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# Relative Position, Prices of Sacrifice and Reciprocity: An Experimental Study Using Individual Decisions

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**Abstract**

We use experimental data to obtain a detailed description of individuals' pro-sociality. Participants are faced with a large number of decisions involving variations in the trade-offs between own and others' payoffs, as well as in other potentially important factors like individuals' positions vis-à-vis others. We find that decisions are affected by payoff trade-offs in an intuitive way but also by whether individuals obtain more or less than others. We find little reciprocity of the type linked to menu-dependence. The influence of social welfare preferences is stronger than that of difference aversion; however, Leontieff preferences are not more important than difference aversion in our data.

**Keywords :** Experiments, Social Preferences, Reciprocity, Difference aversion.

**JEL Classification Codes :** C70, C90, D63, D64

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## 1. Introduction.

We present detailed evidence about individuals' decisions in a number of choice situations involving the payoffs of two persons. Our aim is to obtain a complete picture of individuals' decisions in relation to various dimensions of behavior that are central for a characterization of social preferences. Most of the previous studies of people's pro-social behavior have only looked at a few decisions of each individual and have tended to analyze behavior in the aggregate; some exceptions will be discussed in section 2. Recent models of social preferences have been informed by this kind of aggregate information. However, the accumulated experimental evidence suggests that people are very heterogeneous in their behavior. To better understand this heterogeneity, it is necessary to generate information that directly pertains to *individuals'* social preferences.

In our experiments, each of our participants has to make numerous sequential pair-wise choices between two alternative states described only by payoffs to himself and to another person. In designing these choice problems we have been guided by what previous experimental and modeling studies have identified as some of the basic influences that need to be taken into account when dealing with interdependent motivation. The first of these is that many people care about the payoffs of others in several respects. People may care about the relation of their own payoffs to those of others, about the sum of payoffs to all involved, as well as about other payoff-related aspects. The second lesson that has been learned from previous work is that people may also be influenced by a variety of circumstances surrounding the act of choice that are not directly payoff-relevant; these circumstances may include aspects like the features of foregone payoff distributions, the procedure by which an outcome is reached and the beliefs that people hold about others' expected behavior.

Our design allows us to study the relevance of these different forces at the individual level. More specifically, we measure the impact of three basic factors. First, through a series of different binary choices we elicit whether subjects are willing to spend money to increase or decrease others' payoffs at different prices for sacrificing. Second, we study how the sacrificing of money depends on whether the person is in an advantageous or disadvantageous position. Third, we study whether these same subjects modify their willingness to sacrifice depending on whether another subject has foregone various types of outside options. In this way, our paper presents a joint experimental analysis of the importance of distributional aspects linked only to payoffs and of reciprocity influences of the kind related to menu-dependence.

## 2. Experimental design.

Our design is based on situations involving two persons with roles *i* and *j*. Each subject in the *i* role makes eleven pair-wise choices between a fixed option A and several alternative options, called $B_1$, $B_2$,…, $B_{11}$, in a dictator-type situation. Each option involves a payoff for player *i* and a payoff for player *j*. The set of decisions on these pair-wise choices yields information about the degree to which people are willing to sacrifice money to increase or decrease the payoffs of others.

Overall each subject made pair-wise choices in six different environments. In the first two environments the player in the *i* role makes choices from two different positions, *strong* and *weak*, without the intervention of the other player. In the strong position, player *i*'s payoffs are at least as large as player *j*'s payoffs in the distribution of payoffs of each pair-wise choice. In contrast, in the weak position, player *i*'s payoffs never exceed player *j*'s payoffs in the distribution of payoffs of each pair-wise alternative.

Table 1 shows the specific alternatives from a strong position. Subjects in the player *i* role had to make eleven choices between A and each of the B-choices. Each binary choice, state A versus any particular state B, involves a certain relative price of sacrificing. This price variation across choices allows us to elicit the extent to which people sacrifice their own material payoffs to increase or to decrease other people's payoffs. Consider an example. The binary choice between state A and $B_1$ consists in player *i* deciding whether to forego 100 units to raise the other subject's payoff by 400 units, so that for *i* the price of each payoff unit given to *j* is .25. The number in the last column of table 1 will be used in our figures to refer to the different Bs.

The selection of payoffs in table 1 responds to the following considerations. Since we want to place player *i* in a strong position *i*'s payoff can not be smaller than that of player *j* in any of the possible outcomes. The relation between payoffs at A and those at any of the B cases has to be such that player *i* gives up a part of his payoff and alters that of player *j*; player *i* pays a price for changing *j*'s payoff. We also wanted to give *i* both the possibility of increasing and decreasing the other player's payoff. In this we were guided by the already abundant evidence which shows that many people are willing to act in this manner.[1] All these considerations impose that *i*'s payoff in all the B-choices has to be smaller than 1100 and that *j*'s payoff in these states has to vary in a way that implies different positive and negative relative prices of sacrificing. Here is where we introduce a simplifying element into the design by keeping *i*'s payoff always at a value of 1000 in the different B states and changing only *j*'s payoff. Given this choice, *j*'s payoff in the situation most favorable to *j*, $B_1$, can not be higher than 1000, since otherwise *i* would cease to be in the strong position. From here the other states are derived by diminishing *j*'s payoff until we reach zero. Some of the positive and negative prices have the same absolute value. This is not a necessary feature of the design, but introduces some additional simplicity.

Table 1
Measuring sacrifice from a strong position

| State | Payoff of i | Payoff of j | Relative price of sacrificing | Outcome Number |
|---|---|---|---|---|
| A | 1100 | 600 | - | - |
| $B_1$ | 1000 | 1000 | 0.25 | 4 |
| $B_2$ | 1000 | 900 | 0.33 | 3 |
| $B_3$ | 1000 | 800 | 0.50 | 2 |
| $B_4$ | 1000 | 700 | 1 | 1 |
| $B_5$ | 1000 | 600 | ∞ | 0 |
| $B_6$ | 1000 | 500 | -1 | -1 |
| $B_7$ | 1000 | 400 | -0.50 | -2 |
| $B_8$ | 1000 | 300 | -0.33 | -3 |
| $B_9$ | 1000 | 200 | -0.25 | -4 |
| $B_{10}$ | 1000 | 100 | -0.20 | -5 |
| $B_{11}$ | 1000 | 0 | -0.17 | -6 |

Table 2 shows the set of alternatives from a weak position for players in the *i* role. Note first that here the payoffs in state A are just reversed with respect to what they were for the case where choices are from a strong position. As before, when a subject chooses state B over A in any of the first five binary choices, she is sacrificing own material payoffs to *help* the other subject and when a subject chooses state B over A in any of the last six binary choices, she is sacrificing own material payoffs to *hurt*

[1] Zizzo and Oswald (2001) report results from an experiment in which they vary the price of burning money, i. e. the amount of their own money that subjects must give up to decrease other people's money holdings. They found that nearly two-thirds of subjects paid for impoverishing other people. Even as the price of burning went up, the percentage of people who chose to burn other people did not fall substantially.

the other subject. The different B states are chosen in such a way that i's payoff loss is the same for all the B states and that the relative prices of sacrificing shown in column 4 of table 2 are the same as for the choices from a strong position. As in table 1, column 5 shows a number for each outcome which will be used as a label in the graphical representations below.

Table 2
Measuring sacrifice from a weak position

| *States* | *Payoff i* | *Payoff j* | *Relative price of sacrificing* | *Outcome Number* |
|---|---|---|---|---|
| *A* | 600 | 1100 | - | - |
| $B_1$ | 500 | 1500 | 0.25 | 4 |
| $B_2$ | 500 | 1400 | 0.33 | 3 |
| $B_3$ | 500 | 1300 | 0.50 | 2 |
| $B_4$ | 500 | 1200 | 1 | 1 |
| $B_5$ | 500 | 1100 | ∞ | 0 |
| $B_6$ | 500 | 1000 | -1 | -1 |
| $B_7$ | 500 | 900 | -0.50 | -2 |
| $B_8$ | 500 | 800 | -0.33 | -3 |
| $B_9$ | 500 | 700 | -0.25 | -4 |
| $B_{10}$ | 500 | 600 | -0.20 | -5 |
| $B_{11}$ | 500 | 500 | -0.17 | -6 |

The choices presented in tables 1 and 2 are the baseline for the four remaining environments we confront our subjects with. In these four so-called response games player *j* first decides whether to accept an outside option or to let player *i* make a set of binary choices as above.[2] Table 3 gives an overview of the four response games we used. The names of the different games are meant to capture *j*'s situation in relation to *i*. The letter "S" stands for *i*'s strong position and the letter "W" for his weak position, as used above. The labels "PR" and "NR" refer to positive and negative reciprocity.

We use these terms here in a descriptive way to refer to the fact that for "PR" ("NR") *i* obtains less (more) at the outside option than at any of the choices between A and B, and that player *i* may react favorably (unfavorably) to this fact. What we are looking at here is at the possible existence of what Sen (1997) called 'menu-dependence'. This term refers to the fact that preferences over an outcome may depend on the payoffs at other possible but un-reached outcomes. The responsibility associated with others' choices can influence people's rankings over narrowly defined outcomes and, in our context, this pertains to the available outside option. Existing evidence for menu-dependence is quite mixed. Brandts and Solà (2001), Falk, Fehr and Fischbacher (2003) and Cox (2004) find favorable evidence, while Charness and Rabin (2002) Bolton, Brandts and Ockenfels (1998) and Bolton, Brandts and Katok (2000) do not find it. The question arises of how all this evidence fits together. In our final we will discuss this issue taking into account the new results from the experiment presented in this paper.

Menu-dependence is not the only aspect of the circumstances around the actual choice set that may have a bearing on how people decide. Sen (1997) refers also to 'chooser-dependence': a person's evaluation of an outcome may depend on the identity or some characteristics of the chooser, i.e. the decision-maker that led to that outcome. The results in Blount (1995) and Charness (2004) are examples of what can be interpreted in terms of chooser-dependence. At this point, it is also important to note that Sen's classification is a useful organizing tool, but that it may not easily cover all ways in which non-outcome information may affect behavior.

If in the SPR response game player *j* gives up his outside option he allows player *i* to obtain either 1000 or 1100, in both cases substantially more than the 0 payoff that he would have obtained at the outside option. Observe that at the outside option player *j* obtains a payoff of 1000, so that by passing up that outside option *j* exposes herself considerably, since 1000 is the most *j* can get from *i*'s choices. The fact that *j* has nothing to gain in terms of own payoff from foregoing the outside option, makes this an environment favorable to the emergence of positive reciprocity. Specifically, if *j* allows *i* to effectively play, then *i* can be expected to be more generous towards *j* than in the absence of the (0,1000) outside option. For the SNR game one can make a similar argument; by not taking the outside option, player *j* imposes a large loss on *i* while *j* can still obtain the same – or a similar - payoff than at the outside option. As a consequence, if *i* is called to play he can be expected to be less generous than in the absence of the (2000, 1000) outside option.

For the two response games involving the weak position one can say something rather analogous. Player *i*'s payoff at the outside option of game WPR (WNR) is with 0 (2000) lower (higher) than any of the two payoffs that he can obtain if *j* foregoes the

[2] This kind of response games is used extensively in Charness and Rabin (2002).

outside option. Player *j*'s payoff is equal to the highest possible payoff that can arise if she gives *i* the opportunity to choose.[3]

Table 3
Response games

| | |
|---|---|
| Game SPR | *j* chooses (0,1000) or lets *i* make the choices in table 1 |
| Game WPR | *j* chooses (0,1500) or lets *i* make the choices in table 2 |
| Game SNR | *j* chooses (2000,1000) or lets *i* make choices in table 1 |
| Game WNR | *j* chooses (2000,1500) or lets *i* make choices in table 2 |

In summary, our data consist of individual choices for what can be seen as 22 different budget set segments, involving both positive and negative relative prices, for three cases (the DT and the two variations of the RT) which differ with respect to the overall menu available to the players involved. Experiments make it possible to generate rich data sets of this kind and this can yield important advantages in some cases. A few previous studies collect such data sets. Brandts and Schram (2001) study a public good environment in which subjects have to make contribution decisions for 10 different relative prices of a private and public good. This yields a complete 'contribution function' for each subject and makes it possible to reject in a simple way the long-lived hypothesis that subjects contribute positive amounts only by mistake. In Johansson-Stenman et al. (2002) subjects are asked to choose between alternative states with different uniform income distributions. Through choices between alternative states they obtain information about participants' degree of relative risk aversion and the degree of positionality (the concern for relative standing). Andreoni and Miller (2002) had their subjects make between 8 and 11 allocation different combinations between themselves and another person. Each of these involved an endowment of tokens as well as a own payoff from keeping a token and a payoff to the other from giving a token to the other. This allows them to study the consistency of behavior in their context. We feel that this way of collecting data opens many possibilities and hope that it will become more standard in the future. However, in our concluding section we will reflect on possible drawbacks of this approach.

[3] In the WPR game *i*'s payoff loss at the outside option is smaller than in the SPR game, so that *j*'s decision to forego the outside option could be considered less kind in WPR than in SPR. However, at the same kind *j*'s payoff is larger at the WPR outside option than at the SPR one, so that player *i* is "more behind" in the latter case and this element may also affect the way in which the foregoing of the outside option is judged. Something similar can be said about the comparison of the SNR and WNR games.

## 3. Theoretical Background and Research Questions.

In this section we briefly discuss the predictions of several prominent models of social preferences and formulate the research questions that we want to take to the data. Among the models designed to capture other-regarding preferences two prominent classes can be distinguished: models that only take into account distributional concerns, and models that include other motivational forces. The distributional approach permits subjects to be motivated not only by their own material payoff, but also by the final distribution of payoffs. We first concentrate on this type of models.

Andreoni and Miller (2002) report that a large part of their subjects' decisions can be represented by three kinds of simple distributional preferences: purely selfish, Leontieff and perfect substitutes preferences. Our design separates rather cleanly these three types. The predictions of the different types of preferences pertain to the behavior vis-à-vis the eleven different relative prices in the six choice environments. Purely selfish preferences simply imply that player *i* will always choose A, both in the strong and in the weak position. Leontieff (or maximin) preferences predict that in the strong position $B_1$ to $B_4$ will be chosen over A, while A will be chosen over the other B options; in the weak position, A will always be chosen. Perfect substitutes preferences imply that both in the strong and the weak position $B_1$ to $B_3$ will be chosen over A, while A will be chosen over $B_5$ to $B_{11}$, with indifference for $B_4$.

Charness and Rabin (2002) present a simple conceptual model of social preferences in two-person games, which embeds the three simple models just described, as well as other models of social preferences in terms of different parameter ranges. Letting $x_i$ and $x_j$ be player *i*'s and *j*'s money payoffs, the Charness-Rabin utility function of player *i* can be written as:

$$U_i\,(x_i\,,\,x_j) \equiv (1 - \rho r - \sigma s - \theta q)\,x_i + (\rho r + \sigma s + \theta q)\,x_j$$

where

$$r = 1 \text{ if } x_i > x_j, \text{ and } r = 0 \text{ otherwise;}$$
$$s = 1 \text{ if } x_i < x_j, \text{ and } s = 0 \text{ otherwise;}$$
$$q = -1 \text{ if } j \text{ has misbehaved, and } q = 0 \text{ otherwise.}$$

In words, *i*'s utility is a weighted sum of her own payoff and *j*'s payoff, where the weight *i* places on *j*'s payoff may depend on whether *j* is getting a higher or lower payoff than *i* and on how *j* has behaved. The parameters ρ, σ and θ capture various aspects of other-regarding preferences and reciprocal behavior; in all purely distributional models θ=0. In the Charness-Rabin formulation, the reciprocity element is conceived to only come into play negatively, but one can modify this simply by considering that q = +1 if *j* behaves in an honorable way. We have seen in our discussion of menu-dependence and chooser-dependence that there are different reasons why somebody may be judged to misbehave or to behave nicely. The possible importance of these distinctions for understanding behavior in our and other experiments will be discussed below.

The cases considered by Andreoni and Miller (2002) discussed above fit nicely into the Charness-Rabin model. We start by discussing these cases; however, our design may help identify behavior different from these categories. Pure selfishness is represented by $\sigma=\rho=0$. In Leontieff preferences the utility is determined by the player who gets less so that $\sigma=0$ and $\rho=1$; given the specific parameters of our design the pure Leontieff preferences will be indistinguishable from those with $\sigma=0$ and $0<\rho\leq 1$.

Pure perfect substitutes preferences are represented by $\sigma=\rho=$ ½; for our design these preferences are indistinguishable from those were $0<\sigma\leq 1/2$ and $0<\rho\leq 1/2$. Note that perfect substitutes preferences are insensitive to relative position but respond to the price of sacrifice, for Leontieff this is reversed.

Charness and Rabin (2002) discuss three other types of simple distributional preferences: The first is competitiveness, represented by $\sigma \leq \rho \leq 0$; a person with such preferences would always prefer to do as well as possible in comparison to the other player, while also caring directly about his payoff.[4] The second very prominent hypothesis about distributional preferences is what can be called "difference aversion", which has been modeled by Fehr and Schmidt (1999).[5] Difference aversion implies $\sigma < 0 < \rho < 1$.[6] These preferences are, hence, sensitive to relative position and the price of sacrifice, in a particular way.

The third additional type that Charness and Rabin (2002) discuss is what they call social-welfare preferences, where $0 < \sigma \leq \rho \leq 1$. Note that the perfect substitutes

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4 It is also conceivable that $\rho<=\sigma<= 0$.

5 Bolton and Ockenfels (2000) present a related model. For some survey evidence on the importance of relative position see Solnick and Hemenway (1998).

6 If people were consistently difference-averse choices in our set-up would elicit rather precisely the relevant parameters. Consider the strong position. In state A, the income of player *i* and *j* is respectively $x^A_i = 1100$ and $x^A_j = 600$ units of lab money. In state B, the income of both players is $x^B_i = 1000$ and $x^B_j = 700$ units of lab money. If the player *i* is indifferent between the two states, we have $U^A_i(x) = U^B_i(x)$ and for this reason we have $\rho_i = (x^A_i - x^B_i) / (x^A_i - x^B_i)\text{-} (x^A_j - x^B_j)$. In this particular case, indifference corresponds to $\rho_i = 0.5$. Consequently, if the player prefers state A over B, $\rho_i < 0.5$ and vice versa. The parameter $\sigma$ in the Charness-Rabin utility function could be elicited in an analogous way.

preferences to which a good part of the subjects studied in Andreoni and Miller (2002) conform to, are a special case of social-welfare preferences. In the more general version they are sensitive to relative position and to the price of sacrifice.

The main alternatives so far to these distributional preference models are models that try to capture actions that are conditional on the actions or intentions of others. Rabin (1993) and Dufwenberg and Kirchsteiger (2003) present different theoretical models that capture this kind of element. In this paper we systematically study to what extent the reaction to others' favorable or unfavorable actions is present in the data from our response games. We will get back to this below.

We can now succinctly state our four research questions:

- *How do people react to the different relative prices of sacrificing?*
- *Do people make different decisions in the weak and in the strong position?*
- *Does the presence of the outside options affect behavior?*
- *Which preference models represent individual behavior?*

## 4. Experimental procedure.

A total of 120 students from the University of Valencia took part in this experiment in October 2003. Technically, the experiment consisted of two parts which we call treatments: the *distributional treatment* (DT, hereafter), involving the choice situations presented in tables 1 and 2, and the *reciprocity treatment* (RT, hereafter), involving the four response games presented in table 3. The experiment began with 80 students taking part in the distributional treatment, 40 as active players and 40 as passive players. At the end of the distributional treatment, the same 40 active players were asked, following a surprise restart, to participate in the reciprocity treatment (they received no information about the second treatment at the beginning of the first one) with a fresh group of 40 subjects. The introduction of this new fresh group eliminates possible repeated game effects.

At the beginning of the distributional treatment, the 40 (active) subjects in the player *i* role and the 40 subjects in the player *j* role were seated in two different rooms. Participants kept their roles during the whole treatment and did not have any additional information except the individual payoffs described by the states A and B. Players *i* made 22 sequential choices between two alternative states, A and B, corresponding to the strong and the weak positions.[7] The *j* players did not make any kind of decision. All participants knew that they would be paid according to the outcome generated by one of the 22 choices of the corresponding *i* player and that they would be anonymously paired with another participant of the other room, both - outcome and partner - to be selected at random.

In the experiment, 1000 units of lab money = 5 euros. The hand-run treatment took less than 30 minutes and average earnings (included a 3 euros show-up fee) were around 10 euros. Experimental instructions are provided in Appendix 1. To make sure subjects understood the instructions we had them answer a questionnaire after the instructions had been read aloud to the group and just before the experiment began. Nobody made a mistake.[8]

A total of 79 subjects took part in reciprocity treatment: 40 in the first-mover role of player *j* and 39 in second-mover role of player *i*.[9] Again, each group was seated in one of two different rooms. As already mentioned, this treatment was run just after the DT and the *i* players were the same subjects in both treatments while the *j* players were different.[10]

In this treatment involving the four response games we applied what is called the strategy elicitation method, which goes back to Selten (1967). The *i* players made their pair-wise choices between two states conditional on the corresponding *j* player letting them choose. In making these decisions, the *i* players knew that their decisions only mattered if the corresponding *j* player had passed up the outside option.[11] In this treatment the *i* players (second-mover role) made a total 44 sequential choices, distributed in 4 blocks of 11 decisions, between two alternative states, A and B. The *j* players (first-mover role) made 4 choices, one for each response game shown in table 3, between two possibilities: to choose the outside option or to let player *i* choose.

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[7] This means that they made their decisions in a fixed order starting with the A vs. $B_1$ choice in table 1, then moved to the A vs. $B_2$ choice etc., then proceeded in the same way in table 2 etc. In our analysis below we take into account possible sequencing effects.

[8] During the experiment we encouraged participants to check their decisions once they had been made.

[9] A player *i* left the experimental room once the distributional treatment finished. When we asked him to participate in a new treatment, he refused. Hence, we have complete data from 39 subjects.

[10] To mitigate order effects with regard to the kind of reciprocity (positive or negative), we designed the reciprocity treatment in such a way that half the group of players *i* began with the games SPR and WPR and the other half began with games SNR and WNR. A Mann-Whitney test showed that there was no significant difference between the two sub-treatments. Hence we can conclude that the results are not driven by the order in which subjects made these decisions. We did not change the order between the other parts of the experiment.

[11] On the use of this method see Brandts and Charness (2000 and 2003).

Again, all participants knew that they would be anonymously paired with another participant of the other room, and that they would be paid according to the outcome generated by themselves in one of the 4 blocks, both - outcome and payoffs - to be selected at random. To make sure subjects understood the RT we had them answer a questionnaire after the instructions were read aloud to the group and just before the experiment began. Again, the explanation was repeated until nobody made a mistake (in this case, this was true almost from the beginning).

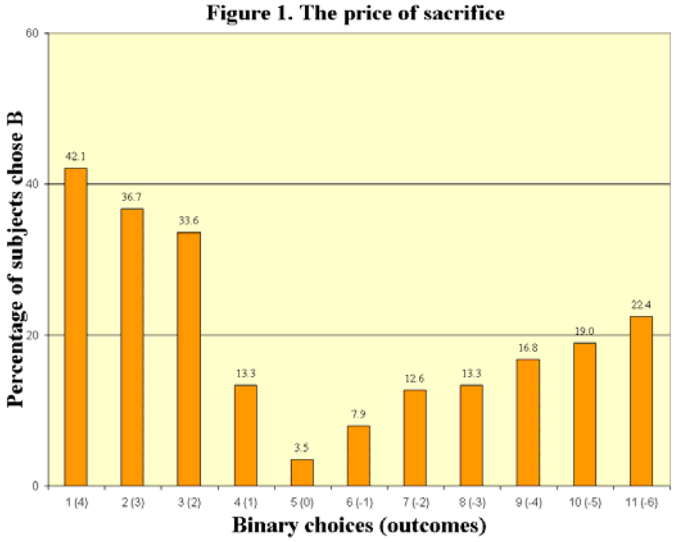
## 5. Results.

We first present an overview of our results based on aggregate data.[12] After that we will present a description of our individual data as well as a statistical analysis of the significance of the impact of the different variables at work.[13]

### 5.1. Aggregate level data.

In this section the effects of different relative prices of sacrificing on subjects' choices are examined. As mentioned earlier, each binary choice implies a different relative price of sacrificing, namely, a different impact on the other's payoff for the same amount of sacrifice (one hundred units) of own material payoffs. The set of these relative prices is the same for the six choice environments that subjects in the player *i* role find themselves in. Figure 1 shows aggregate data about the effects of the price of sacrifice, as represented by the percentage of subjects that choose B over A, aggregated over all subjects and all six choice environments.

**Figure 1. The price of sacrifice**

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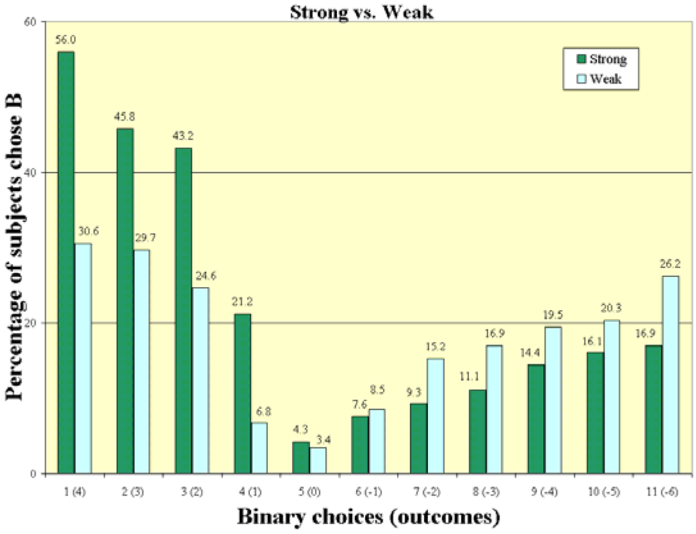
[12] Appendix 2 contains the complete data set.
[13] We do no study the behavior of the *j* player in the response game, since it involves both motivational and strategic aspects and in this paper we are only interested in the former.

As the figure shows, in the aggregate individuals are to a considerable extent willing to sacrifice money to alter the other's payoff, both positively and negatively. In both cases this aggregate willingness depends on what can be considered the natural way on the price of sacrificing money. If one views positive and negative prices with the same absolute value in a symmetric way, then one can state that, in the aggregate, people are more willing to give up money to help than to hurt the other.

Figure 2 yields a somewhat more disaggregated view of our results. It shows the average percentage of subjects that chose state B from each position (strong and weak), with 118 observations on each binary choice.

**Figure 2. The price of sacrifice**
**Strong vs. Weak**



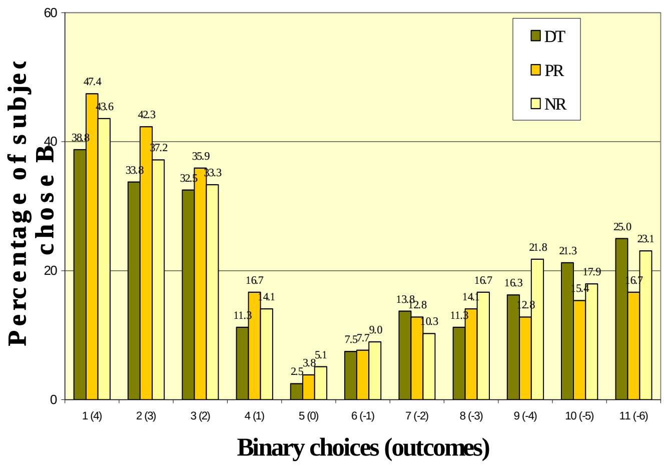

Note first that choices are indeed quite sensitive to the relative price of sacrificing for *both* treatments separately. Second, observe that there is a clear difference between the data from the strong and from the weak position. In the first five binary choices involving a positive price of sacrificing a larger percentage of subjects choose B from a strong position than from a weak position. On the contrary, in the last six binary choices (negative outcome) the percentage of subjects choosing B is larger from a weak position. Essentially, the relative price is not the only relevant parameter here.[14] The relevance of being ahead or behind in payoffs can of course be captured by purely distributional theoretical models, but it does impose some restrictions on such models.

We next look at how the effects of the price of sacrifice depend on the influence of reciprocity. Figure 3 shows *i*'s aggregate behavior in the reciprocity treatment (PR

[14] Observe also that for the data from the weak position it is not that obvious that B choices are more frequent for certain positive prices than for the negative prices with same absolute value.

and NR) together with the behavior, given the same binary choices, in the distributional treatment where player *j* had no option at all. The general features of the effects are the same for all three cases (DT, NRT, PRT). There are some differences, but they appear to be rather secondary ones. For negative prices the differences do not seem to follow any clear pattern. For the four cases of binary choices with positive prices there is a common order of the percentages which are highest for the PR case, intermediate for the NR case and lowest for the DT case. However, note that this is not the pattern that would be consistent with a reciprocity interpretation of our results, which would demand that the percentage of B choices would be lowest for NR, intermediate for DT and highest for PR. At any rate, observe that the differences between the cases are

**Figure 3. The price of sacrifice**
Reciprocal behavior




considerably smaller than the respective lowest percentage, a baseline, so that they may not show up as significant in the statistical analysis we present below.

**Figure 4. The price of sacrifice**
Strong vs. Weak: Positive Reciprocity Treatment

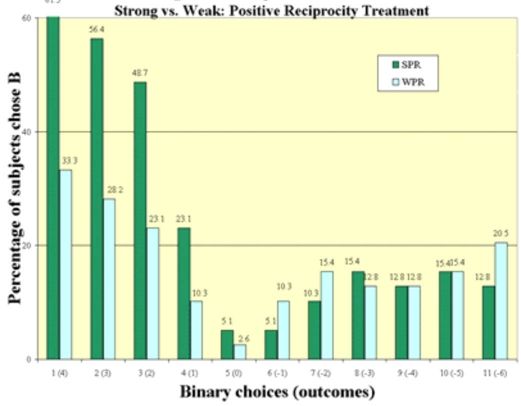
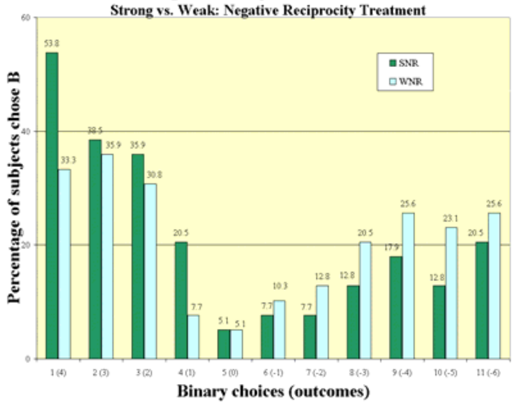



**Figure 5. The price of sacrifice**
Strong vs. Weak: Negative Reciprocity Treatment



Figures 4 and 5 show the data of figure 3 disaggregated by position. Again, there are some differences but they do not amount to any very clear pattern and it remains to be seen whether they have any statistical validity. This means that the weak evidence for reciprocity that the data presentation of figure 3 suggests is not hiding an important interaction effect with the position.

**5.2. A closer look at the data.**

Figures 6-11 (in the back of the paper) represent individual behavior separately for the six different choice environments. They summarize the interplay between the willingness to sacrifice for helping and the willingness to sacrifice for hurting. The horizontal axis shows the different relative prices of helping and the vertical axis the relative prices of hurting in absolute terms. In each of these graphs each individual is located according to the maximum price that he is willing to pay to help and the maximum price he is willing to pay to hurt the other.[15] A subject not willing to sacrifice at all (neither for hurting nor for helping) will be located at the origin of both axes. A subject willing to pay the maximum price for helping and not a single penny for hurting will be located at the bottom of the vertical scale (the maximum price she is willing to pay for hurting is zero) and at the right of the horizontal scale (the maximum price she is willing to pay for helping is one), and so on.

The different magnitudes of the different disks that appear in the graphs correspond to the different number of people at each position. A quick look at the first two figures shows that subjects are willing to sacrifice for helping much more than they are willing to sacrifice for hurting in both distributional treatments. Other than that, almost no subject from the weak position is willing to pay the maximum price for helping, but a significant mass of them are willing to pay the maximum price of one when they are in the strong position.

A similar pattern is observed when Figures 8 and 9 (both positive reciprocity treatments) or Figures 10 and 11 (negative reciprocity treatments) are compared. The

[15] When considering individual behavior, one encounters the natural difficulty of inconsistencies and the need for making a judgment about their scope. Note that in our context it is not hard to envision inconsistencies arising. Subjects made choices in 6 different choice environments and any back and forth switching between the A choice and one of the eleven B choices will strictly speaking be an inconsistency. For the construction of figures 6-11 we feel that using maximum prices subjects are willing to pay is a reasonable choice.

majority of subjects are located around the zero price for hurting (they do not exhibit a clear sign of willingness to reduce the payoff of others) and subjects are willing to pay higher prices for helping the stronger their position is.

A sharp contrast emerges when comparing Figures 8 vs. 10 (positive versus negative reciprocity conditions, all subjects choosing from the strong position) and Figures 9 vs. 11 (positive versus negative reciprocity conditions, subjects choosing from the Weak position). Both comparisons reveal the absence of significant changes between them. So, conditional on choosing from the same relative position (strong or weak), changes in the intentionality features of the setting seem to have only minor effects on the prices subjects accept to pay for their sacrifice.

One can see that the three figures corresponding to the strong position do not differ much from each other and that the same is true within the weak position. Specifically one can not distinguish any obvious pattern that separates the "PR" from the "NR" case with the data from the purely distributional treatment being somewhere in between. Comparing the corresponding figures of the strong and the weak position we observe a larger concentration at the (0,0) point in the weak position in all three cases.

We now move to our statistical analysis which consists of a series of random-effects probit regressions, to compare decisions across blocks. We estimate models taking into account the 6 experimental treatments at the same time. We use panel data techniques to estimate two random effects probit models using the following reduced form equations:

$$d_{it} = \beta_0 + \beta_1 D_P + \beta_2 D_{PR} + \beta_3 D_{NR} + \beta_4 D_P D_{PR} + \beta_5 D_P D_{NR} + \beta_6 D_S + \beta_7 PRICE + \beta_8 ROUND + \mu_{it} \quad (1)$$

$$d_{it} = \beta_0 + \beta_1 D_P + \beta_2 D_R + \beta_4 D_P D_R + \beta_6 D_S + \beta_7 PRICE + \beta_8 ROUND + \mu_{it} \quad (2)$$

where the endogenous variable, $d_{it}$, is the decision of subject *i* in round t (for t = 1,…,66).[16] $D_P$ is a dummy variable that takes the value of one for games W, WPR and WNR (that is, all decisions from the weak position, 0 otherwise); $D_{PR}$ ($D_{NR}$) is a dummy variable set equal to one for decisions in the positive (negative) reciprocity

[16] The 66 rounds correspond to the 11 choices in the six different environments.

environments in model 1 and $D_R$ is a dummy variable set equal to one for all decisions in either of the reciprocity environments (negative or positive) in model 2.

**Table 4: Random effects probit regression**
**Dependant variable: Decision (B choice)**

| | | Model (1) | Model (2) |
|---|---|---|---|
| | Constant | 0.0671 (0.670) | 0.0666 (0.673) |
| *Relative position/D* | $D_P(\Delta^{WD}_{SD})$ | -0.2288** (0.049) | -0.2284** (0.049) |
| *Positive reciprocity/S* | $D_{PR}(\Delta^{SPR}_{SD})$ | 0.1058 (0.356) | --- |
| *Negative reciprocity/S* | $D_{NR}(\Delta^{SNR}_{SD})$ | -0.0301 (0.794) | --- |
| *Reciprocity/S* | $D_R(\Delta^{SR}_{SD})$ | --- | 0.0378 (0.703) |
| | $D_P D_{PR}$ | -0.1363 (0.412) | --- |
| | $D_P D_{NR}$ | 0.2122 (0.197) | --- |
| | $D_P D_R$ | --- | 0.0410 (0.774) |
| | $D_S$ | -0.6879*** (0.000) | -0.6871*** (0.000) |
| | $D_O$ | 0.0418 (0.718) | 0.0410 (0.726) |
| *Price of the sacrifice* | *PRICE* | -1.2380*** (0.000) | -1.2368*** (0.000) |
| *Period* | *ROUND* | -0.0286 (0.245) | -0.0284 (0.248) |
| *Relative position/PR* | $D_P + D_P D_{PR} (\Delta^{SPR}_{WPR})$ | -0.3652*** (0.002) | --- |
| *Relative position/NR* | $D_P + D_P D_{NR} (\Delta^{SNR}_{WNR})$ | -0.0165 (0.887) | --- |
| *Positive reciprocity/W* | $D_{PR} + D_P D_{PR} (\Delta^{WPR}_{WD})$ | -0.0305 (0.801) | --- |
| *Negative reciprocity/W* | $D_{NR} + D_P D_{NR} (\Delta^{WNR}_{WD})$ | 0.1820 (0.124) | --- |
| *Relative position/R* | $D_P + D_P D_R (\Delta^{RS}_{RW})$ | --- | -0.1873** (0.024) |
| *Reciprocity/W* | $D_R + D_P D_R (\Delta^{RW}_{WD})$ | --- | 0.0789 (0.446) |
| | Number of obs | 2360 | 2360[17] |
| | Prob>chi2 | 0.0000 | 0.0000 |
| | Log likelihood | -949.7373 | -952.0044 |

Note: p-values between brackets; *** significant at the 1% level, ** at the 5% level, * at the 10% level

[17] The number of observations is 2360 because decision 5 of each block is a missing value for price (it is infinite) and subject 4 left the lab after the first two blocks.

To capture the effect of the willingness to sacrifice we introduce in both models two different variables: $D_S$ (it takes the value of one when subjects are willing to sacrifice for hurting, 0 otherwise) and PRICE (the relative price of sacrifice in absolute terms, as previously defined), to isolate the effect of the price of the sacrifice from the effect of its sign (hurting vs. helping). ROUND refers to the order in the sequence in which the binary decisions were made and $\mu_{it} = \alpha_i + \varepsilon_{it}$ where $\alpha_i$ are the individual effects that are considered as random effects and $\varepsilon_{it}$ is the error term.

By construction, $\beta_1$ captures the effect on the probability of choosing B of moving from a strong to a weak position; $\beta_2$ and $\beta_3$ measure the effects on this same probability of a change between games S and SPR (we denote this as $\Delta_S^{SPR}$) and S and SNR ($\Delta_S^{SNR}$), respectively. Analogously, $\beta_2 + \beta_4$ ($\beta_3 + \beta_5$) are the differentials between game W and game RPW (RNW) noted by $\Delta_W^{WPR}$ ($\Delta_W^{WNR}$).

The coefficient estimates of (1) and (2) appear in Table 4. To facilitate interpretation, beside each variable we show, in parentheses, the differential that the coefficient of the variable estimates. Thus, for example, in model 1 the coefficient of the $D_{PR}$ term is an estimate of $\Delta_S^{SPR}$, and the coefficient of $D_P + D_P D_{PR}$ estimates $\Delta_{WPR}^{SPR}$ (that is, whether the sum of both coefficients is significantly different from zero). To check for the significance of all treatment effects we include in the table all relevant differentials between coefficients, e.g. the coefficient of $D_P + D_P D_{PR}$ ($\Delta_{WPR}^{SPR}$) measures the effect of relative position conditional on the presence of positive reciprocity (treatments WPR, subindex, vs. SPR, superindex), and so on. For clarity, all treatment effects are listed in the first column[18].

Table 4 reveals that ROUND has no significant effect on the probability of choosing B. The effects of the relative position (weak or strong) on the probability of choosing state B is significant for games W vs. S in both models; the probability is significantly altered when comparing WD vs. WS, WPR vs. SPR and RS vs RW. The only case where the relative position has no significant effect seems to be in the case of negative reciprocity treatments (WNR vs. SNR).

Table 4 shows a completely different qualitative picture when analysing the effects of reciprocity on the probability of sacrificing: All plausible treatment effects

[18] We are not trying to estimate treatment effects quantitatively, so marginal effects are not included in Table 4.

dealing with reciprocity have no significant effect in any of the two models. Neither the comparison of SD vs. SPR, SD vs. SNR, WD vs. WPR, WD vs. WNR are significant in model 1. The same result is observed when comparing SD vs. SR and WD vs. WR in model 2.

The estimates of both models clearly confirm the informal impression given by the aggregate data shown above. Price, sacrifice and relative position treatment effects are highly significant and have the expected sign, while the reciprocity variables are never significant.

We now know that overall reciprocity (related to menu-dependence) does not matter and that the relative price and the position do matter. However, we have not yet identified more precisely what type of preference models the different individuals' behavior are consistent with. The only way to find out about this is to look at the individual data and to classify people's behavior into a number of different categories. These categories are not arbitrary; they are informed by previous experimental evidence and modeling efforts. In our design context the different models predict very different behavior.

We start by looking at the preference categories identified by Andreoni and Miller (2002).[19] Seven of our 40 subjects (number 6, 11, 24, 29, 30, 33 and 34) – see Appendix 2 - always chose option A and we classify them as pure individualists. To these one can add the subjects with numbers 2, 7, 12 and 22, who exhibit some deviations from the purely selfish pattern; this is between 17.5% and 27.5%, depending on whether one includes the second group of subjects.[20] Leontieff preferences imply the maximin decision-rule; recall that it predicts that in the strong position $B_1$ to $B_4$ will be chosen over A, while in the weak position A will always be chosen. It is not easy to assign any subjects to this category; with tolerance for some deviations subjects 5, 31 and perhaps also 23 can be considered to belong to this class, less than 10% in total.

To the perfect substitute class, implying the maximization of the payoff-sum or social welfare, one can assign the subjects with numbers 3, 14, 15, 17, 27, 28, 37 and perhaps also those with numbers 1, 10, 25 and 39. A total of 27,5% of participants.

Now to difference aversion. This model makes it possible that a person selects a set of initial B's in the strong position, while in the weak position he selects A against

[19] Appendix 2 contains the complete data set for all our subjects.
[20] This is in line, perhaps somewhat below the number of individualists typically found. See Offerman, Sonnemans and Schram (1996).

the initial B's and then switches to the B's. In the strong position that person would be willing to give up some money if by doing that he can help the other sufficiently, while in the weak position he would be willing to give up money to hurt the other, if he can hurt the other sufficiently. The more striking prediction pertains to behavior in the weak position. The subjects that can be considered to conform to the behavioral pattern of difference aversion are those with numbers 9, 21, and with some tolerance also 18 and 36: at most 10%.[21] Subjects 19, 35 and 40 can with some tolerance be classified under competitive preferences as defined above. All other 8 subjects (including subject 4 for which we only have data from the distributional treatment) do not conform to any of the above distributional categories; they appear to behave in inconsistent ways.

## 6. Discussion and Conclusions.

Our data present the following aggregate regularities. First, a large part of our subjects' behavior can not be understood in purely individualistic terms; subjects' behavior is sensitive to the prices of sacrificing to help and hurt others and to whether they obtain more or less than others. Second, menu-dependence is not a statistically significant force in our data.

How can the second result be understood in relation to the previous mixed evidence about menu-dependence and other possible sources of reciprocity? With respect to the menu-dependence evidence a first source of explanation may be the response-elicitation method. The strategy method we use can be plausibly considered to induce different behavior than the direct response method in which people only react to effectively made decisions. However, we do not believe that there is a "right" approach here. Efficiency in data gathering speaks in favor of the strategy method; indeed, collecting our kind of individual data with the direct response method would have been a very demanding organizational task. However, efficiency is not the only virtue of the strategy method. One can also say that it captures more reflective or studied behavior and for this reason it is often described as a 'cold' method. We feel that this kind of more thoughtful behavior is relevant in many economic situations in which decision makers have some time to meditate about how to act. Naturally, it does not capture those other situations involving more immediacy, where visceral factors can have a strong influence on behavior, but it is not clear that such situations are the only or even the most important ones to consider.

[21] Subject 38 behaves in the weak position somewhat in accordance with difference aversion.

A second consideration to take into account in interpreting the absence of menu-dependence in our results is that issues of motivation and behavior can not always be separated from issues of cognition and perception. Some circumstances surrounding the act of choice may just jump more readily to people's eye than others. For instance, for many individuals being lied to may be a naturally more salient event than the fact that another person has passed up an allocation with certain payoff features. The interplay of cognition and motivation is rather unexplored terrain at this point, but may actually be of considerable importance for understanding social and economic life.

Our design makes it possible to get down to characterizing individual preferences. We find that observed non-individualistic behavior is very heterogeneous across individuals. As also stressed by Andreoni and Miller (2002) people conform to more than one model of social preferences. In relation to the debate about what kind of other-regarding preferences are more effective in explaining behavior, our results are to some extent compatible with those in Charness and Rabin (2002). They also concord partially with the findings of Engelmann and Strobel (2004), who study social preferences in the context of three-person games and do not investigate any issues related to reciprocity. As they, we find that the influence of perfect substitutes or social welfare preferences is stronger than that of inequality aversion; however, in our data Leontieff preferences are not more important than difference aversion or competitive preferences. Overall, the heterogeneity of preferences is quite considerable.

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## Appendix 1: instructions

### Instructions distributional experiment

This is an experiment about decision making. You will be paid for participating, and the amount of money you will earn depends on the decisions that you and the other participants make. At the end of the experiment you will be paid privately and in cash for your decisions. You will never be asked to reveal your identity to anyone during the course of the experiment.

In this experiment there are two types of subjects, x and y. As subject x will make 22 sequential choices in 2 blocks of 11 decisions between two alternative states (A and B). Each decision is independent from each your other decisions. Your payoffs in the experiment depend on your decisions. You will be anonymously paired with a subject y.

As subject y will not make any kind of decision. You will be anonymously paired with a subject x and your payoffs in the experiment depend on subject x's choices.

To make decisions you only have to circle in the control sheet one of the two options A and B in each round.

At the end of the experiment you will thus have 22 outcomes from the rounds played, only one of these outcomes will be selected for payoffs.

### Instructions reciprocity experiment

This is an experiment about decision making. You will be paid for participating, and the amount of money you will earn depends on the decisions that you and the other participants make. At the end of the experiment you will be paid privately and in cash for your decisions. You will never be asked to reveal your identity to anyone during the course of the experiment.

In this experiment there are two types of subjects, x and z. As subject x will make 44 sequential choices in 4 blocks of 11 decisions between two alternative states (A and B). Each decision is independent from each your other decisions. You will be anonymously paired with a subject z. As player x your decisions will only affect the payoffs if player z opts to give you the choice.

As subject z will be anonymously paired with a subject x and will make 4 decisions, one per block, between two possibilities: to choose or to let player x choose. The player x knows that her decisions will only affect the payoffs if subject z opts to give her the choice.

To make decisions you only have to circle in the control sheet one of the two options in each block.

At the end of the experiment you will be paid according to the outcomes generated by yourselves in the 4 blocks, only one of these outcomes will be selected for payoffs.

# Appendix 2: raw data.

Distributional Treatment ---- Strong Position ---- Individual Number

| | Binary Choice Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **1** | B | A | A | A | A | A | A | A | A | A | A |
| **2** | A | A | A | A | A | A | A | A | A | A | A |
| **3** | B | B | B | B | A | A | A | A | A | A | A |
| **4** | A | A | A | A | A | A | A | A | A | A | A |
| **5** | B | A | B | A | A | A | A | A | A | A | A |
| **6** | A | A | A | A | A | A | A | A | A | A | A |
| **7** | B | A | A | A | A | A | A | A | A | A | A |
| **8** | B | A | A | B | A | A | A | A | B | A | A |
| **9** | B | B | B | B | A | A | A | A | A | A | A |
| **10** | B | A | A | A | A | A | A | A | B | B | B |
| **11** | A | A | A | A | A | A | A | A | A | A | A |
| **12** | A | A | A | A | A | A | A | A | A | A | A |
| **13** | A | A | A | B | A | A | B | A | B | B | B |
| **14** | B | B | B | B | A | A | A | A | A | A | A |
| **15** | B | B | B | A | A | A | A | A | A | A | A |
| **16** | A | B | A | A | A | A | B | A | A | B | B |
| **17** | B | B | B | A | A | A | A | A | A | A | A |
| **18** | B | B | B | B | A | A | A | A | A | A | A |
| **19** | A | A | A | A | B | B | B | A | A | B | B |
| **20** | B | A | B | A | A | A | A | A | A | B | A |
| **21** | B | B | A | A | A | A | A | A | A | A | A |
| **22** | A | A | A | A | A | A | A | A | A | A | A |
| **23** | B | B | B | A | A | A | A | A | A | A | A |
| **24** | A | A | A | A | A | A | A | A | A | A | A |
| **25** | B | A | B | A | A | A | A | A | A | A | A |
| **26** | A | B | B | A | A | B | A | B | B | B | A |
| **27** | B | B | B | A | A | A | A | A | A | A | A |
| **28** | B | B | B | B | A | A | A | A | A | A | A |
| **29** | A | A | A | A | A | A | A | A | A | A | A |
| **30** | A | A | A | A | A | A | A | A | A | A | A |
| **31** | B | B | B | A | A | A | A | A | A | A | A |
| **32** | A | A | A | A | A | B | B | B | B | B | B |
| **33** | A | A | A | A | A | A | A | A | A | A | A |
| **34** | A | A | A | A | A | A | A | A | A | A | A |
| **35** | A | A | A | A | A | A | A | A | A | A | A |
| **36** | B | B | A | A | A | B | A | A | A | A | A |
| **37** | B | B | B | A | A | A | A | A | A | A | A |
| **38** | A | A | B | B | A | A | A | A | A | A | B |
| **39** | B | B | B | A | A | A | A | A | A | A | A |
| **40** | A | B | B | A | A | A | A | A | A | B | B |

| Distributional Treatment ---- Weak Position ---- Individual Number | Binary Choice Number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | B | B | A | A | A | A | A | A | A | A |
| 2 | A | A | A | A | A | A | A | A | A | A | A |
| 3 | B | B | B | A | A | A | A | A | A | A | A |
| 4 | B | B | B | A | A | A | A | A | A | A | A |
| 5 | A | A | A | A | A | A | A | A | A | A | B |
| 6 | A | A | A | A | A | A | A | A | A | A | A |
| 7 | A | A | A | A | A | A | A | A | A | A | A |
| 8 | A | A | B | A | A | A | A | A | A | A | A |
| 9 | A | A | A | A | A | A | B | B | B | B | B |
| 10 | B | B | A | A | A | A | A | A | A | A | A |
| 11 | A | A | A | A | A | A | A | A | A | A | A |
| 12 | A | A | A | A | A | A | A | A | A | A | A |
| 13 | A | A | A | A | A | A | B | B | B | B | B |
| 14 | A | A | A | A | A | A | A | A | A | A | A |
| 15 | A | A | A | A | A | A | A | A | A | A | A |
| 16 | A | A | A | A | A | A | A | A | A | A | A |
| 17 | B | B | B | A | A | A | A | A | A | A | A |
| 18 | A | A | A | A | A | A | B | B | B | B | B |
| 19 | A | A | A | A | B | A | A | A | A | A | B |
| 20 | B | A | A | A | A | A | A | B | A | A | A |
| 21 | A | A | A | A | A | A | A | A | A | A | B |
| 22 | A | A | A | A | A | A | A | A | A | A | A |
| 23 | B | B | A | A | A | A | A | A | A | A | A |
| 24 | A | A | A | A | A | A | A | A | A | A | A |
| 25 | A | A | B | A | A | A | A | A | A | A | A |
| 26 | A | A | A | B | A | A | B | B | B | B | B |
| 27 | B | B | A | A | A | A | A | A | A | A | A |
| 28 | B | B | B | A | A | A | A | A | A | A | A |
| 29 | A | A | A | A | A | A | A | A | A | A | A |
| 30 | A | A | A | A | A | A | A | A | A | A | A |
| 31 | A | A | A | A | A | A | A | A | A | A | A |
| 32 | A | A | A | A | A | B | B | B | B | B | B |
| 33 | A | A | A | A | A | A | A | A | A | A | A |
| 34 | A | A | A | A | A | A | A | A | A | A | A |
| 35 | A | A | A | A | A | A | A | B | B | B | B |
| 36 | A | B | A | A | A | B | B | A | B | B | B |
| 37 | B | B | B | A | A | A | A | A | A | A | A |
| 38 | A | A | A | A | A | A | A | A | A | B | B |
| 39 | A | A | A | A | A | A | B | A | A | A | B |
| 40 | A | A | A | A | A | A | A | A | B | B | B |

| Reciprocity Treatment ---- SPR ---- Individual Number | Binary Choice Number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | B | B | B | B | A | A | A | A | A | A | A |
| **2** | A | A | A | A | A | A | A | A | A | A | A |
| **3** | B | B | B | A | A | A | A | A | A | A | A |
| **4** | | | | | | | | | | | |
| **5** | B | B | B | A | A | A | A | A | A | A | A |
| **6** | A | A | A | A | A | A | A | A | A | A | A |
| **7** | A | A | A | A | A | A | A | A | A | A | A |
| **8** | B | B | A | B | A | A | A | A | A | A | A |
| **9** | B | B | B | B | A | A | A | A | A | A | A |
| **10** | B | B | A | A | A | A | A | A | A | A | A |
| **11** | A | A | A | A | A | A | A | A | A | A | A |
| **12** | B | B | A | A | A | A | A | A | A | A | A |
| **13** | B | B | B | B | B | B | B | B | B | B | B |
| **14** | B | B | B | B | A | A | A | A | A | A | A |
| **15** | B | B | B | B | A | A | A | A | A | A | A |
| **16** | B | B | A | A | A | A | A | A | A | A | A |
| **17** | B | B | B | A | A | A | A | A | A | A | A |
| **18** | B | B | B | B | A | A | B | B | B | B | A |
| **19** | A | A | A | A | B | B | B | A | A | A | B |
| **20** | B | A | A | A | A | A | A | A | A | B | A |
| **21** | B | B | A | A | A | A | A | A | A | A | A |
| **22** | A | A | A | A | A | A | A | A | A | A | A |
| **23** | B | B | B | B | A | A | A | A | A | A | A |
| **24** | A | A | A | A | A | A | A | A | A | A | A |
| **25** | B | B | B | A | A | A | A | A | A | A | A |
| **26** | B | B | B | A | A | A | A | B | A | A | A |
| **27** | B | B | B | A | A | A | A | A | A | A | A |
| **28** | B | B | B | A | A | A | A | A | A | A | A |
| **29** | A | A | A | A | A | A | A | A | A | A | A |
| **30** | A | A | A | A | A | A | A | A | A | A | A |
| **31** | A | A | A | A | A | A | A | A | A | A | A |
| **32** | B | B | B | B | A | A | A | A | A | A | A |
| **33** | A | A | A | A | A | A | A | A | A | A | A |
| **34** | A | A | A | A | A | A | A | A | A | A | A |
| **35** | A | A | A | A | A | A | A | B | B | B | B |
| **36** | B | A | B | A | A | A | A | A | A | A | A |
| **37** | B | B | B | A | A | A | A | A | A | A | A |
| **38** | A | A | B | A | A | A | B | B | B | B | B |
| **39** | B | B | B | A | A | A | A | A | A | A | A |
| **40** | A | A | A | A | A | A | A | B | B | B | B |

| Reciprocity Treatment ---- WPR ---- Individual Number | Binary Choice Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **1** | B | B | B | B | A | A | A | A | A | A | A |
| **2** | A | A | A | A | A | A | A | A | A | A | A |
| **3** | B | B | B | A | A | A | A | A | A | A | A |
| **4** | | | | | | | | | | | |
| **5** | A | A | A | A | A | A | A | A | A | A | A |
| **6** | A | A | A | A | A | A | A | A | A | A | A |
| **7** | A | A | A | A | A | A | A | A | A | A | A |
| **8** | B | B | A | A | A | A | A | A | A | A | B |
| **9** | A | A | A | A | A | B | B | B | B | B | B |
| **10** | B | B | A | A | A | A | A | A | A | A | A |
| **11** | A | A | A | A | A | A | A | A | A | A | A |
| **12** | B | A | A | A | A | A | A | A | A | A | A |
| **13** | B | B | B | B | B | B | B | B | B | B | B |
| **14** | B | B | A | A | A | A | A | A | A | A | A |
| **15** | A | A | A | A | A | A | A | A | A | A | A |
| **16** | A | A | A | A | A | A | A | A | A | A | A |
| **17** | A | A | A | A | A | A | A | A | A | A | A |
| **18** | A | A | A | A | A | B | A | A | B | A | A |
| **19** | A | A | A | A | A | B | A | A | A | A | A |
| **20** | A | A | B | A | A | A | A | A | B | A | A |
| **21** | A | A | A | A | A | A | A | A | A | A | B |
| **22** | A | A | A | A | A | A | A | A | A | A | A |
| **23** | A | A | A | A | A | A | A | A | A | A | A |
| **24** | A | A | A | A | A | A | A | A | A | A | A |
| **25** | B | A | B | A | A | A | A | A | A | A | A |
| **26** | A | B | A | B | A | A | B | A | A | B | B |
| **27** | B | B | B | A | A | A | A | A | A | A | A |
| **28** | B | B | B | A | A | A | A | A | A | A | A |
| **29** | A | A | A | A | A | A | A | A | A | A | A |
| **30** | A | A | A | A | A | A | A | A | A | A | A |
| **31** | A | A | A | A | A | A | A | A | A | A | A |
| **32** | B | A | A | A | A | A | B | B | A | A | A |
| **33** | A | A | A | A | A | A | A | A | A | A | A |
| **34** | A | A | A | A | A | A | A | A | A | A | A |
| **35** | A | A | A | A | A | A | A | A | A | A | B |
| **36** | A | A | A | A | A | A | B | B | A | B | B |
| **37** | B | B | B | B | A | A | A | A | A | A | A |
| **38** | A | A | A | A | A | A | B | B | B | B | B |
| **39** | B | B | B | A | A | A | A | A | A | A | A |
| **40** | A | A | A | A | A | A | A | A | A | B | A |

| Reciprocity Treatment ---- SNR ---- Individual Number | Binary Choice Number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | A | A | A | A | A | A | A | A | A | A | A |
| **2** | B | A | A | A | A | A | A | A | A | A | A |
| **3** | B | B | B | A | A | A | A | A | A | A | A |
| **4** | | | | | | | | | | | |
| **5** | B | B | B | B | A | A | A | A | A | A | A |
| **6** | A | A | A | A | A | A | A | A | A | A | A |
| **7** | A | A | A | A | A | A | A | A | A | A | A |
| **8** | A | A | A | A | A | B | B | B | B | B | B |
| **9** | B | A | A | A | A | A | A | A | A | A | A |
| **10** | B | B | A | A | A | A | A | A | A | A | A |
| **11** | A | A | A | A | A | A | A | A | A | A | A |
| **12** | A | A | A | A | A | A | A | A | A | A | A |
| **13** | B | B | B | B | B | B | B | B | B | B | B |
| **14** | B | B | B | A | A | A | A | A | A | A | A |
| **15** | B | B | B | A | A | A | A | A | A | A | A |
| **16** | A | A | A | A | A | A | A | A | A | A | B |
| **17** | B | B | B | A | A | A | A | A | A | A | A |
| **18** | B | B | B | B | A | A | A | A | A | A | A |
| **19** | B | B | B | B | B | A | A | A | B | B | A |
| **20** | A | B | A | A | A | A | A | A | A | A | A |
| **21** | B | A | A | A | A | A | A | A | A | A | A |
| **22** | A | A | A | A | A | A | A | A | A | A | A |
| **23** | B | B | B | A | A | A | A | A | A | A | A |
| **24** | A | A | A | A | A | A | A | A | A | A | A |
| **25** | A | A | A | B | A | A | A | A | B | A | B |
| **26** | B | B | B | B | A | A | A | B | A | A | A |
| **27** | B | B | B | A | A | A | A | A | A | A | A |
| **28** | B | B | B | A | A | A | A | A | A | A | A |
| **29** | A | A | A | A | A | A | A | A | A | A | A |
| **30** | A | A | A | A | A | A | A | A | A | A | A |
| **31** | B | A | A | A | A | A | A | A | A | A | A |
| **32** | B | A | A | A | A | A | A | A | A | A | B |
| **33** | A | A | A | A | A | A | A | A | A | A | A |
| **34** | A | A | A | A | A | A | A | A | A | A | A |
| **35** | A | A | A | A | A | A | A | A | B | B | B |
| **36** | B | A | B | B | A | A | A | A | A | A | A |
| **37** | B | B | A | A | A | A | A | A | A | A | A |
| **38** | A | A | A | B | A | B | A | B | B | A | B |
| **39** | B | A | B | A | A | A | A | A | A | A | A |
| **40** | A | A | A | A | A | A | B | B | B | B | B |

Reciprocity Treatment
----
WNR
----
Individual Number

| | Binary Choice Number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **1** | B | B | B | B | A | A | A | A | A | A | A |
| **2** | A | A | A | A | A | A | A | A | A | A | A |
| **3** | B | B | B | A | A | A | A | A | A | A | A |
| **4** | | | | | | | | | | | |
| **5** | A | A | A | A | A | A | A | A | A | A | A |
| **6** | A | A | A | A | A | A | A | A | A | A | A |
| **7** | A | A | A | A | A | A | A | A | A | A | A |
| **8** | A | A | A | A | A | A | A | A | A | A | B |
| **9** | A | A | A | A | A | B | B | B | B | B | B |
| **10** | B | B | A | A | A | A | A | A | A | A | A |
| **11** | A | A | A | A | A | A | A | A | A | A | A |
| **12** | A | A | A | A | A | A | A | A | A | A | A |
| **13** | B | B | B | B | B | B | B | B | B | B | B |
| **14** | B | B | B | A | A | A | A | A | A | A | A |
| **15** | B | B | B | A | A | A | A | A | A | A | A |
| **16** | A | A | A | A | A | A | A | A | A | A | A |
| **17** | B | B | B | A | A | A | A | A | A | A | A |
| **18** | A | A | A | A | A | A | A | A | A | A | A |
| **19** | A | A | A | A | A | B | A | A | B | B | B |
| **20** | B | B | B | A | A | A | A | A | A | A | A |
| **21** | A | A | A | A | A | A | A | A | A | A | B |
| **22** | A | A | A | A | A | A | A | A | B | B | A |
| **23** | A | A | A | A | A | A | A | A | A | A | A |
| **24** | A | A | A | A | A | A | A | A | A | A | A |
| **25** | A | B | B | A | A | A | A | A | A | A | A |
| **26** | A | B | B | A | A | A | B | B | B | A | B |
| **27** | B | B | B | A | A | A | A | A | A | A | A |
| **28** | B | B | B | A | A | A | A | A | A | A | A |
| **29** | A | A | A | A | A | A | A | A | A | A | A |
| **30** | A | A | A | A | A | A | A | A | A | A | A |
| **31** | A | A | A | A | A | A | A | A | A | A | A |
| **32** | B | A | A | B | B | B | B | B | B | B | B |
| **33** | A | A | A | A | A | A | A | A | A | A | A |
| **34** | A | A | A | A | A | A | A | A | A | A | A |
| **35** | A | A | A | A | A | A | A | B | B | B | B |
| **36** | A | A | A | A | A | A | A | B | B | B | A |
| **37** | B | B | B | A | A | A | A | A | A | A | A |
| **38** | A | A | A | A | A | A | B | B | A | B | B |
| **39** | B | B | A | A | A | A | A | A | B | A | A |
| **40** | A | A | A | A | A | A | A | B | B | B | B |

**Figure 6: Strong position DT**

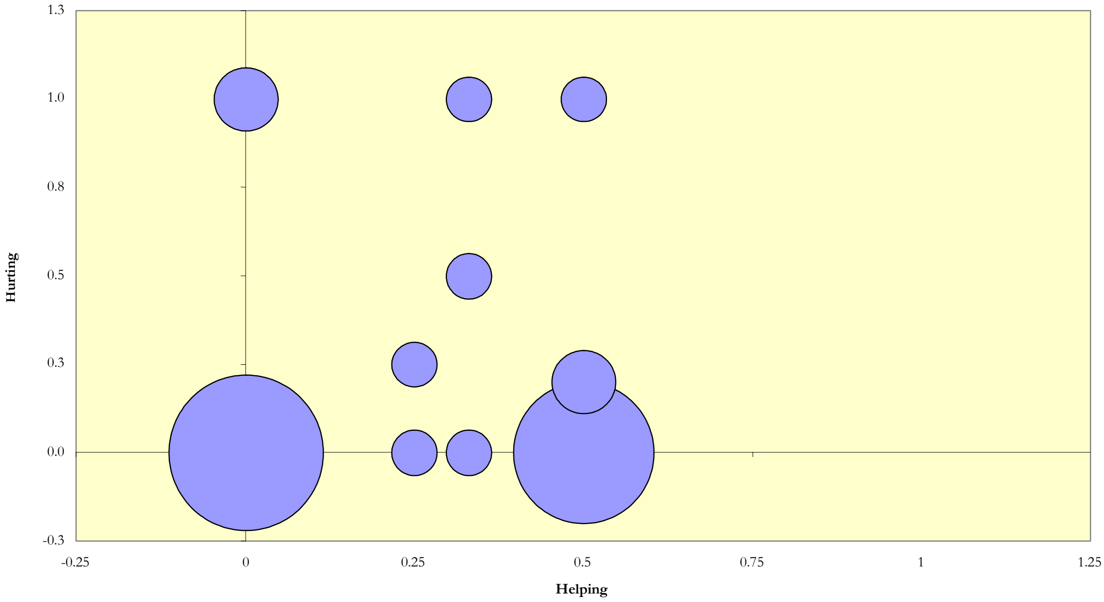


**Figure 7: Weak position DT**

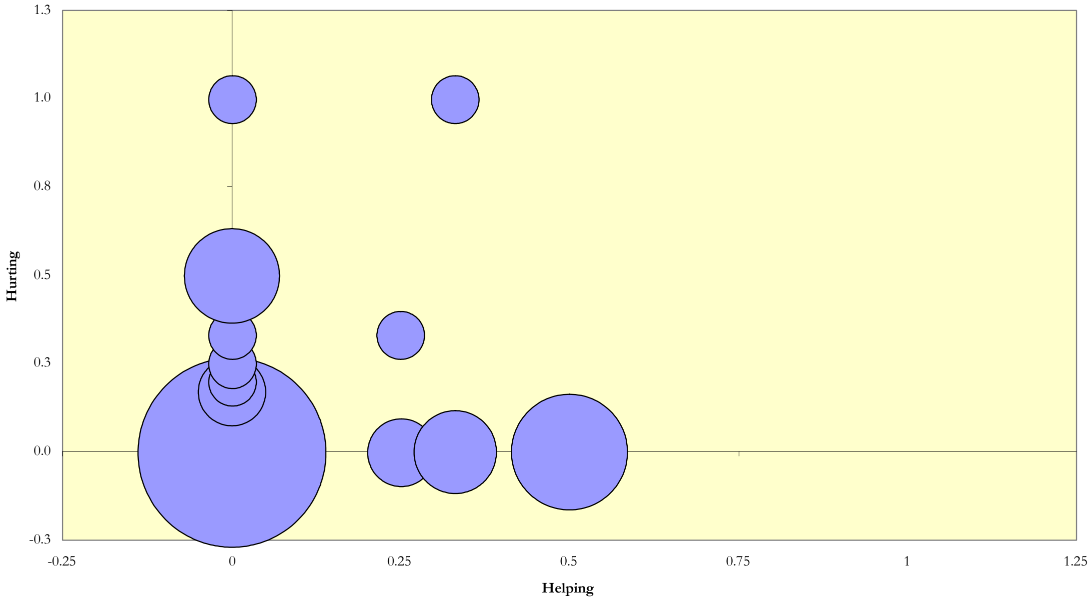

**Figure 8: Strong Position - Positive Reciprocity**

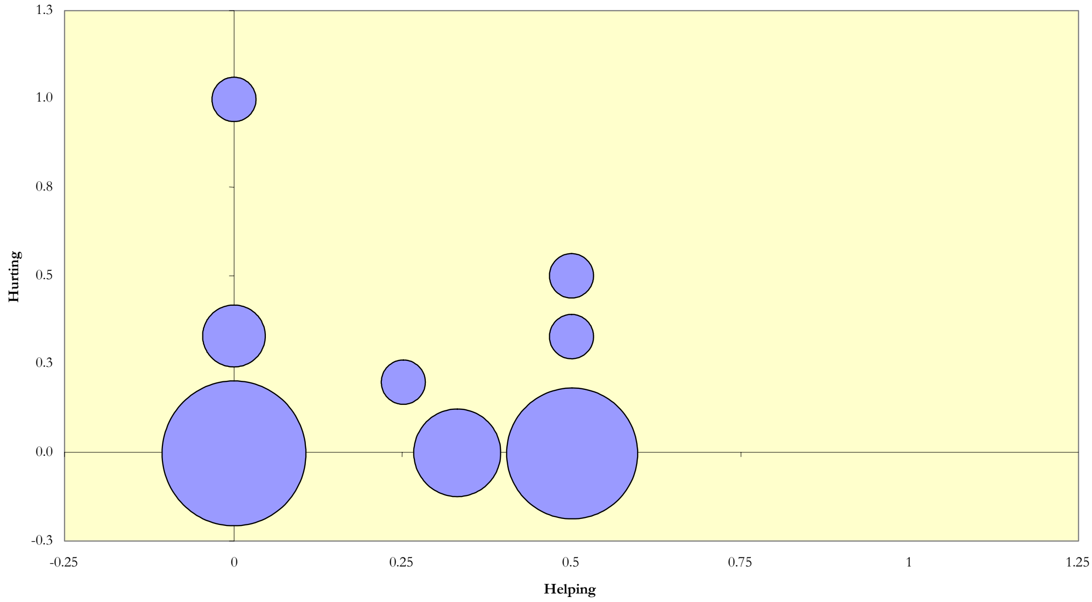


**Figure 9: Weak Position - Positive Reciprocity**

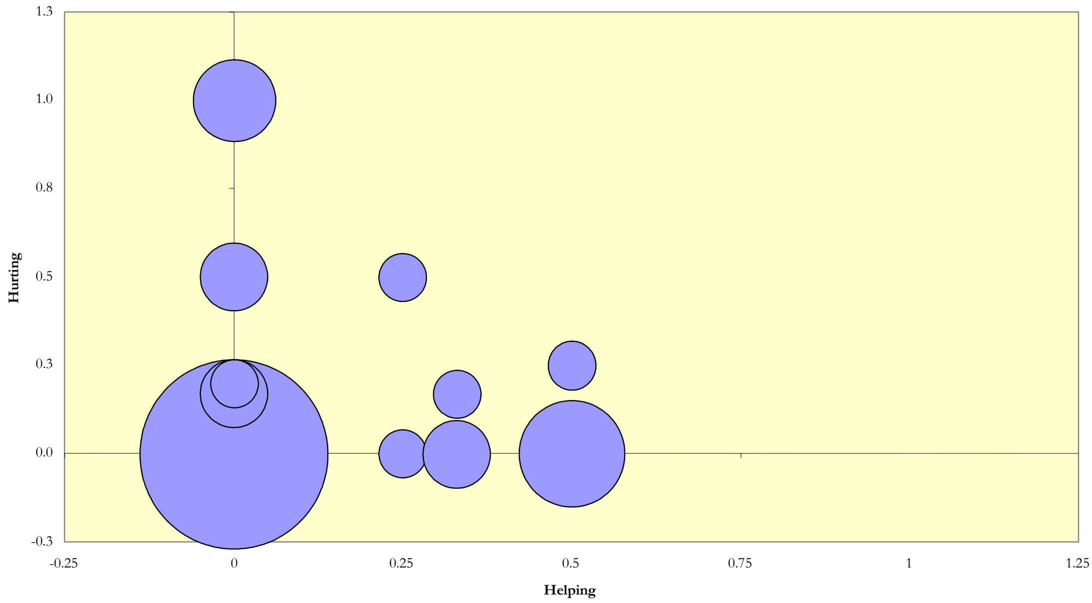

**Figure 10: Strong Position - Negative Reciprocity**

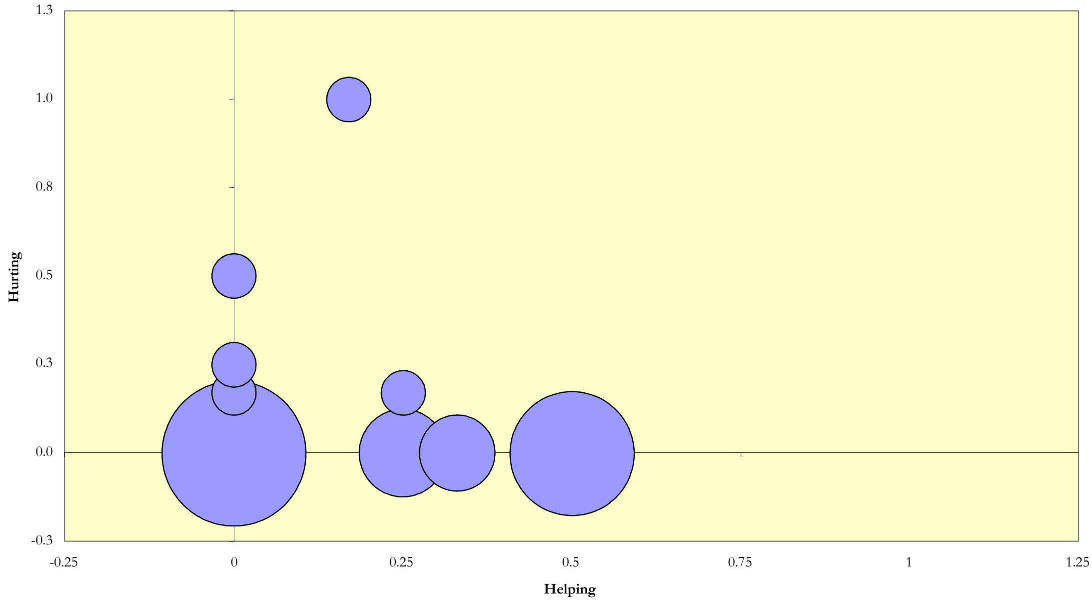


**Figure 11: Weak Position - Negative Reciprocity**