Social Ties and Coordination on Negative Reciprocity: The Role of Affect[☆]

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ABSTRACT: This is an experimental study of negative reciprocity in the case of multiple reciprocators. We use a three-player power-to-take game where a proposer is matched with two responders. We compare a treatment in which responders are anonymous to each other (strangers) with one in which responders know each other from outside the lab (friends). We focus on the responders' decisions, beliefs, and emotions. Our main findings are: (1) friends punish the proposer more than strangers, (2) friends are more likely to coordinate their punishment (without communication), and (3) both punishment and coordination are explained by the responders' emotional reactions.

JEL Codes: D01, C92, Z13

Keywords: reciprocity, affect, social ties, social norms, experiment

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[☆] A previous version of this paper circulated under the title "Reciprocity and emotions when reciprocators know each other". We are thankful for feedback from participants at the Public Choice Society meeting in Baltimore, the ESA meeting in Amsterdam, and the 2004 Tilburg Symposium on Psychology and Economics.

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1. Introduction

Negative reciprocity is a behavioral regularity that can play an important role in situations of interest to economists.[1] By now, it is a well-documented fact that many individuals are willing to incur a cost in order to punish those who treat them unkindly (Camerer, 2003). However, there are still few studies that concentrate on how the presence of multiple reciprocators affects an individual's decision to punish. After being wronged, a lone individual's punishment decision can be seen as a simple tradeoff between the pleasure of inflicting harm and the cost of punishment (Fehr et al., 2005). However, in the presence of other potential punishers, this decision becomes much more complicated. On one hand, if the pleasure derived from seeing the wrongdoer harmed is independent of who does the punishing, an externality is introduced which opens up the opportunity to free ride with less punishment. On the other hand, if individuals care about the behavior of the other punishers, then the punishment decision can become a coordination problem in which individuals would like to punish only if others do the same.

The main purpose of this paper is to study the motivations behind an individual's decision to negatively reciprocate in the more complex case of multiple reciprocators. Furthermore, presuming that the behavior of reciprocators may depend on the type of relationship that reciprocators have with each other, we also investigate the effect of social ties on negative reciprocity.

In order to do this in a tractable setting we carried out an experiment using a three-player version of the power-to-take game (Bosman and van Winden, 2002). In the experiment, a proposer (or the take authority) can make a claim on the resources of two responders. Subsequently, each responder can destroy any part (including nothing and everything) of her own resources. In order to study social ties, we asked subjects to come to the laboratory with a friend. We used different matching procedures so that in some triads responders were friends while in others they were strangers. Since responders cannot affect each other's monetary payoff, any

[1] For example, negative reciprocity has significant effects on bargaining outcomes (Güth et al., 1982), dispute settlement (Ellickson, 1994), public good provision (Fehr and Gächter, 2000), and the performance of incentive schemes when sabotage is possible (Harbring and Irlenbusch, 2005).

difference with the two-player version of the game can be attributed to the fact that there are now two instead of one responder. Furthermore, any difference between triads with friends and triads with strangers can be attributed to the social tie between responders.

Compared to the sole-responder case, having two responders changes their relationship vis-à-vis the take authority in two potentially important ways. First, as was mentioned, if the benefit from punishing the take authority is independent of who does the punishing, an externality is introduced which gives responders the opportunity to free ride by punishing less. Previous work does not tell us whether responders will see satisfied their desire to harm the take authority if someone else does the punishing. Second, if take authorities take a positive amount, they are now doing so from two instead of one responder. This can be seen as being considerably more unkind and thus more destruction could result.

However, the key difference between the two-player and the three-player game might be the relationship between the two responders. For instance, responders may care about their relative payoffs[2] or about how they will feel regarding each other's behavioral response. If a responder's utility depends on the actions of the other responder, destruction quickly becomes a coordination problem. Accurately predicting the other responder's destruction is then important. For example, if responders care about income differences, as in Fehr and Schmidt (1999), they might dislike destroying alone if destruction increases the income difference between them. Or, if a responder is concerned with how his action will be viewed by others, the other responder's destruction may become a reference point for evaluating his decision. If a responder destroys less than the other, he might think he is not standing up to unfair behavior. Alternatively, if he destroys more, he might think he overreacted. In contrast, if responders destroy an equal amount, they may interpret this as confirmation that they made the 'right' decision.

The type of social tie that exists between responders is likely to affect how much they care about each other's behavior and well-being. For example, it would be natural to expect a responder to be bothered more by a payoff difference between

[2] As in the models of Levine (1998), Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Charness and Rabin (2002), and Falk and Fischbacher (2005).

a take authority and a friend than when it concerns a stranger. Although there are a few experiments that study the effects of social distance by having subjects interact across different countries (e.g. Charness et al., 2006), there is practically no experimental work on the economic significance of social ties – in the sense of people knowing each other from outside the lab.[3] Hence, it is hard to predict the behavioral consequences of responders being friends instead of strangers. Since ties seem to play an important role in collective action (see Chong, 1991) and are potentially relevant in many economic situations (e.g. work environments), the issue whether and how they affect behavior is in fact of much wider interest. We have therefore decided to give it a prominent place in our experimental design.

In the past few years, a number of experimental studies have established that emotions may be key to our understanding of negative reciprocity (e.g. Bosman and van Winden, 2002; Sanfey et al., 2003; Ben-Shakhar et al., 2004; Quervain et al., 2004; Bosman et al., 2005). Using various methods of measurement, these studies suggest that an individual's decision to negatively reciprocate is motivated by negative emotions such as anger. Angry responders can be seen as deriving pleasure from harming the take authority and trading off their emotional satisfaction with the (more cognitive) reward of a monetary gain. A further goal of this paper is to contribute to this body of research by analyzing how affective responses to each other's behavior influences the decision of multiple responders to destroy.

Understanding which emotions motivate reciprocal behavior is important because a model based on an incorrect view may lead to incorrect conclusions and predictions. For instance, if the driving force behind an individual's decision to punish is anger but we incorrectly model it as envy (see Kirchsteiger, 1994; Fehr and Schmidt, 2000), we will make wrong inferences regarding the action tendencies and other characteristics of the emotions at stake. As a result, we are likely to make wrong predictions. For instance, anger as opposed to envy has been shown to be elicited by intentional acts (Haidt, 2003), which explains why intentions have an impact on punishment behavior (Falk et al., 2000; Charness and Levine, 2006). Furthermore, anger's action tendency is to attack (Lazarus, 1991). In other words, the

[3] An exception is Abbink et al. (2006).

goal of angry individuals is to harm the other party, and not, through punishment, to correct unfair material outcomes. This is why we observe punishment even in situations where it has no effect on income differences (Falk et al., 2005).

The paper is organized as follows. In Section 2 we present the experimental design and link it to related studies. Section 3 describes the experimental procedures. Results are presented in Section 4. Section 5 discusses the main results in relation to the existing literature. Section 6 concludes.

2. Design and Related Literature

For our study we use a three-player version of the power-to-take game (Bosman and van Winden, 2002). In this one-shot game, one subject, who can be considered as the *take authority* (with endowment E^{take}), is matched with a pair of other subjects, the *responders* (each with an endowment E_i^{resp} where $i \in \{1,2\}$ indicates the responder). The game consists of two stages. In the first stage, the randomly chosen take authority decides on the 'take rate' $t_i \in [0,1]$, which is the part of responder i's endowment after the second stage that will be transferred to the take authority. In the second stage, both responders decide simultaneously to destroy a part $d_i \in [0,1]$ of their own endowment. The payoff of the take authority equals her endowment plus the transfer from each of the responders, i.e. $E^{take} + t_1(1 - d_1)E_1^{resp} + t_2(1 - d_2)E_2^{resp}$. Responder i's payoff equals the part of his endowment that he does not destroy minus the amount transferred to the take authority, i.e. $(1 - t_i)(1 - d_i)E_i^{resp}$. In order not to introduce too many behavioral issues at a time, in our experiment take authorities can only select a uniform take rate (that is, $t_1 = t_2 = t$) and all the endowments are equal ($E_1^{resp} = E_2^{resp} = E^{take}$).[4]

To study the impact of social ties among responders, the experiment consists of two treatments, one where responders are anonymous to each other (*strangers* treatment), and one where responders know each other (*friends* treatment). By comparing the results from the strangers treatment with earlier experiments

[4] The power-to-take game differs in three ways from the well-known ultimatum game (Güth et al., 1982). First, in the power-to-take game each participant has an endowment. Second, in this game only the endowment of the responder(s) is at stake. And third, the responders can destroy any amount of their endowment.

involving only one responder, we can observe whether the presence of another responder makes a difference. By comparing the results from the strangers and friends treatments we can establish whether the existence of a tie between the responders makes a (further) difference.

The simplicity of our design facilitates the study of the influence of emotions on the behavior of responders. First, each responder makes only one decision. This is useful since emotions can impact various decisions and it might be hard to disentangle which emotion influenced which decision. Second, responders cannot influence each other's monetary payoffs. Therefore, we are able to observe how a responder feels about the decision of the other responder without interference of any effect the other responder might have had on the first responder's income.

Our work is related, on the one hand, to studies exploring the impact of emotions on negative reciprocity and, on the other hand, to studies investigating how the presence of others affects decision-making. Although still small in number, there are some studies explicitly dealing with emotions to explain responder behavior in the kind of game investigated in this paper. However, they are all restricted to the one-proposer-one-responder case.[5] A relatively early paper exploring this issue is Pillutla and Murnighan (1996). Responders in an ultimatum game experiment were asked, after each of a series of offers they had to accept or reject, to answer the open-ended question "How do you feel?" Answers to the feeling question were rated for expressions of the emotion of anger, and the rejection of offers was found to be related to this measure of anger. Bosman and van Winden (2002) introduced the power-to-take game to explicitly investigate the importance of emotions for negative reciprocity in a situation of appropriation. In several experiments they had responders self-report on their feelings, but now concerning a list of different emotions (see also van Winden, 2001; Bosman et al., 2005). Their results show that the destruction of own resources by responders is related to the intensity of experienced negative emotions (particularly, contempt, irritation, and

[5] Gächter and Herrmann (2006) do use three-player groups in order to study the relation between emotions and punishment in public good games. However, they concentrate on the subjects' emotional reaction after observing the contributed amounts. In our paper we also study the subjects' emotional reaction after observing how much others punish.

anger), which in turn is positively related to the actual take rate and negatively to the responders' expectations regarding the take rate.

Recently, for both games evidence has been found of a biological substrate for the negative reciprocity exhibited by responders. Sanfey et al. (2003), using fMRI of ultimatum game players, find that 'unfair' offers elicited activity in brain areas related to both emotion and cognition, and significantly heightened activity in an area related to emotions in case of rejection. In a similar study, Quervain et al. (2004) show that the effective punishment of individuals who behave unkindly produces activity in areas of the brain associated with the processing of rewards. Regarding the power-to-take game, Ben-Shakhar et al. (2004), using skin conductance as physiological measure of emotional arousal as well as self-reports, find that both self-reported anger and physiological arousal are related to destruction. Moreover, the self-reported measures of emotions are shown to be correlated with the physiological measures, which is reassuring for the use of self-reports in the study of reciprocity.

In this paper, we contribute to this line of research by studying the effects of introducing a second responder. In this respect, our work is related to papers on three-player ultimatum games. For instance, various authors have conducted experiments using ultimatum games that involve an inactive dummy player (Güth and van Damme, 1998; Kagel and Wolfe, 2001; Bereby-Meyer and Niederle, 2005). They find that responders concentrate on their own as well as the proposers' payoffs and mostly ignore the welfare of the dummy players.[6] Knez and Camerer (1995) use the strategy method to observe if a pair of responders playing with the same proposer condition their acceptance on the amount offered to the other responder. They find that about half of the responders will condition their response on the income the other responder would get. Riedl and Vyrastekova (2003) ran a three-player ultimatum game experiment in which they varied the effect the rejection of one responder has on the payoffs of another responder. They find that responders are more likely to reject proposals if this does not negatively affect their standing with respect to the other responder. However, all these experiments were not

[6] On the other hand, Güth et al. (2005) find that non-student responders do condition their acceptance on the amount given to dummy players.

designed for an analysis of emotions and their explanatory value. Hence, important variables from that perspective, such as expectations, were not measured. Our experimental design is a first shot at exploring head-on the affective side of reciprocity in case of multiple reciprocators.

Lastly, our work is related to psychological studies that suggest people have different emotional reactions when others are present, and the more so if the other person is a friend rather than a stranger (see e.g. Jakobs et al., 1996; Jakobs et al., 1999). We explore the economic relevance of this literature by investigating whether the presence of another responder in the power-to-take game and the nature of the relationship between the responders have an effect on their behavior as well as on their emotional response.

3. Experimental Procedures

The computerized experiment was run in November 2003 and May 2005 in the CREED laboratory of the University of Amsterdam. In total 189 subjects, almost all undergraduate students from the University of Amsterdam, participated in the experiment. About 42% of the subjects were students of economics. The other 58% were students from various fields such as biology, political science, law, and psychology. About 46% of the subjects were female. Subjects received a show-up fee of 5 euros, independent of their earnings in the experiment, and 10 euros as endowment. On average, subjects were paid out 13.52 euros. The whole experiment took around one hour.

The experiment consisted of two treatments: a *strangers* treatment, where the two responders in the game did not know each other, and a *friends* treatment, where the responders knew each other. For both treatments, subjects were allowed to sign up only if they did so as a pair, that is, they had to provide the name of someone they knew and with whom they would take part in the experiment.[7] If a subject

[7] In order to check whether forcing people to attend the experiment in pairs attracts different subjects compared to the normal recruiting procedure, we also ran a few sessions (72 subjects) in which we recruited subjects individually. We found no significant differences between the behavior, beliefs, or emotional reaction of subjects in the strangers treatment and subjects who were recruited independently. In fact, all results reported in the paper also hold if we use the individually-recruited subjects as the control treatment.

signed up with someone else but nevertheless showed up alone to the experiment, he or she was not allowed to participate. In this way we hoped to recruit subjects with social ties. This approach, which is similar to the one used by Abbink et al. (2006), gives the opportunity to employ individuals with stronger bonds than one can establish in the laboratory. In an attempt to measure the strength of each pair's social tie, we asked each individual to describe the type of relationship they had with their partner and how frequently they saw each other.

After arrival in the lab's reception room, each pair of subjects drew a card to be randomly assigned to two seats in the laboratory. Once everyone was seated the instructions for the (one-shot) power-to-take game were read. The game was framed as neutral as possible, avoiding any suggestive terms (a translation of the instructions is provided in Appendix A). The instructions were followed by a few exercises to check the subjects' understanding of the procedures. After these exercises the subjects were informed, by opening an envelope on their desk, which role (that of take authority or responder) they had been assigned in the game. Subsequently, the subjects played the three-player power-to-take game via the computer.[8]

For the game, subjects were randomly assigned into groups of three. In the strangers treatment, subjects that came together to the experiment were assigned to *different* groups. Hence, complete anonymity was ensured since none of the members of the group knew who the other group members were. In the friends treatment, each group included a take authority and a pair of responders who signed up together for the experiment. Consequently, in this treatment anonymity was ensured between take authorities and responders but not between the responders themselves. The group assignment was clearly explained in the instructions.

Throughout the game, subjects filled out a few forms to indicate how they felt, which take rate they expected, and which take rate they considered to be fair. Figure 1 shows the precise order in which the responders' decisions, emotions, and expectations were measured. Note that we asked subjects to report what they

[8] The experiment was programmed and conducted with the software z-Tree (Fischbacher, 1999).

expected others to do before they observed their actual behavior.[9] As in Bosman and van Winden (2002) subjects' emotions towards other players were measured after the subject observed what the other did.[10] We asked for the fair take rate, at the end, in the debriefing questionnaire.

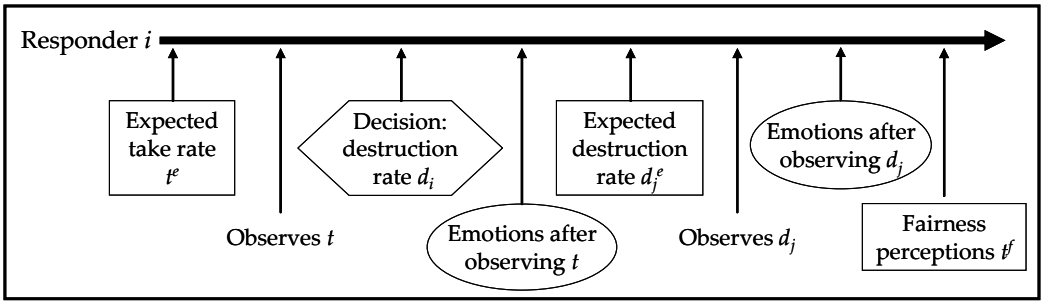

FIGURE 1 – SEQUENCE OF EVENTS FOR RESPONDERS

We used self-reports as research method for measuring emotions. This is a widely used method in social psychology that according to Clore and Robinson (2002) is potentially the best way to measure an individual's emotional experience. In this experiment self-reports have various advantages over physiological and neurological methods. In particular, self-reports allow us to investigate the relevance of specific emotions. Knowing which emotions are important in a particular situation can help us make better predictions as different negative and positive emotions have different action tendencies (e.g. Raghunathan and Pham, 1999). Furthermore, it gives us a better idea of the type of situations to which our findings might apply. Moreover, given that interaction occurs between three subjects, self-reports allow us to differentiate a subject's emotional reaction towards each of the other two individuals in the group.

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[9] Expectations were measured by asking subjects to indicate the most likely value for t or d_j. We decided to measure expectations in this way since subjects might have difficulty reporting the probability distribution of a continuous variable (over the interval [0,1]).

[10] Emotions were measured by providing subjects with a list of fourteen emotion names and asking them to report on a 7-point scale with what intensity they experienced each emotion. The list included the following emotions: admiration, anger, contempt, disappointment, envy, gratitude, guilt, irritation, joy, pride, regret, sadness, shame, and surprise. A variety of emotions were included to avoid pushing subjects in a particular direction.

4. Results

In this section we present and analyze the subjects' decisions and experienced emotions. Furthermore, we investigate whether the reported emotions help explain the behavior of responders in both treatments. Descriptive statistics are provided in Appendix B.

4.1 Observed behavior

On average, the take rate is 58.6% in the strangers treatment and 62.3% in the friends treatment. In both treatments, a considerable number of responders destroy some or all of their endowment. In the strangers treatment, 21.4% of responders destroy a positive amount (on aggregate, they destroy 13.2% of their endowment). In the friends treatment 40.0% of responders destroy a positive amount (on aggregate they destroy 29.4% of their endowment).

Take rates in both treatments are very similar to the 60.0% mean take rate reported in the comparable two-player power-to-take game (Bosman et al., 2005). In the case of responders, destruction in the strangers treatment and friends treatment is respectively below and above destruction in the two-player game. In Bosman et al. (2005) 37.5% of the responders destroy a positive amount, and on aggregate, 24.7% of the endowment is destroyed. In fact, at first glance, the behavior of proposers and responders appears to be similar to behavior in the ultimatum game.[11] However, we would like to point out that the outcomes in the two games are quite different. If we take into account that in the power-to-take game only the responder's income is at stake, take authorities are on average offering only 19.7% of the total income to responders (as opposed to around 40% in ultimatum games, Camerer, 2003).

If we compare the behavior of strangers to the behavior of friends, we see that, even though take rates are not significantly different (p = 0.78),[12] there is more and more frequent destruction when responders are friends. This difference is even

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[11] In ultimatum games the average offer is usually between 40% and 30%. Furthermore, responders reject around 50% of the offers below 20% (Camerer, 2003). In this experiment, on average, take authorities 'offer' 39.3% of the responders' endowment. Moreover, responders destroy 63.2% of their income at 'offers' below 20%.

[12] Throughout the paper, unless it is otherwise noted, we always use a Wilcoxon-Mann-Whitney test. Furthermore, all tests in the paper are two-sided.

starker if we concentrate on responders who face above-average take rates. This is reported as our first result.

RESULT 1: *Friends destroy more and more frequently than strangers. This difference is due to high destruction rates among friends when faced with high take rates*.

Support: Comparing destruction behavior across treatments, one can reject the hypothesis that friends and strangers destroy equal quantities (p = 0.02) and equally often (p = 0.03). Among responders who face a high (i.e. above-average) take rate, strangers destroy on aggregate less than friends, namely 32.8% vs. 67.3% (p = 0.01). Moreover, only 33.3% of strangers destroy some of their endowment whereas 78.6% of friends decide to do so (p = 0.01). There are no significant differences between treatments for responders who face a low (i.e. below-average) take rate (p > 0.85).[13] This result is partly driven by the fact that friends are more likely to destroy *all* of their endowment than strangers: 24.3% of the friends destroy everything while only 8.9% of the strangers do so (p = 0.03).[14]

Interestingly, whereas at high take rates friends are likely to destroy more and more frequently than strangers, the behavior of take authorities does not depend on whether they are facing a pair of friends or a pair of strangers. This is clearly reflected in the earnings of the take authorities. In the strangers treatment, take authorities who chose a high take rate earn on average 11.5% *more* than take authorities who chose a low take rate. They also face more risk, however, in the sense of a higher variance in earnings. In contrast, in the friends treatment, take authorities who chose a high take rate earn on average 21.4% *less* than those that chose a low take rate, even though they also face a larger variation in earnings.

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[13] Results do not change if we use take rates above or below the median take rate.

[14] It would certainly be of interest to know if the strength of the social tie between responders has an effect on destruction. Unfortunately, we have little variation in the two variables used to measure the strength of social ties, and hence, we cannot make a meaningful analysis. Roughly 60% of all pairs report their type of relationship as a "friendship" and the rest is evenly distributed among four categories. Similarly, 60% of all pairs report their frequency of contact as "very frequent" and the rest is evenly distributed among three categories (the precise categories are available in Appendix A).

Hence, while in the strangers treatment it might make sense to choose a high take rate and risk some variation in income, in the friends case this is clearly an inferior choice. Nevertheless, it turns out that the proportion of take authorities choosing a high take rate is roughly the same in both treatments.

4.2 Emotions

We now turn to the relationship between emotions and the decision to destroy. We find that destruction is positively (negatively) related to the intensity of experienced negative (positive) emotions. Responders who destroy report significantly higher intensities of anger, contempt, disappointment, and irritation, and significantly lower intensities of joy and gratitude ($p < 0.07$). This replicates the findings reported in previous studies (see Bosman and van Winden, 2002; Bosman et al., 2005).

Having found that destruction is related to experienced emotions, the question arises what explains the different emotional responses? Bosman et al. (2005) find that negative emotions, in particular anger-like emotions, are triggered by high take rates and by a large difference between the experienced take rate and the expected take rate. We find that the same variables explain the emotional reaction of responders in the three-player power-to-take game. To illustrate, we estimate a multivariate ordered probit model with the average intensity of the three anger-like emotions (anger, irritation, and contempt) as the dependent variable. We use the following explanatory variables: demographic data (gender and area of study), the take rate, the expected take rate, the perceived fair take rate, and treatment dummies. In addition, we check for significant interaction terms (see Appendix C). We find a positive and significant coefficient for the take rate ($p = 0.04$). The same holds true for the coefficient of the difference between the take rate and the expected take rate ($p = 0.00$). Contrary to what one would expect given the emphasis on fairness in the literature, but in line with the findings of Pillutla and Murnighan (1996), the variable measuring the difference between the take rate and the fair take rate is not a significant determinant of anger-like emotions.

In combination with the finding that emotions are predictors of destruction, this suggests the following intuitive explanation for destruction: the higher the take rate and the larger the difference between the take rate and the expected take rate, the stronger the intensity of anger experienced by responders. This in turn makes it more likely that they will destroy in order to punish the take authority.

Further evidence that is easily explained with an emotion-driven account of destruction (but is hard to explain otherwise) is the time responders take to make their decision. In our experiment, responders that destroy a positive amount not only report higher intensities of negative emotions, they also take more time to make a decision (t-test, $p = 0.07$). However, if we focus on responders who destroy everything we find that, even though they report the highest intensities of negative emotions, they do not take more time to decide than responders who do not destroy (t-test, $p = 0.43$). In other words, the slowest responders are those who report intermediate intensities of negative emotions and destroy intermediate amounts.[15] Standard economic theory gives us no reason to think why making the decision to destroy an intermediate amount requires more time than making the decision not to destroy or to destroy everything. However, research on emotions suggests the following. At low intensities of negative emotions a decision can take little time because there is no real conflict between the (cognitive) interest to earn as much money as possible and the (emotional) urge to punish the take authority. At higher intensities, this conflict does arise and hence one would expect subjects to take more time in order to sort it out. However, if the intensity of the negative emotions becomes very high it can push subjects over a threshold beyond which they are less prone to think and simply follow the emotion's action tendency, which entails less time to reach a decision (Frijda, 1986; Frijda, 1988).

Nevertheless, there is an important aspect of the data that is not explained by the responders' emotional reaction *towards the take authority*. As was pointed out in Result 1, at high take rates friends destroy more and more frequently than strangers. However, we do not find that the emotional reaction of responders having observed the take rate differs between the two treatments. This means that friends and strangers are equally angry and unhappy at high take rates ($p > 0.33$). A more detailed look at the data reveals that the disparity between destruction and anger is

[15] This may explain why Rubinstein (2006) finds no difference in decision times between individuals who reject or accept ultimatum game offers. Because in the standard ultimatum game it is not possible to destroy intermediate amounts, individuals who otherwise would have done so probably end up being equally divided over the sets formed by those who reject and by those who accept.

caused by the fact that angry strangers destroy less frequently and smaller amounts than angry friends.[16]

As can be seen in Figure 2, in both treatments there are a similar proportion of angry responders (44.6% of strangers and 51.4% friends, $p = 0.45$). Moreover, the frequency of destruction among non-angry responders is roughly the same (12.9% for strangers vs. 11.8% for friends, $p = 0.89$). However, the frequency of destruction among angry responders is considerably different: whereas only 35.0% of the angry strangers destroy something, 62.5% of angry friends decide to do so ($p = 0.01$). If we look at the amounts destroyed we also find a difference. Angry strangers destroy 32.0% of their endowment while angry friends destroy 52.2% ($p = 0.01$).

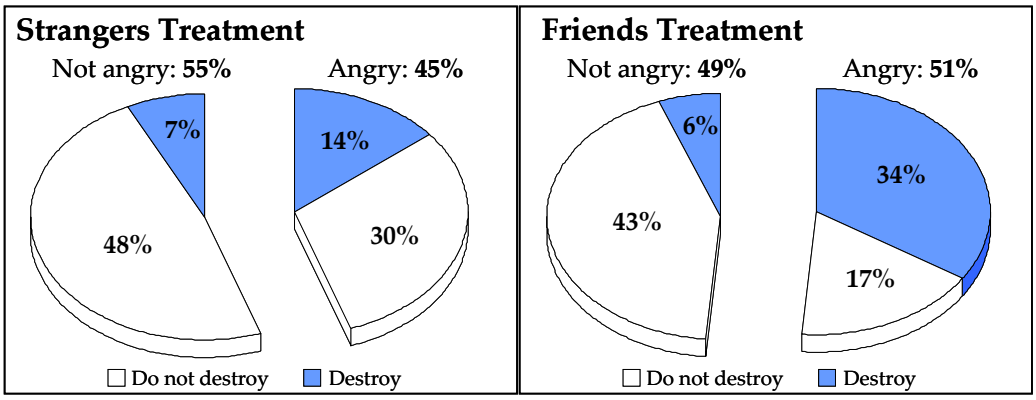

FIGURE 2 – DESTRUCTION BY ANGRY AND NON-ANGRY RESPONDERS

4.3 Coordination

In order to explain this difference, we further analyze the behavior and emotional response of responders. What we are interested in is to see whether pairs of friends behave markedly different than pairs of strangers. The following result is obtained.

RESULT 2: *Friends are better at coordinating destruction than strangers*.

Support: In both treatments a comparable number of pairs of responders coordinate on similar destruction rates (i.e. within 10 percentage points of each other),

[16] Mirroring the U-index of Kahneman and Krueger (2006), we classify subjects as angry if the maximum intensity for the anger-like emotions (anger, irritation, and contempt) is higher than the maximum intensity of the positive emotions (joy, gratitude, and admiration). However, similar results are obtained with different definitions of being angry.

specifically, 60.7% of the pairs of strangers, and 62.9% of the pairs of friends. However, if we concentrate on pairs in which at least one of the two responders destroys, we find a large difference between treatments. Among these pairs, in the strangers treatment only 8.3% coordinate on similar destruction rates whereas 42.8% do so in the friends treatment (p = 0.04). There is not a significant difference in the case of pairs where at least one responder did not destroy (p = 0.90). This result can also be observed if we look at the correlation between the destruction rates within pairs of responders. The correlation coefficient in the friends treatment is significantly higher than in the strangers treatment, 0.560 vs. –0.175 (z test, p = 0.01, this includes pairs of responders in which there was no destruction).

A possible explanation for the better coordination of friends compared to strangers is that friends tend to be more alike (which could also explain why they are friends in the first place). However, sharing a similar preference for destruction cannot explain the higher destruction rate in the friends treatment (where pairs of friends played in the same group) compared to the strangers treatment (where pairs of friends played in separate groups). A more plausible explanation for the better coordination of friends is first, that they are better at predicting each other's behavior, and second, that they have a preference for coordinating on the same action.

Overall, half of the responders accurately predict the destruction rate of the other responder in their group. Specifically, 53.4% of the strangers and 54.3% of the friends correctly predict the destruction rate of the responder they were paired with (within 10 percentage points). Although we do not see that in general the predictions of friends are better than the predictions of strangers, we do find that friends are better at predicting positive destruction. In total, 37.5% of the strangers and 50.0% of the friends thought the other responder would destroy a positive amount. Among these responders, in the strangers treatment only 4.7% of them correctly predict the other's destruction rate. Friends do much better with 34.3% of them making an accurate prediction (p = 0.01). There is not a significant difference between treatments if we look at responders who thought the other would not destroy (p = 0.39). The better predicting ability of friends is also evident if we look at the correlation between the actual and the expected destruction rate. The correlation coefficient is significantly higher in the friends treatment (0.518 vs. –0.036, z test, p = 0.01).

Lastly, we also find evidence within the strangers treatment indicating that people are better at predicting the destruction rate of their friends. In this treatment subjects also came together as friends but they were assigned to different groups. Nevertheless, they were assigned to the same role.[17] Hence, after informing responders of the take rate faced by their friend, we were able to ask them to predict their friend's destruction rate. If we compare each responder's ability to predict the behavior of their friend versus the behavior of the responder they were paired with, we find that they do considerably better when predicting their friend's destruction rate. Specifically, 53.6% of responders correctly predict the destruction rate of the other responder in their group, whereas 73.2% of them correctly predict the destruction rate of their friend. The better accuracy of responders when predicting the behavior of friends is due to better predictions of positive destruction rates. Only 4.8% of responders correctly predict the positive destruction of the other responder in their group. In contrast, 30.8% of them accurately predict the positive destruction rate of their friend ($p = 0.04$).

Even though friends predict destruction better than strangers, in itself this need not lead to more coordination among friends. To do so requires, in addition, that responders care about each other's destruction rate. Looking at the emotional response *towards the other responder* it appears that both friends and strangers care about what the other responder does. However, there is one important difference between the treatments, which is stated as the third result.

RESULT 3: *The emotional response towards the other responder facilitates the coordination of destruction among friends but not among strangers*.

Support: To backup this result we show that strangers, unlike friends, experience strong negative emotions if they happen to destroy more than the other responder. Thereafter, we show that friends, unlike strangers, experience strong positive emotions if they happen to coordinate on the same destruction. To start, we compare differences in emotional intensity scores across two sets of responders. The first set

[17] Subjects did not learn that they were assigned to the same role until they reached the debriefing questionnaire. The experiment's instructions simply gave no information concerning the role assigned to their friend.

consists of responders who destroy more than the responder they are paired with. For convenience, we will call them *punishers*. The second set consists of responders who destroy less than the other responder, which will be labeled *acquitters*, for short. In the strangers treatment, compared to acquitters, punishers report higher intensities of disappointment, irritation, and sadness ($p < 0.07$). Given this negative emotional response, it stands to reason that, ceteris paribus, strangers prefer to be among the acquitters rather than the punishers. In contrast, in the friends treatment punishers and acquitters report similar intensities for all emotions ($p > 0.29$). Hence, given the choice, friends might be indifferent between being in the punisher or acquitter situation. The negative emotional reaction that strangers experience in the punisher position is also evident across treatments. Compared to friends, strangers feel more anger, irritation, and disappointment if they destroy more than the other responder ($p < 0.04$). Next, we compare acquitters with paired responders who destroy the same amount: the *coordinators*. Compared to coordinators, acquitters in the friends treatment report more anger, irritation, and disappointment, and less joy and gratitude ($p < 0.08$). Therefore, given the choice, friends presumably prefer to be coordinators rather than acquitters. In contrast, in the strangers treatment acquitters and coordinators reported similar intensities for all these emotions ($p > 0.10$). Thus, strangers might be indifferent between being a coordinator and being an acquitter. The friends desire to coordinate can be also observed across treatments. Friends who coordinate experienced more admiration, gratitude, and joy than strangers who coordinate ($p < 0.01$).

In view of these differences, destruction seems to be more risky for strangers than for friends since it might leave them in the punisher position inducing additional negative emotions. This may explain why, even when very angry, strangers often decide not to destroy. Friends, on the other hand, seem to have a strong preference for coordination. Consequently, angry friends may be much more inclined to destroy. Especially if they believe that the other responder will also destroy. Moreover, the fact that they are better predicting each other's behavior further facilitates them to obtain the positive emotional boost of coordination.

We briefly discuss a potentially alternative explanation of destruction behavior. Since in our experiment friends have the possibility of interacting after the experiment, side payments are possible. So, one could perhaps argue that the

stronger coordination among friends who destroy is due to side payments and not because of differences in their emotional response. In order to test if side payments play a role we ask subjects in the debriefing questionnaire first, if they intend to share their earnings after the experiment, and second, if the possibility of sharing earnings after the experiment affected their decision. If side payments would indeed boost coordination one would expect significantly more coordination among responders who answer positively to one or both of the abovementioned questions. However, this is not the case even if we look only at angry responders, that is, the responders who acted differently across the two treatments ($p > 0.41$). Hence, we tentatively conclude that although side payments are possible they play no significant role in the game.

Lastly, note that we find little evidence of a desire to free-ride on the punishment of others. In the friends treatment, it is clear that acquitters (i.e. responders who see the take authority punished without punishing themselves), experience a more negative emotional response than responders who coordinate on positive destruction.[18] In the stranger treatment we cannot make this comparison as there is no coordination at positive destruction rates. However, we do not find that acquitters experience a more positive emotional response than angry responders who coordinate on zero destruction (but presumably would like to see the take authority punished).[19]

5. Discussion

In this section we draw attention to two important aspects of our results that are either missing or unsatisfactorily modeled. First, we discuss the role of expectations on behavior, and second, we comment on the effects of social ties on reciprocity.

5.1 Expectations about what happened

Expectations clearly play a crucial role in decision-making. In case of uncertain actions by other agents, individuals base their decisions on what they expect these

[18] Acquitters experience lower intensities of pride, joy, and gratitude, and higher intensities of envy, anger, shame, irritation, and disappointment ($p < 0.09$).

[19] Acquitters did not experience more pride, joy, gratitude, and admiration, or less envy, anger, shame, guilt, irritation, contempt, regret, sadness, and disappointment ($p > 0.27$).

actions to be. However, in economic theory expectations affect an individual's behavior only as long as the uncertainly remains unresolved. Once individuals know that a certain action has taken place, what they expected that action to be has no effect on current behavior. Our results demonstrate that this may not be the case.

In our experiment a responder's expected take rate is an important determinant of whether he destroys or not (see also van Winden, 2001). Destruction, and especially high destruction (at least 50%), is carried out almost exclusively by responders who expected a lower take rate that the one they experience.[20] For example, once we control for the effect of the take rate by looking only at take rates in the third quartile, we find that responders who experience a take rate that is higher than the one they expected destroy more and more often than responders who experience a take rate that is lower than the one they expected (p = 0.02). It is actually quite intuitive to think that an individual feels angrier in the case of high expectations that are proved wrong as opposed to the case of low expectations that are confirmed.[21] Nonetheless, this simple and intuitive reaction is not present in theoretical models of reciprocity.

In many models, responders who destroy do so because they have a strong preference for a given fairness norm or outcome (e.g. Levine, 1998; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). However, if differences in expectations explain an important part of the heterogeneity we observe in reciprocal behavior, we should be more careful in predicting how individuals behave across games and time. Since expectations, unlike preferences, may change substantially in the short-run, behavior might adjust faster than a model based solely on preferences would predict.

Models that use psychological game theory do give expectations a more central role (e.g. Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2005), but not in the way we have discussed. As in other models, once a responder observes the take rate, his expected take rate has no effect on his decision.

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[20] Of the responders who destroyed (at least 50%) 65.0% (82.8%) fall in this category.

[21] See Ortony et al. (1988) on the importance of expectations for the intensity of emotions. For some neural evidence of the role of unexpected negative feedback in action selection, see Ridderinkhof et al. (2004).

In fact, since these models focus on equilibria where individuals *correctly* anticipate the actions of others, they miss an important trigger of anger and thus of destruction. This raises the question, to what extent these models capture experienced emotions (see Elster, 1998). Although fulfilled expectations might be a plausible assumption for the long-run, in many situations there is simply not enough time to learn what others will do. In these circumstances, understanding the emotional reactions to deviations from expected actions might prove very useful for predicting how individuals behave. Furthermore, in cases in which the long-run outcome is heavily influenced by the initial situation, emotions experienced when expectations are still unfulfilled can have a crucial effect on long-run behavior.

Instead of having as reference point the expectation of what the take authority will do, a responder may (also) be affected by what she thinks the take authority *should* do. That is, the reference point could be the take rate that she considers fair. However, we do not find a relationship between destruction and the reported fair take rates.[22] This is the case even though it is argued that equity considerations are especially important in highly asymmetric situations with complete information (Smith, 1976; Fehr et al., 1993).

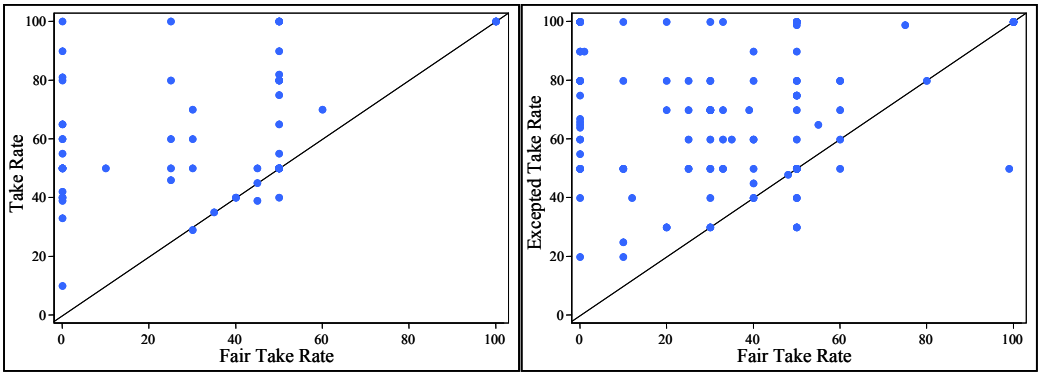

FIGURE 3 – SCATTER PLOTS OF FAIR AND ACTUAL OR EXPECTED TAKE RATES

[22] For example, if we control for the effect of the take rate by looking at take rates in the third quartile, we find that, responders with an above-average fair take rate destroy the same as those with a below-average fair take rate ($p = 0.45$). In comparison, if we do the same test for the expected take rate, we find more destruction among responders with a below-average expected take rate ($p = 0.01$). Results do not change if we use fair take rates above or below the median.

This is not to say that fairness perceptions do not play a role in the responders' decision. It may be that fairness plays a more indirect role than usually envisaged. Suggestive in this respect is the following analysis. Focusing on the difference between the expected take rate and the fair take rate shows that in only 5.6% of the cases this difference was negative. In other words, the overwhelming majority of responders expected a higher take rate than the one they considered fair (reflected by the average fair take rate being lower than the average expected take rate). An almost identical pattern is seen if we look at the relationship between the take rate chosen by take authorities and the take rate take authorities considered fair (only 4.8% of take authorities choose a take rate that is lower than their fair take rate). Indeed, a glance at the scatter plot of the fair and chosen take rates or the fair and expected take rates suggests that individuals seem to use their fair take rate as a lower bound for their choice or expectation (see Figure 3).

In other words, it seems that take authorities are using the take rate they consider to be fair as a reference point for the determination of the optimal take rate. Similarly, responders may use their fair take rate as a reference point to form an expectation of what the real take rate will be. Once this expectation has been formed, it is a deviation from the expected take rate that triggers the high intensities of anger that motivate responders to destroy.

5.2 Social Ties

As shown in the previous section, social ties can have a considerable impact on behavior. Not only do friends react differently to higher take rates, their emotional reaction towards one another is also very different. Improving our understanding of the effects of social ties on reciprocal behavior is important since not all meaningful economic interaction occurs between strangers. In cases such as interaction at the work floor, informal credit institutions, scientific research, and political participation, more interaction might actually occur between friends than between strangers. In fact, as argued by Rosenblat and Mobius (2004), technological advances that reduce communication costs, such as the internet, can make interaction among groups of friends even more important.

In our experiment, angry friends manage to coordinate destruction much more frequently than angry strangers. If we consider the emotional reactions between responders, as discussed in Result 3, this is not surprising. Note that angry strangers who intend to destroy face a situation akin to a collective action problem.

The findings of Quervain et al. (2004) indicate that these responders would like to see the take authority punished. However, our results suggest that they also would like to avoid being the only ones doing the punishment. We do not know the precise amount of satisfaction that subjects derive from each of the possible outcomes. Nevertheless, judging by the responders' emotional reactions, it would not be farfetched to model the angry strangers' situation as a prisoner's dilemma or a stag hunt game. In either case, destruction is unlikely. In contrast, in the angry friends case, the observed desire of responders to coordinate on the same action combined with an impulse to destroy makes their situation noticeably different. Angry friends can be modeled as playing a coordination game in which destruction not only gives them the highest payoff but is also the risk-dominant choice and hence, the most attractive option.

We discuss two natural ways of incorporating social ties into current models of social preferences. The first way is to assume that friends are better than strangers at predicting what the other responder does. The second way is to assume that friends, as opposed to strangers, care for each other's utility.

In models of social preferences that are based on income differences (e.g. Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), a difference in knowledge about what the other responder will do might indeed lead to a situation where strangers destroy less than friends. For example, if the income difference between two responders is important, responders will wish to destroy similar amounts. In this case, more uncertainty about the other's behavior makes a responder's destruction decision more difficult. If individuals prefer advantageous inequality to disadvantageous inequality, then destroying less becomes more attractive. Nonetheless, this line of thought fails to describe one important aspect of the data, namely that the difference between friends and strangers occurs at high take rates. At high take rates the main concern of responders is to lower the income difference between themselves and the take authority.[23] Hence, under these conditions both friends and strangers destroy similar amounts. In intention-based models of fairness,

[23] The reason is that, when facing a high take rate, unilateral destruction creates only a small income difference between the responders but it substantially reduces the income difference with the take authority.

knowing better what the other responder will do does not affect a responder's behavior (e.g. Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2005). In these models, responders care about each other's income only if they can affect it through their actions. However, this is not the case in the three-player power-to-take game.

Assuming that friends care for each other's utility might be a more promising way to explain why friends destroy more than strangers when facing high take rates. In models based on income differences, if responders care for the *utility* of the other responder, then in addition to receiving disutility because the take authority has a higher income than they do, they will also receive disutility because the take authority has higher income than their friend does. This leads to a stronger desire to destroy, particularly at high take rates. In this respect, investigating the precise effect of an interdependent utility function might prove a fruitful line of research. Intention-based models might have a more natural way of incorporating social ties. In the current models, an individual evaluates the kindness of others by looking at how their actions lead to a higher or lower payoff for the individual. The friends case could be modeled by allowing individuals to include into their evaluation as well the way their friends are treated.

6. Conclusion

An important goal of this paper is to investigate whether and, if so, how social ties impact negative reciprocity in case of multiple reciprocators. In addition, we look at the role of affect on this context. For this purpose we use a three-player power-to-take game. We find that friends destroy more of their income than strangers. Furthermore, they are more likely to coordinate their destruction. These differences in behavior can be explained by differences in the affective responses of friends and strangers.

Our results indicate that the study of emotions helps explain observed behavior. Anger-like emotions appeared to be the main driving force behind the decision to destroy income. Furthermore, by observing the emotional reaction between responders we can explain why friends are able to coordinate on destruction more frequently than strangers. Without investigating these emotional responses, the precise mechanism by which social ties affect the subjects' choices would have remained unclear.

In this paper we also call attention to the role of expectations in determining the subjects' emotional responses. One interesting issue for future research concerns the interaction between expectations and social norms. If social norms are based on the actual behavior of the majority of individuals in a society, then expectations may be largely fulfilled in many well established situations. However, when faced with new circumstances in which a social norm is not clearly defined, the initial expectations of individuals might have an important effect on the behavior that later becomes a norm.

In addition to expectations, we would like to emphasize the importance of studying social ties. Our experiment shows clear differences in emotional reactions depending on the presence of a social tie. In some situations this could lead to differences in behavior that might be economically relevant. For example, the emotional boost that friends receive from coordination makes economic interaction with friends more enjoyable that with strangers. Results from the literature on social distance suggest that this type of preferences can lead to segregation, inefficient outcomes, and conflict between groups (Schelling, 1978; Borjas, 1995; Glaeser et al., 1996; Akerlof, 1997).

The behavioral differences induced by social ties can be especially important for the effectiveness of various policies. It might be the case that a given policy improves a situation only if individuals (do not) share social ties. Investigating the emotional responses may reveal the precise mechanism through which social ties affect people's choices, and therefore, it can help us predict the effects of different policies. To give an example, the emotional responses of friends indicate a strong desire to coordinate their actions. In this case, a coordination mechanism such as the possibility to make decisions sequentially (as in Potters et al., 2005) might be more effective among friends than among strangers.

So far, the effects of social ties have received little attention in experimental investigations. To some extent, this neglect is due to the difficulty of creating strong social ties in controlled environments. The usual ingredients of complete anonymity, no face-to-face communication, and a little time for interaction, produce an environment in which meaningful social bonding is difficult. Nevertheless, the design we have used suggests that it is possible to include social ties in experiments and to acquire insights into their properties.

Appendix A – Instructions and Relationship Questions

A.1 Instructions (translation from Dutch)

These are the instructions for the friends treatment. The instructions for the strangers treatment were very similar, and are available upon request.

Introduction

In order to sign up for this experiment, you had to sign up together with a second participant. For convenience, we will refer to this second participant as your partner. In the experiment each of you will be assigned to a 3-person group, that is, you plus two other participants. We will explain how groups are formed later on.

Throughout the experiment, the type of decision you make will depend on your position in your group. Some of you will be positioned to move first, and some of you will be positioned to move second. Participants moving first will be referred to as As while participants moving second will be referred to as Bs.

Before the experiment started each desk was assigned either an A or a B. Therefore, by randomly assigning the yellow cards (in the reception room), each participant was randomly assigned a position. Once you are informed which position has been assigned to you, the corresponding letter will appear on the top-right part of the screen.

The 3-person group that you belong to depends on your position as well as on the position of others in the following way:

- Your group (including yourself) consists of one A and two Bs.
- If you are a B:
    - Then, the other B in your group is your partner (the person with whom you signed up).
    - The other participant will be a randomly chosen A.
- If you are an A:
    - Then your partner (the person with whom you signed up) is also an A and thus he/she is not in your group.
    - The other two participants will be a randomly selected pair of Bs that signed up together for the experiment.

Note: Each group, and thus also your group, was formed randomly in the sense that the A in the group does not know who the B's are, and similarly the B's do not know who the A is.

The experiment

At the beginning of the experiment each participant – this includes all A participants and all B participants – will receive 10 euros as his/her initial endowment. The experiment consists of two phases. In phase one, only the A participant must make a decision. Similarly, in phase two, only the B participants must make a decision. Hence, every participant makes only one decision. In addition to the decision, during the experiment you will be asked to answer a few questions.

Phase one: A chooses a percentage

In this phase, A must choose a percentage and type it into the corresponding field on the screen. This percentage determines how much of the money of each B in the group after phase two, will be transferred to A. The percentage chosen by A must be an integer between 0 and 100 (inclusive). If you wish to make any calculations, you can use the calculator located on your desk.

Once you are satisfied with your decision, you have to confirm it by clicking on the button "Ready". Note that all decisions are final; once you have clicked on "Ready" there is no way of changing your choice. Once A has completed phase one, phase two begins.

Phase two: each B chooses a percentage

At the beginning of this phase, each B is informed of the percentage chosen by A. At this point, each B must also choose a percentage and type it into the corresponding field on the screen. This percentage determines how much of his/her initial endowment will B destroy. The percentage chosen by B must be an integer between 0 and 100 (inclusive). Hence, the transfer from each participant B to participant A will be based on the endowment of B that is left.

Once you are satisfied with your decision, you have to confirm it by clicking on the button "Ready". Note that all decisions are final; once you have clicked on "Ready" there is no way of changing your choice. Once each person has made his/her decision, phase two ends.

Payoffs

After phase two, all participants will be informed of the amount of money they have earned during the experiment. You will also be informed of the amount of money earned by the other two participants in your group.

Example of how to calculate your payoffs

We will now give an example for the purpose of illustration. Remember that all participants in your group have an initial endowment of 10 euros. Suppose that in phase one participant A decides that 30% of the endowment of each participant B will be transferred to him/her (participant A). In phase two, each B can destroy part or everything of his/her initial endowment. Suppose that both Bs decide to destroy 0% percent of their initial endowment. The transfer from each B to A is then equal to 3 euros (30% of 10 euros). The earnings of each B are equal to 7 euros (namely, the initial endowment of 10 euros minus the transfer of 3 euros). The final endowment of A is equal to 16 euros (namely, the initial endowment of 10 euros plus twice a transfer of 3 euros).

Now suppose that in this example, one of the B participants decides to destroy 50% of his/her initial endowment. In this case, his/her transfer to A is only 1.5 euros (namely, 30% of the endowment that was not destroyed, i.e. is 30% of 5 euros). The earnings of A are equal to 14.5 euros (namely, the initial endowment of 10 euros plus 3 euros transferred from the B who destroyed 0% plus 1.5 euros transferred from the B who destroyed 50%). The earnings of the B who destroyed 0% are again 7 euros, and, finally, the earnings of the B who destroyed 50% are 3.5 euros (namely, 50% of the initial endowment of 10 euros minus the transfer of 1.5 euros).

In summary

In the experiment you will be divided into groups of 3, each consisting of one A and two Bs (who signed up together for the experiment). The roles of A and B where randomly and anonymously assigned by drawing your table number. Each participant receives 10 euros as an initial endowment. Then there are two phases. In phase one, A decides on a percentage that indicates how much of the endowments of each B after phase two will be transferred to A. In phase two, each B decides what percentage of his/her initial endowment will be destroyed.

If you have any questions now, please raise your hand. If you do not have any questions, please click on “Ready”. Note that once you click on “Ready” you will not be able to go back to the instructions. Next, we will ask you to answer a few questions in order to familiarize you with the calculation of your earnings.

A.2 Questions measuring the strength of the relationship of friends

We ask you to answer a few questions concerning your partner (the person with whom you registered for the experiment).

1. Which of the following best describes the relationship between you and your partner (check all that apply)?

   a. We have no relationship at all (e.g. we just met to sign up together for the experiment).
   b. We are just acquaintances (e.g. we knew each other before the experiment but we normally don't interact).
   c. We are coworkers (e.g. we see each other only at the university (work) and we have little contact besides then).
   d. We are friends (e.g. we see each other under various environments and we know each other's friends).
   e. We are involved in a romantic relationship (e.g. we are currently dating, boyfriend/girlfriend, or husband/wife).

2. During the last 6 months, how would you characterize the frequency of contact between you and your partner (circle one number)?

No Contact – 1 2 3 4 5 6 7 – Very Frequent Contact

Appendix B – Descriptive Statistics

TABLE B.1 – MEAN BEHAVIOR OF TAKE AUTHORITIES BY TREATMENT

Treatment	Strangers	Friends
Take rate	58.61 (19.72)	62.29 (22.87)
Destruction rate	13.23 (20.68)	29.43 (38.24)
Expected destruction rate	18.75 (28.00)	26.14 (26.37)
Fair take rate	35.00 (22.97)	29.57 (29.34)

Note: Numbers between brackets are standard deviations.

TABLE B.2 – MEAN BEHAVIOR OF RESPONDERS BY TREATMENT AND DESTRUCTION

Treatment	Strangers	Friends	Strangers $d_i = 0$	Friends $d_i = 0$	Strangers $d_i > 0$	Friends $d_i > 0$
Take rate	58.61 (19.54)	62.29 (22.70)	56.45 (19.54)	49.50 (13.13)	66.50 (18.20)	81.46 (20.48)
Own destruction rate	13.23 (31.91)	29.43 (42.98)	0 (n/a)	0 (n/a)	61.75 (42.68)	73.57 (36.79)
Other responder's destruction rate	–	–	16.84 (35.21)	14.28 (30.65)	0 (n/a)	52.14 (49.02)
Expected take rate	69.52 (21.76)	66.36 (25.97)	71.93 (21.05)	71.24 (28.59)	60.67 (22.94)	59.04 (19.78)
Expected destruction rate	21.87 (36.02)	31.79 (41.19)	9.32 (23.64)	6.55 (14.42)	67.92 (36.89)	69.64 (39.27)
Fair take rate	33.32 (25.23)	29.97 (26.93)	35.30 (26.35)	29.95 (28.79)	26.08 (19.92)	30.00 (24.38)

Note: d_i = own destruction rate. Numbers between brackets are standard deviations.

TABLE B.3 – MEAN EMOTIONAL INTENSITY OF RESPONDERS TOWARDS THE TAKE AUTHORITY

	Strangers		Friends	
Emotion	$d_i = 0$	$d_i > 0$	$d_i = 0$	$d_i > 0$
Admiration	2.6 (1.8)	1.9 (1.3)	2.7 (1.9)	1.3 (0.7)
anger	2.8 (2.0)	4.0 (1.9)	2.3 (1.6)	4.1 (2.2)
contempt	2.6 (2.1)	3.8 (2.2)	2.2 (1.7)	4.5 (2.2)
disappointment	3.0 (2.0)	4.3 (1.9)	2.7 (1.7)	4.3 (2.1)
envy	3.2 (1.9)	3.8 (2.3)	3.3 (1.7)	3.7 (2.3)
gratitude	3.1 (1.9)	1.9 (1.4)	3.5 (2.1)	1.5 (0.9)
guilt	1.6 (1.0)	1.6 (0.9)	1.4 (0.9)	1.4 (0.8)
irritation	3.4 (2.2)	4.6 (2.2)	2.9 (1.9)	5.2 (2.1)
joy	3.0 (1.8)	1.9 (1.2)	3.6 (2.0)	1.6 (1.3)
pride	2.8 (2.1)	2.7 (1.9)	2.3 (1.4)	2.8 (2.3)
regret	1.4 (0.9)	2.1 (1.2)	1.4 (1.0)	1.6 (1.2)
sadness	2.1 (1.7)	2.4 (1.7)	1.6 (1.1)	2.2 (1.5)
shame	1.4 (0.8)	1.3 (0.6)	1.4 (0.9)	1.6 (1.3)
Surprise	3.7 (2.1)	4.1 (2.2)	4.0 (2.1)	4.5 (1.9)

Note: d_i = own destruction rate. Numbers between brackets are standard deviations.

TABLE B.4 – MEAN EMOTIONAL INTENSITY OF RESPONDERS TOWARDS THE OTHER RESPONDER

	Strangers			Friends		
Emotions	$d_i > d_j$	$d_i = d_j$	$d_i < d_j$	$d_i > d_j$	$d_i = d_j$	$d_i < d_j$
admiration	2.2 (1.5)	2.5 (1.6)	2.5 (1.9)	3.1 (2.2)	3.8 (1.9)	3.1 (2.2)
anger	3.3 (2.1)	1.8 (1.5)	2.2 (1.6)	2.3 (2.3)	1.1 (0.3)	1.6 (1.0)
contempt	2.7 (2.1)	1.5 (1.1)	1.9 (1.0)	1.7 (1.3)	1.1 (0.3)	1.3 (0.7)
disappointment	4.1 (1.9)	1.9 (1.7)	2.2 (1.6)	2.6 (2.4)	1.1 (0.3)	1.6 (1.1)
envy	2.9 (1.7)	1.7 (1.3)	2.6 (1.9)	2.3 (2.1)	1.1 (0.3)	1.5 (1.1)
gratitude	1.6 (1.0)	1.8 (1.3)	1.8 (1.5)	2.7 (2.1)	3.2 (2.1)	2.0 (1.3)
guilt	2.4 (1.6)	1.3 (0.9)	2.0 (1.5)	1.5 (1.1)	1.2 (0.8)	1.4 (0.9)
irritation	4.3 (1.9)	2.0 (1.8)	2.8 (2.0)	2.5 (2.3)	1.1 (0.2)	1.6 (1.2)
joy	1.9 (1.5)	3.2 (2.0)	2.2 (1.7)	2.6 (2.0)	5.0 (1.3)	3.2 (2.1)
pride	2.2 (1.5)	3.6 (2.2)	2.0 (1.5)	3.1 (2.1)	4.8 (1.9)	2.5 (1.9)
regret	1.8 (1.2)	1.4 (0.9)	1.5 (1.0)	1.3 (0.7)	1.2 (0.7)	1.8 (1.5)
sadness	2.1 (1.4)	1.7 (1.5)	1.3 (0.8)	1.9 (1.9)	1.1 (0.5)	1.3 (0.6)
shame	1.8 (1.1)	1.3 (0.9)	1.7 (1.2)	1.9 (1.8)	1.1 (0.3)	1.9 (1.6)
surprise	4.8 (2.4)	2.0 (1.6)	3.7 (2.2)	4.7 (1.7)	2.1 (1.4)	4.1 (2.5)

Note: d_i = own destruction rate, d_j = destruction rate of the other responder. Numbers between brackets are standard deviations.

Appendix C – Regressions

Ordered probit model with the average intensity of the three anger-like emotions (anger, irritation, and contempt) as the dependent variable. Independent variables include: gender, field of study, a treatment dummy, the take rate, the difference between the take rate and the expected take rate, and the difference between the take rate and the fair take rate. There are no significant interaction terms.

TABLE C.1 – ORDERED PROBIT MODEL ESTIMATING THE INTENSITY OF ANGER-LIKE EMOTIONS

Variable	Coefficient	Std. Error	*p* value
Take Rate	0.0146	0.0071	0.039
Take Rate – Expected Take Rate	0.0143	0.0039	0.000
Take Rate – Fair Take Rate	0.0002	0.0037	0.957
Economist	0.2178	0.2007	0.278
Female	–0.3185	0.1930	0.099
Friends	–0.0018	0.1891	0.992
# of obs. = 126	LR $\chi^2(6) = 47.49$	Prob > $\chi^2 = 0.00$	Log likelihood = –322.96

Dummy variables: Friends: 1 if friends treatment, 0 otherwise; Strangers: 1 if strangers treatment, 0 otherwise; Economist: 1 if economics student, 0 otherwise; Female: 1 if female, 0 if male.

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