

Gender Differences in Reciprocal Behavior

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## **I. Introduction**

The classical ideas of rationality are often violated by human behavior. These violations can be frequently observed in the world and in controlled experiments. It seems obvious then that a new theory of human behavior must be developed. Behavioral economics, with some influence from evolutionary psychology, has generated a promising concept: reciprocal behavior. Reciprocity is an in-kind response to the actions of others. Specifically, a reciprocal person rewards those who are kind to them and punishes those who are unkind. Positive reciprocity has been documented in some experimental settings, such as in gift-exchange games (Falk 2006), though others have found no evidence for it (Charness and Rabin 2002).

When thinking about reciprocal behavior, it is important to question why a person should be reciprocal and consider how this behavior might help him or her. Though the existence of reciprocal inclinations is not controversial, it is not clear how likely it is for a person act on those inclinations. There is also very little information on the extent of gender differences in preferences. We observe socioeconomic differences between genders, such as type of career or wage rate. Yet, we do not observe the role of preferences in determining these outcomes.

In this paper, I present experimental results from a simple decision-making game. I designed an experiment in order to examine what situations you could expect to find positive reciprocal action. All participants were students at the University of California, Santa Barbara (UCSB). I also present results from a survey taken by the subjects and other students at UCSB.

Forty-one people participated in the experiment, 14 males and 27 females. The survey was administered to an additional 61 people. In total, I have survey data on 41 males and 61 females. The experiment participants were paid; the additional survey participants were not.

## **II. Gender and Preferences: Background**

Understanding gender differences in preferences is an important and active area of current research and is of interest to both economic theorists and policy makers. The data consistently shows that there are differences in gender behavior, which can clearly be seen by examining the labor market or aggregate purchasing decisions. What is not clear is to what extent these differences are the result of individual preferences.

If observed gender differences are the result of preferences, then these differences should be (at least partially) observable in economic experiments. In fact, this is precisely what we find. A wealth of data from experiments finds that women display higher levels of risk aversion, shy away from competition, and are more sensitive to context when making decisions (Croson and Gneezy 2009). Differences in other areas of preferences are still unclear.

The gender differences in willingness to enter competition seem to be present from early in life, so it is unlikely that sociological aspects of life cause these differences. The findings of Gneezy and Rustichini (2004) show that even in fourth grade boys and girls (ages 9-10) there are different preferences for competition as well as different performances in competition. In their experiment, boys and girls ran races, twice alone to discover baseline times (time to run specified distance, in seconds) and then in pairs. The

fastest two boys (girls) were paired, then the next two fastest, etc.. The results show a significant improvement among the boys under a competitive environment versus running alone. There was no change between the competitive and non-competitive environments in the girls. When faster girls ran against slower boys, the boys caught up, but girls did not catch up to faster boys.

There is more to preferences than whether or not people take risks or like to enter competitions. People also have preferences over outcomes, especially with respect to distribution of resources. Many models of fairness have been developed, though they do not seem to capture the complexities of human behavior well enough to be considered complete. Rawlsian models of preferences, also called maximin preferences, assert that individuals are concerned with the payoff to the worst off member of society. Competitive preferences assert that people only care about their payoff relative to other people. Inequality aversion asserts that people care about payoffs being equal and prefer equal payments to unequal ones. A simple test in Charness and Rabin (1999) illustrates the need for a more complex model of preferences. A player C was asked to determine the payoffs for two anonymous players, (A, B). When asked to choose between (1200, 0) and (400, 400), 82% of C players selected (400, 400). Yet, when choosing between (750, 375) and (400, 400), only 46% chose (400, 400). In the first case, people seem to hold Rawlsian preferences, while in the other people tend towards classical utilitarian ideas of maximizing total payoff.

A critical aspect of some current theories of preferences is the concept of reciprocity. Loosely defined, reciprocity is a type of conditional behavior where the intentions of other people are considered when making decisions. Essentially, people

exhibit reciprocal preferences when they reward good (nice) behavior or punish bad behavior, even if it involves a small cost. If reciprocal preferences are found, then models attempting to make behavioral predictions could be used to inform policy decisions.

Theoretical models involving reciprocal preferences have been developed by Charness and Rabin (2002) and Falk and Fischbacher (2006). In their models, individuals are concerned with intentions and outcomes, rather than just outcomes like other distributional theories of utility, such as inequality aversion or competitive preferences. The Charness and Rabin model is a complete social preferences model, which incorporates the theories of self-interest, Rawlsian preferences (maximin), utilitarian efficiency, and reciprocity. Depending on the parameters of the model, an individual can match one of the “pure” theories (i.e., pure self interest) or have a combination of preferences (the most accurate and complicated case). The Falk and Fischbacher model is mainly focusing on the theory of reciprocity itself, which seeks to model reactions to kind and unkind behavior. They develop a notion of “reciprocity equilibrium,” where both players (the model extends to N persons) are “reciprocating” each other’s behavior. They also provide an interesting application to the ultimatum game and the gift exchange game and show that their model predicts the (stylized) empirical observations.

One experiment designed to test for the existence of positive reciprocity (conditional altruism) by Clark and Sefton (2001) utilizes a sequential prisoner’s dilemma (SPD) (figure 1).

Figure 1.

Baseline Game

|          |          |
|----------|----------|
| 400, 400 | 0, 500   |
| 500, 0   | 100, 100 |

Since co-operate is a dominated strategy, we would expect people who care purely for their own payoff to play defect. Whereas, if a person were an altruist or cared purely about maximizing total societal payoff, we would expect a person to play cooperate in all cases. They find that, when conditioned upon the first mover playing cooperate, the second mover also cooperates 30% of the time. This is a significant difference, considering that mutual cooperation occurred in only 10% of games played, and implies that positive reciprocity may be playing a part in behavior. This still is not a conclusive experiment for the existence of reciprocity however, since significantly more people played defect when the opponent played cooperate.

The results from Charness and Rabin (2002) find some evidence for positive reciprocity (Table 1). Their data comes from fourteen experimental sessions using college students from the University of California, Berkeley and the Universitat Pompeu Fabra in Barcelona. In total they had 467 participants and 29 different games, creating a total of 1697 decisions. The games that reveal (some) positive reciprocity involve Player A making the decision of “Out” or “Enter,” then Player B has the choice of “Left” or “Right” if and only if Player A selects “Enter.” Since, based on the nature of the games’ payoffs, it seemed unlikely that many A’s would select “Enter,” B was instructed to utilize the strategy method, and make their decision assuming A played “Enter.” The

results in Table 1 show that a significant number of B's are willing to make small sacrifices to help A on the condition that A behaves nicely.

Table 1

| Proportion of B's Choosing:                                    | Left | Right |
|--|------|-------|
| A chooses (725,0) or lets B Choose (400, 400) vs. (750, 375)   | .62  | .38   |
| A chooses (800,0) or lets B Choose (400, 400) vs. (750, 375)   | .62  | .38   |
| A chooses (750,0) or lets B Choose (400, 400) vs. (750, 375)   | .61  | .39   |
| A chooses (750,100) or lets B Choose (300, 600) vs. (700, 500) | .75  | .25   |

\*Data from Charness and Rabin (2002)

Charness and Rabin (2002) also find insignificant evidence for negative reciprocity. In games to the ones in table 1, player A's choice of "enter" leads to lower payoff for B. For example, A chooses (375, 1000) or lets B Choose (400, 400) vs. (250, 350). In this treatment, 97% of B's chose (400, 400), even though A's intention was to get an extra 25 while costing B 600. Other experiments do find a significant role for negative reciprocity (punishment).

In Croson and Gneezy (2009), public goods games that incorporate punishment for non-contributors find significantly higher levels of overall contribution. Punishment is anonymous, and involves making a monetary sacrifice to reduce the non-contributors payoff. This is generally done in a fashion so that the punished party loses more than the punishing party. It seems that reciprocity may require a repeated game scenario to fully manifest.

Since a necessary (though not sufficient) condition for the existence of reciprocity requires that people take intentions into consideration, it is rational to ask if there are reasons why people should care about intentions. Since a person's intention does not change the state of reality, one could argue that intentions, whatever they happen to be, should not matter. Charness and Levine (2007) argue that intentions do matter and that people do in fact consider intentions when making decisions. They argue that "intentions play a major role in US legal codes, often determining whether punitive damages are to be awarded in civil cases and the degree of punishment in criminal cases," so it is natural that intentions matter to people.

In their experimental study, Charness and Levine assign people to be employers and employees and endow the employer with \$12. The employer can then assign a wage to the employee of \$8 (High) or \$4 (Low). The employee may or may not receive the amount chosen by the firm. With equal probability, (1/2, 1/2), there will be a "good conditions" or "poor conditions." If there are good conditions, the wage is increased by \$2, and if there are poor conditions, the wage is decreased by \$2. The employee is told the conditions and the choice by the firm. Then, he or she makes an effort decision. Low (punish) effort costs the employee \$1 and the firm \$4. Medium (neutral) costs nothing for both. High (reward) effort costs \$1 and helps the firm by \$4. In the two cases that result in a wage of \$6, (High, poor) or (Low, good), there is a significant difference in the level of effort from the employee. In the (Low, good) case, 19% punish and 10% reward, compared to 3% and 39% in the (High, poor) case. It seems clear that the intention of the firm (to be "fair" and give a high wage) matters to the employees and not simply what wage they receive.

After developing a notion of reciprocity, it seems natural to consider if reciprocal tendencies are constant across genders. Croson and Gneezy (2009) document several experiments designed to measure gender differences in reciprocity, though the experimental findings are inconclusive and somewhat contradictory. Of 18 experiments, seven find that females are more reciprocal than males, ten find that they are the same, and one finds that males are more reciprocal. It seems that these findings are being confounded by something and that there should be some explanation for the inconsistencies. Croson and Gneezy cite arguments that these discrepancies are primarily due to the context of the experiments. For example, in a dictator game among men and women, women seem to be influenced by what they receive in the first round more than men were. Other experiments have found that females are more sensitive to context, so it seems plausible that this may be confounding the results.

It seems that both the existence (and nature) of reciprocity and the existence of gender differences in reciprocal behavior are in states of mild confusion, yet a clear understanding of gender preferences is of great importance for policy (and theory).

### **III. Experimental Design**

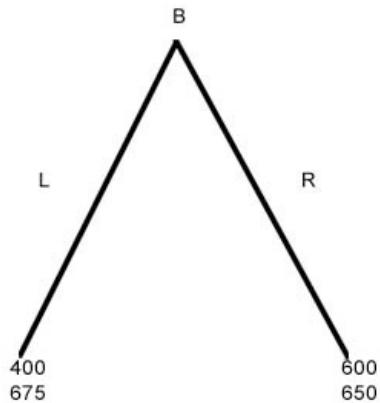
This experiment generated data to test for the existence of positive reciprocity and for different propensities to reciprocate based on participant's gender. Participants were all students at the University of California, Santa Barbara that responded a mass email, which requested participants for an economics experiment. Two experimental sessions were held in March 2010.

At the beginning of the experiment, each person was randomly assigned an ID number and asked to take a seat at a computer. The experiment was programmed and

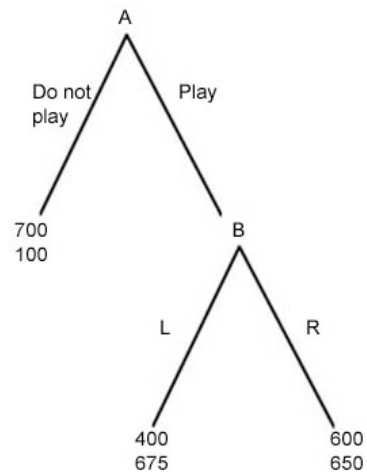
conducted with the software z-Tree (Fischbacher 2007). The instructions were read aloud and example was worked through before beginning. Any questions were answered privately. The experiment used points with the following real conversion, 100 points = \$1 dollar. Participants were paid for only one game, which was determined randomly via coin flip.

Once the session began, all players were assigned to the role of player B and were then asked to then make a simple decision. In game two, players were asked to use the “strategy method” in their decision-making.

Game 1



Game 2



Game 1 was determined to serve as a control to understand B’s preferences when A has no choice to make. Game 2 was determined to understand B’s preferences when player A has a choice to make. Each participant made decisions for both games, but the order in which the games were shown was random. Empirically, a person is exhibiting positive reciprocity if their strategy in game 1 is L (0) and their strategy in game 2 is R

(1). Players who play R in both games could be said to be either altruistic or highly concerned with efficiency. Formally, person  $i$  is said to have behaved reciprocally if his or her strategy vector for games one and two is  $S_i = (0_1, 1_2)$ . That is, play 0 in game 1 and 1 in game 2. Any other strategy combination and person  $i$  did not behave reciprocally.

The participants were then given a short survey that requested gender information, self-reported levels of reciprocity, GPA, hours spent employed and studying, number of close friends, and subjective life satisfaction. The survey is partially modeled after one conducted by the German Socioeconomic Panel (SOEP) (Dohmen, Falk, Huffman, Sunde 2009). Survey respondents were asked to determine how well the following statements applied to them on a 7-point scale, where 1 corresponds to “does not describe me at all” and 7 corresponds to “describes me perfectly.” The statements were (1) If someone does me a favor, I am eager to return it, (2) I go out of my way to help somebody who has been kind to me before, (3) I am willing to bare a personal cost to help a person who has helped me in the past, (4) If somebody insults me, I will respond with an insult, (5) If somebody inconveniences me, I will attempt to inconvenience him or her, and (6) If I suffer a serious wrong, I will take revenge no matter the cost.

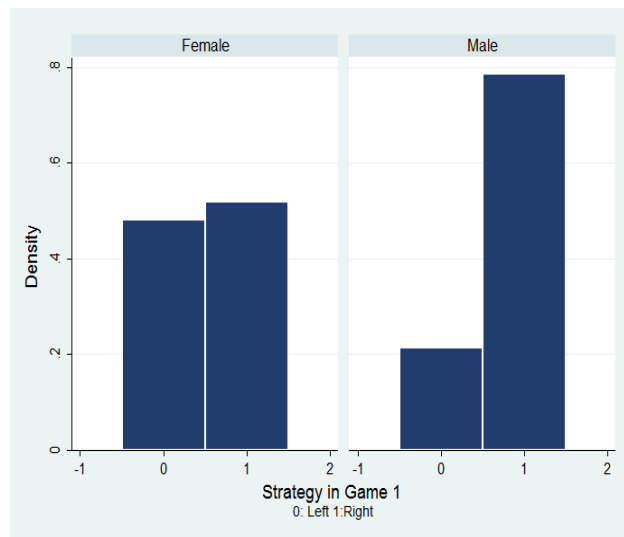
Additionally, I conducted a population wide survey. I approached students on campus and requested their participation in anonymous survey. The survey was identical to the one given to the experimental subjects.

### **III. Results**

The data consist of 41 observations of decisions and 102 surveys. The experimental results found little evidence for positive reciprocal behavior. Of the 41

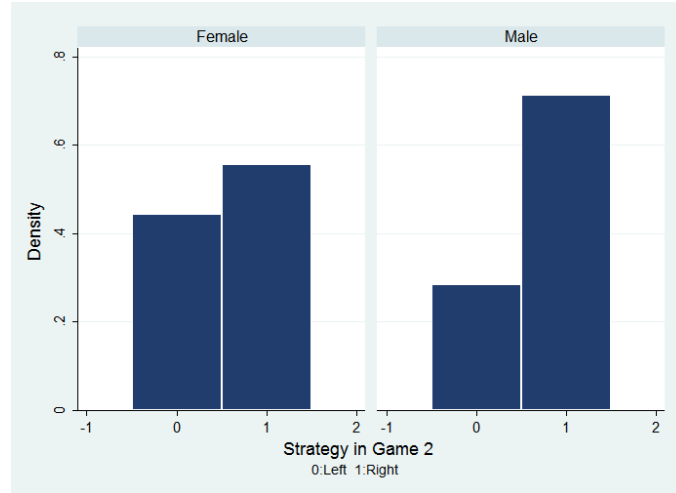
participants, only 3 engaged in what I have defined as reciprocal action. The majority of participants chose the same strategy in both games. Figure 2 shows the strategy distribution for each game, grouped by gender. One notices immediately that the proportion of males choosing strategy 1 is considerably greater than the corresponding proportion of females. The proportion of males choosing 1:R in game 1 is statistically greater than the proportion of females choosing 1:R at the  $\alpha=0.05$  level. The significance is lost in game 2 (Figure 3).

Figure 2: Strategy Histogram for Game 1



Since playing strategy 1 in game 1 consists of making a sacrifice to help the other player when the other player has not helped you, it seems to correspond with an altruistic strategy. Due to the design of the game, the altruistic strategy and efficiency strategy coincide, so it is impossible to determine what the actual motivation was.

Figure 3: Strategy Histogram for Game 2



The interesting aspects of the experiment require the use of the survey data. The summary statistics for the survey information is shown in Table 2 (Appendix I). After a brief examination of the summary statistics, it is clear that only marginal differences were observed between male and female reported information.

Figure 4 (Appendix I) shows the distribution of all the responses to the six reciprocity questions. The distributions are sorted by gender so that it is easy to compare. The genders clearly have different distributions, though many times they have the same mean. For the "I am willing to bare a personal cost to help a person who has helped me in the past" question, the females have a much larger spread than the males. This demonstrates how females can be more sensitive to context than men.

The mean self-reported negative reciprocity score for women is 2.96. If we condition on their strategy choice in game 1, then the mean scores for negative reciprocity conditional on L being played and conditional on R being played, are 3.359, and 2.476, respectively. The difference between the two conditional means is statistically significant at the 99% confidence level. It seems we can conclude that the greater the

negative reciprocity score, the more likely it is that the player will play the "selfish" strategy.

Tables 3, 4, and 5 (Appendix I) present all the regression results. All coefficients are from OLS regressions. In table 3, the dependent variables are positive and negative reciprocity. In contrast with the findings of Dohmen, Falk, Huffman, Sunde (2009) (Dohmen, et al), I find no significant gender effect in the regression. I do find a significant "age" effect, where age is measured by the college student's year. The lack of gender difference is not troubling though, as Dohmen, et al (2009) found a significant age effect, where positive(negative) reciprocity increases(decreases) with age. A likely explanation is that females on average have a larger reciprocity variance.

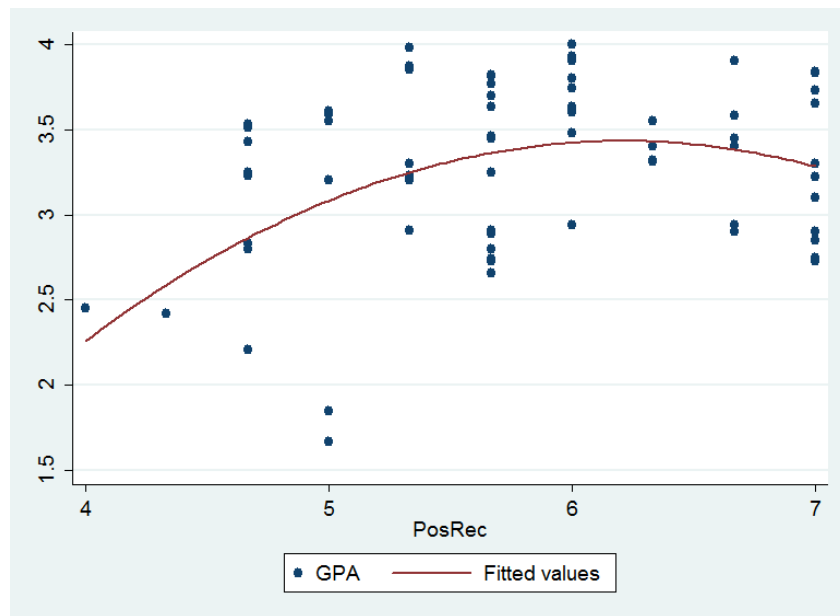
In Table 4, I found a slightly significant effect of negative reciprocity on the amount of hours worked. This is also in contrast to Dohmen et al, where no correlation between negative reciprocity and hours worked was found. It seems likely that negative-reciprocal behavior could have a negative correlation with hours worked. Many find that positive reciprocity correlates with more hours worked, so the opposite direction seems intuitive.

In table 5, I examine the effect of reciprocity on variables that serve as indicators of success: GPA, reported life satisfaction, and number of close friends. In order for it to make sense to ever behave reciprocally, it must be that such behavior yields an advantage.

The first measure of success is GPA. While GPA does correlate with intelligence, it also is majorly impacted by the amount of effort put into the class. GPA also is a positive signal to prospective employers. I find a highly significant positive reciprocity

effect on GPA. This makes sense, as Dohman et al (2009) have found that positive reciprocal behavior correlates with working more hours. It seems that positively reciprocal people exert higher levels of effort during certain tasks. In fact, it seems that there may be an optimal level of positive reciprocity, at least with respect to GPA. Figure 5 shows the average positive reciprocity scores plotted with GPA,

Figure 5: Optimal Positive Reciprocity



The next measure of success is the life satisfaction score reported on the survey. Life satisfaction is an important goal for people, so it seems clear that we can use life satisfaction as a proxy for success or happiness. In the survey, I used the standard measure of life satisfaction. Each person who participated in the survey was asked to rate how satisfied he or she is with their life on a scale of 1-10. 1 corresponds to "completely dissatisfied", while 10 corresponds to "completely satisfied". I find a significant correlation of positive reciprocity and life satisfaction. If being more positively reciprocal causes higher levels of satisfaction, then positive reciprocity may help people

handle stressful scenarios more successfully, which can increase their success in the workplace. In addition, I find that negative reciprocity has a significant correlation with the number of close friends a person has.

### **III. Conclusion**

In this paper, I have shown that people have, or consider themselves to have, reciprocal tendencies. I found no gender difference in actual behavior, but I found a significant age effect on reciprocal behavior. I also found that positive reciprocity correlates with a more successful, satisfying life and is related to academic (GPA) performance. Therefore, positive reciprocity should have a large impact on work-place performance.

While I did not find people behaving in a positively reciprocal manner in the experiment, I did find that a person's reported level of negative reciprocity has a significant impact on their decision making. Positive reciprocity is more difficult to induce in an experimental setting, since in an anonymous environment people do not always act in the same way they usually would. Policies would be more effective if they considered the way people actually behaved, but in order to do this we must first establish a firm theoretical foundation for how reciprocal tendencies influence behavior.

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**Appendix I**

Table 2: Survey Summary Statistics

|              | (1)<br>GPA      | (2)<br>Friends    | (3)<br>Satisfaction | (4)<br>Competitive | (5)<br>Positive<br>Recip. | (6)<br>Negative<br>Recip. |
|--------------|-----------------|-------------------|---------------------|--------------------|---------------------------|---------------------------|
| Female       | 3.26<br>(0.103) | 7.185<br>(1.113)  | 7.852<br>(0.237)    | 5.111<br>(0.263)   | 5.809<br>(0.130)          | 2.962<br>(0.253)          |
| Male         | 3.27<br>(0.155) | 10.387<br>(1.225) | 7.677<br>(0.551)    | 5.484<br>(0.414)   | 5.772<br>(0.181)          | 3.154<br>(0.332)          |
| Observations | 61/41           | 54/31             | 54/31               | 54/31              | 54/31                     | 61/41                     |

Standard errors in parentheses

Table 3: Determinants of Reciprocity

| DEPENDENT<br>VARIABLES | (1)<br>Positive Reciprocity | (2)<br>Positive Reciprocity | (3)<br>Negative Reciprocity | (4)<br>Negative Reciprocity |
|------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Female                 | 0.0363<br>(0.149)           |                             | -0.193<br>(0.255)           |                             |
| Year                   |                             | 0.157***<br>(0.0589)        |                             | -0.228*<br>(0.117)          |
| Constant               | 5.772***<br>(0.115)         | 5.234***<br>(0.204)         | 3.154***<br>(0.197)         | 3.711***<br>(0.405)         |
| Observations           | 102                         | 83                          | 102                         | 83                          |
| R-squared              | 0.001                       | 0.080                       | 0.006                       | 0.045                       |

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 4: Reciprocity and Work

| DEPENDENT<br>VARIABLES | (1)<br>Study Hours | (2)<br>Work        |
|------------------------|--------------------|--------------------|
| Gender                 | 4.453<br>(2.784)   | -0.0401<br>(1.702) |
| Pos. Reciprocity       | -0.564<br>(2.380)  | -0.889<br>(1.455)  |
| Neg. Reciprocity       | -0.855<br>(1.171)  | -1.220*<br>(0.716) |
| Competitive            | 0.395<br>(1.179)   | 0.491<br>(0.721)   |
| Constant               | 11.87<br>(13.19)   | 14.03*<br>(8.065)  |
| Observations           | 85                 | 85                 |
| R-squared              | 0.036              | 0.035              |

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

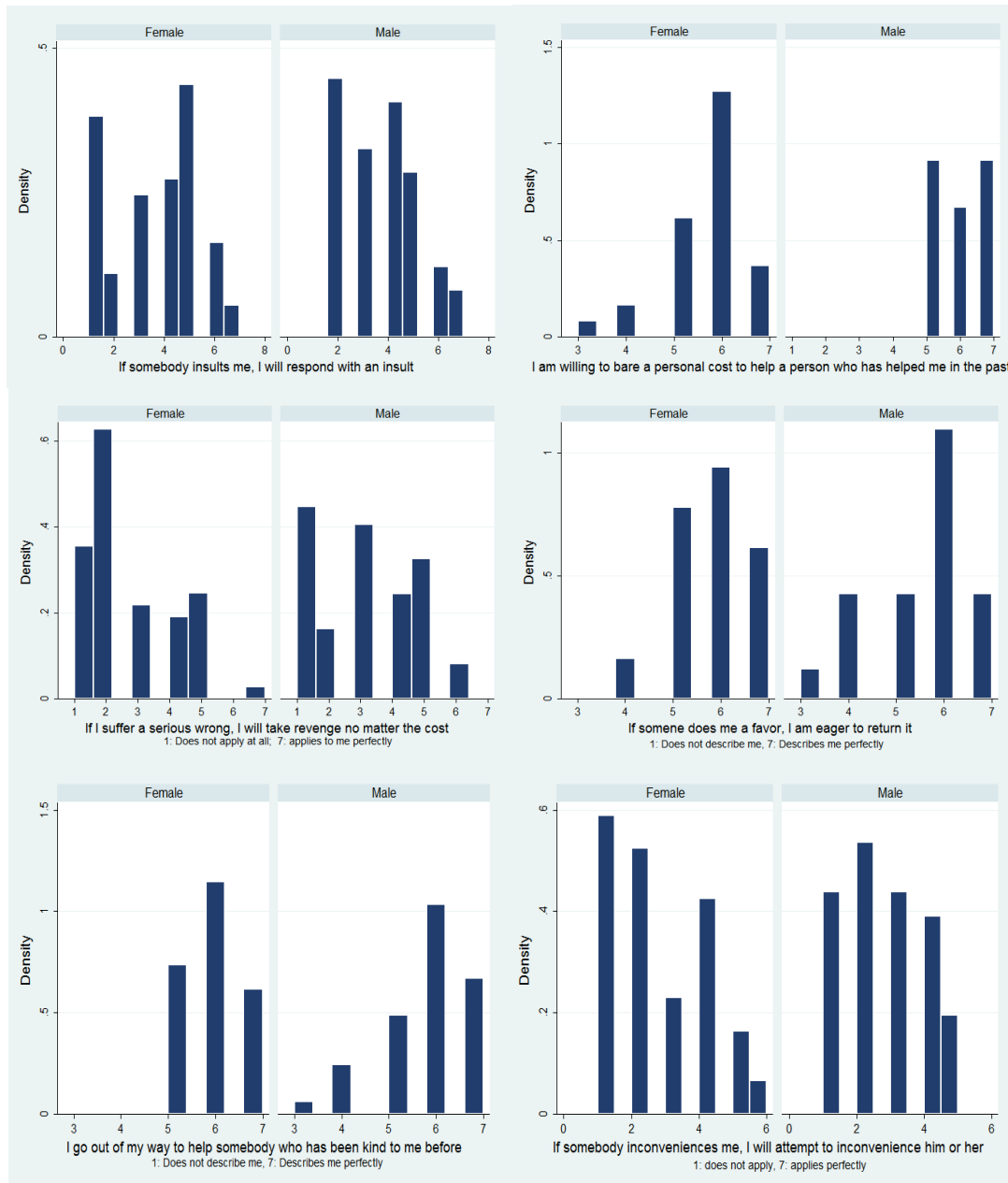
Table 5: Reciprocity and Success

| DEPENDENT<br>VARIABLES | (1)<br>GPA           | (2)                 | (3)<br>Life Satisfaction | (4)<br>Friends      |
|------------------------|----------------------|---------------------|--------------------------|---------------------|
| Pos. Reciprocity       | 0.205***<br>(0.0703) |                     | 0.600**<br>(0.240)       | 0.375<br>(0.965)    |
| Neg. Reciprocity       | 0.0436<br>(0.0408)   |                     | 0.0349<br>(0.127)        | 1.106**<br>(0.486)  |
| Year                   |                      | 0.112**<br>(0.0481) |                          | 1.977***<br>(0.527) |
| Constant               | 1.945***<br>(0.444)  | 2.885***<br>(0.167) | 4.218***<br>(1.518)      | -3.552<br>(5.962)   |
| Observations           | 102                  | 83                  | 85                       | 83                  |
| R-squared              | 0.083                | 0.063               | 0.072                    | 0.185               |

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Figure 5: Response Distribution for Reciprocity Questions



Note: The distributions of answers to the reciprocity questions are shown above. The corresponding question is just below the Histogram. The scale of 1-7 is such that 1 corresponds to "the statement does not describe me at all" and 7 corresponds to "describes me perfectly."

## Appendix II

### Instructions:

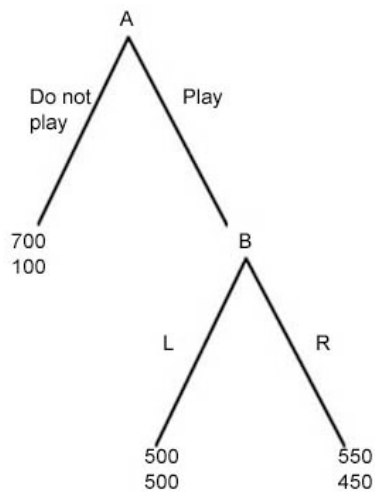
During this experiment you will be asked to make two simple decisions. These decisions will determine real monetary payoffs.

The decisions you make will determine your points and then your points will be converted into US dollars. The conversion ratio is; 100 points = \$1.

You will also be asked to answer a short survey. This survey does not ask for personally identifiable information and no identifiable information will be recorded.

Only one decision will be considered for pay, which will be determined randomly. The random process used to determine which decision is paid is a coin flip. A “Heads” will specify decision 1, a “Tails” will specify decision 2. Which decision is being paid will not be determined until after the experiment is over.

Example:



Note: 700 means A gets 700 and B gets 100.  
100

If you are player B, when does your decision matter?

If A chooses “Play” and B chooses “L” what does person A get? Person B?

What if B chooses “R”?

What if A Chooses “Do not play”?

**Appendix III**

**Experimental Survey**

Please specify your gender. **(Circle one)** M F

What is your UCSB GPA? (Please specify two decimal places, i.e., 7.89)

\_\_\_\_\_

What year are you in school? \_\_\_\_\_

What is your major, or intended major (if known)? \_\_\_\_\_

How many hours a week do you work? (Please use your best estimate of average hours. Put 0 if unemployed) \_\_\_\_\_

How many hours a week, on average, do you spend studying? \_\_\_\_\_

Approximately how many close friends do you have? \_\_\_\_\_

Do you regularly participate in sports? Y N

Please rate how well each of the following statements applies to you. A 1 corresponds to “Does not describe me at all; does not apply to me” and a 7 corresponds to “Describes me perfectly; applies perfectly”.

1: “Does not describe me at all; does not apply to me”

7: “Describes me perfectly; applies perfectly”

- If I suffer a serious wrong, I will take revenge no matter the cost.

1      2      3      4      5      6      7

- If somebody inconveniences me, I will attempt to inconvenience him or her.

1      2      3      4      5      6      7

- I am willing to bare a personal cost to help a person who has helped me in the past.

1      2      3      4      5      6      7

Please rate how well each of the following statements applies to you. A 1 corresponds to “Does not describe me at all; does not apply to me” and a 7 corresponds to “Describes me perfectly; applies perfectly”.

1: “Does not describe me at all; does not apply to me”

7: “Describes me perfectly; applies perfectly”

- If somebody insults me, I will respond with an insult.

1      2      3      4      5      6      7

- If someone does me a favor, I am eager to return it.

1      2      3      4      5      6      7

- I go out of my way to help somebody who has been kind to me before.

1      2      3      4      5      6      7

- I am a competitive person.

1      2      3      4      5      6      7

Lastly, please answer the following question.

How satisfied are you with your overall quality of life?

(not at all satisfied)  
satisfied)

(extremely

1      2      3      4      5      6      7      8      9      10