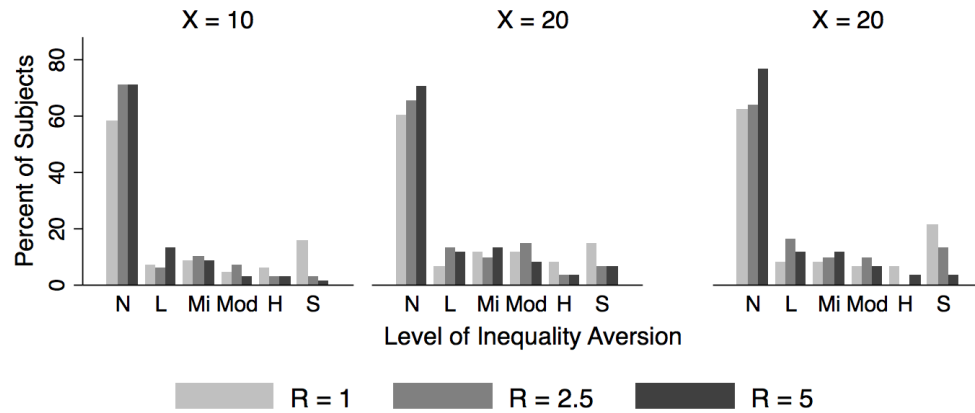


Figure 13 : Vary X and $Y = 10$ or $Y = 20$



F.6 Result 5 Figures

Figure 14 : Vary R and $X = 20$

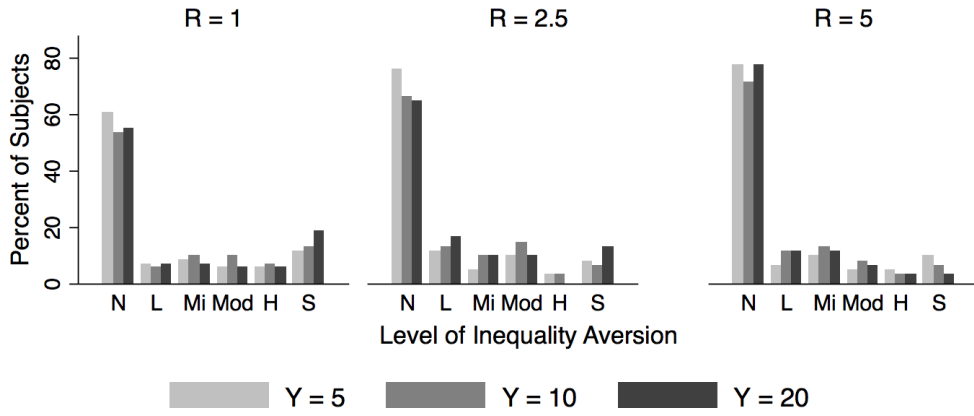
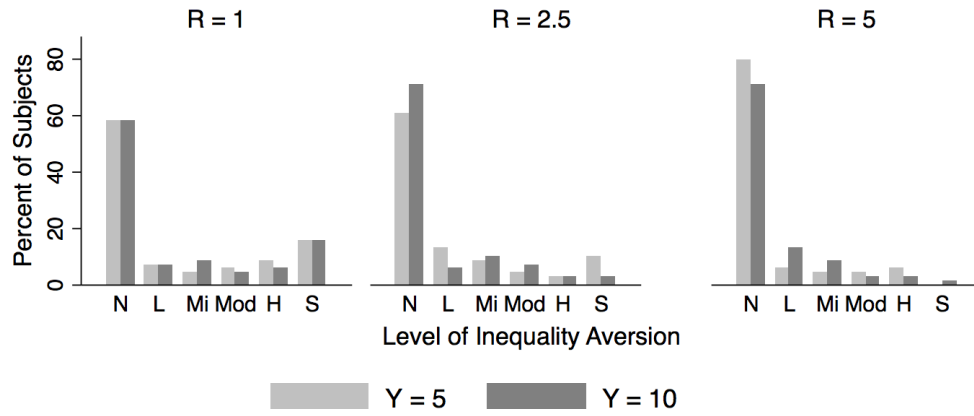


Figure 15 : Vary R and $X = 10$



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