Identity, Groups, and Social Preferences

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Abstract: This paper presents a novel experiment on identity and individual social preferences. Using a within subject design and new empirical methods, we find more than twenty percent of subjects destroy total income – at personal cost – to earn more than subjects outside their group. *Minimal groups* divide subjects according to arbitrary criteria, and *political groups* divide subjects according to party affiliations and opinions. In both treatments, Democrats behave more selfishly and destructively towards out-group members. Independents do so only in political groups, though less strongly. Thus group divisions are salient for some people but not others, depending on individual differences and identities.

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I. Introduction

This paper presents a novel experiment on identity, group divisions, and social preferences. In the classic economic paradigm people pursue their own self-interest. But it has long been that held people are cooperative and concerned with equity, fairness, and social welfare.[1] In economic experiments, subjects give up own income in order to achieve higher total income or allocations that are more equitable.[2] Yet this picture of human beings is also apparently incomplete. Throughout time people have been unfair and cruel to others, through forced extraction of goods and labor, prolonged and destructive wars, and genocide. Conflicts are often between groups explicitly defined as different, in terms of physical characteristics, religion, ethnicity, or moral principles.[3] Empirical economic research finds ethnic divisions are related to lower levels of public goods, dysfunctional institutions, and reduced growth.[4]

This study delves into these contradictions. The experiment divides participants into groups and asks them to allocate income to themselves and others. They have a range of options—including increasing total income or destroying it. Following Akerlof & Kranton (2000, 2010), we ask whether individuals' social identities relate to the allocations they make. Using a unique within-subject design and new empirical methods,

1. For summaries of the arguments and perspectives from economics as well as other disciplines see Gintis, Bowles, Boyle, & Fehr (2006).

2. For the economics of social preferences and experiments, see, for example, Fehr & Schmidt (1999), Bolton & Ockenfels (2000), Andreoni & Miller (2002) Charness & Rabin (2002), Engelman & Strober (2004).

3. Much social psychology research is devoted to group conflict (Turner (1978), Tajfel & Turner (1979), Smith & Mackie (2000)). For prominent political science on group conflict see Hardin (1997) and Fearon & Laitin (1996).

4. Studies include Easterly & Levine (1997), Alesina, Baqir, & Easterly (1999), Alesina & La Ferrara (2005), Miguel & Gugerty (2005), and Esteban, Mayoral, and Rey (2012).

we estimate individual social preferences rather than the sample average, as is done in most literature to date. Participants allocate income in a control and in two group treatments. The groups in the experiment—*minimal groups* where subjects are divided into two groups according to arbitrary criteria, and *political groups* where subjects are divided into Democratic and Republican groups according to their stated political affiliations and opinions—are obviously mild compared to historical conflicts recalled above. Yet, even in a congenial university environment, more than twenty percent of participants pay to reduce others' incomes when in opposite groups.[5]

This behavior and other patterns show systematic heterogeneity, which relates to individual identities. About a third of subjects consistently do not maximize total income or seek equitable allocations. Twenty-five percent maximize their own payoffs across all conditions; five percent always seek to lower others' incomes—what we call "dominance-seeking." About a third of subjects adopt this selfish or dominance seeking behavior only when allocating income to someone outside their group.

The heterogeneous response to group treatments relates to subjects' identities. Subjects who say they are Democrats adopt more selfish/dominance seeking behavior in both group treatments. The effect of the minimal group treatment is almost as strong as the political group treatment. But for Independents in our subject pool who have the same political opinions as Democrats (and thus are assigned to the Democratic group),

5. This behavior is not punishment for non-cooperative behavior, "negative reciprocity," or other reactions to previous play found by, for example, Fehr & Schmidt (1999), Fehr & Gächter (2000), Charness & Rabin (2002), Andreoni, Harbaugh & Vesterlund (2003), Falk, Fehr & Fischbacher (2008). Individual subjects are simply choosing income allocations. A few experiments without group manipulations have documented this kind of behavior, which has been given different names, e.g., "spitefulness," "competitiveness," "nastiness," and "equity aversion" (Levine (1998), Fehr, Hoff, and Kshetramde (2008)), Abbink & Sadrieh (2009), Ibierri & Rey-Biel (2012), Fershtman, Gneezy, & List (2012)).

only the political group treatment leads to group-biased behavior.[6] Our interpretation is that subjects who are party affiliates are more prone to join groups in general and adopt group-like behaviors. Non-party affiliates are less prone in general to join groups and only bias choices when the group division is socially meaningful.

To our knowledge, the prevalence of dominance seeking in group settings, the marked heterogeneity in social preferences across contexts, and the significance of identity in explaining this response are all new in the experimental literature. Our results echo new interpretations of Stanley Milgram's (1974) experiments, which are (mis)understood to show people are generally obedient.[7] A major contribution of our design and methods is to uncover possible individual heterogeneity and its sources. People are not homogeneous and do not automatically adopt a bias against an out-group. Rather, individuals have systematically different social preferences that depend on individual identity and the social context.

This experiment and analysis draw on and advance three interrelated strands of research. First, we estimate the distribution of individual social preferences, as advocated by Fehr & Schmidt (2009). Most previous work estimates average social preferences; i.e., the estimation procedure assumes all subjects have the same preferences and each subject is one observation. Charness & Rabin (2002) find subjects on average seek to maximize total income. The present experiment follows their lead in using simple allocations, but we study individual preferences. Chen & Li (2009) are the first to study social

6. As shown below, in the subject pool there are too few Republicans and subjects who share the opinions of Republicans to give power to our statistical tests concerning their social preferences.

7. While Milgram's baseline study shows overall high levels of obedience, Reicher & Haslam (2011) argue that the other variants indicate subjects' responses relate to their individual identities.

preferences and group divisions; using minimal groups they find, on average, subjects put less, but still positive, weight on out-group subjects' incomes. The present paper, like Andreoni & Miller (2002), estimates individual social preferences and finds subjects can be categorized as having one of a few distinct types of preferences, which almost completely describe choices. We allow for dominance-seeking behavior, which was not possible in Andreoni & Miller (2002), as well as study variation across social contexts.

Second, this paper shows individual identity is a possible source of variation and thus advances our understanding of identity and economic choices (Akerlof & Kranton 2000, 2010). Identity here, as in social psychology, describes an individual in terms of a social category or group. Examples of broad social categories in the real world are gender, race, ethnicity, nationality, political party, etc. One experimental approach to studying economic choices and identity employs such "natural groups," with findings, for example, that the race or ethnicity of subjects relates to play in dictator and ultimatum games (Fershtman & Gneezy (2000), Glaeser, Laibson, Scheinkman, & Souter (2000)). More recent work shows that natural groups impact play in prisoner's dilemma, public goods and trust games (e.g., Goette, Huffman & Meier (2006), Bernard, Fehr, & Fischbacher (2006)). In an experiment studying redistribution, Klor & Shayo (2010) divide subjects according to their university fields of study and find subjects vote more often for the tax rate that favors in-group members. A second method creates social categories inside the laboratory, as in Chen & Li (2009), using an approach like the minimal group paradigm.[8] The present study uses both methods, where a minimal group

8. For review of the minimal group paradigm and social psychology experiments, see Haslam (2001). While a pure minimal group paradigm does not allow payments to decision-makers, economic experiments have used minimal group methods to divide subjects into arbitrary groups where subjects are anonymous

treatment serves as a control for the political group treatment.[9] With this control we can test for an effect of possibly meaningful natural group divisions beyond the effect of group divisions per se.

Third, to estimate and study individual preferences we develop new methods. We employ a finite mixture model[10] and use the output to characterize individual subjects. In the present experiment subjects make a series of choices between alternative allocations of income as in Charness & Rabin (2002). We posit a utility function derived from Fehr & Schmidt (1999) and Charness & Rabin (2002) and estimate parameters with a discrete choice maximum likelihood function and a finite mixture model. The mixture model yields *types* of subjects, where the parameters for each type are not assumed but estimated, maximizing the likelihood function. Iriberri and Rey-Biel (2012) similarly engage the possibility that subjects have heterogeneous behavior; in dictator games they estimate types using the same utility function that we adapt.[11]

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and otherwise have no other attachments. Chen & Li (2009) provide an extensive review of the minimal group paradigm and group effects in social psychology and economics. Other economic experiments using arbitrary groups include Charness, Rigotti & Rustichini (2006) who test for group effects in Prisoner's Dilemma and Battle of the Sexes games, Chen & Chen (2011) who study group effects on equilibrium selection, and Hargreaves Heap & Zizzo (2009) who study the value of being in a group and trust games.

9. Goette, Huffman & Meier (2012) compare two sets of subjects, one randomly assigned to minimal groups and the other randomly assigned to groups that involve real social interactions leading to social ties. In the present experiment, any heightened group attachment would come from individual characteristics and identities and an assigned group that is more meaningful to a subject. Furthermore, we employ a within subject design and follow individuals in different contexts, studying individual heterogeneity in response to different treatments and the sources of this variation.

10. Mixture models are relatively new to experimental economics. To the best of our knowledge Stahl & Wilson (1995) and Stahl (1996) were the first, and they and followers such as Bosch-Domènech et. al. (2010) estimate the proportion of subjects who reason at different levels. Harrison & Rutström (2009) and Conte, Hay, and Moffatt (2011) allow a mixture of expected utility and prospect theory. Andersen, Harrison, Lau & Rutström (2011) consider exponential vs. hyperbolic discounting.

11. Iriberri & Rey-Biel's (2012) objective is to determine how future play depends on knowing the distribution of current play.

We take a second step and classify individuals into types in a way consistent with the mixing distribution.[12] That is, we construct a posterior probability that each individual is a certain type and assign individuals to the type with the greatest posterior probability. To our knowledge, the present study is the only one in experimental economics that classifies subjects into types and uses demographics and other subject-specific data to study the sources of individual variation. It is this combination that enables us to follow individual subjects across conditions and test how behavior relates to individual identities.[13]

The paper is organized as follows. Section II describes the experiment in detail. Section III presents patterns of behavior in the raw data. Section IV provides the empirical methodology and estimates individual social preferences. Section V studies group treatment effects. Section VI concludes.

II. The Experiment and Subject Pool

The experiment was conducted at the Duke's Human Neuroeconomics Laboratory, which follows the same protocols as laboratories in experimental economics, in particular the protocol of no deception. The experiment involved 141 subjects drawn from the Duke University community.[14]

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12. In criminology Nagin (2005) develops this classification method and uses arrest data to understand who becomes a career criminals and who commits crimes as an adolescent but desist from crime as an adult.

13. Fischbacher, Hertwig & Bruhin (2013) use a finite mixture model to classify subjects into types according to their behavior in dictator games. Klor & Shayo (2010) estimate individual utility functions and classify subjects according to the parameters using a series of hypothesis tests. Many of these tests have low power leading to failures to reject, implying that the order in which the tests are done affects an individual's classification. Andreoni & Miller (2002) find that 43% of subjects can be perfectly described by one of three canonical CES utility functions. They classify the remaining individuals by how closely choices match the behavior predicted by each of these CES functions, via a minimum distance criterion.

14. Seventy-six percent were Duke students, eleven percent students from other schools (largely University of North Carolina, Chapel Hill), with the remainder non-students (largely staff). Of the students, eighty-six

Instructions	3-5 Minutes
Non-Group Control	
52 Choices	12 Minutes
Minimal Group or Political Group Treatment (randomized)	
Survey	2-5 Minutes
78 Choices	17 Minutes
Minimal Group or Political Group Treatment (randomized)	
Survey	2-5 Minutes
78 Choices	17 Minutes
Post Experiment Survey	3-5 Minutes

Figure 1. Timeline of Experiment

Experimental sessions proceeded as in Figure 1. Subjects received instructions on the decisions they would make and practiced using the computer keys that would indicate their choices. All sessions began with the *non-group* control. Each subject then made decisions in the *minimal group treatment* and the *political group treatment*, with the order randomized across subjects.[15] The post-experiment survey asked for demographic information (e.g., age, sex, major field of study, hometown). It further asked subjects to rank the importance of different objectives (e.g., highest payoffs for self, equal payoffs for self and other person) when allocating income in different parts of the experiment.

In the non-group control, subjects allocated money to themselves and other participants in two kinds of pairings: (1) between themselves and other subjects, labeled

percent were undergraduates. Eighteen percent of all subjects were born abroad. Sixteen percent were born in North Carolina, 12% in New York or New Jersey, and 6% in California, with the rest of the subjects born in one of 28 states or the District of Columbia. Students in the subject pool reported a wide range of major fields of study, many listing multiple fields. In all, 27 different fields were mentioned; 21% listed biology as one of their fields, 16% listed psychology/neuroscience as one of their fields, and 8% listed economics as one of their fields. The pool was 65% female.

15. Chi-squared tests show no statistically significant difference between the distributions of social preferences for subjects receiving the minimal group treatment first vs. the political group treatment first.

YOU-OTHER, and (2) between two random other subjects, labeled OTHER-OTHER.[16] The screens indicated the match, as in Figure 2 for a YOU-OTHER match. All pairings occurred

randomly

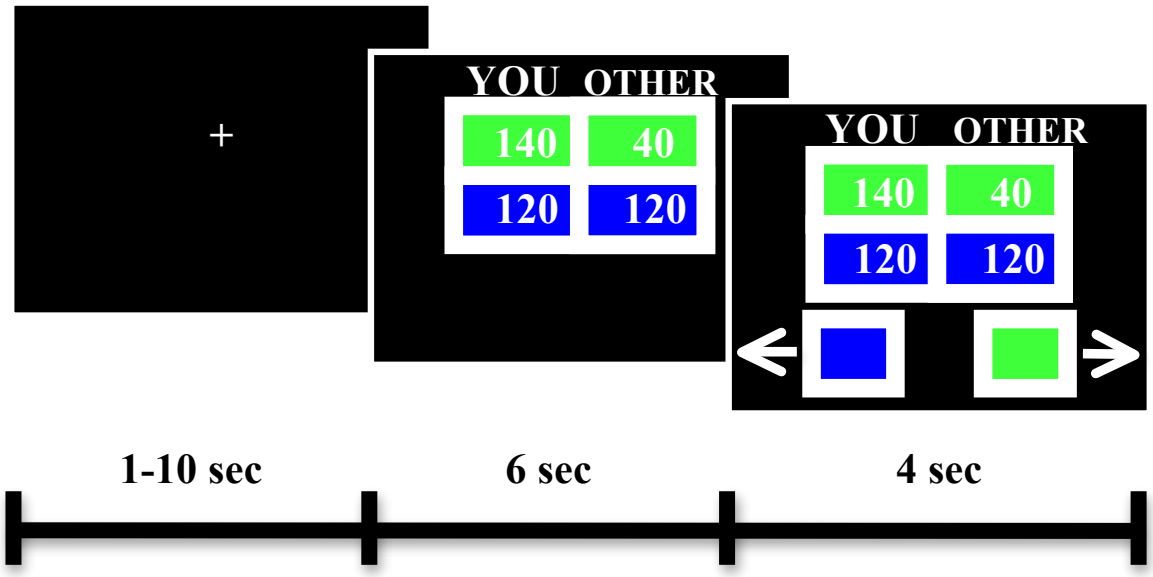


Figure 2. Timing and Presentation of Allocation Choices

In each group treatment, subjects were divided into two groups according to answers to survey questions. In the *minimal group treatment*, subjects were presented pairs of lines of poetry, landscape images, and abstract paintings (by Klee or Kandinsky) and asked which item in each pair they preferred. The items in each pair were matched (e.g., the landscape images were almost identical) so that this choice is unrelated to individual subject characteristics. The online Appendix provides examples. Subjects were then assigned to a group based on their answers to these questions and were given (true) information on the percentage of subjects in their group that answered similarly in

16. The latter allocations do not affect a subject's own payoffs. The present paper does not use data from the Other-Other pairings or the Own-Other pairings in the group treatments.

the survey and the percentage of subjects in the other group that answered differently. Subjects then allocated money in three kinds of pairings, presented randomly: (1) between themselves and an own-group member, labeled YOU-OWN, (2) between themselves and an other-group member, labeled YOU-OTHER, and (3) between an own-group member and an other-group member, labeled OWN-OTHER. Participants were given information about subjects to whom they were allocating income—the group assignment and the commonality of answers to survey questions.

The *political treatment* began with a political survey. Subjects were first asked their affiliation as Democrat, Republican, Independent, or None of the Above. The next question asked subjects to refine their leanings: "strong" or "moderate" for party affiliates, "closer to Democratic" or "closer to Republican" for Independents and None of the Above. Subjects were asked their opinions on five issues dividing the political spectrum in the United States at that time,[17] as well as on media outlets and religious service attendance. Subjects were assigned to one of two groups—Democratic or Republican—according to an algorithm that placed Democrats and Democratic party-leaning subjects in one group and Republicans and Republican party-leaning subjects in the other group. Subjects were given (true) information on survey answers of participants assigned to each group, as well as information on the subjects to whom they would allocate income.[18] Subjects allocated income in three types of pairings, YOU-OWN, YOU-OTHER, and OWN-OTHER, with exactly the format as in the minimal group treatment.

17. Abortion, illegal immigration, size of government, gay marriage, and status of the Bush tax cuts.

18. The online Appendix describes the procedure and the information subjects received about the other participant's answers to survey questions. In all other ways the matching is anonymous, and the recipient could be from another session of the experiment.

For each kind of pairing in each condition, subjects were randomly presented 26 different 2x2 allocation matrices. The Appendix provides the collection of matrices, and Figure 2 provides an example. The rows within each matrix were randomized; i.e., randomly the top or the bottom row gave the decision-maker more money. The colors of the rows (blue or green), as well as the left and right keys, were all randomized.

Following Charness & Rabin (2002), these matrices capture three basic types of "social objectives." A subject could, at possible expense to self, (1) reduce inequity, (2) increase total income, or (3) increase the difference between own and other subject's payoff. An example of latter is matrix 12, $\begin{bmatrix} 140 & 100 \\ 80 & 0 \end{bmatrix}$; a subject choosing the bottom row would sacrifice 60 of her potential payoff to decrease the other subject's payoff by 100, thereby increasing the difference between own and other's payoffs from 40 to 80. A choice could involve more than one motive; in Figure 2, a subject who picked the bottom row would, at personal cost, both increase total income and increase equity. Our econometric estimation of social preferences below distinguishes among the motives.

In addition to the show-up fee of $6, subjects received payment for one choice selected at random from each of the three conditions—non-group, minimal group, and political group. The points in the matrices were translated into dollars according to a conversion factor, and each subject earned an average of $15 for a one-hour session.

In the analysis below, we test if different people have different reactions to the two group treatments. We compare political party affiliates to those with no party affiliation because (1) party affiliates possibly identify more with their assigned political group, and (2) all else equal, party affiliation is an observable characteristic which may correlate with unobservable differences among subjects.

Table 1 shows the distribution of subjects' party affiliations and non-affiliations.

POLITICAL CATEGORY	% OF SUBJECTS
Democrat – Strong	15
Democrat – Moderate	33
Republican – Strong	0
Republican – Moderate	13
Independent – Dem leaning	13
Independent – Rep leaning	10
None of the Above – Dem leaning	11
None of the Above – Rep leaning	5

Table 1. Distribution of Subjects' Political Affiliations and Leanings

Just under half are Democrats (48%) and only 13% are Republicans. Independents and None of the Above make up more than one third of subjects (39%). Of these, 62% are Democratic-leaning.[19] We pool together and call "Independent" any subject who responded as either Independent or None of the Above.[20] We designate Democratic-leaning Independents as "D-Independents" and Republican-leaning Independents as "R-Independents." We ultimately compare Democrats and D-Independents since (1) they are

19. The subject pool appears to be representative. It matches the political spectrum of undergraduates at Princeton, which has a similar undergraduate program and is the one peer institution for which we could find survey data (http://www.dailyprincetonian.com/2008/11/04/21969/). Overall the majority (by at least 10 percentage points) of North Carolina's population is Democratic or "leans" Democratic, with a concentration of Democrats in the region where Duke is located (http://www.gallup.com/poll/114016/state-states-political-party-affiliation.aspx). Nationally this age cohort is largely Democratic (http://www.people-press.org/2011/11/03/the-generation-gap-and-the-2012-election-3/).

20. Among our subjects, there is no systematic difference between the political positions and demographics of Independents who report being closer to the Democratic party and None of the Above who report being closer to the Democratic party (see online Appendix).

observationally equivalent in demographics and political positions (see Appendix),[21] and (2) there are too few Republicans or R-Independents to give power to our statistical tests.

Before analyzing the data, we discuss possible experimenter demand effects. In this experiment, for example, subjects might think the experimenters are calling attention to group divisions and act according to what they think the experimenters want them to do. Several factors alleviate this concern. First, the aim of this experiment is to see how people behave when groups and differences are highlighted. Many real-world actors create and exploit group divisions. Second, if there is a demand effect, there is apparently no common understanding as to what the demand is, since there is a wide range of behavior. Finally, if there is a demand effect, there is no reason to believe that the effect would be different for the minimal group treatment and the political treatment. Hence, we control for any demand effect when comparing those two treatments.

III. Description of Choice Data

This section provides an overview of subjects' choices in the experiment.[22] We begin by discussing the matrices presented to subjects and how choices on these matrices can represent different social preferences.

III.A. *Matrices and Social Preferences*

Each matrix involves a choice between two allocations of income, with tradeoffs between own income, π_i, and other's income π_j. For purposes of analysis, we represent

21. A body of political science argues there is little difference between the voting behavior of political party affiliates and Independents who "lean" towards that party, see e.g. Keith et. all. (1992). For general study of social identity and party affiliation see Green, Palmquist & Schickler (2002).

22. In addition to the description below, we conducted a factor analysis of subjects' choice data which shows (1) subjects make consistent choices on matrices that are shown, by the analysis, to be similar, (2) subjects have heterogeneous choice patterns, and (3) subjects are sensitive to the losses in own income when choosing allocations. The model and analysis are available upon request.

i's choice as a normalized matrix $\begin{bmatrix} \pi_i & \pi_j \\ \pi_i' & \pi_j' \end{bmatrix}$, where *i* earns weakly more in the top row than the bottom. (As reported above, in the actual experiment the rows were randomized.) Subject *i* who chooses the bottom row loses $\pi_i - \pi'_i \geq 0$, and *j* has a gain or loss $\pi_j - \pi'_j$. For a normalized matrix, when a subject chooses the top row we say his choice is consistent with being "selfish."

A subject who chooses the bottom row is giving up own income for a social objective. We say the choice of the bottom row is consistent with "inequity aversion" if $|\pi'_i - \pi'_j| < |\pi_i - \pi_j|$. Choosing the bottom is consistent with "maximizing total income" if $\pi'_i + \pi'_j > \pi_i + \pi_j$. Finally, choosing the bottom row is "dominance-seeking" if $\pi'_i - \pi'_j > \pi_i - \pi_j$.[23]

In the next section, III.B., we compare subjects' choices in the twenty-three matrices that can be divided into two disjoint sets—(1) those matrices where choosing the bottom is consistent with inequity aversion and/or total income maximization and (2) those matrices where choosing the bottom is consistent only with dominance seeking.[24]

III. B. *Descriptive Analysis of Choice Data*

The choice data suggest four regularities. First, individual subjects are consistent in their choices, and there is significant heterogeneity across subjects. Subjects either make selfish choices, inequity-averse/total-income maximizing choices, or dominance-

23. Previous literature has used some different terminology, e.g., total income maximizing has been called "social welfare maximizing," "dominance-seeking" has been called "spitefulness" and "competitiveness." We choose total income maximizing since the utility function below involves only the income, and not the utility, of others. We choose dominance-seeking since it describes a subject who wants to decrease another subject's income relative to his own (whereas "competitiveness" in many economic settings leads to efficiency and alternatives such as "inequity loving" do not indicate the direction of the inequity).

24. The Appendix provides the list of (normalized) matrices and the social objective achieved by choosing the bottom row. Matrices 3, 4, and 14 do not meet the criteria for either set.

seeking choices in a condition/match. Second, there are group treatment effects. More subjects make dominance-seeking choices and fewer subjects make inequity-averse/total-income maximizing choices in You-Other group matches. Third, there is differential response to the group treatments. Party affiliates respond to both treatments, but not so Independents. Fourth, subjects are price-sensitive. They are less likely to choose a bottom row that involves a higher relative loss in own income.

Consistency and Heterogeneity. For each subject, we calculate the rates at which s/he chooses the bottom row when presented with matrices in each set—inequity-averse/total-income maximizing vs. dominance-seeking—for each condition and each type of match. Figure 3 Panel A presents the data for the subject pool. In each graph, the *x*-axis gives the rate of choosing the bottom row in inequity-averse/total-income maximizing matrices; the *y*-axis gives the rate of choosing the bottom row in dominance-seeking matrices. Each dot represents a single subject. The line is the regression line through the points, and the large dot is the average across all subjects.

< Figure 3 about here.>

The graphs show that subjects make consistent choices, and there is significant heterogeneity across subjects. There are subjects who make mostly selfish choices. These subjects are the dots close to the origin—they almost always choose the top row for matrices in both sets. There are subjects who tend to make dominance-seeking choices, whenever such matrices are presented, and there are subjects who tend to make inequity averse/total-income-maximizing choices, whenever such matrices are presented. These sets do not overlap—for every condition/pairing, there is a lack of subjects in the

upper right corner of the graph. That is, subjects who consistently make dominance-seeking choices do not make inequity-averse choices, and vice versa.

Group Treatment Effects – You-Other Matches. Figure 3A indicates a group treatment effect. More subjects occupy the top lefts of the group-treatment You-Other graphs, indicating more subjects make dominance-seeking choices. The regression lines are steeper, with higher y-intercepts, and the averages move up and left.

Differential Response to Group Treatment. Breaking down the subject pool reveals a differential response to group treatments. Figure 3 Panel B provides the choice data for Democrats, in black, and D-Independents, in gray. Relative to the control, in minimal group You-Other matches, more Democrats make dominance-seeking choices and more Democrats make selfish choices. D-Independents, in contrast, do not change their pattern of choices from the control condition to the minimal group condition. In the political treatment, D-Independents make more dominance seeking choices and fewer inequity averse/total income maximizing choices, like Democrats, though less frequently. Hence, a well-defined subset of the population appears non-responsive to the arbitrary group division when allocating income to an out-group subject, but responsive to a group division that is socially meaningful. Furthermore, this group treatment effect is weaker than for those with arguably stronger attachment to the group.

Price Sensitivity. Subjects choose the bottom row less often when it involves a larger loss in own income relative to the gain in the social objective. We order matrices (see Appendix) according to an inverse "bang-for-the-buck" measure $\Delta\pi_{i,}/(\Delta\pi_{i,}-\Delta\pi_{j,})$, where $\Delta\pi_i$ is *i's* loss in choosing the bottom row, and $\Delta\pi_j$ is the change in *j's* income. Choosing the bottom to achieve a social objective is *relatively more expensive* for *i* when

$|\Delta\pi_i/(\Delta\pi_i-\Delta\pi_j)|$ is larger. Figure 4 shows the percentage of subjects that choose the bottom row for matrices where *i* earns more than *j* in both rows (19 matrices). In this case, $\Delta\pi_{i,}/(\Delta\pi_{i,}-\Delta\pi_j)$ is positive for inequity-averse/total-income maximizing matrices, and the further from the origin, the more relatively expensive is the bottom row for *i*. For dominance-seeking matrices, $\Delta\pi_{i,}/(\Delta\pi_{i,}-\Delta\pi_{j,})$ is negative, and the further from the origin, the more relatively expensive is the bottom row for *i*. Each hash mark on the *x*-axis indicates a set of matrices with the same value $\Delta\pi_{i,}/(\Delta\pi_{i,}-\Delta\pi_{j,})$

< Figure 4 about here>

The graphs in Figures 4 are all inverse-U-shaped, showing fewer subjects chose the bottom when it is relatively more expensive. Panel (b) compares choices in the control to the group treatment You-Other pairings. Subjects show less willingness to pay for equity/higher total income and more willingness to pay for dominance. Panel (c) indicates a differential response to the political group treatment, with Democrats and D-Independents differing on their willingness to pay for dominance-seeking and for equity/total income maximization.

IV. Estimation Method and Individual Social Preferences

This section estimates individual social preferences. We posit a utility function, estimate types of social preferences using a mixture model, and categorize each individual as a type. The estimation demonstrates the importance of individual heterogeneity. More than two-thirds of the subjects' choices significantly diverge from the choices predicted by the estimates for the average subject. Section V below examines individual behavior across experimental conditions and group effects.

IV.A. *Structural Estimation Strategy*

Suppose individuals care about their own income and care about another person's income, possibly in relation to their own. Individual *i*'s utility is then some function of own and the other's income: $U_i(\pi_i, \pi_j)$. There are many specifications of such utility in the literature (e.g., Andreoni & Miller (2002), Bolton & Ockenfels (2000), Fehr & Schmidt (1999)). We adapt the utility function proposed by Fehr & Schmidt (1999) and Charness & Rabin (2002), which is simple and allows for a range of behavior, including dominance-seeking. Utility depends on π_i and the divergence between own and other's income, $(\pi_i - \pi_j)$, depending on whether $\pi_i \geq \pi_j$ or the reverse. Let

$$U_i(\pi_i, \pi_j) = \beta_i \pi_i + \rho_i(\pi_i - \pi_j)r + \sigma_i(\pi_j - \pi_i)s \ ,$$

where β_i is the weight on own income, ρ_i is the weight on relative income when $\pi_i \geq \pi_j$, r is an indicator variable for $\pi_i \geq \pi_j$, σ_i is the weight on relative income when $\pi_i < \pi_j$, and s is an indicator variable for $\pi_i < \pi_j$.[25]

$\beta_i > 0$	$\sigma_i = 0$	$\sigma_i > 0$	$\sigma_i < 0$
$\rho_i = 0$	*Purely Selfish*	*Total Income Max if* $\beta_i - \sigma_i > 0$	*Inequity Averse/ Dominance Seeking*
$\rho_i < 0$	*Inequity Averse/ Total Income Max if* $\beta_i + \rho_i > 0$	*Total Income Max if* $\beta_i + \rho_i - \sigma_i > 0$	*Inequity Averse*
$\rho_i > 0$	*Dominance-Seeking*		*Dominance-Seeking*

Figure 5. Social Preferences as Combinations of Utility Function Parameters

Combinations of utility function parameters yield the motives discussed above, as seen in Figure 5. Given $\beta_i > 0$, if $\rho_i = \sigma_i = 0$ then an individual places no weight on π_j; he

25. While this function is simple and captures social preferences described in the literature, it is linear and thus does not allow for diminishing marginal utility in π_i or $(\pi_i - \pi_j)$. To correct for this, we also conduct our analysis for polynomial specifications of $U_i(\pi_i, \pi_j)$. This estimation, available upon request, yields more precise parameter estimates, but does not qualitatively change the distributions of social preferences.

is then *(purely) selfish*. If $\rho_i < 0$ and $\sigma_i > 0$ and $\beta_i + \rho_i - \sigma_i > 0$, utility is always increasing in both π_i and π_j, which corresponds to *total income maximizing*. If $\rho_i < 0$ and $\sigma_i < 0$, an individual is *inequity averse*, since utility is always increasing when π_i and π_j are closer together. If $\rho_i > 0$ and $\sigma_i < 0$, then utility always increases when i's income rises relative to j's income, which corresponds to *dominance seeking*.[26]

In previous literature a single set of utility function parameters is usually assumed for all individuals. Individual-specific parameters are typically not estimated, since each subject would need to make more decisions than is feasible in an experimental setting for individual data to yield precise estimates.

As a compromise strategy, we consider the possibility of different types of people, where each type has distinct preferences. Our design generates panel data (multiple choices for each individual), and thus it is possible to estimate a finite mixture model (aka latent class model). A mixture model allows for a finite number of types in the population, where each type t is characterized by parameters $(\beta_t,\rho_t,\sigma_t)$, and each type t is a proportion of the population p_t, where $\sum_t p_t = 1$. We estimate four types, i.e., four sets of utility parameters $(\beta_1, \rho_1,\sigma_1)$, $(\beta_2, \rho_2,\sigma_2)$, $(\beta_3, \rho_3,\sigma_3)$, $(\beta_4, \rho_4,\sigma_4)$, and four proportions (p_1, p_2, p_3, p_4). Let μ denote the full set of utility parameters and proportions.

While we estimate four types, it is important to emphasize that it is the data that yields the utility parameters for each type and the proportion of each type. That is, there is no presumption, a priori, that the types will map into the four distinct motives outlined above. We choose four because it is the minimum number that could capture four distinct

26. If $\rho_i > 0$ and $\sigma_i > 0$, then an individual is "inequity loving" in that utility always increases when inequality increases, whether i's income is higher than j's income or vice versa.

motives. We find estimation of five or more types does not yield qualitatively more information for the purposes of our analysis.[27]

Formally, we build our estimation as follows. If each individual's type were known, we could estimate a binary choice model for choosing the bottom row in each matrix. Assuming an extreme value distribution for the error terms would yield the well-known logit model, which could be estimated for type t individuals by maximizing the following likelihood function:

$$L(\beta_t, \sigma_t, \rho_t) = \prod_{i=1}^{141} \prod_{k=1}^{26} \Lambda_{ki}(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j)^{d_{ki}} \left(1 - \Lambda_{ki}(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j)\right)^{1-d_{ki}} \quad (1)$$

where $\Lambda_{ki}(\beta_t, \sigma_t, \rho_t) = \exp\left(U_{ki}^{bot} - U_{ki}^{top}\right) \Big/ \left(1 + \exp\left(U_{ki}^{bot} - U_{ki}^{top}\right)\right)$

and $\left(U_{ki}^{bot} - U_{ki}^{top} \mid \beta_t, \sigma_t, \rho_t\right) = \begin{pmatrix} \beta_t \left(\pi_{i,k}^{bot} - \pi_{i,k}^{top}\right) + \\ \rho_t \left(\left(\pi_{i,k}^{bot} - \pi_{j,k}^{bot}\right) \times r^{bot} - \left(\pi_{i,k}^{top} - \pi_{j,k}^{top}\right) \times r^{top}\right) + \\ \sigma_t \left(\left(\pi_{j,k}^{bot} - \pi_{i,k}^{bot}\right) \times s^{bot} - \left(\pi_{j,k}^{top} - \pi_{i,k}^{top}\right) \times s^{top}\right) \end{pmatrix}$.

Since we do not know each individual's type, we condition on an individual being of a type and then sum over the distribution of types. That is, we estimate:

$$L(\mu) = \prod_{i=1}^{141} \prod_{i=1}^{26} \prod_{t=1}^{4} p_t \Lambda_{ki}(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j)^{d_{ki}} \left(1 - \Lambda_{ki}(\beta_t, \sigma_t, \rho_t | \pi_i, \pi_j)\right)^{1-d_{ki}} \quad (2)$$

where (p_1, p_2, p_3, p_4) is estimated along with the utility parameters.[28]

IV. B. *Utility Function Parameter Estimates and Distribution of Social Preferences*

27. As shown in the online Appendix, the five-type estimation divides one of the types into two sub-types, while the other three have the same parameter estimates and mixing proportions.

28. To insure that $0 \leq p_t \leq 1$ for all t, the mixing distribution is specified as a logistic function with a constant. That is, the probability of being of type 1, 2 or 3 is where is estimated and .

Estimating (2) yields a precise division of the subject population into types, each with distinct social preferences. Panel A of Table 2 reports the parameter values for four types and their proportions in the population in the non-group condition.

<Table 2 about here.>

Mapping the parameter estimates to the typology in Figure 5, we label the types as "selfish," "total income maximizing," "inequity-averse" and "dominance-seeking." The mixing proportions yield: 25% of subjects are selfish, 36% maximize total income, 34% are inequity-averse, and 5% are dominance-seeking. The last column gives the estimates when utility parameters are assumed to be the same for all individuals. Thus, in our sample, on average subjects are inequity averse.

IV.C. *Individual Subjects: Categorizing Each as a Type*

Having estimated the model, it is straightforward to calculate the *posterior* probability that a particular subject *i* is type *t*. Under the estimated parameters and given the full sequence of choices that person *i* actually made, the probability of making those choices if person *i* is type *t* is

$$\Gamma_t\left(\beta,\sigma,\rho\right)=\prod_{k=1}^{26}\Lambda_{\mathrm{tk}}\left(\beta_t,\sigma_t,\rho_t\mid\pi_i,\pi_j\right)^{\mathrm{d_{ki}}}\times\left(1-\Lambda_{\mathrm{tk}}\left(\beta_t,\sigma_t,\rho_t\mid\pi_i,\pi_j\right)^{(1-\mathrm{d_{ki}})}\right)$$

Using Bayes' rule with the estimated mixing proportions p_t as priors of being type *t*, the posterior probability that *i* is type *t* is just

$$P_t=\frac{p_t\Gamma_t(\beta,\sigma,\rho)}{\sum_{t=1}^{4}\Gamma_t(\beta,\sigma,\rho)}\quad .$$

We then categorize individuals as type t based on their posterior probability of being type *t*. In particular, we assign *i* type *t* if $P_t = max\{P_1 \ldots P_4\}$.[29]

<Table 3 about here.>

Table 3 shows that the posterior probabilities used for type assignment are above 90% for all but a few subjects. The best estimated type assignment is dominance-seeking; each subject designated as dominance-seeking has 100% probability of being of this type. Assignment to selfish is almost as precise, with all but one subject having above a 90% posterior probability of being this type. Total income maximizers and inequity averse types are only a bit less precisely assigned; this slightly smaller precision is due to the fact that these types exhibit somewhat similar behavior, which is less distinctive than selfish and dominance-seeking behavior.

The estimation from the mixture model and the characterization of each individual subject in this section give us our first result:

Result 1: Individuals exhibit significant heterogeneity in social preferences, with subjects having one of four distinct sets of utility parameters that almost completely describe their choices: individuals are either selfish, total income maximizing, inequity averse or dominance seeking.

IV.D. *Goodness of Fit: The Importance of Heterogeneity*

This section demonstrates that estimating heterogeneous social preferences yields a significantly better fit to subject's actual choices. To see the divergence of choices from the average, Panel B of Table 2 gives, for each of the four types produced by the mixture

25. For ease of exposition, we present the results where each individual is assigned a type based on the highest posterior probability. All the results below hold when individuals are characterized by a weighted average of types, using individual posterior probabilities for each type (available upon request).

model, the probabilities of choosing the bottom row for three specific matrices representing canonical tradeoffs. In matrix 15, the bottom row is dominance seeking; in matrix 5 the bottom row reduces inequity without lowering total income; in matrix 17 the bottom row reduces inequity but also lowers total income. To take just one example, on average 40% of individuals would choose the bottom row in Matrix 5. In fact, 30% of the population (selfish plus dominance-seeking types) would almost never make such a choice and another 34% (inequity averse types) are about 1.4 times as likely to make this choice than the population average implies.

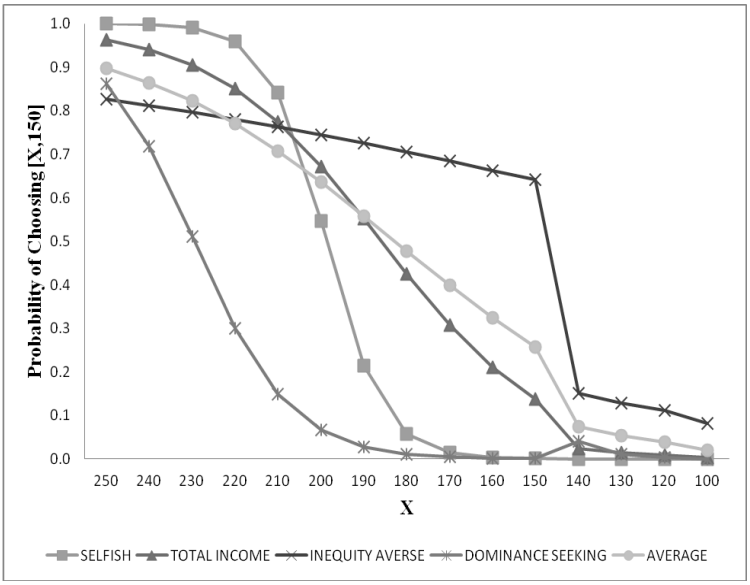


Figure 6. Probabilities of Choosing [*X*, 150] for Four Estimated Types

Figure 6 illustrates how the four estimated types capture distinctly different choices patterns. Consider two allocations [200,100] and [*X*,150], where *X* varies from 250 to 100. Figure 6 gives the probability each estimated type would choose the allocation [*X*,150] for different values of *X*. Selfish individuals would choose [*X*,150] with high probability (100% to 85%) as long as *X* is greater than 200. The probability quickly drops to zero for *X* less than 200; that is, selfish individuals would not choose

[X,150] as soon as it entails a loss in own income. Inequity-averse individuals would choose [X,150] with rather constant 80% to 70% probability as long as X is greater than 150.[30] The probability drops to 15% after X=150, where incomes are equal.

Total income maximizing can be seen as hybrid of selfish and inequity-averse choices. Like selfish types, total income maximizers have a higher probability of choosing the bottom row, until X=200. Like inequity-averse types, the probability remains high for X>200, with a slight kink at X=150. Dominance-seeking types give up own income more often than any other type. While the probability of choosing [X,150] is close to other types at X=250, the probability falls quickly, reaching less than 10% at X=200.

Finally, we conduct formal tests of goodness of fit, which can be found in the on-line Appendix. A simple Chi-square test of twice the difference in the log likelihoods of the two models rejects the model without heterogeneity at the 1% level. Further tests show the predictive power of the heterogeneous model over the homogeneous model. As a point of comparison, a model of random choice would predict 50% of choices correctly. The model with a single set of utility parameters predicts 72.4% of choices correctly with a confidence interval of 71.2% to 73.2%. The model with four sets of utility parameters predicts 82.6% of choices correctly with a confidence interval of 82.2% to 83.4%. This is a sound rejection of the single-set-of-parameters model. The single-set-of-parameters model fits Inequity Averse and Dominance Seeking types most poorly, predicting only 62.5% and 62.6% of choices correctly. The four-type model correctly predicts 76.2% and 91.8%, respectively, of choices for these types. These tests yield our second result:

30. The probabilities for the average appear here to match most closely the probabilities for a total-income maximizing subject, in contrast to the utility parameter estimation reported in Table 2. The reason is found in the 5-type model, where total income-maximizing subjects bifurcate into two sub-types, one of whose parameters are close to the inequity-aversion parameters. See on-line Appendix for he five-type model.

Result 2: A model of individual heterogeneity provides significantly better predictions of subjects' choices.

V. Social Preferences, Group Divisions, and Identity

This section asks how group divisions affect individual social preferences. A person who is inequity averse in the non-group condition, for example, could be selfish in a group treatment when allocating income to someone in the other group. To test for such possibilities, we consider each individual's choices and classify each individual as a type in each condition/match.[31] We then compare distributions of social preferences across non-group and group treatments and between You-Own and You-Other matches within group treatments.

V. A. *Distributions of Social Preferences across and within Conditions*

For the subject population, Table 4 provides the distribution of types in each condition and match.

<Table 4 about here.>

Across Conditions: Non-Group vs. Group Treatments. Comparing the control to group treatments for You-Own matches, the distribution shifts from total income maximizing to inequity aversion. In minimal group You-Own matches compared to the control, for example, fewer subjects are total income maximizers, 27% vs. 37%, and more are inequity averse, 40% vs. 33%.

31. We again use subjects' own choices to make these classifications. We define four utility functions using the estimated parameters in the non-group control. We then consider the probability each subject's choices were generated by each of these utility functions, in each condition-match. These probabilities give us each subject's categorization in each condition-match. An alternative method would estimate new utility function parameters for each condition-match. Rather than hold the specification of utility functions constant, this alternative would have the utility functions for each type to change across conditions. The results, available upon request, are qualitatively similar to what is presented in the paper.

Comparing You-Other matches to the control, there is a large shift from inequity aversion/total income maximization to selfish and dominance-seeking. In the minimal group You-Other many more subjects are selfish (30%) and dominance-seeking (16%). For political group You-Other matches, 35% of subjects are "selfish" and 21% are dominance-seeking. Fewer subjects are total income maximizers, with only 21% in minimal group You-Other matches and 13% in political group You-Other matches.

Within Group Treatments. More subjects are dominance-seeking and selfish towards out-group members. For minimal group You-Other matches, 16% of subjects are dominance-seeking, compared to 4% in You-Own matches. The pattern in the political treatment is even more pronounced (21% vs. 1%).

<Table 5 about here.>

Table 5 reports the Chi-squared tests for the differences in distributions for the population and tests for group treatment effects: We can reject that the minimal group You-Other distribution is the same as the control and reject that the political You-Other distribution is the same as the control. In addition, subjects in both group treatments distinguish between in-group and out-group members; we can reject for both the minimal group and the political group that You-Own and You-Other distributions are the same. However, we are not able to reject that the political group distributions are the same as the minimal group distributions.

Result 3: For the subject pool as a whole, there is a significant group treatment effect. More subjects are dominance seeking and selfish in You-Other matches compared to the control. There is no significant difference in the distributions for the minimal group and the political group treatments.

VI. B. *Individual Subjects across Conditions*

<Table 6 about here.>

Looking at individuals, we see that some subjects do not change their choices across conditions/matches, but for others social context changes their behavior. Table 6 provides the number of subjects that are type *x* in one condition/match and type *y* in another. It gives three cross-tabulations: non-group vs. political group You-Other, minimal group You-Own vs. minimal group You-Other, and political group You-Own vs. political group You-Other.

On the diagonals: Subjects who are selfish in the control tend to stay selfish in most conditions and matches. Subjects who are dominance seeking in the control tend to stay dominance-seeking in most conditions and matches.

On the off-diagonals: Many subjects who are total-income-maximizing or inequity averse in the control or You-Own group matches are dominance-seeking or selfish in group You-Other matches. Consider the 52 subjects who are total income maximizing in the control (Panel A). In political group You-Other matches, only 17 of them are total-income-maximizing, 16 become selfish, and 11 become dominance-seeking. Comparing You-Own vs. You-Other in the group treatments, there is a similar pattern. Most selfish subjects in You-Own matches are also selfish in You-Other matches. But many subjects switch from inequity averse or total income maximizing in You-Own matches to dominance-seeking in You-Other matches. For example, of the 67 subjects who are inequity-averse in political group-You-Own matches (Panel C), only 39 are inequity averse in political group-You-Other matches; 6 are total income maximizing, but 18 are dominance-seeking and 4 are selfish.

V.C. *Differences in Responsiveness to Group Treatments and Identity*

This section considers heterogeneous response to group treatments, comparing party to non-party affiliates. Tables 7 and 8 provide the distributions of social preferences for Democrats and D-Independents, respectively, by condition and by match.[32] Chi-squared tests are reported in Tables 9 and 10.

<Tables 7, 8, 9 and 10 about here.>

For Democrats, the distributions of social preferences show a general group treatment effect. There is a significant difference between the control and group treatments distributions (minimal group You-Other, political group You-Own, and political group You-Other), but no significant difference between the minimal group and the political group distributions. Within each group treatment, there is more dominance seeking and more selfishness when subjects are in opposite groups. While this behavior is more prevalent in the political treatment than the minimal group treatment, we cannot reject the hypothesis that the distributions are the same.

For the D-Independents, the distributions of social preferences show only a political group treatment effect. These subjects behave similarly in the minimal group treatment as in the non-group control. For both minimal group You-Own and You-Other matches, we cannot reject that the distributions of types are the same as in the control. Moreover, within the minimal group treatment, we cannot reject that the distributions for You-Own and You-Other matches are the same; for D-Independents there does not appear to be in-group/out-group bias in this case. In the political treatment, in contrast, there is a significant in-group/out-group bias, where subjects become dominance seeking

32. Distributions for Republicans and R-Independents are provided in the online Appendix.

or selfish against out-group members (political group You-Own vs. You-Other). We can reject that the political group You-Other distribution is the same as the minimal group You-Other distribution.

The D-Independent distributions of social preferences are different than that of the Democrats in the political condition. In You-Other matches, only 15% of D-Independents are dominance-seeking compared to 24% of Democrats. Half of D-Independents (50%) are total-income maximizing or inequity-averse, compared to 38% of Democrats, and the breakdown between these two types shows that more D-Independents are inequity-averse, in this condition/match and indeed in all conditions.

Result 4: The group treatment effect varies across the subject pool. A well-defined subset of the population (non-political party affiliates) does not change behavior in the minimal group treatment, but does change behavior in the socially salient political treatment.

The results indicate that individual identities relate to behavior in the group contexts. Not all individuals respond to arbitrary group divisions. D-Independents do not respond to the minimal group treatment, perhaps reflecting a preference for not joining groups. But when facing subjects who are significantly different in terms of political identity (i.e., they identify with the Republican party and hold opposite political views), D-Independents adopt different behavior. Some become dominant seeking, but others become inequity averse. The D-Independents react differently than Democrats to the political group treatment; the Chi-squared test reported in Table 10 shows we can reject that the distribution of social preferences is the same for You-Other matches.[33]

V. D. *Participants' Self-Reported Motives: Results from Post-Experiment Survey*

33. For minimal group You-Other matches, the distributions for Democrats and D-Independents look to be different but due to the weak power of the test we cannot reject that they are the same.

Subjects' own ranking of objectives matches their classifications in the statistical model. At the end of the experiment, subjects were asked to rank four objectives: (A) maximizing payoff to self, (B) minimizing difference in payoff to self and other, (C) maximizing the total of payoffs to self and other, and (D) maximizing the difference between self and other. They were asked whether each was "very important," "somewhat important," or "not important;" in their recollection of how they made their choices in the various parts of the experiment for different pairings.

<Table 11 about here.>

Table 11 gives responses of subjects of each estimated type, for the non-group control and political group You-Other matches. In the non-group control, 88% of selfish subjects and 100% of dominance seeking subjects said that maximizing payoff to self was very important, in contrast to 22% of inequity-averse subjects. While payoff to self was very important for both selfish and dominance-seeking subjects, only 3% of selfish subjects reported that maximizing the difference was very important, while 86% (6 out of 7) of dominance-seeking subjects did. Similarly 95% of inequity-averse subjects reported most equal payoffs as being very important or somewhat important, in contrast to 41% of selfish and 14% of dominance-seeking individuals. Table 11 also supports the notion that total income maximizing types are difficult to classify – being selfish in some dimensions and inequity-averse types in others.

In the political treatment, the reported objectives again match our classifications. Both selfish and dominance-seeking subjects report that maximizing payoffs to self is very important (94% and 97%, respectively). Dominance seeking types report maximizing the difference in payoffs is very important (73%) while selfish types do not

(8%). Very few selfish or dominance-seeking types report that most equal payoffs is important in any way, but 83% of inequity-averse types report do.

VI. Conclusion

From the sandlot, where a friendly pick-up game can turn into a brawl, to the public square where a democracy movement can turn into a civil war, people form groups that alternatively coalesce or conflict. This experiment studies individual behavior in group settings. It builds on the long history of experiments in social psychology on group conflict and on the established literature in economics on social preferences. The experiment strips away social interactions, punishments, collective benefits and other dynamics that might drive people to help or hurt others in different groups. The simplicity of the experiment places the focus on individuals' underlying predispositions. With a new design and methods, the paper asks whether individuals themselves may be more or less prone to treat people differently, and whether individual identities and the personal salience of groups relate to their treatment of others.

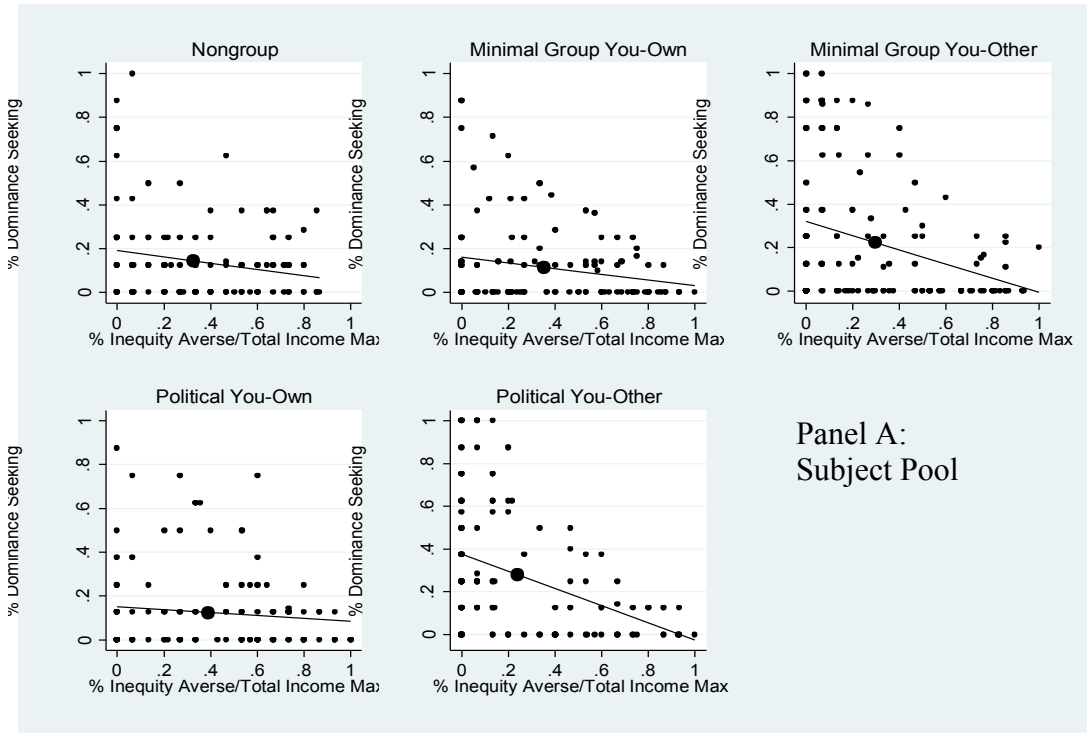
Subjects make simple choices between allocations of income to self and others. Each subject allocates income in a control and two group settings—minimal group and political group—in both in-group pairings and out-group pairings. Using a finite mixture model, we estimate social preferences allowing for distinct types of social preferences and classify the preferences of each individual subject.

The results reveal a high degree of individual heterogeneity both in social preferences and in response to group treatments. In the non-group control, 25% of subjects are selfish, 36% are total-income maximizing, 34% are inequity averse, and 5% are dominance-seeking. For the subject pool as a whole, there are significant group

treatment effects. In the political group condition in out-group pairings, selfish subjects comprise 35% of the population and dominance-seeking subjects 21% in out-group pairings. The heterogeneous-type model yields significantly better predictions of actual choice behavior, and subjects' self-reports match their choices.

This group treatment effect, we find, is not uniform across the population. Democrats exhibit this behavior in both the minimal group and political group treatments. Not so for Independents who are otherwise observationally equivalent to Democrats. These Independents do not change their behavior in the minimal group setting, adopting a bias only in the political setting.

These results support the call for a richer model of individual choice—one that includes identities and social contexts as key variables. The results speak to the remarkable variety of human behavior in situations of group conflict. While some people actively engage in wars and disputes, sacrificing their lives or livelihoods, there are others who seek ways to profit. In the midst of genocides, there are people who risk everything to protect others from harm. The experiment gives statistical evidence for possible sources of this heterogeneity—individual differences in basic social preferences, individual differences in predispositions towards groups, and differential attachment to groups related to individual identities. While the paper studies groups, identity and social preferences, the methods we develop are general and pave the way to study individual heterogeneity and its sources in any economic context.



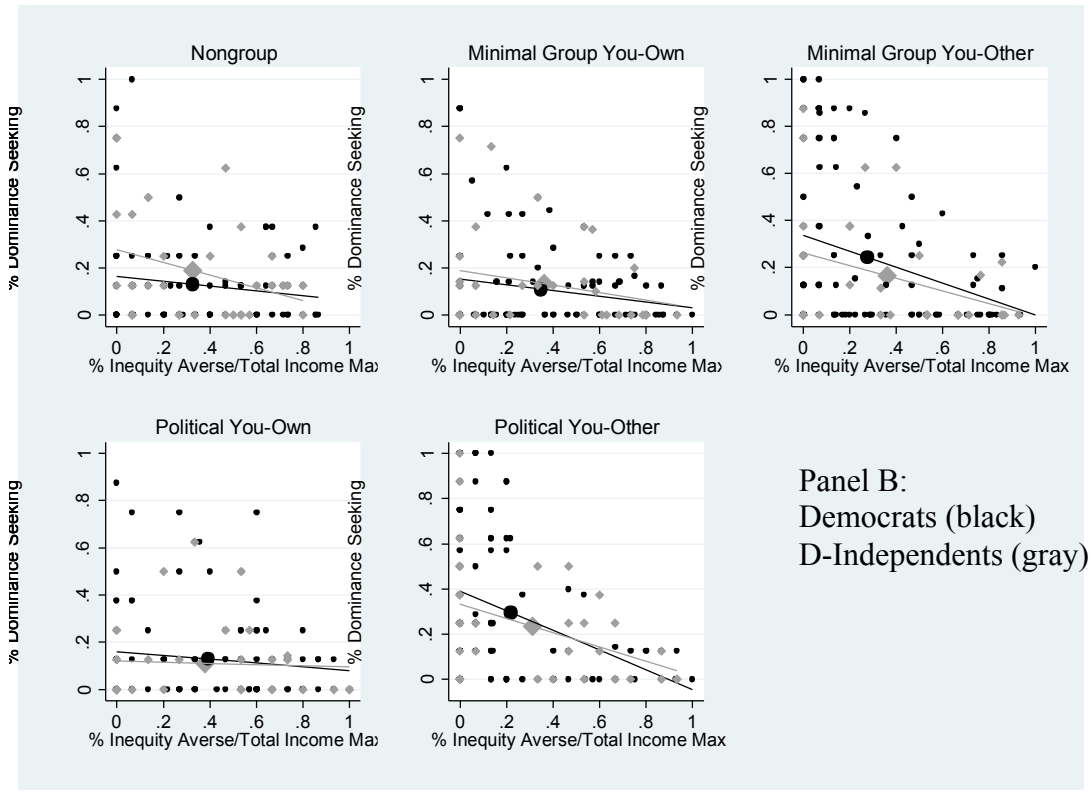
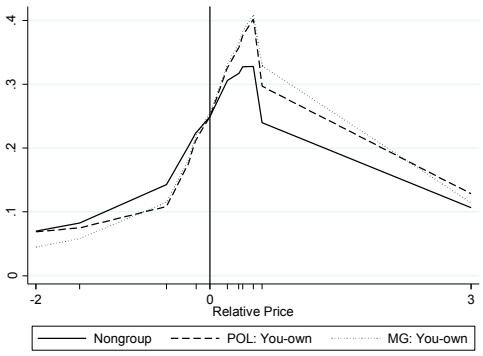
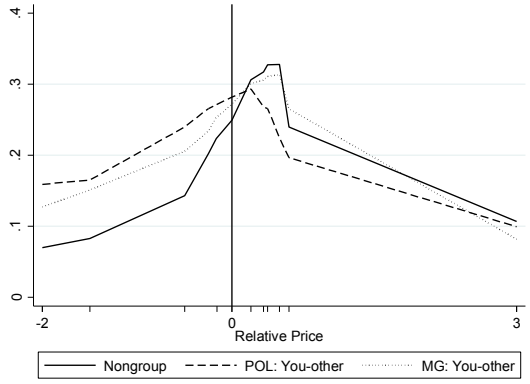


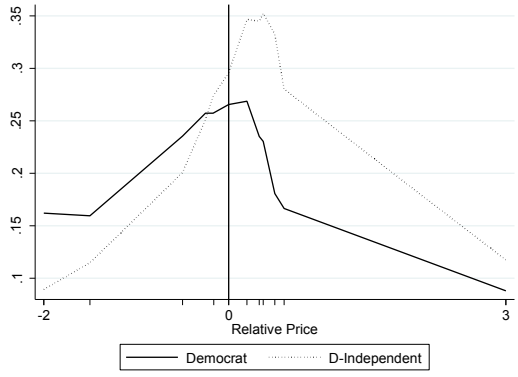
Figure 3. Individual Subjects' Choices in Dominance Seeking vs. Inequity Averse/Total Income Maximizing Matrices



(a) Subject Pool: Non-Group vs. Group You-Own Matches



(b) Subject Pool: Non-Group vs. Group You-Other Matches



(c) Democrats vs. D-Independents: Political You-Other Matches

Figure 4. Fraction Choosing Bottom Row in Matrices Ranked by $\Delta\pi_i/(\Delta\pi_i - \Delta\pi_j)$

Table 2. Results from Mixture Model—Non Group Control

PANEL A:	**Parameter Estimates and Proportions for Four Types versus Population** Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1				
Utility Function Parameters	Type 1	Type 2	Type 3	Type 4	Population
Beta	0.152***	0.0655***	0.0312***	0.0367***	0.0436***
	(0.0134)	(0.00441)	(0.00310)	(0.00980)	(0.00168)
Rho	-0.00372	-0.0144***	-0.0214***	0.0528***	-0.0112***
	(0.00254)	(0.00157)	(0.00138)	(0.0106)	(0.000655)
Sigma	0.00489*	0.00544**	-0.00747***	-0.0439***	-0.00247**
	(0.00287)	(0.00240)	(0.00240)	(0.0169)	(0.00124)
Observations	3,636	3,636	3,636	3,636	3,636
Proportion of Type	25 %	36 %	34 %	5 %	100%
Category Implied by Parameters	SELFISH	TOTAL INCOME MAX	INEQUITY AVERSE	DOMINANCE SEEKING	INEQUITY AVERSE

Panel B:	**Implied Probability of Choosing Bottom in Canonical Matrices**				
Matrix 15 [140 100],[120,0]	0.034	0.079	0.088	0.970	0.146
Matrix 5 [120 80],[100,100]	0.053	0.324	0.558	0.055	0.396
Matrix 17 [140 120],[80,80]	0.000	0.026	0.191	0.037	0.084

Table 3. Posterior Probabilities of Being Classified Type in Non-group Condition

Posterior Probability of:	Obs.	Mean	Std. Dev.	Min	2nd Low	Max
SELFISH (Type 1)	35	0.966	0.051	0.725	0.908	0.999
TOTAL INCOME MAX (Type 2)	52	0.932	0.096	0.541	0.717	0.999
INEQUITY AVERSE (Type 3)	47	0.971	0.067	0.588	0.865	1.000
DOMINANCE (Type 4)	7	1.00	0.000	1.000	1.000	1.000

Table 4. Distribution of Types, by Condition and Match
POPULATION

PANEL A: NON-GROUP

Type	Freq.	Percent
SELFISH	35	25
TOTAL INCOME	52	37
INEQUITY AVERSE	47	33
DOMINANCE	7	5
Total	141	100

PANEL B: MINIMAL GROUP

	YOU-OWN		YOU-OTHER	
Type	Freq.	Percent	Freq.	Percent
SELFISH	40	28	42	30
TOTAL INCOME	38	27	30	21
INEQUITY AVERSE	57	40	47	33
DOMINANCE	6	4	22	16
Total	141	100	141	100

PANEL C: POLITICAL GROUP

	YOU-OWN		YOU-OTHER	
Type	Freq.	Percent	Freq.	Percent
SELFISH	42	30	50	35
TOTAL INCOME	26	18	18	13
INEQUITY AVERSE	71	50	43	31
DOMINANCE	2	1	30	21
Total	141	100	141	100

Table 5. Chi-Squared Test of Differences in Distribution of Types
POPULATION

Comparison	Test Statistic	** P-Val < 0.05 * P-Val < 0.10
Non-Group vs.:		
Minimal Group You-Own	3.55	
Minimal Group You-Other	14.30	**
Political Group You-Own	16.96	**
Political Group You-Other	33.64	**
Minimal Group You-Own vs. You-Other	11.09	*
Political Group You-Own vs. You-Other	33.53	**
Minimal Group You-Own vs. Political Group You-Own	5.83	
Minimal Group You-Other vs. Political Group You-Other	5.10	

Table 6. Cross Tabulations of Individual Subjects by Condition/Match

Panel A

		Political Group You-Other				
		SELFISH	TOTAL INC	INEQUI	DOMIN	
Non-Group Control	SELFISH	28	3	0	4	35
	TOTAL INC	16	17	8	11	52
	INEQUI	1	5	33	8	47
	DOMIN	0	0	0	7	7
	Total	45	25	41	30	141

Panel B

		Minimal Group You-Other				
		SELFISH	TOTAL INC	INEQUI	DOMIN	Total
Minimal Group You-Own	SELFISH	34	5	1	0	40
	TOTAL INC	4	20	9	5	38
	INEQUI	4	6	36	11	57
	DOMIN	0	1	0	5	6
	Total	42	32	46	21	141

Panel C

		Political Group You-Other				
		SELFISH	TOTAL INC	INEQUI	DOMIN	Total
Political Group You-Own	SELFISH	34	3	0	4	41
	TOTAL INC	7	16	2	5	30
	INEQUI	4	6	39	18	67
	DOMIN	0	0	0	3	3
	Total	45	25	41	30	141

Table 7. Distribution of Social Preferences, by Condition and Match
DEMOCRATS

PANEL A: NON-GROUP		
	YOU-OTHER	
Type	Freq.	Percent
SELFISH	15	22
TOTAL INCOME	27	40
INEQUITY AVERSE	21	31
DOMINANCE	5	7
Total	68	100

PANEL B: MINIMAL GROUP				
	YOU-OWN		YOU-OTHER	
Type	Freq.	Percent	Freq.	Percent
SELFISH	18	26	20	29
TOTAL INCOME	20	29	15	22
INEQUITY AVERSE	26	38	20	29
DOMINANCE	4	6	13	19
Total	68	100	68	100

PANEL C: POLITICAL GROUP				
	YOU-OWN		YOU-OTHER	
Type	Freq.	Percent	Freq.	Percent
SELFISH	18	26	26	38
TOTAL INCOME	14	21	11	16
INEQUITY AVERSE	34	50	15	22
DOMINANCE	2	3	16	24
Total	68	100	68	100

Table 8. Distribution of Social Preferences, by Condition and Match
DEMOCRAT-LEANING INDEPENDENTS

PANEL A: NON-GROUP		
	YOU-OTHER	
Type	Freq.	Percent
SELFISH	9	26
TOTAL INCOME	11	32
INEQUITY AVERSE	12	35
DOMINANCE	2	6
Total	34	100

PANEL B: MINIMAL GROUP				
	YOU-OWN		YOU-OTHER	
Type	Freq.	Percent	Freq.	Percent
SELFISH	11	32	9	26
TOTAL INCOME	5	15	10	29
INEQUITY AVERSE	16	47	13	38
DOMINANCE	2	6	2	6
Total	34	100	34	100

PANEL C: POLITICAL GROUP				
	YOU-OWN		YOU-OTHER	
Type	Freq.	Percent	Freq.	Percent
SELFISH	12	35	12	35
TOTAL INCOME	5	15	1	3
INEQUITY AVERSE	17	50	16	47
DOMINANCE	0	0	5	15
Total	34	100	34	100

Table 9. Chi-Squared Test of Differences in Distribution of Types in Condition/Match within Democrats and within D-Independents

	DEMOCRATS		D-INDEPENDENTS	
Comparison	Test Statistic	** p < 0.05 * p < 0.10	Test Statistic	** p < 0.05 * p < 0.10
Non-Group vs.:				
Minimal Group You-Own	5.05		0.66	
Minimal Group You-Other	7.72	*	0.88	
Political Group You-Own	17.96	**	6.31	*
Political Group You-Other	16.45	**	10.62	**
Minimal Group You-Own vs. You-Other	6.37	*	2.18	
Political Group You-Own vs. You-Other	20.07	**	7.70	*
Minimal Group You-Own vs. Political Group You-Own	2.79		2.07	
Minimal Group You-Other vs. Political Group You-Other	2.42		9.39	**

Table 10. Chi-Squared Test of Differences in Distribution of Types in Condition/Match between Democrats and D-Independents

Comparison	Test Statistic	** p < 0.05 * p < 0.10
Democrat Non-Group vs.:		
D-Independent Non-Group	0.724	
Democrat MG You-Own vs.:		
D-Independent MG You-Own	2.704	
Democrat MG You-Other vs.:		
D-Independent MG You-Other	3.814	
Democrat Pol You-Own vs.:		
D-Independent Pol You-Own	2.021	
Democrat Pol You-Other vs.:		
D-Independent Pol You-Other	8.946	**

Table 11. Subjects' Self-Reports of Importance of Objectives

	Panel A Non Group			**Panel B Political You-Other**		
Estimated Type						
(A) Highest for Me Importance						
	Very	Somewhat	Not	Very	Somewhat	Not
Selfish	88.2%	11.8%	0.0%	93.9%	6.1%	0.0%
Tot Income	71.2%	28.8%	0.0%	77.8%	22.2%	0.0%
Inq Averse	22.2%	57.8%	20.0%	31.7%	48.8%	19.5%
Dominant	100.0%	0.0%	0.0%	96.7%	3.3%	0.0%
(B) Most Equal Importance						
	Very	Somewhat	Not at All	Very	Somewhat	Not at All
Selfish	5.9%	35.3%	58.8%	2.0%	20.4%	77.6%
Tot Income	13.5%	61.5%	25.0%	11.1%	44.4%	44.4%
Inq Averse	53.3%	42.2%	4.4%	41.5%	41.5%	17.1%
Dominant	14.3%	0.0%	85.7%	3.3%	13.3%	83.3%
(C) Largest Total Importance						
	Very	Somewhat	Not at All	Very	Somewhat	Not at All
Selfish	20.6%	32.4%	47.1%	12.2%	26.5%	61.2%
Tot Income	28.8%	38.5%	32.7%	16.7%	44.4%	38.9%
Inq Averse	53.3%	33.3%	13.3%	48.8%	36.6%	14.6%
Dominant	28.6%	14.3%	57.1%	10.0%	10.0%	80.0%
(D) Highest Difference Importance						
	Very	Somewhat	Not at All	Very	Somewhat	Not at All
Selfish	2.9%	20.6%	76.5%	8.2%	24.5%	67.3%
Tot Income	9.6%	11.5%	78.8%	11.1%	16.7%	72.2%
Inq Averse	11.1%	13.3%	75.6%	12.2%	19.5%	68.3%
Dominant	85.7%	14.3%	0.0%	73.3%	20.0%	6.7%

Notes:
Questions about importance of objectives were:
"For each of the following statements, please evaluate the importance of the statement in making your choice:
(A) I chose the option that had the highest point total for me.
(B) I chose the option that came closest to making both point totals equal.
(C) I chose the option that resulted in the largest point total for both me and the other person together.
(D) I chose the option that had the biggest difference in point totals between me and the other person."

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Appendix

Instructions to Participants

PAGE 1

WELCOME!

INSTRUCTIONS

Thank you for participating in this experiment. The object of this investigation is to study how people make decisions. There is no deception in this experiment – and we want you to understand everything about the procedures. If you have any questions at any time, please ask the experiment organizer in the room.

PART I: THE CHOICE TASK

A) During the experiment, you will be presented with a series of choices. For each choice, you will be asked to award points to between either (1) yourself and another participant or (2) two other participants. You will earn the points you allocate to yourself, and the other person will earn the points you allocate to him or her. At the end of the experiment, one of your choices will be selected at random by a computer and the points earned will be converted into payments.

Each decision is independent from the others. Your decisions and outcomes in one choice will not affect your outcomes in any other choice. For each choice, you will be paired with new participants.

Use LEFT and RIGHT arrow keys to make your choices.

PART II and III:

A) INITIAL SURVEY
You will take a brief survey. There are no right or wrong answers. Your answers to these questions will not affect your payments. Please only use the RIGHT and LEFT arrow keys or NUMBER keys as instructed to answer all questions.

B) THE CHOICE TASK
After completing the initial survey, you will once again be presented with a series of choices. You will be anonymously paired with two new participants. These participants will remain the same throughout this part of the experiment. At the end of the experiment, one of your choices will be selected at random by a computer and the points earned will be converted into payments. Each decision is independent from the others. Your decisions and outcomes in one choice will not affect your outcomes in any other choice.

TURN PAGE OVER FOR ADDITIONAL INSTRUCTIONS

PAGE 2

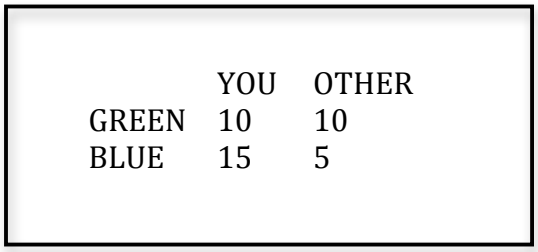
PAYMENT

At the end of the experiment, the points you get will be converted into money by a predetermined conversion factor. This money will be added to your $6 participation payment and given to you at the end of the experiment. Since we want you to focus on completing the experiment and not calculating points to money conversions, we will not inform you of the conversion factor. However, we expect participants to earn between $12 and $18, with an average of $15.

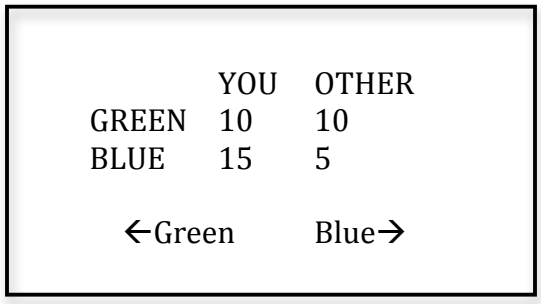
SETUP

You will make all choices on a computer screen. You will make approximately 200 choices.

For each choice, you will see a screen that presents the two different points allocations you can make.



After a one second pause, two arrows will appear so you can pick which allocation you prefer. You can press either 'LEFT' or 'RIGHT' arrow keys on the keyboard to match the arrows presented on the screen. Please only touch the RIGHT or LEFT arrow keys for all choices.



Are there any questions? Press any key to begin.

Table A1. Normalized Matrices and Social Objectives

A. Matrices where $\pi_i \geq \pi_j$ in both rows, ordered by $\Delta\pi_i/(\Delta\pi_i - \Delta\pi_j)$

Matrix Number	(π_i, π_j) (π'_i, π'_j)		Social Objective	$\Delta\pi_i/(\Delta\pi_i - \Delta\pi_j)$
14	140	100	Dominance	-2
	100	40		
12	140	100	Dominance	-1.5
	80	0		
16	140	100	Dominance	-0.5
	120	40		
19	140	140	Dominance	-0.5
	120	80		
15	140	100	Dominance	-0.25
	120	0		
18	140	140	Dominance	-0.16
	120	0		
1	100	100	Dominance	0
	100	20		
7	140	20	Inequity Aversion/ Total Income Max	0.2
	120	100		
9	140	40	Inequity Aversion/ Total Income Max	0.2
	120	120		
10	140	60	Inequity Aversion/ Total Income Max	0.33
	120	100		
11	140	80	Inequity Aversion/ Total Income Max	0.33
	120	120		
21	160	0	Inequity Aversion/ Total Income Max	0.375
	100	100		
5	120	80	Inequity Aversion	0.5
	100	100		
22	160	40	Inequity Aversion	0.5
	120	80		
25	200	0	Inequity Aversion	0.5
	100	100		
26	200	0	Inequity Aversion	0.5
	180	20		
8	140	40	Inequity Aversion	0.6
	80	80		
17	140	120	Inequity Aversion	3
	80	80		
13	140	100	None	NA
	80	40		

B. Matrices where $\pi_i < \pi_j$ in at least one rows ordered by $\Delta\pi_i/(\Delta\pi_i - \Delta\pi_j)$

Matrix Number	(π_i, π_j) (π'_i, π'_j)		Social Objective	$\Delta\pi_i/(\Delta\pi_i - \Delta\pi_j)$
3	100	200	Inequity Aversion/ Dominance	0
	100	100		

4	100	200	Inequity Aversion/ Dominance	0
	100	140		
2	100	140	Dominance	0
	100	60		
6	140	0	Inequity Aversion/ Total Income Max	0.125
	120	140		
23	160	80	Inequity Aversion/ Total Income Max	0.2
	140	160		
20	140	140	Total Income Max	0.33
	120	180		
24	160	120	Total Income Max	0.33
	140	160		

Table A2. Demographics and Political Opinions of Democrats and D-Independents

Demographics & Distribution of Answers to Political Survey (in fractions)	**Democrat** (N=68)	**D-Independent** (N=34)	**T-test of Difference**
Fraction Female	0.72	0.65	0.756
Fraction White	0.40	0.32	0.718
Fraction Asian	0.32	0.44	1.161
Attends religious services at least once a week:			
No	0.81	0.82	0.178
Yes	0.19	0.18	
Would you have less social security & medicare for smaller government :			
No	0.82	0.79	0.356
Yes	0.18	0.21	
Bush Tax Cuts Should be:			
Allowed to Expire	0.78	0.88	1.256
Made Permanent	0.22	0.12	
Abortion Should be:			
Generally Available	0.73	0.62	1.214
Under Stricter Control	0.24	0.35	1.252
Not Available	0.03	0.02	0.000
Gay Marriage Should be:			
Legally Recognized	0.75	0.79	0.491
Civil Unions Only	0.16	0.12	0.588
Not Recognized	0.09	0.09	0.000
Arizona Immigration Law:			
Goes Too Far	0.63	0.68	0.435
Is About Right	0.35	0.29	0.589
Does not Go Far Enough	0.02	0.03	0.501