Do Unto Others:

A Theory and Experimental Test of Interpersonal Factors in Decision Making Under Uncertainty*

by

Joyce E. Berg
and
Thomas A. Rietz

College of Business Administration
University of Iowa
Iowa City, Iowa 52242-1000

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Abstract

Using a very simple method, we isolate and study precisely how interpersonal factors may influence individuals' decisions under uncertainty. We develop and test a model of individual behavior that encompasses the interpersonal concepts of altruism, malice, competitiveness (or, more properly, distinction) and fairness in decision making. As Veblen (1909) suggests, the relative importance of such factors may vary with the institutions governing decision maker behavior. Experimentally, we study five such situations, three of which parallel decision making in partnership, bargaining and auction situations. Preliminary results show that, when acting alone, individuals appear risk-neutral to slightly risk averse on average in a simple choice task. However, their risk aversion (measured using the same task) appears to shift when their decisions also affect other participants. Thus, interpersonal factors may account for anomalous patterns of risk aversion within particular institutions and differences in apparent risk aversion across institutions.

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I. Introduction

Most economic models assume self-interested, maximizing agents. Most models under uncertainty assume agents maximize expected utility functions with final wealth as the only argument.[1] However, when facing uncertainty, experimental subjects often appear not to maximize expected utility.[2] Economists have developed various non-expected utility models in response. While they relax some assumptions of expected utility theory, most such utility models still assume self interested agents who maximize some perceived notion of their own well-being, independent of what happens to others.[3] As Veblen (1909, p. 627) puts it, "conceived in hedonistic terms," conventional economic theory "concerns a disconnected episode in the sensuous experience of an individual."

A large body of experimental research shows that, when choosing between alternative risky propositions, subjects often appear not to maximize expected utility.[4] Instead, a variety of framing effects and probability judgement biases appear to affect choices.[5] In response, economists have developed and experimentally tested various non-expected utility models.[6] Many

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[1]Von Neumann and Morgenstern (1944), Allais (1953) and Arrow (1953) firmly established this precedent.

[2]For examples and summaries of this evidence, see Kahneman and Tversky (1979), Machina (1982 and 1987) and Samuelson and Zeckhauser (1988), among others.

[3]For some examples of such non-expected utility theories, see Bell (1982), Gul (1991), Kahneman and Tversky (1979), Loomes and Sugden (1982), Machina (1982), etc.

[4]See Machina (1987) for a survey.

[5]These are too numerous to list here. For examples, see Machina (1987), Kahneman and Tversky (1979), many of the Journal of Economic Perspectives "Anomalies" sections and most of the Journal of Business, Volume 59, Number 4.

[6]See Sugden (1986) and Weber and Camerer (1987) for reviews of a number of alternative models. See Battalio, Kagel and Jiranyakul (1990) for a summary of and experimental tests of some non-expected utility models.

researchers model agents who care about their payoff levels relative to some benchmark as well as their absolute payoff levels. Prospect theory (Kahneman and Tversky, 1979) proposes a benchmark payoff level of 0. Regret theory (Bell, 1982, and Loomes and Sugden, 1982) is used to compare two gambles. The benchmark is the outcome of the other gamble. Disappointment theory (Bell, 1988, and Gul, 1991) uses the expected value or the certainty equivalent of a gamble as the benchmark.

Experimental research subjects also often appear care about the payoffs others receive in interactive games with certain payoffs. In particular, Pareto dominant and "fair" equilibria appear to attract subjects.[7] Further, how the problem is presented affects behavior.[8] The research in social psychology shows that subjects care about the payoffs others receive in a wider variety of situations with certainty. Further, a subject's relationship with or attitude toward the other affects choices.[9] In response, researchers have developed and tested new choice models that include interpersonal payoff comparison arguments. For example, MacCrimmon and Messick (1976) identify several factors influencing choices in social situations.[10] Scott (1972) proposes that egalitarianism affects choices.[11] Many of these factors appear to affect decisions when subjects interact with each other (i.e., when one's payoffs are affected by one's own and the other subject's actions). These lines of research contrast sharply and the large body of experimental research in which conventional economic theory “works” as predicted.

Here, we begin to explore several aspects of these interpersonal effects. We wish to study whether interpersonal factors affect choices under uncertainty and how much of the effect is

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[7]For examples, see Cooper, DeJong, Forsythe and Ross (1990 and 1992).

[8]For example, see Hoffman and Spitzer (1982) and Hoffman, McCabe, Shachat and Smith (1992).

[9]See Loewenstein, Thompson and Bazerman (1989) for a summary of such research in dispute situations.

[10]Four of these are based on payoff comparisons, including ones analogous to our later definitions of altruism, malice and distinction seeking.

[11]This is analogous to our later definition of fairness.

driven by social context and how much is a stable, generic attribute of the subjects themselves.

We begin by extending expected utility theory to include notions of concern for others' payoffs. We define concepts of altruism, malice, distinction seeking (competitiveness) and fairness seeking in a social and relationship context free manner as attributes of this utility function.[12] We then show how such factors would affect choices in several specific, relatively sterile situations if the factors were indeed context free.

We ask whether these factors appear important in laboratory settings without a contextual relationship between subjects and when there is no interaction between subjects.[13] We isolate interpersonal effects using simple choices under uncertainty with five slightly different incentive treatments. Under these treatments, the choices a subject makes always affect his or her own payoffs in the same manner. The effect on another subject's payoffs changes. (We will refer to this other subject the "matched subject" and the payoffs he or she receives as the "matched payoffs.") The specific effects vary across the treatments. Two treatments serve as benchmarks to assess risk aversion over own and matched payoffs. Three treatments study interaction effects under incentive structures that parallel decision making in a partnership situation, a bidding situation and a bargaining situation. We will refer to the treatments accordingly.

We study several aspects of choice under these situations. Our results highlight the differences between individual subjects and "on average" group outcomes.

First, we determine if subjects' responses vary as a result of affecting payoffs of another participant. We find that they do. While some experimental subjects appear unaffected by how their decisions affect matched payoffs, most vary their decisions with changes in this impact on

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[12]Definitions of these terms vary. We interpret altruism as the desire to increase the other's payoffs, malice as the desire to decrease the other's payoffs, distinction seeking as the desire to maximize the difference between own and other's payoffs (i.e., decrease their cross moment) and fairness seeking as the desire to minimize the difference between own and other's payoffs (i.e., increase their cross moment). By "context free" we mean that the factors are stable across contexts and remain in the absence of context.

[13]We isolate both direct interaction (subjects are unknown to each other, remain anonymous and do not have face to face contact) and indirect interaction through payoffs.

matched payoffs.

Second, we determine whether any of these effects appear to consistently bias subjects' choices in predictable directions. We also determine whether a simple reference frame has a larger effect on average than these interpersonal frames. We find that the reference frame does have a slight impact. However, when studying interpersonal frames, we find relatively uncorrelated variances across subjects tend to wash out these effects on average. This leaves the average choices across treatments similar.

Third, we ask if individuals display consistent patterns of altruism or maliciousness and fairness or distinction seeking across these treatments. Using the results across choice tasks, we classify subjects according to several categories. Using one baseline treatment, we classify them as risk averse or risk seeking in own payoffs. Using a second baseline treatment, we classify them as risk averse, neutral or risk seeking in matched payoffs. On average, responses are risk neutral to slightly risk seeking along both dimensions. However, we find a simple, intuitive pattern across subjects. Subjects who appear risk averse for their own payoffs also appear risk averse in the matched subject payoffs. Similarly, those who appear risk risk seeking in own payoffs also appear risk seeking in the matched payoffs. Using the partnership treatment, we can classify subjects as fairness seeking, distinction seeking or neutral.[14] Using the bidding treatment, we can also classify subjects as altruistic, malicious or neutral.[15] We find that subjects who are altruistic are generally fairness seeking. Subjects who are malicious tend to be distinction seekers as well. Subjects who appear neutral along one dimension typically appear neutral on both. Finally, we use the bargaining treatment to assess the subjects' consistency along these dimensions when both are present. We find that subjects are generally consistent in their own choices. Overall, we

[14]This classification depends on whether a subjects choices reflect a tendency to increase, decrease or leave unaffected correlations between own and matched payoffs, other things constant.

[15]This classification depends on whether their choices reflect a tendency to increase expected matched participant payoffs, decrease them or leave them unaffected, other thing's constant.

can classify a large portion of individuals as consistently altruistic and fairness seeking, consistently malicious and distinction seeking or neutral on both dimensions.

Our work contrasts with earlier work in that the average responses here do not deviate significantly across treatments from the risk neutral, self-interested predictions of traditional economic theory. This arises because roughly equal numbers of subjects appear risk averse versus risk seeking. Similarly, roughly equal numbers of subjects appear altruistic versus malicious and roughly equal numbers appear fairness seeking versus distinction seeking. Other factors must account for the consistent effects observed in earlier work. Perhaps social context tends to bias the mindsets of subjects toward the altruistic and fair end of the continuum or toward the malicious and distinction seeking end of the continuum. For example, social comparisons may predispose subjects to be altruistic and fair to subjects who are known to be very similar to themselves. Alternatively, the institution may favor particular behavioral types. For example, auction prices likely result from the bids of the most competitive bidders, not from a cross section of all bidders. Thus, they tend to reflect choices made by more competitive (distinction seeking) individuals. In contrast, if the same items were priced through negotiations, we would observe prices that resulted from successful bargaining agreements. These more likely reflect the preferences of more cooperative individuals.

In further research, we will explore factors that we hope will reproduce the consistent interpersonal effects observed in other experiments. Is it the face to face interaction? (If so anonymity is very important to experimental design.) Is it the interdependence of payoffs and interactions between subjects? Specifically, is it the chance that one will be punished by a subject who was adversely affected by one's actions? (If so, then designs need to carefully control and understand such possibilities.) Or, is it due purely to social context? (If so, then experimenters must bring important social features into the lab or recognize their possible impact when generalizing to situations outside the lab.) We will also ask whether demographic information

can help explain the patter of choices across subjects.

Specific next steps:

Determine if patterns arise because of INTERACTION effects. Stage 1: Allow subjects to affect and be affected in the same manner by other subjects. Stage 2: Allow face to face interaction. Determine if demographic information has any explanatory power.

II. Theory

We propose a simple generalization of expected utility theory to include the impact of actions on the payoffs of another individual (matched payoffs). Arguments include the subject's own and matched payoffs. The first, second and cross partial derivatives determine whether the subject is self interested or not, altruistic or not, risk averse or risk seeking in his or her own payoffs, risk averse or risk seeking in matched payoffs and fairness or distinction seeking.

Specifically, let u(x,y) be the utility function over own (x) and other's (y) payoffs and let U(.) denote the expected value of this function. We will assume self interest ($u_1(x,y) > 0$) and make the following definitions:

Self-Interest:	$u_1(x,y) > 0$
Risk Aversion in Own Payoffs:	$u_{11}(x,y) < 0$
Risk Seeking in Own Payoffs:	$u_{11}(x,y) > 0$
Altruism:	$u_2(x,y) > 0$
Malice:	$u_2(x,y) < 0$
Risk Aversion in Matched Payoffs:	$u_{22}(x,y) < 0$
Risk Seeking in Matched Payoffs:	$u_{22}(x,y) > 0$
Fairness Seeking:	$u_{12}(x,y) > 0$
Distinction Seeking:	$u_{12}(x,y) < 0$

If the subject is neither altruistic nor malicious ($u_2(x,y) = 0$) and neither fairness nor distinction seeking ($u_{12}(x,y) = 0$), the utility function defined over x and y becomes the simple expected utility function over x. A specific example of such a function is the following second moment utility function which is a direct extension of the commonly used mean/variance utility function:

$$\begin{aligned} u(x,y) &= ax - \alpha x^2 + by - \gamma y^2 - c(x-y)^2 \\ \Rightarrow U &= aE(x) - \alpha E(x^2) + bE(y) - \gamma E(y^2) - cE((x-y)^2). \end{aligned} \quad \textbf{(1)}$$

Another example is the constant relative risk aversion counterpart:

$$\begin{aligned} u(x,y) &= a\frac{x^{1-\alpha}}{1-\alpha} + b\frac{y^{1-\gamma}}{1-\gamma} + c\frac{x^{1-\alpha}y^{1-\gamma}}{(1-\alpha)(1-\gamma)} \\ \Rightarrow U &= aE\left(\frac{x^{1-\alpha}}{1-\alpha}\right) + bE\left(\frac{y^{1-\gamma}}{1-\gamma}\right) + cE\left(\frac{x^{1-\alpha}y^{1-\gamma}}{(1-\alpha)(1-\gamma)}\right) \end{aligned} \quad \textbf{(2)}$$

In both cases, the parameters α, γ, a, b and c allow for self interest, risk aversion and the four interpersonal factors of altruism, malice, fairness seeking and distinction seeking. Of course, interactions between all these terms exist, but roughly speaking, the following representations hold: Self interest is represented by $a>0$ dominating over the risk preference effect of α and the correlation effect of c.[16] Risk aversion over own and other's payoffs are represented by $\alpha>0$ and $\gamma>0$, respectively. Altruism and malice are represented by $b>0$ and $b<0$, respectively (again dominating over the risk preference effect of γ and the correlation effect of c). Finally, fairness and distinction seeking are represented by $c>0$ and $c<0$ respectively.

In the Appendix II, we show that, all else constant, subjects will prefer gambles increasing in the properties associated with the interpersonal factors in their utility factions. For example, an

[16] If we assume individuals are always somewhat self interested, we can set $a=1$ without loss of generality.

altruistic subject will prefer a gamble with a slightly higher expected payoff to the other all else constant. Similarly, a fair subject will prefer a slightly higher first cross moment all else constant. Thus, below we ask if subjects react to interpersonal impacts of their choices on others by changing their choices in response to how their choices affect the mean and variance of another's payoff and first cross moment of own and other's payoffs.

III. Experimental Design and Predictions

A. Design

We test for interpersonal comparison effects on decisions made under uncertainty by paying two experimental subjects based on one subject's decision and a random draw. Across treatments, decisions made by the decision making subject always affects his or her own payoffs in the same way. How this subject's decision affects the other (matched) subject's payoff varies by treatment. The decision making subject never knows anything about the matched subject except how much he or she will receive as a result of the decision made and the random draw. This isolates pure comparison effects from perceptions and attitudes about the matched subject and from interactions between the matched subject's actions and the deciding subject's own payoffs. By not varying the relationship between a subject's choices and his or her own payoffs, we can isolate pure comparison effects from the framing effects and probability judgement biases that affect choices between alternative risky situations. While these other factors may all be important, we wish to focus only on interpersonal payoff comparisons in this study.

The experiment consists of six sessions of twenty subject each. We draw subjects randomly from a large volunteer subject pool recruited in undergraduate and MBA classes at the University of Iowa. Subjects are paid $3 for participating (in addition to any earnings they receive as a result of their choice tasks). We have subjects arrive in two adjoining rooms and leave by separate doors to insure anonymity.

Upon arrival, subjects were given copies of the instructions and seated at desks separate from each other. The instructions were read aloud to all subjects from a doorway between the rooms. All questions were repeated and answered so that all subjects could hear.[17]

Each subject made five choices, one for each of five payoff cards. The payoff relevant portions of the cards used for sessions F1S1, F1S2 and F1S3 are given in Figures 1 through 5. These cards showed the subject how much they would be paid conditional on the choice they make (denoted by "*C*" later) and a random draw. They also showed that each choice affected a "Matched Participant" from the other room and how the choice affected that subject's payoffs.

The payoff determining random draws occurred after all subjects made all five choices. These consisted of draws (with replacement) from a box of lottery tickets numbered 00 to 99. If the ticket drawn exceeded the cutoff in the chosen row, the subject received the payment listed in the "Ticket $\geq$ Cutoff" column on the left hand side of the payoff table. If not, the subject received nothing. Thus, each choice corresponded to a probability of winning cash for the subject. This probability does not vary with the treatment and we will use it as the measure of response, denoting it by *p*. The figures at the top of each page show, as functions of *p*, the expected levels and variances of payoffs to both subjects along with their (non-central) cross moment (the expected value of the payoffs multiplied together).

The payoff cards contained five different "Matched Participant" sections, corresponding to each of five treatments. In each treatment, the subjects' choices affect his or her own in exactly the same manner. Increasing the choice (increasing *C*) corresponded to decreasing the probability of receiving a payoff (*p*) but increasing its size. The optimal choice for a risk neutral subject would be 50. Risk averse subjects will make smaller choices (corresponding to higher probabilities of lower payoffs) while risk loving subjects will make larger choices (corresponding

[17]The instructions are given in Appendix I. The rooms are arranged so that subjects in one room cannot see subjects in the other even when the door is open.

to lower probabilities of higher payoffs).[18]

In the Baseline treatment (Figure 1), subjects make this choice without having any impact on another's payoffs. The Matched Participant payoff portion of the card corresponding to the baseline contained only zeros. In the other treatments, the matched participant receives a payment conditional on the decision making subject's choice and corresponding random draw. If the ticket drawn exceed the cutoff in the chosen row, the matched participant received the amount given in the "Ticket $\geq$ Cutoff" column on the right hand side of the table. If not, the matched participant received the amount listed in the "Ticket < Cutoff" column.

The Matched Baseline treatment in Figure 2 serves to identify relative risk attitudes over own and matched participant payoffs. The expected payoffs of the two subjects align with each other. However, the variances of these payoffs are mirrored around 0.5. The other three treatments parallel “real world” situations and allow us to measure the impact of other interpersonal comparisons on behavior. The incentives in Figure 3 corresponds roughly to a partnership situation. The subjects' payoffs align perfectly. The incentives in Figure 4 corresponds roughly to a bidding situation. If the decision making subject decreases *p* (i.e., bids less aggressively), the probability of receiving a payoff (winning the auction) decreases but the subject receives more. This action increases the probability that the other subject receives a payoff (wins the auction) and raises the other subject's payoff size (winning with a lower bid). The incentives in Figure 5 corresponds roughly to a bargaining situation. If the decision making subject lowers *p* (i.e., bargains more aggressively), the probability of receiving a payoff (settlement) decreases, but the subject receives more while the other subject receives less. The treatments are labeled accordingly.

Payoffs cards for sessions F2S1, F2S2 and F2S3 differed in slightly in their presentation.

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[18] A choice of 50 would maximize expected payoffs given the relationship between the choice and payoffs. However, so we could see if approximately risk neutral subjects tended toward risk aversion or risk seeking, we did not allow this choice.

Subjects received payments if the ticked draw was less than the cutoff and the payoff sizes were inverted accordingly. Thus, in these sessions, the "Ticket $\geq$ Cutoff" columns were re-labeled, "Ticket $\leq$ Cutoff;" the "Ticket > Cutoff" columns were re-labeled, "Ticket < Cutoff;" and all of the payoff columns were inverted. This changes the presentation frame and will be discussed later. However, for the purposes of presentation, we will use *p* and the relationship between *p* and own and matched subject payoffs. These do not vary between the frames.

Subjects were matched and payoff cards were given to them under the following constraints. First, each subject received five different cards, one corresponding to each treatment. Subjects received these cards in ten different orders to mitigate presentation order effects. Each subject was matched with and affected the payoffs of five different subjects in the other room. Similarly, they were affected by an entirely separate group of five different subjects from the other room. Finally, in any given choice, the matched payoff treatment they had (and sent to the matched participant in the other room) differed form the matched payoff treatment they received from the other room as a matched participant. The instructions describe these constraints carefully (except for the exact number of presentation orders), so we assume all subjects were aware of them.

B. Predictions

Figure 6 shows how the four interpersonal factors can influence behavior for risk neutral, self-interested subjects under all treatments. Consider introducing a reasonable level of altruism ($a>b>0$ in the utility function given in Equation (2)). Because of the desire to increase the other's expected payoffs, the decision maker will bargain less aggressively (increase *p* in the bargaining treatment to increase the size and likelihood of the other's payoff) and bid less aggressively (decrease *p* in the bidding treatment to increase the size and likelihood of the other's payoff). A reasonable level of malice ($0>b>-a$ in Equation (2)) will change behavior in the opposite direction

as the decision maker tries to decrease the likelihood and size of the other's payoff.

Fairness results in apparent risk seeking behavior in the partnership treatment. The increased covariance resulting from a lower *p* compensates for the loss in expected value. Intuitively, since both misery and elation love company, the decision maker becomes more of a risk taker. In the bidding treatment, the decision maker bids more aggressively (increases *p*). This decreases the other's payoff when the decision maker receives nothing, increasing the covariance and compensating for the decreased expected value. Intuitively, when the decision maker loses the auction, he or she takes solace in the face that the other received a low payoff.

Distinction seeking is a desire for distinction between the subjects' payoffs. Thus, it affects behavior in a direction opposite of fairness for the opposite reasons.

For the risk neutral bidder, the matched baseline treatment results in the same behavior as the baseline treatment. However, choices in the baseline and matched baseline will serve to pin down each subject's risk preferences over the his or her own and the matched participant's payoffs.

IV. Results

We will discuss the data in terms of the probabilities of winning cash implicit in each subjects choice. Recall, that p=0.5 is the optimal choice for a risk neutral subject in the baseline treatment, p>0.5 reflects risk aversion and p<0.5 is risk seeking.

A. Summary of Choices

Table 1 summarizes the choices made by subjects in each treatment, in each session, in each presentation frame and overall. Generally, Frame 1 choices do not differ significantly from risk neutral on average, while Frame 2 choices appear slightly risk seeking. We interpret this as a presentation frame effect. The payoff tables in Frame 2 were ordered top to bottom from

highest own payoff to lowest and from lowest own probability of winning to highest. The payoff tables in Frame 1 were ordered top to bottom from lowest own payoff to highest and from highest own probability of winning to lowest. If subjects start reading the tables at the top and their focus is only pulled to the bottom by higher own payoffs, this may explain the differences in overall results.

B. Stability of Choices

We ask whether subjects behave as pure hedonistic economic theory predicts: Do they each consistently make a single (expected utility maximizing) choice on each of the five payoff cards? Overwhelmingly not. Table 2 shows the frequencies with which individual subjects chose one row in all five payoff cards, chose two rows, three rows, four rows and five rows. It also shows the averages for Frame 1, Frame 2 and overall. The median number of unique choices is three per subject. Only 10.00% of subjects made a single choice across all five payoff cards. In contrast 18.33% made five unique choices across the five treatments.

C. Patterns in Individual Choices

Here, we develop a simple classification scheme based on subject choices and how choices should vary across treatments depending on the subject's preferences. The scheme is based simply on directional movements in choices between treatments. We find this scheme, thought somewhat arbitrary, does an excellent job in organizing the data sensibly. Alternative schemes based on derivatives or absolute levels of own and matched expected payoffs, variances and cross moments perform similarly. We will use the directional movements scheme because it is intuitive and computationally simple.

1. Risk Preferences in Own Payoffs

Using the Baseline choice, we classify subjects according to revealed risk preferences over their own payoffs. We classify choices of $p<0.5$ as risk seeking and $p>0.5$ as risk averse. Table 3 shows how many subjects displayed each type of risk preference. Table 1 shows that the average choice did not differ significantly from risk neutral in Frame 1 and was slightly risk averse in Frame 2 and overall. Nevertheless, the frame did not make a significant difference when classifying risk attitudes in this manner. Overall, about half the subjects appeared risk averse and half appeared risk seeking.

One could conduct a similar exercise and infer risk preferences under an assumption of pure hedonism in each other treatment. According to these measures risk preferences for many individual subjects appear to change across treatments. Between the baseline and matched baseline treatments, 45 subjects (37.5%) appear to "switch" between risk aversion and risk seeking preferences. Respective numbers for apparent "switches" between the baseline and partnership, bidding and bargaining choices are: 50 (41.67%), 43 (35.83%) and 43 (35.83%). Thus, if one were to ignore the effect of participants' choices on others, one would conclude that risk preferences are relatively unstable across institutions.

This evidence is consistent with Berg, Dickhaut and McCabe (1992) who measure apparent risk preferences for subjects across three institutions. They find that subjects appear overwhelmingly risk averse in sealed bid auctions to purchase risky assets. The same subjects appear overwhelmingly risk seeking in clock auctions to sell similar assets and, on average, they appear risk neutral when using the Becker, DeGroot, Marschak (1964) procedure to determine purchase prices for these assets. Berg, Dickhaut and McCabe conclude that apparent risk preferences change across institutions. However, many other factors change across their institutions. The auction procedures entail new kinds of uncertainty (uncertainty about others' values and strategic uncertainty) as well as interpersonal effects. Here, we find this apparent

instability of risk preferences remains without these new types of uncertainty. However, since the only factor that changes in our design is the effect on others' payoffs, we propose interpersonal factors as an alternative explanation.

Next, we will classify subjects according to their responses to particular interpersonal factors and look for patterns in these responses.

2. Risk Preferences in Matched Participant Payoffs

We compare the Baseline treatment to the Matched Baseline treatment to assess each subject's response to affecting the risk faced by the matched participant. From comparing Figure 1 and Figure 2, notice that the expected payoffs for both subjects are the same for each choice. Also, the subjects own impact on his or her own variance does not change between the treatments. Finally, there is a zero cross moment between own and matched payoffs since the subject and matched participant are never paid at the same time. If the subject is not overwhelmingly malicious ($u_1(x,y)>-u_2(x,y)$), then the only choice-relevant factor that changes across the treatments is the effect the subject's choice has on the risk faced by the matched participant. If the subject is risk averse in the matched participant's payoffs, the optimal p should fall relative to the baseline. If the subject is risk seeking in the matched participant's payoffs, the optimal p should rise relative to the baseline.

We classify subjects as risk averse, risk neutral or risk seeking in matched payoffs by comparing the choice in the Matched Baseline treatment to the benchmark of the Baseline treatment. We classify a subject as risk neutral in the matched payoff if the choices are the same in the two treatments. We classify the subject as risk averse in the matched payoff if $p_{\text{Matched Baseline}}<p_{\text{Baseline}}$ and as risk seeking if $p_{\text{Matched Baseline}}>p_{\text{Baseline}}$.[19] Table 4 shows how many

[19]Were we to classify subjects according to the more complex procedures discussed above, we would classify them as other risk seeking if they moved in the direction of the derivative of the other's variance or if they actually (continued...)

subjects were risk averse, risk neutral and risk seeking in matched payoffs across the two Frames and overall. Again, the Frame did not matter. The distribution of risk preferences over matched payoffs was tilted slightly to risk seeking with 30% risk averse, 30% risk neutral and 40% risk seeking.

3. Correlation In Risk Preferences over Own and Matched Participant Payoffs

Having categorized subjects according to their risk preferences over own and matched payoffs, we ask whether a systematic correlation between the two exists. Table 5 shows the correlation between these measures. Most subjects who are risk averse in own payoffs are risk neutral or risk averse in matched payoffs (with the mode being risk averse). Similarly, those who are risk seeking in own payoffs are correspondingly risk neutral or risk seeking in matched payoffs (with the mode being risk seeking). The correlation is striking with an $\chi^2(4)$ statistic of 31.531. (This is especially striking because the only way risk averse subjects could be classified as matched risk averse is to decrease the risk of the matched participant at the expense of increasing the risk they faced themselves. Similarly, the only way risk seeking subjects could be classified as matched risk seeking is to increase the risk of the matched participant at the expense of decreasing the risk they faced themselves.)

4. Fairness versus Distinction Seeking

The Baseline and Matched Baseline treatments tell us how the subject is affected by the impact of his or her choice on the expected value and variance of own and matched payoffs. In fact, the shift in choice between them shows how the subject changes because he or she affects

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[19](...continued)
increased the other's variance. As mentioned above, it matters little for the results. These two measures have correlation coefficients of 0.9157 and 0.9527 with our simpler measure. This holds similarly for our other classifications. However, these other classifications become relatively complex in the bargaining treatment.

the variance of own and matched payoffs in the opposite direction. (Increasing p decreases own variance and increases matched variance.) Here, we use these shifts to create a benchmark for the partnership choice. We make the simplifying assumption that, if the effect on the matched variance is reversed, the shift his or her choice from the baseline by the same amount, but in the opposite direction.[20] Figures 2 and 3 show there are two differences between the check and partnership choices. First, the effect on matched variance works in the opposite direction. Second, since both subjects are paid at the same time and lose at the same time, the choice of p affects the correlation across payoffs in the partnership treatment.

To account for the effect on matched variance, we use the benchmark of $2p_{\text{Baseline}}-p_{\text{Matched Baseline}}$. This reflects the shift from the Baseline to Matched Baseline treatment around the choice in the Baseline treatment. (That is, it assumes the subject will be affected by the impact on matched variance by the same amount, but in the opposite direction.) Then, we compare $p_{\text{Partnership}}$ to this benchmark and classify subjects as neutral (if $p_{\text{Partnership}} = p_{\text{benchmark}}$), fairness seeking (if $p_{\text{Partnership}} < p_{\text{benchmark}}$) or distinction seeking (if $p_{\text{Partnership}} > p_{\text{benchmark}}$).

Table 6 gives the results of this classification. The last two lines show subjects with benchmarks that fall outside the admissible range of choices. We do not classify them. For the subjects we do classify, many fall in each category. The Frame does appear to affect this categorization. Fewer subjects appear neutral under Frame 2 than under Frame 1. Overall, the median subject is neutral, but the modal subject seeks fairness.

5. Altruism versus Malice

Again, we will use the Baseline and Matched Baseline choices to create a benchmark for the Bidding choice. Again, we make the simplifying assumption that, if the effect on the matched

[20]This is an approximation which is correct at p=0.5.

variance is reversed, the subject's choice shifts from the baseline by the same amount, but in the opposite direction. Figures 2 and 4 show there are two differences between the Matched Baseline and Bidding choices. First, as in the Partnership choice, the effect on matched variance works in the opposite direction. Second, the subject can affect the expected payoff of the matched participant. If the subject decreases p_{Bidding}, he or she increases both the probability and size of the matched participant's payoff. Essentially, at the expense of his or her own expected payoff, the subject can hand money over to or take money away from the matched participant. An altruist will decrease p_{Bidding} and a malicious subject will increase p_{Bidding}.

To account for the effect on matched variance, we again use the benchmark of $2p_{\text{Baseline}}-p_{\text{Matched Baseline}}$. This reflects the shift from the Baseline to the Matched Baseline treatment around the choice in the Baseline treatment. (That is, it assumes the subject will be affected by the impact on matched variance by the same amount, but in the opposite direction.) Then, we compare p_{Bidding} to this benchmark and classify subjects as neutral (if $p_{\text{Bidding}} = p_{\text{benchmark}}$), altruistic (if $p_{\text{Bidding}} < p_{\text{benchmark}}$) or malicious(if $p_{\text{Bidding}} > p_{\text{benchmark}}$).

Table 7 gives the results of this classification. Again, the last two lines show subjects that have benchmarks outside the admissible range of choices. Again, many subjects fall in each category. The Frame does not make a significant difference. Overall, the median subject is neutral, but the modal subject is altruistic.

6. Correlation between Altruism/Malice and Fairness/Distinction Seeking

Having categorized subjects along an Altruism/Malice dimension and Fairness/Distinction dimension, we ask whether a systematic correlation between the two exists. Table 8 shows the correlation between these measures. Most subjects who are altruistic are also fair. Similarly, those who are or malicious are also distinction seeking. Finally, those who are neutral in the altruism/malice dimension are also generally neutral in the fairness/distinction dimension. Again,

the correlation is striking with an $\chi^2(4)$ statistic of 77.6147.

7. Consistency Check using the Bargaining Choice

The Bargaining choice can be used to determine whether altruism/fairness seeking or malice/distinction seeking dominates. Figure 5 shows that the Bargaining treatment has aspects of all four other treatments. As with all the treatments, the impact of the choice on own expected payoffs and variance in own payoffs is the same as in the Baseline treatment. The impact on variance of own payoffs is the same as in the Matched Baseline treatment. The impact on expected matched payoffs is the mirror image of the Bidding treatment. The impact on correlation of own and matched is the mirror image of the Partnership treatment. Thus, subject preferences along both altruism/maliciousness and fairness/distinction seeking dimensions can affect choice.

Here, the effect on matched variance is the same as in the Matched Baseline choice, so we will use the Matched Baseline choice as the benchmark. Both altruism and fairness seeking tend to increase the optimal *p*. Both maliciousness and distinction seeking tend to decrease the optimal *p*. Thus, we will classify a subject as altruism/fairness seeking dominant if the Bargaining choice exceeds the Matched Baseline choice. We will classify a subject as malicious/distinction seeking dominant if the Bargaining choice falls below the Matched Baseline choice. We will classify a subject as neither if the Bargaining and Matched Baseline choices equal each other. We then compare this classification to a classification of both altruistic and fairness seeking or both malicious and distinction seeking according to the other four choices.

Table 9 shows the correlation between the classification according to the Bargaining choice versus the classification using the other four choices. Generally, the modal subject who is classified as both altruistic and fairness seeking according to the other four choices is also classified as altruistic/fairness seeking dominant according to the Bargaining choice. Similarly, the modal subject is neither according to the other choices is also neither according to the

Bargaining Choice. However, subjects who are classified as malicious/distinction seeking according to the other four choices tend to be less so according to the bargaining choice. We note that the incentive structure in the bargaining choice is the most complex here. In addition, fairness and altruism can work in opposite directions relative to the baseline choice with a high p. Alternatively, the correlation structure of payoffs in the bargaining situation may serve to emphasize and bring out altruistic and fairness seeking traits.

V. Conclusions

To be Completed. Here are notes from the proposal:

Regardless of the results, this research should prove interesting. If interpersonal factors do not exist, we can eliminate them when searching for explanations of the "sub-optimal" behavior often observed in experimental games. Such results support the currently accepted notion of "rational" self-interested decision making. Conversely, if the factors do exist, they may explain apparent "sub-optimal" behavior in experiments or everyday life. This provides an explanation for the apparent instability of risk preferences across institutions. It also may explain Berg and Dickhaut's (??) result that it is more difficult to induce apparent risk neutrality in some institutions (e.g., sealed bid auctions) than in others (e.g., individual choice settings).

We should take these factors into consideration when making predictions about behavior. Further, since we can often frame the same decisions in different terms (e.g., forming prices by bidding, bargaining or market exchanges), we can select the frame to promote desired outcomes. For example, if we want an equitable division of surplus from a transaction and we find that individuals are likely to have a greater concern for fairness in bargaining situations, we may want to arrange a transaction through bargaining instead of bidding. Conversely, if we prefer to maximize surplus and we find that bidding encourages this outcome, we may want to arrange the transaction through bidding.

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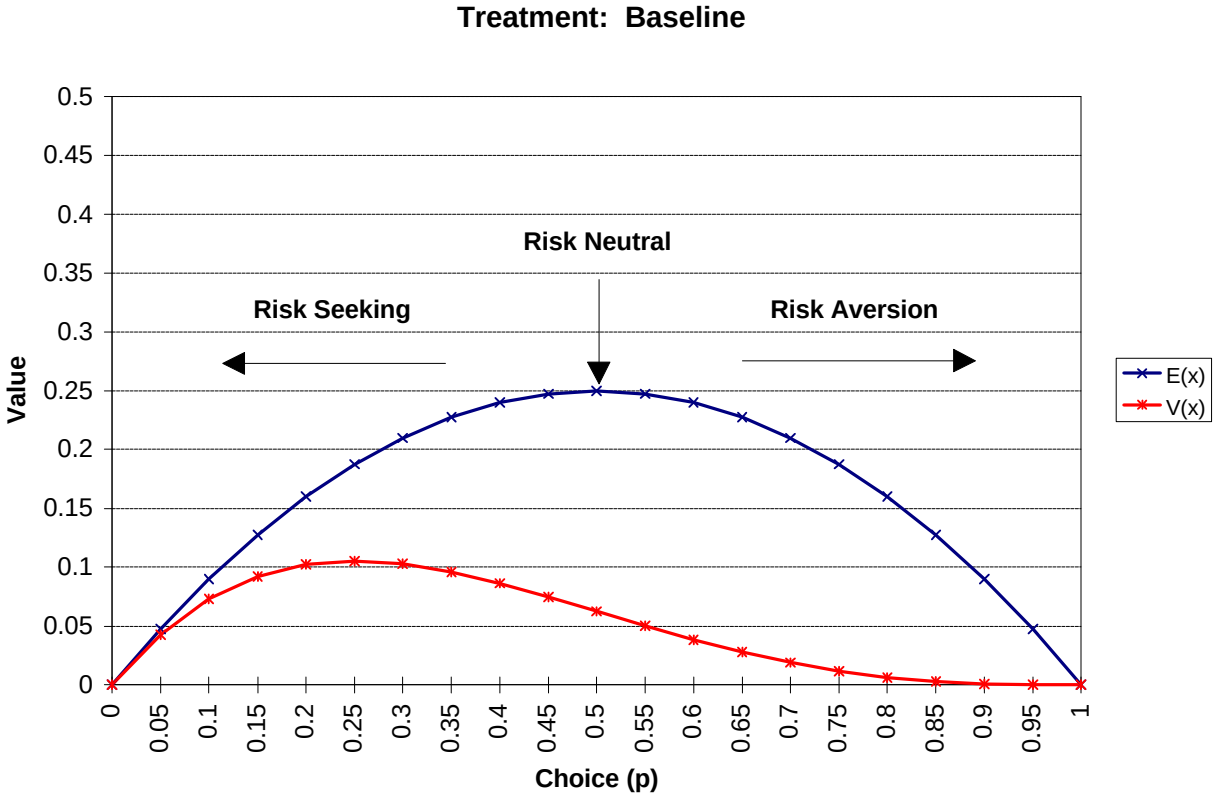
FIGURES

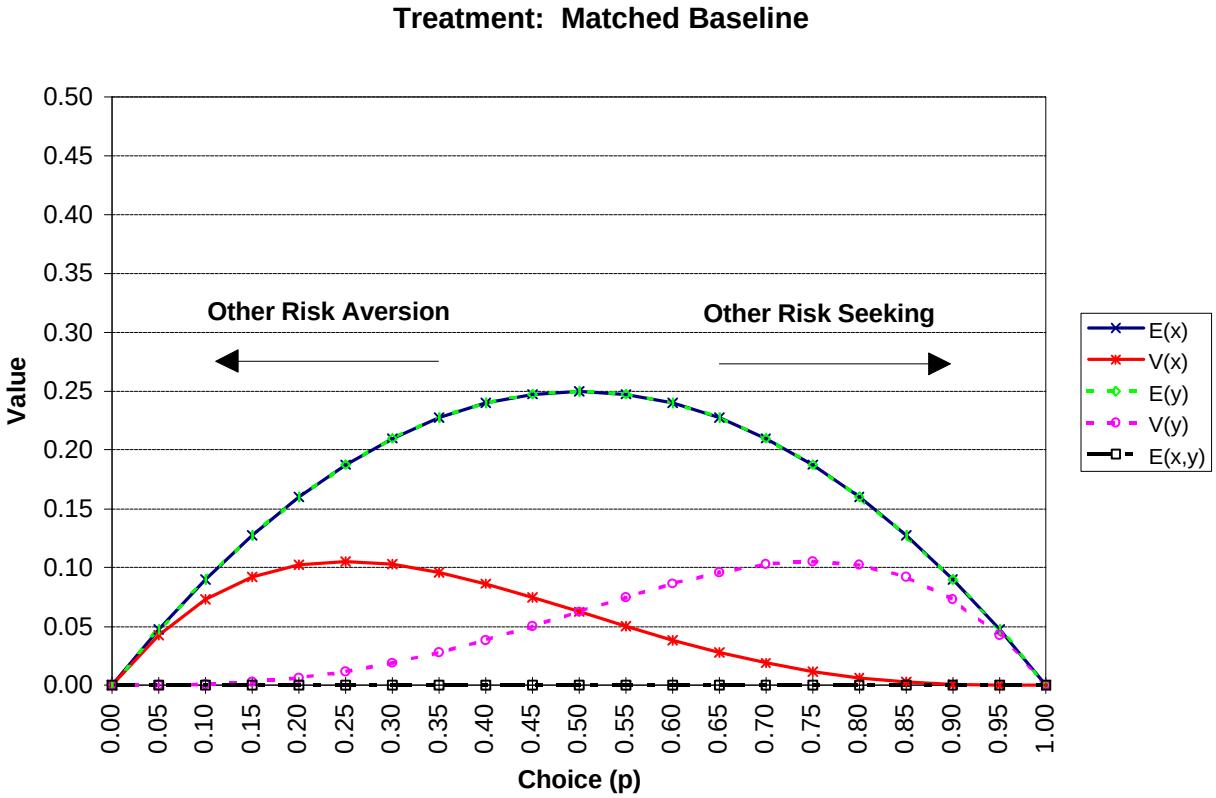
Figure 1: Payoff Structure in Baseline Choice



Payoff Card for Baseline Treatment

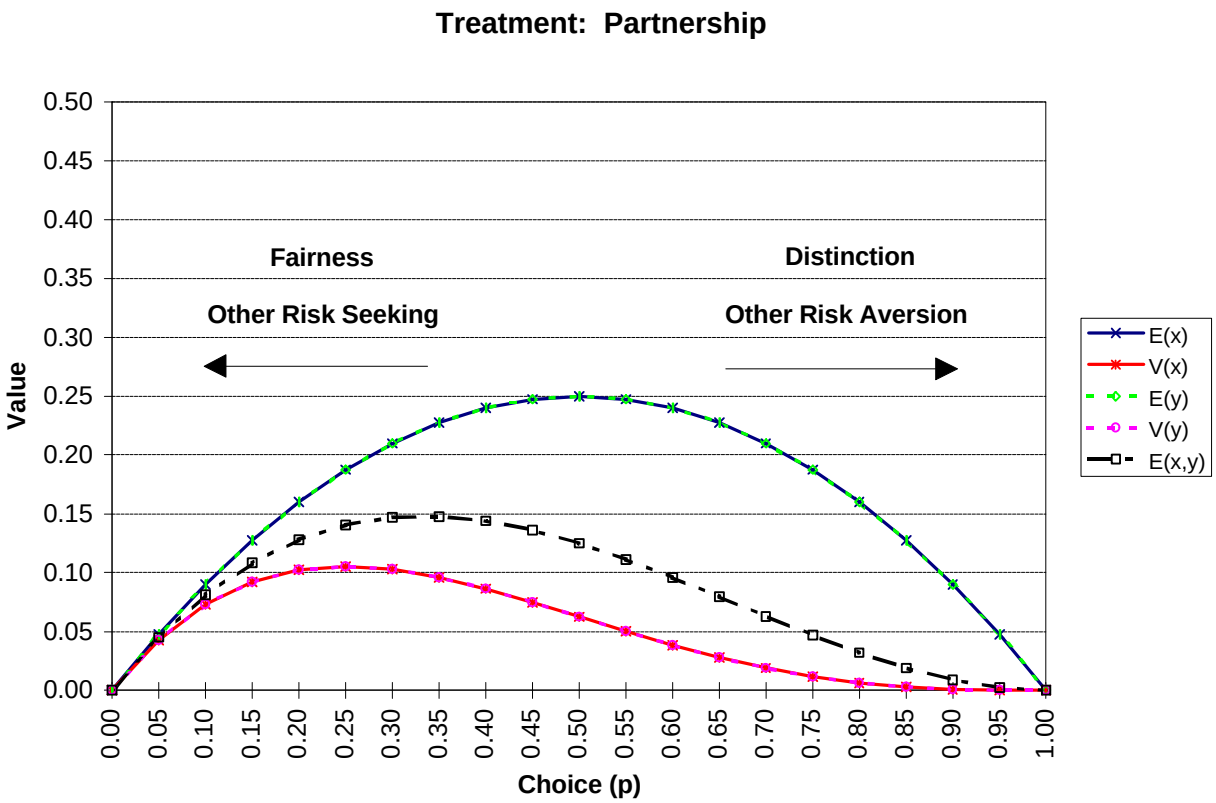
	Own Payoff Table				Matched Participant Payoff Table				
Cutoff Choice	Ticket ≥ Cutoff Prize	Ticket ≥ Cutoff Prob.	Ticket < Cutoff Prize	Ticket < Cutoff Prob.	Ticket ≥ Cutoff Prize	Ticket ≥ Cutoff Prob.	Ticket < Cutoff Prize	Ticket < Cutoff Prob.	Cutoff Choice
5	$0.25	0.95	$0.00	0.05	$0.00	0.95	$0.00	0.05	5
15	$0.75	0.85	$0.00	0.15	$0.00	0.85	$0.00	0.15	15
25	$1.25	0.75	$0.00	0.25	$0.00	0.75	$0.00	0.25	25
35	$1.75	0.65	$0.00	0.35	$0.00	0.65	$0.00	0.35	35
45	$2.25	0.55	$0.00	0.45	$0.00	0.55	$0.00	0.45	45
55	$2.75	0.45	$0.00	0.55	$0.00	0.45	$0.00	0.55	55
65	$3.25	0.35	$0.00	0.65	$0.00	0.35	$0.00	0.65	65
75	$3.75	0.25	$0.00	0.75	$0.00	0.25	$0.00	0.75	75
85	$4.25	0.15	$0.00	0.85	$0.00	0.15	$0.00	0.85	85
95	$4.75	0.05	$0.00	0.95	$0.00	0.05	$0.00	0.95	95

Figure 2: Payoff Structure for the Matched Baseline Treatment



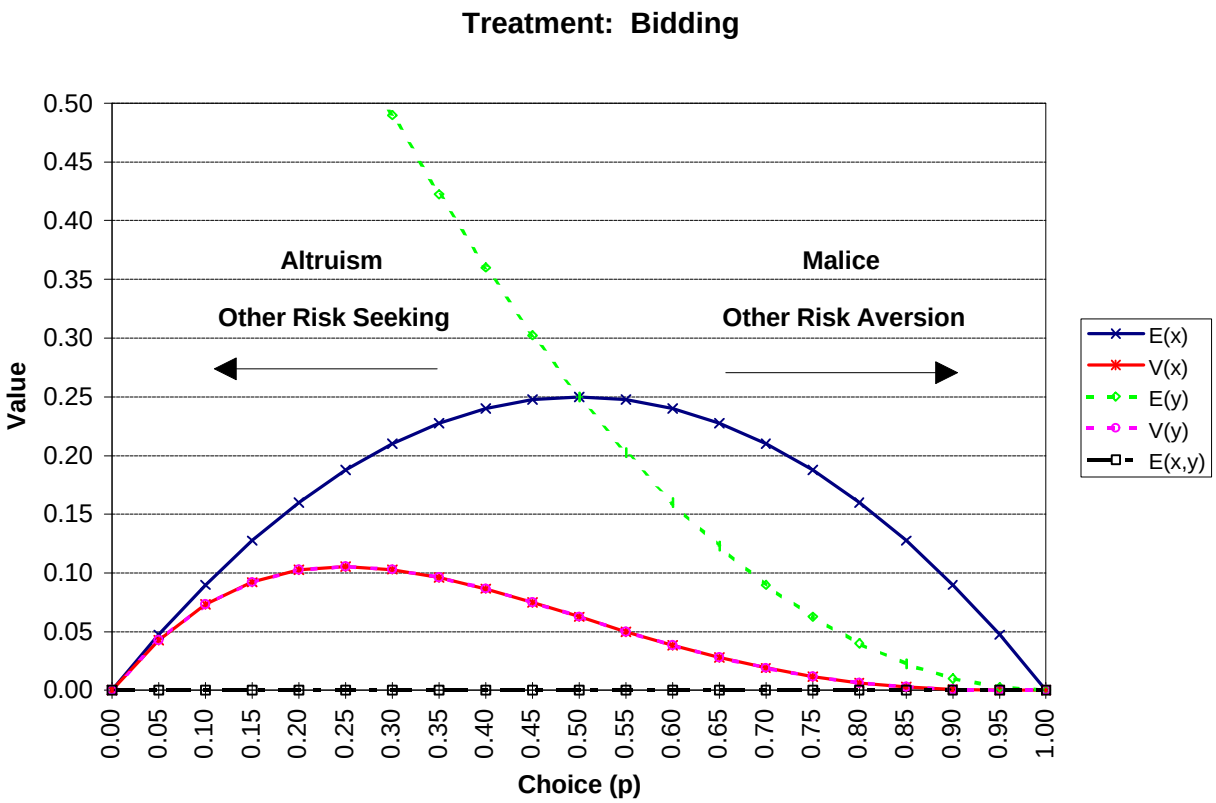
Payoff Card for Matched Baseline Treatment									
	Own Payoff Table				**Matched Participant Payoff Table**				
Cutoff Choice	Ticket ≥ Cutoff		Ticket < Cutoff		Ticket ≥ Cutoff		Ticket < Cutoff		Cutoff Choice
	Prize	Prob.	Prize	Prob.	Prize	Prob.	Prize	Prob.	
5	$0.25	0.95	$0.00	0.05	$0.00	0.95	$4.75	0.05	5
15	$0.75	0.85	$0.00	0.15	$0.00	0.85	$4.25	0.15	15
25	$1.25	0.75	$0.00	0.25	$0.00	0.75	$3.75	0.25	25
35	$1.75	0.65	$0.00	0.35	$0.00	0.65	$3.25	0.35	35
45	$2.25	0.55	$0.00	0.45	$0.00	0.55	$2.75	0.45	45
55	$2.75	0.45	$0.00	0.55	$0.00	0.45	$2.25	0.55	55
65	$3.25	0.35	$0.00	0.65	$0.00	0.35	$1.75	0.65	65
75	$3.75	0.25	$0.00	0.75	$0.00	0.25	$1.25	0.75	75
85	$4.25	0.15	$0.00	0.85	$0.00	0.15	$0.75	0.85	85
95	$4.75	0.05	$0.00	0.95	$0.00	0.05	$0.25	0.95	95

Figure 3: Payoff Structure for Partnership Choice



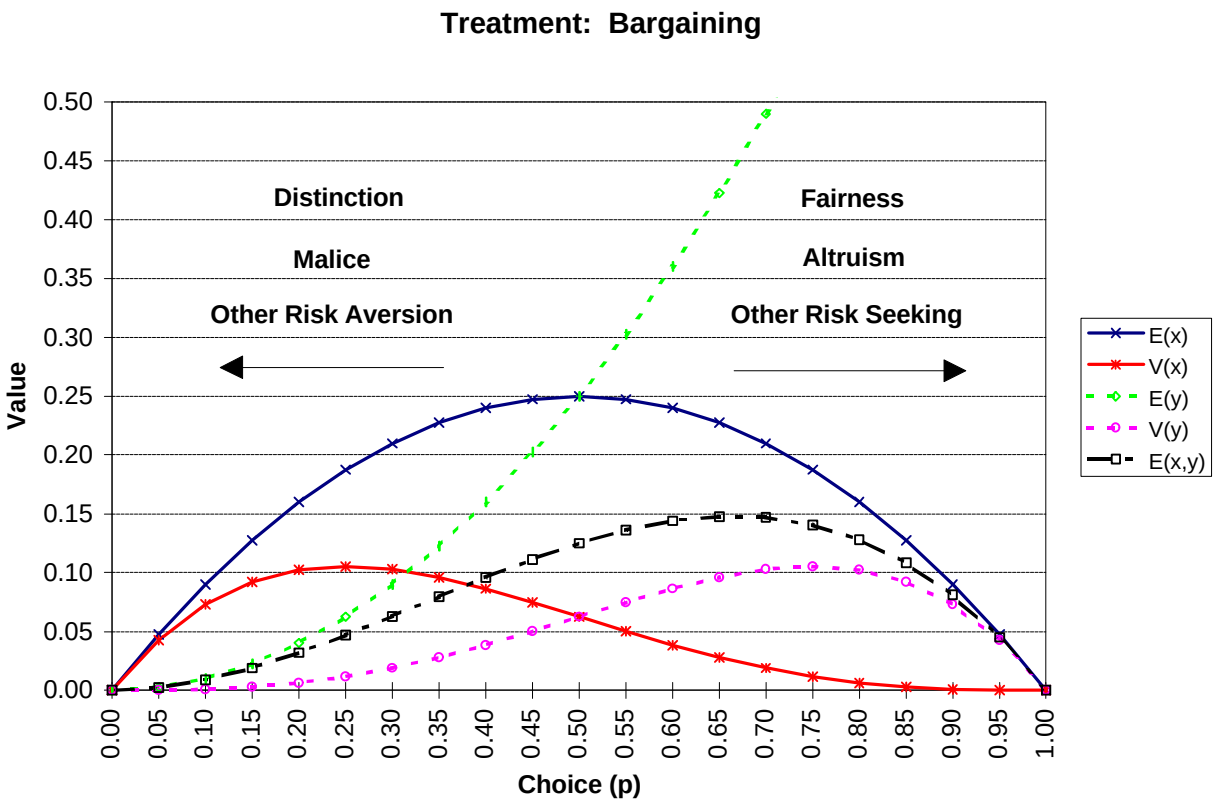
Payoff Card for Partnership Treatment									
	Own Payoff Table				**Matched Participant Payoff Table**				
Cutoff Choice	Ticket ≥ Cutoff		Ticket < Cutoff		Ticket ≥ Cutoff		Ticket < Cutoff		Cutoff Choice
	Prize	Prob.	Prize	Prob.	Prize	Prob.	Prize	Prob.	
5	$0.25	0.95	$0.00	0.05	$0.25	0.95	$0.00	0.05	5
15	$0.75	0.85	$0.00	0.15	$0.75	0.85	$0.00	0.15	15
25	$1.25	0.75	$0.00	0.25	$1.25	0.75	$0.00	0.25	25
35	$1.75	0.65	$0.00	0.35	$1.75	0.65	$0.00	0.35	35
45	$2.25	0.55	$0.00	0.45	$2.25	0.55	$0.00	0.45	45
55	$2.75	0.45	$0.00	0.55	$2.75	0.45	$0.00	0.55	55
65	$3.25	0.35	$0.00	0.65	$3.25	0.35	$0.00	0.65	65
75	$3.75	0.25	$0.00	0.75	$3.75	0.25	$0.00	0.75	75
85	$4.25	0.15	$0.00	0.85	$4.25	0.15	$0.00	0.85	85
95	$4.75	0.05	$0.00	0.95	$4.75	0.05	$0.00	0.95	95

Figure 4: Payoff Structure for Bidding Choice



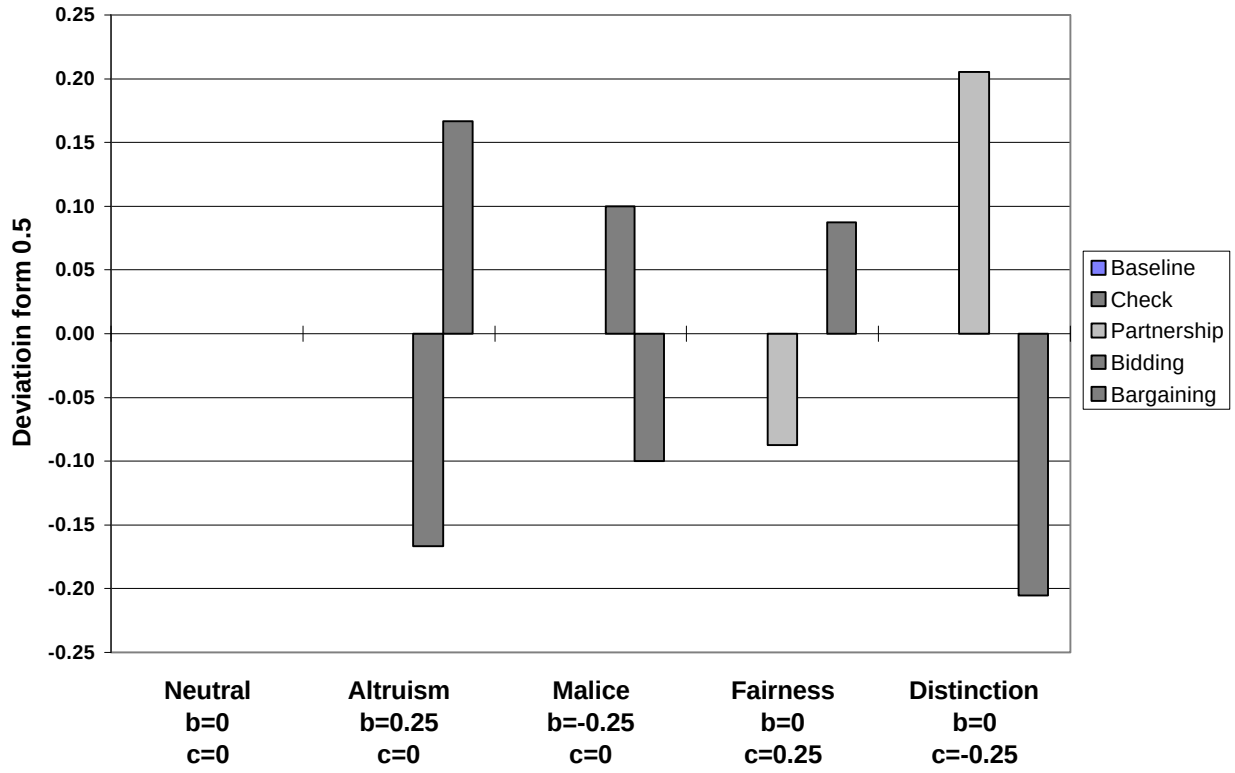
Payoff Card for Bidding Treatment									
	Own Payoff Table				**Matched Participant Payoff Table**				
Cutoff Choice	Ticket ≥ Cutoff		Ticket < Cutoff		Ticket ≥ Cutoff		Ticket < Cutoff		Cutoff Choice
	Prize	Prob.	Prize	Prob.	Prize	Prob.	Prize	Prob.	
5	$0.25	0.95	$0.00	0.05	$0.00	0.95	$0.00	$0.25	5
15	$0.75	0.85	$0.00	0.15	$0.00	0.85	$0.00	$0.75	15
25	$1.25	0.75	$0.00	0.25	$0.00	0.75	$0.00	$1.25	25
35	$1.75	0.65	$0.00	0.35	$0.00	0.65	$0.00	$1.75	35
45	$2.25	0.55	$0.00	0.45	$0.00	0.55	$0.00	$2.25	45
55	$2.75	0.45	$0.00	0.55	$0.00	0.45	$0.00	$2.75	55
65	$3.25	0.35	$0.00	0.65	$0.00	0.35	$0.00	$3.25	65
75	$3.75	0.25	$0.00	0.75	$0.00	0.25	$0.00	$3.75	75
85	$4.25	0.15	$0.00	0.85	$0.00	0.15	$0.00	$4.25	85
95	$4.75	0.05	$0.00	0.95	$0.00	0.05	$0.00	$4.75	95

Figure 5: Payoff Structure for Bargaining Choice



Payoff Card for Bargaining Treatment									
	Own Payoff Table				**Matched Participant Payoff Table**				
Cutoff Choice	Ticket ≥ Cutoff		Ticket < Cutoff		Ticket ≥ Cutoff		Ticket < Cutoff		Cutoff Choice
	Prize	Prob.	Prize	Prob.	Prize	Prob.	Prize	Prob.	
5	$0.25	0.95	$0.00	0.05	$4.75	0.95	$0.00	0.05	5
15	$0.75	0.85	$0.00	0.15	$4.25	0.85	$0.00	0.15	15
25	$1.25	0.75	$0.00	0.25	$3.75	0.75	$0.00	0.25	25
35	$1.75	0.65	$0.00	0.35	$3.25	0.65	$0.00	0.35	35
45	$2.25	0.55	$0.00	0.45	$2.75	0.55	$0.00	0.45	45
55	$2.75	0.45	$0.00	0.55	$2.25	0.45	$0.00	0.55	55
65	$3.25	0.35	$0.00	0.65	$1.75	0.35	$0.00	0.65	65
75	$3.75	0.25	$0.00	0.75	$1.25	0.25	$0.00	0.75	75
85	$4.25	0.15	$0.00	0.85	$0.75	0.15	$0.00	0.85	85
95	$4.75	0.05	$0.00	0.95	$0.25	0.05	$0.00	0.95	95

Figure 6: Deviations in Optimal Probability Choices (p) from 0.5 for Risk Neutral Utility Functions with Moderate Levels of Altruism/Malice and Fairness/Distinction Seeking



TABLES

Table1: Summary Information

	Treatment				
Session	Baseline	Bidding	Partnership	Bargaining	Matched Baseline
F1S1	0.480 (0.117)	0.525 (0.085)	0.550 (0.138)	0.480 (0.159)	0.500 (0.185)
F1S2	0.460 (0.165)	0.500 (0.105)	0.440** (0.097)	0.505 (0.161)	0.495 (0.143)
F1S3	0.505 (0.167)	0.480 (0.211)	0.525 (0.112)	0.525 (0.177)	0.520 (0.103)
F2S1	0.415* (0.201)	0.445 (0.182)	0.385** (0.193)	0.375** (0.162)	0.425 (0.202)
F2S2	0.440 (0.234)	0.420** (0.159)	0.450 (0.145)	0.460 (0.200)	0.390** (0.179)
F2S3	0.435* (0.160)	0.485 (0.179)	0.460 (0.152)	0.495 (0.115)	0.480 (0.134)
Frame 1	0.482 (0.150)	0.502 (0.143)	0.505 (0.124)	0.503 (0.164)	0.505 (0.145)
Frame 2	0.430** (0.197)	0.450** (0.173)	0.432** (0.165)	0.443** (0.168)	0.432** (0.175)
Overall	0.456** (0.176)	0.476* (0.160)	0.468** (0.150)	0.473* (0.168)	0.468** (0.164)

*Significantly different from 0.5 at the 90% level of confidence
**Significantly different from 0.5 at the 95% level of confidence

Table 2: Frequency of Number of Unique Choices Made

	Number of Unique Choices					
Session	1	2	3	4	5	Median
F1S1	2	5	6	5	2	3
F1S2	2	5	7	5	1	3
F1S3	3	4	5	3	5	3
F2S1	2	4	6	4	4	3
F2S2	0	3	6	3	8	4
F2S3	3	7	5	3	2	2.5
Frame 1	2.33	4.67	6.33	4.33	2.67	3
Frame 2	1.67	4.67	5.67	3.33	4.67	3
Overall	2.00	4.67	6.00	3.83	3.67	3

Table 3: Subjects' Risk Attitudes over Own Payoffs
Inferred from Baseline Choice*

	Frame Number		
Risk Attitude	1	2	Overall
Risk Averse	34 56.67%	27 45.00%	61 50.83%
Risk Seeking	26 43.3%	33 55.00%	59 49.17%
Pearson chi2(1) = 1.6338 Pr = 0.201			

*Coded from the Baseline Choice as follows:
Risk Seeking if $p_{Base} \leq 0.45$
Risk Averse if $p_{Base} \geq 0.55$

Table 4: Subjects' Risk Attitudes over Other Payoffs
Inferred from Baseline Choice vs Matched Baseline Choice*

	Frame Number		
Risk Attitude	1	2	Total
Risk Averse	17 28.33%	19 31.67%	36 30.00%
Risk Neutral	19 31.67%	17 28.33%	36 30.00%
Risk Seeking	24 40.00%	24 40.00%	48 40.00%
Pearson chi2(2) = 0.2222 Pr = 0.895			

*Coded from the Baseline Choice as follows:
Risk Neutral if $p_{Matched\ Baseline} = p_{Base}$
Risk Seeking if $p_{Matched\ Baseline} > p_{Base}$
Risk Averse if $p_{Matched\ Baseline} < p_{Base}$

Table 5: Correspondence of Risk Attitudes over Own vs Other Payoffs

Risk Attitude Over Own Payoff	Risk Attitude over Other Payoff			
	Risk Averse	Risk Neutral	Risk Seeking	Total
Risk Averse	***29***	22	10	61
Risk Seeking	7	14	***38***	59
Total	36	36	48	120
Pearson chi2(2) = 31.5310 Pr = 0.000				

Table 6: Subjects' Attitudes over Fairness vs Distinction
Inferred from Partnership Choice vs Baseline and Matched Baseline Choices*

	Frame Number		
Attitude Displayed	1	2	Total
Fairness Seeking	16 30.77%	24 54.55%	40 41.67%
Neutral	16 30.77%	6 13.64%	22 22.92%
Distinction Seeking	20 38.46%	14 31.82%	34 35.42%
Pearson chi2(2) = 6.4651 Pr = 0.039			
$2*p_{Base} - p_{Matched\ Baseline} < 0$	6 10.00%	12 20.00%	18 15.00%
$2*p_{Base} - p_{Matched\ Baseline} > 0$	2 3.33%	4 6.67%	6 5.00%

*Coded from the Partnership, Baseline and Matched Baseline Choices as follows:
Neutral if $p_{Part} = 2*p_{Base} - p_{Matched\ Baseline}$
Fairness Seeking if $p_{Part} < 2*p_{Base} - p_{Matched\ Baseline}$
Distinction Seeking if $p_{Part} > 2*p_{Base} - p_{Matched\ Baseline}$

Table 7: Subjects' Attitudes over Altruism vs Malice
Inferred from Bidding Choice vs Baseline and Matched Baseline Choices*

Attitude	Framing Number		
	1	2	Total
Altruistic	15 28.85%	21 47.73%	31 37.50%
Neutral	12 23.08%	8 18.18%	20 20.83%
Malicious	25 48.08%	15 34.09%	40 41.67%
Pearson chi2(2) = 2.7589 Pr = 0.252			
$2*p_{Base} - p_{Matched\ Baseline} < 0$	6 10.00%	12 20.00%	18 15.00%
$2*p_{Base} - p_{Matched\ Baseline} > 0$	2 3.33%	4 6.67%	6 5.00%

*Coded from the Biding, Baseline and Matched Baseline Choices as follows:
Neutral if $p_{Bid} = 2*p_{Base} - p_{Matched\ Baseline}$
Altruistic if $p_{Bid} < 2*p_{Base} - p_{Matched\ Baseline}$
Malicious if $p_{Bid} > 2*p_{Base} - p_{Matched\ Baseline}$

Table 8: Correspondence of Attitudes over
Altruism vs Malice and Fairness vs Distinction

Fairness vs Distinction	Altruism vs Malice			
	Altruistic	Neutral	Malicious	Total
Fairness Seeking	***29***	4	7	40
Neutral	3	***15***	4	22
Distinction Seeking	4	1	***29***	34
Total	36	20	40	96
Pearson chi2(4) = 77.6147 Pr = 0.000				

Table 9: Joint Altruism/Fairness versus Malicious/Competitive Classification According to Baseline, Matched Baseline, Partnership and Bidding Compared to Altruism/Fairness Dominant versus Malicious/Competitive Dominant Classification according to Matched Baseline and Bargaining

Classification Based on Matched Baseline versus Bargaining**	Classification Based on Baseline and Matched Baseline versus Partnership and Bidding*			
	Altruistic and Fairness Seeking	Neither	Malicious and Distinction Seeking	Total
Altruistic and Fairness Seeking Dominant	***16***	5	8	29
Neither Dominant	8	***18***	12	38
Malicious and Distinction Seeking Dominant	11	7	***11***	29
Total	35	30	31	96
Pearson chi2(4) = 11.2161 Pr = 0.024				

*Coded as follows:
Malicious and Distinction Seeking if coded as Malicious Using Partnership and Distinction Seeking using Partnership
Altruistic and Fairness Seeking if coded as Altruistic using Partnership and Fairness Seeking using Bidding
Neither if any other coding combination using Partnership and Bidding
Not in table if benchmark not in (0,1)

**Coded as follows:
Altruistic and Fairness Seeking Dominant $p_{Bargaining} > p_{Matched\ Baseline}$
Malicious and Distinction Seeking Dominant $p_{Bargaining} < p_{Matched\ Baseline}$
Neither Dominant Otherwise

APPENDIX I

Instructions (Frame 1)

General Instructions

You are about to participate in study of decision making in which you will make several choices. By carefully following these instructions and making good choices, you can earn a considerable amount of money. This money will be paid to you in cash at the end of the experiment.

There are ___ people participating in today's study. You are split evenly between two different rooms. All of you are reading identical instructions. You will not learn the identities of the participants in the other room, nor will they learn yours. However, some of the choices you make will affect the earnings of participants in the other room. You have a set of Payoff Tables which show if and how your choices affect payoffs of these participants. We will discuss these tables later. A separate group of participants in the other room will make choices that affect your earnings in a similar manner.

You have already earned $3 in cash just for showing up. The instructions below explain how you can earn additional money. If you have any questions during this study, please raise your hand and an administrator will answer them. When we have finished reading these instructions and all questions have been answered, we will begin. Do not talk to other participants after this point.

You should have the following materials in front of you:

- these Instructions
- a pen
- a highlighter
- a Consent Form
- a Receipt Form
- five perforated cards (each labeled "Payoff Card")

If you are missing any of these materials, please tell us now.

How Your Choices Affect Your Earnings

Part of your earnings will be affected by the choices you make. You will make five choices in this study. These choices consist of highlighting one row on each of the five Payoff Cards you have in front of you. Do not make these choices until we have completed these instructions and the administrators have answered all questions.

The "Own Payoff Table" (left side) of each Payoff Card contains information about the choices you can make and how those choices affect your payoffs. Specifically, the experiment will be conducted in two stages. In Stage 1, you will highlight a row on each Payoff Card. This row shows how the choice you make will affect the payoffs you will receive during Stage 2.

In Stage 2, a ticket will be drawn from a box in your room to determine the payoff resulting from your choice. The boxes in each room contain 100 numbered tickets. The last two digits on these

tickets run from 00 to 99. For each choice, a participant in your room will be asked to draw a ticket from this box. The first ticket drawn will determine the payoff associated with Payoff Card 1. If the ticket number is GREATER THAN OR EQUAL TO the Cutoff Choice specified in the row you highlighted, you will receive the amount of cash shown in the column labeled "Ticket $\geq$ Cutoff" on your Own Payoff Table. If the number on the ticket is LESS THAN the Cutoff you chose, you will receive zero. Note that the row you choose in Stage 1 affects both the chances of receiving a payoff and the size of the payoff you receive. After the payoff for Card 1 has been determined, the ticket will be returned to the box and another ticket will be drawn to determine the payoff for Card 2. We will proceed in this fashion until the payoff for each card has been determined.

Each participant in the experiment will make exactly the same set of choices in Stage 1 as you do. However, their Payoff Tables may be in a different order. In Stage 2, five draws from the ticket box in each participant's own room will determine payoffs for the five Payoff Cards her or she has filled out.

How Your Choices Affect Other Participants' Payoffs

Your choices in Stage 1 may also affect the payoffs of five different participants in the other room. Every participant in this study has been assigned a participant number. You participant number is shown at the top of each of your Payoff Cards. The participant number of the participant whose payoff your choice may affect is also shown at the top of these cards. We call this participant your "Matched Participant" for that choice The identity of your Matched Participant changes for each choice you make.

The effect your choice has on this Matched Participant's payoffs is shown in the Matched Participant Payoff Table on the right-hand side of the Payoff Card. The Matched Participant Payoff Table differs for each Payoff Card. The (single) row you choose on the Payoff Card will determine both how your choice affects your payoffs and how your choice affects your Matched Participant's payoffs.

For each choice, the ticket drawn from the box in your room will determine both payoffs. The shading on the Payoff Card shows the association between your payoff and your Matched Participant's payoff. The shaded portions show payoffs received if the ticket number is greater than or equal to the cutoff you chose; the unshaded portions show payoffs received if the ticket number is less than the cutoff you chose.

At the end of the experiment, you will detach the Matched Participant Payoff Table from each Payoff Card. The experimenter will give these tables to the appropriate Matched Participants in the other room. Thus, your Matched Participant for each choice you make will learn how your choice affected his or her payoffs, the choice you made and the resulting payoffs he or she earned.

How Others' Choices Affect Your Payoffs

Just as your choices may affect the payoffs of participants in the other room, choices made by a separate group of participants in the other room may affect your payoffs. You are the "Matched Participant" for five different participants in the other room. None of these participants are those

whose payoffs you affect.

The set of Matched Participant Payoff Tables that you will receive from being a Matched Participant is the same as the set of Matched Participant Payoff Tables shown on the right-hand side of your Payoff Cards. However, in each choice, the other participant's Matched Participant Payoff Table will be different from that portion of your Payoff Card for that choice. Also note that the tickets drawn in each room can differ. Thus, you cannot know how the participants you are matched with affect your payoffs until the study is over. Then, you will receive the five Matched Participant Tables from the participants in the other room whose choices affected your payoff. Thus, you will learn how each of these other participant's choices affected your payoffs, the choice he or she made and the resulting payoffs you earned. At no time will you learn the identities of the participants in the other group or the total payoffs they receive. Similarly, they will not learn your identity or the total payoffs you receive.

Participation and Recording Rules

You have been given a Consent Form, five perforated Payoff Cards, and a Receipt. To participate in this experiment do the following:

1. Read and sign the Consent Form.

2. For each Payoff Card (numbered 1 through 5), select the row that you wish to choose to determine your Own Payoff and your Matched Participant's Payoff. Highlight this entire row on both portions of the Payoff Card. Only one row can be chosen on any card. However, you may choose different rows for different Payoff Cards. If you need to change your choice please notify the administrator before making the change. Cards with more than one row highlighted are invalid without an Administrator's initials.

3. After everyone has completed his or her five Payoff Cards, the administrator will have a participant in each room draw a ticket from the box in his or her room. Recall, this box contains tickets numbered 00 to 99. Record this ticket number at the bottom of both sides of the Payoff Card and highlight the appropriate columns for Your Own Payoff and your Matched Participant's Payoff. This ticket will be returned to the box, and another ticket drawn for the second card. Record this ticket number on the bottom of both sides of Payoff Card 2 and highlight the appropriate columns. This procedure is repeated until a ticket has been drawn for each card.

4. Use the row you highlighted in Stage 1 and columns you highlighted in Stage 2 to determine the payoffs associated with each card. Record each of these amounts in the appropriate space at the bottom of the Payoff Cards.

5. The administrator will collect the Matched Participant Tables from each Payoff Card. These will be given to the five different Matched Participants listed on the Payoff Cards.

6. As the Matched Participant for a separate set of five participants in the other room, you will receive the Matched Participant Tables from these five different participants.

7. Fill in your Receipt with your “Own Payoff” from the five Own Payoff Tables that you have. Then fill in the “Payoff Received as a Matched Participant” from the five Matched Participant Tables you have received. Add these amounts to the $3.00 you received for participating. This result is your "Total Payoffs." Record this total on your receipt.

8. After you have completed your Receipt Form, we will come to your desk individually and pay you this amount in cash.

9. At the end of the experiment, you will also receive a Voluntary Demographic Survey. This survey is voluntary. You may choose to answer none, some or all of the questions. Your payment will not depend on your responses to this survey. However, if you choose to respond, your responses will provide a valuable input to our research. We will keep all survey responses confidential. To respond to the survey, simply circle the appropriate answer or fill in the blank.

Are there any questions?

Voluntary Demographic Survey

Participant Number ___

This survey is voluntary. You may choose to answer none, some or all of the questions. Your payment will not depend on your responses to this survey. However, if you choose to respond, your responses will provide a valuable input to our research. We will keep all survey responses confidential. To respond to the survey, simply circle the appropriate answer or fill in the blank.

We appreciate your taking the time to fill out this survey.

1. What is your gender? 1 Female 2 Male

2. What is your age? _____

3. What is your birth order? _____ out of _____ children

4. How may years have you lived in the Midwest? _____years

5. Do you have a lucky number? _____ If so, what is it? _____

Did it influence your choice in today's study (if so, please describe how)?

6. What is your university status?

1 Freshman
2 Sophomore
3 Junior
4 Senior
5 MA/MBA candidate
6 Law or Medical student
7 Ph.D. candidate
8 Other _____

7. What is your major?

1 Business
2 Social Science
3 Humanities
4 Natural Science
5 Mathematics or Engineering
6 Other

8. Please indicate how strongly you agree or disagree with each of the following statements about yourself using the scale on the right, where 1 indicates strongly disagree strongly, 2 indicates moderately disagree, 3 indicates slightly disagree, 4 indicates slightly agree, 5 indicates moderately agree and 6 indicates strongly agree.

	Disagree					Agree
a. I am a very charitable person	1	2	3	4	5	6
b. I believe distinguishing oneself from peers is important	1	2	3	4	5	6
c. I strive for equitable solutions to problems	1	2	3	4	5	6
d. I am very achievement oriented in reaching my own goals .	1	2	3	4	5	6

9. Have you ever been a member of any type of sports team? _____ (yes or no)

What kind of team(s)?

When?

10. Do you belong to any clubs or social organizations? _____ (yes or no)

Please describe:

APPENDIX II

Consider two gambles X and X' both in R^2. Denote sets of outcomes as (x,y) and (x',y') respectively. Determine the value of outcomes in the gamble X by approximation around its mean outcome:

$$u(x,y) = \left[\begin{array}{c} u(\bar{x},\bar{y}) + u_1(\bar{x},\bar{y})(x-\bar{x}) + u_2(\bar{x},\bar{y})(y-\bar{y}) \\ + \frac{1}{2}u_{11}(\bar{x},\bar{y})(x-\bar{x})^2 + \frac{1}{2}u_{22}(\bar{x},\bar{y})(y-\bar{y})^2 \\ + u_{12}(\bar{x},\bar{y})(x-\bar{x})(y-\bar{y}) + \ldots \end{array} \right.$$

This implies that the expected utility of X is approximately:

$$E[u(x,y)] = \left[\begin{array}{c} u(\bar{x},\bar{y}) + \frac{1}{2}u_{11}(\bar{x},\bar{y})(Ex^2-\bar{x}^2) + \frac{1}{2}u_{22}(\bar{x},\bar{y})(Ey^2-\bar{y}^2) \\ + u_{12}(\bar{x},\bar{y})(Exy-\bar{x}\bar{y}) + \ldots \end{array} \right.$$

Approximate the value of the outcomes of X' around the same point, giving:

$$u(x',y') = \left[\begin{array}{c} u(\bar{x},\bar{y}) + u_1(\bar{x},\bar{y})(x'-\bar{x}) + u_2(\bar{x},\bar{y})(y'-\bar{y}) \\ + \frac{1}{2}u_{11}(\bar{x},\bar{y})(x'-\bar{x})^2 + \frac{1}{2}u_{22}(\bar{x},\bar{y})(y'-\bar{y})^2 \\ + u_{12}(\bar{x},\bar{y})(x'-\bar{x})(y'-\bar{y}) + \ldots \end{array} \right.$$

This gives an expected utility of:

$$E[u(x',y')] = \left[\begin{array}{c} u(\bar{x},\bar{y}) + u_1(\bar{x},\bar{y})(\bar{x}'-\bar{x}) + u_2(\bar{x},\bar{y})(\bar{y}'-\bar{y}) \\ + \frac{1}{2}u_{11}(\bar{x},\bar{y})(Ex'^2-2\bar{x}'\bar{x}+\bar{x}^2) + \frac{1}{2}u_{22}(\bar{x},\bar{y})(Ey'^2-2\bar{y}'\bar{y}+\bar{y}^2) \\ + u_{12}(\bar{x},\bar{y})(Ex'y'-\bar{y}'\bar{x}-\bar{x}'\bar{y}'+\bar{x}\bar{y}) + \ldots \end{array} \right.$$

The difference is:

$$E[u(x',y')]-E[u(x,y)] = \left[\begin{array}{c} u_1(\bar{x},\bar{y})(\bar{x}'-\bar{x}) + u_2(\bar{x},\bar{y})(\bar{y}'-\bar{y}) \\ + \frac{1}{2}u_{11}(\bar{x},\bar{y})(Ex'^2-2\bar{x}'\bar{x}+2\bar{x}^2-Ex^2) \\ + \frac{1}{2}u_{22}(\bar{x},\bar{y})(Ey'^2-2\bar{y}'\bar{y}+2\bar{y}^2-Ey^2) \\ + u_{12}(\bar{x},\bar{y})(Ex'y'-\bar{y}'\bar{x}-\bar{x}'\bar{y}'+2\bar{x}\bar{y}-Exy) + \ldots \end{array} \right.$$

Now compare gambles X' close to X in the sens that the outcomes have different expected values, but the same second and higher moments. All terms but the first two drop out. The first term shows that a self interested person with prefer a higher expected value all else constant. The second term shows that an altruistic person will prefer a higher expected value for the other person, all else constant. Similarly, a malicious person will prefer a lower expected value for the other person all else constant.

Next, compare gambles X' close to X in the sense that outcomes have the same expected values, but vary only in the second moments. Using the equal means, the difference becomes:

$$E[u(x',y')]-E[u(x,y)] = \left[\begin{array}{l} \frac{1}{2}u_{11}(\bar{x},\bar{y})((Ex'^2-\bar{x}'^2)-(Ex^2-\bar{x}^2)) \\ + \frac{1}{2}u_{22}(\bar{x},\bar{y})((Ey'^2-\bar{y}'^2)-(Ey^2-\bar{y}^2)) \\ + u_{12}(\bar{x},\bar{y})(Ex'y'-Exy) \end{array}\right.$$

The first term shows that, a risk averse person ($u_{11}<0$) will prefer lower variance gambles, all else constant. Similarly, a risk seeking person ($u_{11}>0$) will prefer higher variance gambles, all else constant. The second term shows, that a person risk averse in the other's payoffs ($u_{22}<0$) will prefer lower variance gambles for the other person, all else constant. Similarly, a person risk seeking in the other's payoffs ($u_{22}>0$) will prefer higher variance gambles for the other person, all else constant. The third term shows that a fairness seeking person ($u_{12}>0$) will prefer a higher first cross moment, all else constant. Similarly, a distinction seeking person ($u_{12}<0$) will prefer a lower first cross moment, all else constant.