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 gratefully acknowledge the helpful comments of two anonymous referees. We are further thankful for feedback from participants at the Public Choice Society meeting in Baltimore, the ESA meeting in Amsterdam, and the 1st 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 purpose of this paper is twofold. On one hand, we study the motivations behind an individual's decision to negatively reciprocate in the more complex case of multiple reciprocators. On the other hand, 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 earnings, any difference with

[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).

the two-player version of the game can be attributed to the fact that there are now two instead of one responder. Furthermore, differences 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 a potentially important way. If, as was mentioned, 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 a responder's desire to harm the take authority will be satisfied if someone else does the punishing.

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 or about each other's behavioral response. If a responder's utility depends on the actions of the other responder, destruction can become a coordination problem. Accurately predicting the other responder's destruction is then important. For example, if responders care about income differences they might dislike destroying alone if destruction increases the income difference between them.

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. 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), or by studying in-group vs. out-group behavior in minimally created groups (e.g. Yamagishi and Kiyonari, 2000) and real social groups (Bernhard et al., 2006; Goette 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 (an exception is Abbink et al., 2006). 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 (Chong, 1991) and might be 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; 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 influence 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 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 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, 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 this paper, take authorities select a uniform take rate ($t_1 = t_2 = t$) and all the endowments are equal ($E_1^{resp} = E_2^{resp} = E^{take}$).[2]

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). For *both* treatments we asked subjects to come to the experiment with someone they already knew. Thus, the only difference between treatments consisted of the matching procedure used to assign responders to a take authority. In the strangers treatment subjects who came together to the experiment faced different take authorities. In contrast, in the friends treatment, subjects who came together to the experiment faced the same take authority. By comparing the results from the strangers treatment with earlier experiments 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.

Since social ties are not explicitly incorporated by theoretical models used to explain reciprocal behavior, we can not use them directly to formulate specific hypotheses concerning differences between the friends and strangers treatment. However, it can still be useful to describe more generally their predictions in order to understand how social ties may interact with reciprocal motives.

The standard prediction, assuming own-payoff maximization, is that the take authority chooses to take essentially all of the responders' endowment and that the responders do not destroy any of it. However, numerous experiments have demonstrated that this is not to be expected (Camerer, 2003). More accurate predictions are likely to be achieved by models assuming that individuals possess social preferences. These models predict that responders may destroy (particularly at

[2] The power-to-take game differs in three ways from the 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.

high take rates) and that proposers may not take as much as they could. We shortly discuss the predictions of two popular approaches in this literature.[3]

Models of social preferences that assume people dislike income differences (e.g. Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000) predict that going from one to two responders results in higher take rates and less destruction. Roughly put, this is due to two forces. On one hand, from the take authority's perspective, facing two instead of one responder makes taking more profitable. On the other hand, from the responders' perspective, a desire to avoid income differences between responders coupled with a preference for advantageous over disadvantageous inequality makes destruction less desirable. In contrast, models of social preferences that assume a dislike for intentionally unkind actions (e.g. Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2005) predict no difference between the two and the three-player games. In these models, responders care about each other's wellbeing only if they are directly affected by the other responder's actions, which is not the case in the three-player power-to-take game. In Section 5, we discuss possible ways of extending these models to account for social ties and thus better explain our experimental results.

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 small in number, there are a few studies that measure emotions in order to relate them to responder behavior. A relatively early paper is Pillutla and Murnighan (1996). Responders in an ultimatum game experiment were asked, after each of a series of offers, the open-

[3] For a more thorough discussion of the predictive power of models of social preferences in the power-to-take game see Reuben (2006).

ended question "How do you feel?" Answers were rated for expressions of anger, and the rejection of offers was found to be related to this measure. 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 anger), which in turn is positively related to the actual take rate and negatively to the responders' expectations regarding the take rate.

Recently, 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 elicit activity in brain areas related to both emotion and cognition, and heightened activity in areas related to emotions in case of rejection. Quervain et al. (2004) show that effective punishment of individuals who behave unkindly produces activity in areas of the brain associated with the processing of rewards (see also Singer et al., 2006). Regarding the power-to-take game, Ben-Shakhar et al. (2007), 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. Since all these studies are restricted to the one-responder case, with 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.[4] Knez and Camerer (1995) use the strategy method to

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

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 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 responders affect behavior as well as 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, and law. 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 experiment took around one hour.

The experiment consisted of two treatments: a strangers treatment and a friends treatment. For both treatments, subjects were allowed to sign up only in pairs, that is, they had to provide the name of someone they knew and with whom

they would take part in the experiment.[5] If a subject 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 social ties, we asked subjects to describe the type of relationship they had with their partner and how often 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.[6] The instructions were followed by a few exercises to check the subjects' understanding of the procedures. Thereafter, subjects were informed, by opening an envelope on their desk, to which role (that of take authority or responder) they had been assigned. Subsequently, they played the three-player power-to-take game via the computer.[7]

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.

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[5] 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.

[6] An English translation of the instructions is available in Reuben and van Winden (2006).

[7] The experiment was programmed and conducted with the z-Tree (Fischbacher, 2007).

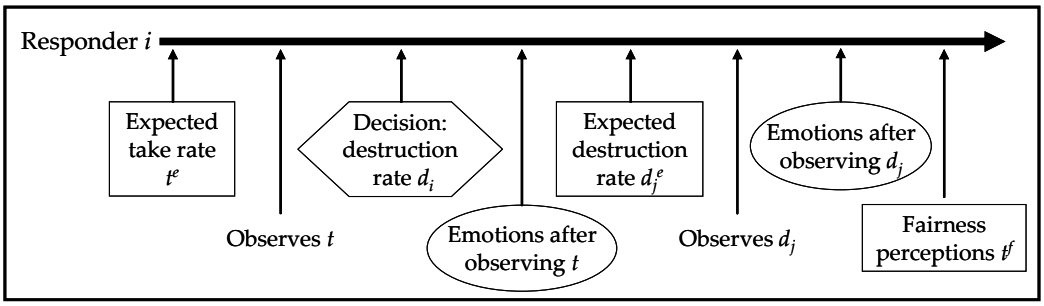

FIGURE 1 – SEQUENCE OF EVENTS FOR RESPONDERS

Throughout the game, subjects filled out a few forms to indicating their emotions, their expectations concerning the actions of others, and the take rate they considered to be fair. Figure 1 shows the precise order in which the responders' decisions, emotions, and expectations were measured. We asked subjects to report what they expected others to do before they observed their actual behavior.[8] As in Bosman and van Winden (2002) subjects' emotions towards other players were measured after the subject observed what the other did.[9] We asked for the fair take rate, at the end, in the debriefing questionnaire.

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 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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[8] Expectations were measured by asking subjects to indicate the most likely value for t or d_j.

[9] Emotions were measured by asking subjects to report on a 7-point scale with what intensity they experienced each of fourteen emotions (admiration, anger, contempt, disappointment, envy, gratitude, guilt, irritation, joy, pride, regret, sadness, shame, and surprise). A variety of emotions were used 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. Descriptive statistics are provided in Appendix A.

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.[10] 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, although take rates are not significantly different (p = 0.78),[11] there is more and more frequent destruction when responders are friends. This difference is starker for responders who face above-average take rates. This is reported as our first result.

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[10] 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%.

[11] 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.

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).[12] 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).[13]

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, plus they also face a larger variation in earnings. 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 treatment this is clearly an inferior choice.

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

[13] 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 describe their contact as "very frequent" and the rest is evenly distributed among three categories (for the precise categories see Reuben and van Winden, 2006).

Nevertheless, the proportion of take authorities choosing high take rates 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 report significant interaction terms (see Appendix B). 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.[14] Standard economic theory gives us no reason to think that 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 money and the (emotional) urge to punish the take authority. At higher intensities, this conflict does arise and hence one can 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 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 responders' emotional reaction to the take rate differs between 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 caused by the fact that angry strangers destroy less frequently and smaller amounts than angry friends.[15]

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[14] 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.

[15] 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.

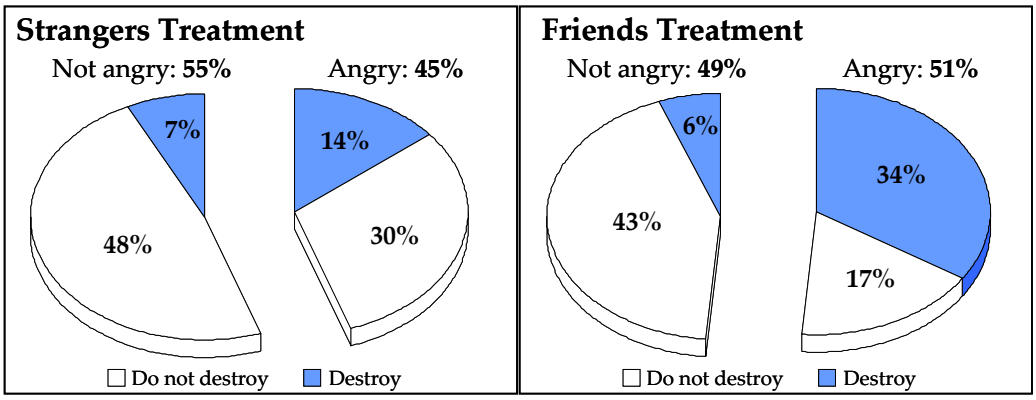

FIGURE 2 – DESTRUCTION BY ANGRY AND NON-ANGRY RESPONDERS

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% ($p = 0.01$).

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: If we look at pairs in which at least one of the two responders destroys, we find that, in the strangers treatment, only 8.3% coordinate on similar destruction rates (i.e. within 10 percentage points of each other). In contrast, 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 is also 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 and therefore are more likely to share a *preference* for punishment. However, our experimental design allows us to rule out this explanation. A common preference for destruction would imply more correlated behavior in the friends treatment but the *same* average destruction rate in both treatments. Since we find a higher destruction rate in the friends treatment (Result 1), there has to be another explanation for the treatment differences. Two possibilities are: first, that friends are better at predicting each other's destruction, and second, that they have a preference for coordinating on the same action.

Overall, friends are indeed better at predicting their partner's destruction. For instance, if we look at the correlation coefficient between the actual and the expected destruction rate, we find it is significantly higher in the friends treatment (0.518 vs. –0.036, z test, $p = 0.01$). This is driven by friends being better than strangers at predicting positive destruction. In total, 50.0% of the friends and 37.5% of the strangers 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 (within 10 percentage points). Friends do much better with 34.3% of them making an accurate prediction ($p = 0.01$). 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 came together as friends but were assigned to different groups. Nevertheless, they were assigned to the same role.[16] 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. We find that they do considerably better when they are predicting their friend's destruction. Only 4.8% of responders correctly predict a positive destruction rate by the other responder in their group. In contrast, 30.8% of them accurately predict a positive destruction rate by 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

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

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 more the coordination of destruction among friends than among strangers*.

Support: To backup this result we show that, compared to friends, strangers experience stronger negative emotions if they happen to destroy more than the other responder. Thereafter, we show that, compared to strangers, friends experience stronger 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 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*. 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 ($p > 0.29$). 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, there is no significant difference between acquitters and coordinators for any of these emotions ($p > 0.10$). The friends desire to coordinate can be also observed across treatments. Friends who coordinate experienced more admiration, gratitude, and joy than strangers who coordinate ($p < 0.01$).

Thus, although there might be a general dislike to being the only responder who destroys, the more intense emotional reaction of strangers in the punisher position makes destruction more risky for them than it is for friends. This can explain why,

even when very angry, strangers often decide not to destroy. Similarly, although both friends and strangers appear to be better off if they choose a similar destruction rate, friends receive a much stronger 'emotional boost' if they manage to coordinate their destruction. 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 experience associated with coordination.

Furthermore, we note that, at least for friend responders, there is little evidence of a desire to free-ride on the punishment of others. In the friends treatment, 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.[17] In the stranger treatment we cannot make this comparison as there is no coordination at positive destruction rates.[18]

We briefly discuss a potentially alternative explanation of destruction behavior. Since friends have the possibility to interact after the experiment, side payments are possible. So, one could 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 affected their decision. If side payments improve coordination one would expect more coordination among responders who answer positively to one or both of these 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 side payments play no significant role in the game.

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

[18] Thus, although subjects (particularly men) enjoy when others punish selfish acts (Singer et al., 2006), they might enjoy punishment even more if they get to partake in it.

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 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 a good predictor 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.[19] For example, once we control for the effect of the take rate by looking 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. 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 (e.g. 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 behavior across time. Since expectations, unlike preferences, change substantially in the short-run, behavior might adjust faster than a model based solely on preferences would predict.

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

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. 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). In many situations, people do not have 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.

It might still be possible for preferences to be behind the predictive power of the expected take rate. If we relax the standard assumption of rational expectations and we assume that fair-minded responders expect others to choose low take rates (perhaps because they think others have similar preferences), then the expected take rate could be masking an underlining preference for fair outcomes.[20] However, given the importance of anger-like emotions for destruction and the evidence from psychology which links anger to violated expectations (e.g. Shaver et al., 1987; Ortony et al., 1988), we think it is more obvious to think of expectations as having an independent effect. That is not to say that fairness does not play a role. We discuss this in the next paragraphs.

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[20] Even, if this were the case, it would have to apply only to responders. For take authorities the same logic would imply that those with a weak preference for fairness would also expect responders not to destroy, and thus, they would take all (minus ε) of the responders' endowment. However, we observe only a small fraction of take authorities choosing such high take rates. The most common behavior is for take authorities to choose a rather unequal division of earnings (the median take authority earned four times as much as the median responder) but not to take everything, which suggests that they do understand that very high take rates provoke considerable destruction.

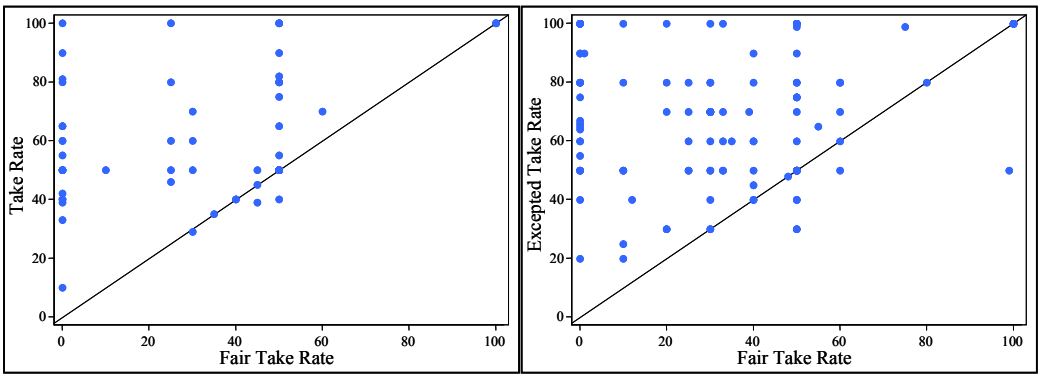

FIGURE 3 – SCATTER PLOTS OF FAIR AND ACTUAL OR EXPECTED TAKE RATES

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.[21]

This does not mean 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. 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). This suggests take authorities might be using their fair take rate as a reference point for the determination of the optimal take rate. Similarly, responders may be using their fair take rate as a reference point for their expected take rate. However, once their expectation is formed, it is a deviation from the expected take rate that triggers the high intensities of anger that motivate responders to destroy.

[21] 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.

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 (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 be reasonable 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 an aversion to inequality, a difference in knowledge concerning the behavior of other responder might indeed lead to a situation where strangers destroy less than friends. Since in these models responders wish to destroy similar amounts, more uncertainty concerning the other

responder's behavior makes the destruction decision more difficult. If advantageous inequality is preferred 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.[22] Hence, under these conditions both friends and strangers would end up destroying similar amounts. In intention-based models of fairness, knowing better what the other responder will do does not affect a responder's behavior. As was mentioned, in these models, responders care about the other's behavior only if they are directly affected by it.

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 the way their friends are treated into their evaluation.

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 in 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

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

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. An interesting subject for future research concerns the interaction between expectations and norms. If norms are based on the actual behavior of the majority of individuals, 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).

Social ties create interdependencies that are ignored in public policy based on standard economic theory, which abstracts from the social environment of production. This may lead to inefficiencies and less social wellbeing. For example, by easing the collective action problem through improved coordination, communities with substantial (positive) social ties may experience a higher quantity and quality of local public goods, like less crime, less pollution, and better care for those in need. From this perspective, current economic policies aiming at greater flexibility of labor markets (particularly, labor supply) are a two-sided sword. The same holds for economic immigration policies that neglect the impact on the social fabric of

communities. By breaking up networks of social ties, the voluntary provision of local public goods can be negatively affected, which may entail an increased and more expensive governmental provision (van Dijk and van Winden, 1997; see also Putnam, 1995). Moreover, it might be the case that a given policy improves a situation only if individuals share social ties. To give an example, the emotional responses of friends indicate a strong desire to coordinate their actions. In this case, facilitating coordination by for instance introducing better communication technology 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 – 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 B – 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.

References

Abbink, K., Irlenbusch, B., Renner, E., 2006. Group size and social ties in microfinance institutions. Economic Inquiry, forthcoming.

Akerlof, G.A., 1997. Social distance and social decisions. Econometrica 65, 1005-1027.

Ben-Shakhar, G., Bornstein, G., Hopfensitz, A., van Winden, F., 2007. Reciprocity and emotions: Arousal, self-reports, and expectations. Journal of Economic Psychology, forthcoming.

Bereby-Meyer, Y., Niederle, M., 2005. Fairness in bargaining. Journal of Economic Behavior & Organization 56, 173-186.

Bernhard, H., Fischbacher, U., Fehr, E., 2006. Parochial altruism in humans. Nature 442, 912-915.

Bolton, G., Ockenfels, A., 2000. A theory of equity, reciprocity, and competition. American Economic Review 90, 166-193.

Borjas, G.J., 1995. Ethnicity, neighborhoods, and human capital externalities. American Economic Review 85, 365-389.

Bosman, R., van Winden, F., 2002. Emotional hazard in a power-to-take game experiment. The Economic Journal 112, 147-169.

Bosman, R., Sutter, M., van Winden, F., 2005. On the impact of real effort and emotions in power-to-take experiments. Journal of Economic Psychology 26, 407-429.

Camerer, C., 2003. Behavioral Game Theory. New Jersey: Princeton University Press.

Charness, G., Levine, D., 2006. The road to hell: An experimental study of intentions. The Economic Journal, forthcoming.

Charness, G., Haruvy, E., Sonsino, D., 2006. Social distance and reciprocity: An Internet experiment. Journal of Economic Behavior & Organization, forthcoming.

Chong, D., 1991. Collective Action and the Civil Rights Movement. Chicago: University of Chicago Press.

Clore, G.L., Robinson, M.D., 2002. Belief and feeling: Evidence for an accessibility model of emotional self-report. Psychological Bulletin 128, 934-960.

van Dijk, F., van Winden, F., 1997. Dynamics of social ties and local public good provision. Journal of Public Economics 64, 323-341.

Dufwenberg, M., Kirchsteiger, G., 2004. A theory of sequential reciprocity. Games and Economic Behavior 47, 268-298.

Ellickson, R., 1994. Order Without Law - How Neighbors Settle Disputes. Cambridge: Harvard University Press.

Elster, J., 1998. Emotions and economic theory. Journal of Economic Literature 36, 47-74.

Falk, A., Fischbacher, U., 2005. A theory of reciprocity. Games and Economic Behavior 54, 293-315.

Falk, A., Fehr, E., Fischbacher, U., 2000. Testing theories of fairness: Intentions matter. Working paper No. 63, University of Zürich.

Falk, A., Fehr, E., Fischbacher, U., 2005. Driving forces behind informal sanctions. Econometrica 73, 2017-2030.

Fehr, E., Gächter, S., 2000. Cooperation and punishment in public goods experiments. American Economic Review 90, 980-994.

Fehr, E., Schmidt, K., 1999. A Theory of fairness, competition and cooperation. The Quarterly Journal of Economics 114, 817-868.

Fehr, E., Schmidt, K., 2000. Theories of fairness and reciprocity: Evidence and economic applications. In Dewatripont, M., Hansen, L., Turnovsky, S.T. (Eds.) Advances in Economics and Econometrics - 8th World Congress, Econometric Society Monographs. Cambridge: Cambridge University Press.

Fehr, E., Fischbacher, U., Kosfeld, M., 2005. Neuroeconomic foundations of trust and social preferences. American Economic Review 95, 346-351.

Fischbacher, U., 2007. z-Tree: Zurich Toolbox for Ready-made Economic Experiments. Experimental Economics, forthcoming.

Frijda, N.H., 1986. The emotions. Cambridge: Cambridge University Press.

Frijda, N.H., 1988. The laws of emotion. American Psychologist 43, 349-358.

Gächter, S., Herrmann, B., 2006. A cross-cultural study of emotions in social dilemmas. In preparation, University of Nottingham.

Glaeser, E.L., Sacerdote, B., Scheinkman, J.A., 1996. Crime and social interactions. The Quarterly Journal of Economics 111, 507-548.

Goette, L., Huffman, D., Meier, S., 2006. The Impact of Group Membership on Cooperation and Norm Enforcement: Evidence using Random Assignment to Real Social Groups. American Economic Review 96, 212-216.

Güth, W., van Damme, E., 1998. Information, strategic behavior and fairness in ultimatum bargaining: An experimental study. Journal of Mathematical Psychology 42, 227-247.

Güth, W., Schmidt, C., Sutter, M., 2005. Bargaining outside the lab: A newspaper experiment of a three person-ultimatum game. Max Planck Institute, Jena.

Güth, W., Schmittberger, R., Schwarze, B., 1982. An experimental analysis of ultimatum bargaining. Journal of Economic Behavior & Organization 3, 367-88.

Haidt, J., 2003. The moral emotions. In Davidson, R.J., Scherer, K.R., Goldsmith H.H. (Eds.) Handbook of Affective Sciences. Oxford: Oxford University Press.

Harbring, C., Irlenbusch, B., 2005. Incentives in Tournaments with Endogenous Prize Selection. Journal of Institutional and Theoretical Economics 161, 636-663.

Jakobs, E., Manstead, A.S.R., Fischer, A.H., 1996. Social context and the experience of emotion. Journal of Nonverbal Behavior 20, 123-142.

Jakobs, E., Manstead, A.S.R., Fischer, A.H., 1999. Social motives, emotional feelings, and smiling. Cognition and Emotion 13, 321-345.

Kagel, J.H., Wolfe, K.W., 2001. Tests of fairness models based on equity considerations in a three-person ultimatum game. Experimental Economics 4, 203-219.

Kahneman, D., Krueger, A.B., 2006. Developments in the Measurement of Subjective Well-Being. Journal of Economic Perspectives 20, 3-24.

Kirchsteiger, G., 1994. The role of envy in ultimatum games. Journal of Economic Behavior & Organization 25, 373-389.

Knez, M., Camerer, C.F., 1995. Outside options and social comparison in a three-player ultimatum game experiments. Games and Economic Behavior 10, 65-94.

Lazarus, R.S., 1991. Emotion and Adaptation. New York: Oxford University Press.

Ortony, A., Clore, G.L., Collins, A., 1988. The cognitive structure of emotions. Cambridge: Cambridge University Press.

Pillutla, M.M., Murnighan, J.K., 1996. Unfairness, anger, and spite: Emotional rejections of ultimatum offers. Organizational Behavior and Human Decision Processes 68, 208-224.

Putnam, R.D., 1995. Bowling alone: America's declining social capital. Journal of Democracy 6, 65-78.

Quervain, D.J.F., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., Fehr, E., 2004. The neural basis of altruistic punishment. Science 305, 1254-1258.

Rabin, M., 1993. Incorporating fairness into game theory and economics. American Economic Review 83, 1281-1302.

Raghunathan, R., Pham, M.T., 1999. All negative moods are not equal: Motivational influences of anxiety and sadness in decision making. Organizational Behavior and Human Decision Processes 79, 56-77.

Reuben, E., 2006. Fairness in the Lab: The effects of norm enforcement in economic decisions. Amsterdam: Thela Thesis.

Reuben, E., van Winden, F., 2006. Social Ties and Coordination on Negative Reciprocity: The Role of Affect. Discussion paper 04-098. Tinbergen Institute.

Riedl, A., Vyrastekova, J., 2003. Responder behavior in three-person ultimatum game experiments. Working paper, University of Amsterdam.

Rosenblat, T.S., Mobius, M.M., 2004. Getting closer or drifting apart? The Quarterly Journal of Economics 119, 971-1009.

Rubinstein, A., 2006. Instinctive and Cognitive Reasoning: A Study of Response Times. Working Paper No. 36.2006, FEEM.

Sanfey, A.G., Rilling, J.K., Aronson, J.A., Nystrom, L.E., Cohen, J.D., 2003. The Neural Basis of Economic Decision-Making in the Ultimatum Game. Science 300, 1755-1758.

Shaver, P., Schwartz, J., Kirson, D., O'Connor, C., 1987. Emotion Knowledge: Further Exploration of a Prototype Approach

Schelling, T.C. (1978). Micromotives and Macrobehavior. New York: Norton.

Singer, T., Seymour, B., O'Doherty, J., Klaas, E.S., Dolan, J.D., Frith, C., 2006. Empathic neural responses are modulated by the perceived fairness of others. Nature 439, 466-469.

van Winden, F., 2001. Emotional hazard exemplified by taxation-induced anger. KYKLOS 54, 491-506.

Yamagishi, T., Kiyonari, T., 2000. The Group as the Container of Generalized Reciprocity. Social Psychology Quarterly 63, 116-32.