NEGATIVE RECIPROCITY AND ITS RELATION TO ANGER-LIKE EMOTIONS IN HOMOGENEOUS AND HETEROGENEOUS GROUPS

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Abtract

Several studies have shown that social identity fosters the provision of public goods and enhances the willingness to reciprocate cooperative behavior of group members dependent on the social environment. Yet, the question of how social identity affects negative reciprocity in identity-homogeneous and -heterogeneous groups has received only little attention. Consequently, we seek to fill this gap by examining whether social identity affects individuals' willingness to sanction deviating group members in a public good context. Moreover, we devote particular attention to the role of anger-like emotions in negative reciprocity. To test our hypotheses we employ one-shot public good games in strategy method with induced social identity. Our results indicate that members of identity homogeneous groups punish much less often and in smaller amounts than of identity heterogeneous groups when they face contributions smaller than their own. We also find that anger-like emotions influence punishment behavior much stronger when individuals are matched with members of different identities than in identity homogenous groups. These findings contribute to the better understanding of the nature of social identity and its impact on reciprocity, improving economists' ability to predict behavior taking emotions also into consideration.

Keywords: social identity; emotions; experiment; public goods; negative reciprocity.

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1   Introduction

Classic economic theory assumes that individuals with selfish preferences maximize their own material utility. On the contrary, experimental research has confirmed that a considerable proportion of subjects reveal social preferences and exhibit a behavioral pattern based on reciprocity. Specifically, reciprocity captures the tendency of individuals to reward cooperative and punish unkind behavior even if this does not yield material benefits in the future (cf. Falk and Fischbacher, 2000). Recently, experiments have provided evidence that such reciprocal preferences are positively influenced by social identity depending on the group composition (see Chen and Li, 2009, Charness et al., 2007, Lankau et al., 2012). Namely, the sense of belonging to a particular group – and the importance ascribed to it – affect an individual's connotations and behavior towards his own group (in-group) as well as towards other groups they do not belong to (out-group). Therefore, in-group members are willing to cooperate more with individuals that share the same identity than with individuals of different identities (see e.g., Solow and Kirkwood, 2002, Wit and Wilke, 1992). This accounts for the intragroup (within-group) sensitivity and intergroup hostility (Chen and Li, 2009, Eaton et al., 2011, Ahmed, 2007). Likewise, field experiments also revealed that individuals in ethnically more homogeneous groups contribute more to local public goods such as education than in less homogeneous communities.[1] What is more, in many real life examples we can additionally observe that groups often make efforts to evoke a person´s particular identity in order to turn this person into an insider. Examples of such behavior include election campaigns, induction into the military, or in the workplace (see Akerlof and Kranton, 2010, Akerlof and Kranton, 2005). All these examples provide evidence that identity is viable for the voluntary contribution of individuals to common resources.

The question of how social identity affects negative reciprocity in identity homogeneous and heterogeneous groups in the provision of public goods has received no particular attention, yet. A limited number of contributions outside the public good context provide rather conflicting insights into how individuals engage in punishment in response to acts perceived as unkind, even if this is costly.[2] Firstly, McLeish and Oxoby (2007) based on two-person bargaining sequential games report that in-group punishment is greater and more frequent than out-group punishment. Likewise, McLeish and Oxoby (2011) applying two-person ultimatum games with strategy vector method argue that subjects with common identity are more prone to negative reciprocity than subjects primed with distinct identity. Secondly, using two-person sequential allocation games Chen and Li (2009) establish that in-group members are more forgiving towards other in-group members´ misbehavior and engage in less negative reciprocity than out-group members. Despite this apparent controversy in two person interactions, to the best of our knowledge, there is still no research that specifically compares negative reciprocity between identity homogeneous and heterogeneous groups when providing a public good. Consequently, the aim of this paper is to examine whether social identity affects how individuals sanction group members if they are confronted by an act that is deemed unkind. To this purpose, we conduct a public good experiment on the basis of one-shot games,

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[1] See Akerlof and Kranton (2010, p. 124) and Eaton et al. (2011) referring to research by Alesina et al. (1999), Miguel and Gugerty (2005) and Mauro (1995).
[2] Some authors suggest that negative reciprocity occurs in case actions are perceived as unfair or anti-social (cf. Fehr and Gächter, 2000b). Therefore, we use the phrase unkind to be as neutral as possible when referring to triggers of punishment behavior.

comprising two identity treatments (ID treatments). Subjects either interact in in-group (i.e. identity homogeneous) or out-group (i.e. identity heterogeneous) matching. A stranger (random) matching protocol serves as a control treatment. We induce social identity in the laboratory using a simple group task to be solved jointly. Since the public good games are carried out in strategy method, we additionally analyze the behavior of individuals classified into different cooperation types based on their initially revealed cooperation preferences. This delivers more refined insights into the effects of social identity on negative reciprocity. Another aim of this paper is to assess the role of emotions in negative reciprocity. The specific emotions may help us to better understand decision-makers' goals and motivations and hence to predict their specific behavior (Zeelenberg and Pieters, 2006). By now, a few studies (cf. Reuben and van Winden, 2008, Bosman and van Winden, 2002, Bosman et al., 2005) address emotions to determine negative reciprocity. However, these did not focus on the social environment in which decisions were made, namely, whether individuals are interacting within identity homogeneous or heterogeneous groups. Our study is, therefore, unique in bringing these aspects together.

The paper proceeds in five parts: Chapter 2 highlights the most important findings in the existing literature, followed by our research hypotheses. The experimental design is presented in Chapter 3, while Chapter 4 presents the main results. Finally, Chapter 5 summarizes the findings and its implications for public policy.

2   Background and Hypotheses

Negative reciprocity is a behavioral pattern, which plays a crucial role in many economic settings. The relevance of the impact of negative reciprocity on conflict resolution (Eisenberger et al., 2004), tax evasion (Falk, 2003), state-society relationship (Etienne, 2012), and labor market (Caliendo et al., 2012, Brandes and Franck, 2012, Pereira et al., 2006) is well-documented. Experimental researchers have also laid focus onto this behavioral pattern and revealed that individuals engage in punishing others in response to acts perceived as unkind even if this is costly and does not yield future benefits. Generally, negative reciprocity constitutes a conditional behavior, which is even present in one-shot interactions (Falk, 2003). In public good experiments negative reciprocity is identified as individuals punishing other group members after observing their voluntary contributions to the public good, which is costly for both the punisher and the punished. Two studies by Fehr and Gächter (2000a, 2002) have focused on long-term interactions and established that the more the participants' contribution is below the average contribution of their group members, the heavier is the punishment they receive.[3]

The question if and to what extent negative reciprocity is different between identity homogeneous and heterogeneous groups in a public good context has not been addressed, yet. This question is highly relevant since individuals who belong to a particular group (based on some common characteristics) derive self-esteem from that group and are influenced in their behavior by stereotypes associated with the group identity (Chen and Li, 2009).[4] Therefore, the subjects´

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[3] They also observed that contributions above the average were punished much less and did not trigger a systematic punishment response. For research on "spiteful punishment" targeted to above-average contributors (see e.g., Falk et al., 2005, Herrmann et al., 2008).

[4] The social identity theory developed by Tajfel and Turner (1979) is specifically devoted to the analysis of the psychological basis for intragroup conflicts and intergroup discrimination.

proclivity to make ´us´ and ´them´ distinctions (Eaton et al., 2011) may determine how 'unkind' they perceive contributions to the public good that are lower than their own.

Outside the public good context research by Reuben and van Winden (2008) provides some evidence on how social identity affects punishment. However, they only make comparisons to stranger groups. Specifically, they implemented two treatments, one with groups composed of friends and another with stranger groups that of unrelated individuals. They investigated this question using three-player power-to-take games, in which a proposer made a claim on the endowments of two responders. As a next step, each responder had a possibility to destroy any part of his own resources, thus reducing the income of the proposer as well. They found that friends with real social ties destroy more and they do it more frequently than strangers, signaling that group identity impacts on how strongly they are affected by others´ behavior and well-being (Reuben and van Winden, 2008). Unfortunately, the authors do not make a comparison to identity heterogeneous groups.

Three studies using two-person games provide insights into the very issue of negative reciprocity in identity homogeneous and heterogeneous matches. Yet, they follow two divergent lines of reasoning about why participants reveal different reciprocity preferences dependent on the social environment. On the one hand, McLeish and Oxoby (2007) conducted two-person bargaining games and induced group identity by letting the groups work together on a series of questions. The pairs were randomly assigned and their group affiliation was common knowledge. After the proposers decided how much of their endowment they want to keep for themselves and how much they are willing to allocate to the responder, the responder had an opportunity to engage in costly punishment reducing the proposer´s income. One punishment point assigned cost the offender a deduction of 1.5 points. They demonstrated that individuals imposed more punishment and more frequently when an in-group member engaged in uncooperative behavior than when an out-group member did so. Additionally, the responder´s behaviour was much more dependent on the invested amount from in-group members than from the out-group members. They interpreted their results applying Akerlof and Kranton´s identity-model (2000), according to which one´s social identity can be threatened by the behavior of one's group members. Consequently, social identity triggers a special type of externality, meaning that the behavior of an in-group member affects other group members´ identity and evokes responses in turn. Thus, the offers, which are considered as unfair by in-group members (as allocating too low amounts to the responder) might be seen as an identity-threat.[5] Individuals will then invest in sanctioning more when faced by an unkind act of an in-group member than by an out-group member. Consequently, more negative reciprocity with in-group matches may be a means of reacting to the identity-threat (McLeish and Oxoby, 2007, 2011). The same tendency with regard to negative reciprocity has been confirmed by McLeish and Oxoby (2011) using ultimatum games. They made the saliency of student-identity with the help of a writing task about positive experiences with fellow students from the university. Negative reciprocity was identified with the demandingness, which is the level of the minimum acceptable offer that does not entail a rejection of the proposer´s offer. Consequently, subjects with shared identity exhibited the highest demands and subjects with distinct identity the lowest ones. They concluded that the proclivity to engage in negative reciprocity increases with shared identity. On the contrary, Chen and Li (2009) reached opposite conclusions. They induced group identity based on preferences of Klee and Kandinsky paintings (for this method see Tajfel et al., 1971). Within two-person dictator and

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[5] See the theoretical works of Akerlof and Kranton (2000) and Bénabou and Tirole (2006) on identity.

response games they found that participants are less likely to punish an in-group member for misbehavior than an out-group member, thus being more forgiving towards a defection by an in-group member. Secondly, they established that in-group members show less envy in case the other group member receives higher payoffs than they do. It can thus be assumed that the well-being of in-group members constitutes a positive weight in an individual's utility function and that of outsiders a negative weight (Eaton et al., 2011). Consequently, the infliction of costly punishment on in-group members is not to be expected. Moreover, groups with high levels of identification tend to maintain group loyalties even after group failures or anticipated failures (cf. Jackson, 2011, p. 345), which supports the findings of Chen and Li (2009). Thus individuals are not prone to punish their in-group matches, which is why less negative reciprocity may occur in in-groups than in out-groups.

Summing up, the existing literature suggests that social identity has an impact on subjects' preferences for negative reciprocity. The findings regarding the direction of its effect are, however, controversial and have only been tested in two-person games. Therefore, the aim of is article it to investigate how social identity affects negative reciprocity in identity homogeneous and heterogeneous groups in the provision of public goods. To investigate this question and gain more detailed insights on negative reciprocity in different social environments, we also devote particular attention to emotions that determine negative reciprocity. Emotion-specificity is important since its motivational implications are proximal causes of behavior (Zeelenberg and Pieters, 2006, Martinez et al. 2011, Elster, 1998). Emotions often increase one's preference for acts that are contrary to economic interest, such as engaging in costly punishment when people believe they have been treated unfairly (Loewenstein, 2000). Indeed, existing experimental research has shown that negative emotions such as anger, contempt, and irritation (also referred to as anger-like emotions, ALEs) fuel negative reciprocity (e.g., Reuben and van Winden, 2008, Ben-Shakhar, 2007, Bosman and van Winden, 2002). Other negative emotions such as sadness and grief are declared as passive in evoking behavioral responses (Elster, 1996).[6] Since we have still no evidence of how ALEs fuel behavior depending on the social environment, it will be of particular interest over the course of this study.

Considering the existing findings and theories, we formulate the following hypotheses.

HYPOTHESIS 1: *Negative reciprocity is dependent on social environment.*

We base this hypothesis on prior research of social psychology and economics on identity and assume that social environment does influence negative reciprocal preferences.

Furthermore, psychological research suggests that subjects reveal emotional reactions dependent on the social context (see Reuben and van Winden, 2008 referring to works of Jakobs et al., 1996 and Jakobs et al., 1999). Consequently, we assume that acts that are deemed unkind trigger different emotional intensities in in- and out-groups as the individual's connotations and behavior towards his group is influenced by social identity. Therefore, the intensity of ALEs felt when confronted by an unkind act can vary based on the matching protocol. Subsequently, the different action tendencies in the different social environments are attributable to the different intensity of emotions felt when facing unkind acts.

HYPOTHESIS 2: *Unkind acts trigger different emotional intensities in in- and out-groups.*

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[6] For thoughts on classification of emotions based on their motivational functions see Zeelenberg and Pieters (2006).

3 Experimental Design

We designed an experiment that builds on and extends the studies of Noussair and Tucker (2005)[7] and Reuben and van Winden (2008) and features three different subject matching treatments: an in-group, an out-group and a control treatment (see Table 1). Each subject participated only in one of the treatments, so that our experiment follows a between subject design.

The experimental design was composed of three stages. In each stage every subject was a member of a group of three. Equally applying to all treatments, Stage A comprised a one-shot public good game (PGG) that was played in strategy method (SM).

Treatment	Stage A	Stage B	Stage C
In-Group	One-Shot PGG (SM)- Random Matching	Induction of Social Identity- Random Matching	One-Shot PGG (SM) with Punishment- In-Group Matching
Out-Group			One-Shot PGG (SM) with Punishment- Out-Group Matching
Control		-	One-Shot PGG (SM) with Punishment- Random Matching

Table 1 – The experimental design (PGG- public good game; SM- strategy method)

Specifically, subjects were randomly assigned to groups and received an initial endowment of 20 points.[8] Each group member (k) had to decide how many points to contribute to the public good, framed as a project (c_i). The remaining points (20 - c_i) were automatically put into the subject´s private account. The payoff function was as follows (Formula 1):

$$E_i = 20 - c_i + 0.4 \times \sum_{k=1}^{3} c_k$$

Formula 1 – Payoff function of stage A

Consequently, each point invested into the project returned 0.4 points and each group member profited equally from contributions to the public good. Therefore, for every individual it is more beneficial to deposit all the endowment on the private account. Overall, the participants were required to make two types of decisions. On the one hand, they had to state their *unconditional contribution* to the project independent of the others´ contributions. On the other hand, they were required to make 21 entries in a contribution table stating how much they *would* contribute to the project if their group members invested on average 0-20 points (*conditional contribution*). They were also required to state their expectations regarding the others´ unconditional contribution. Finally, a random mechanism determined for which two group members their unconditional contributions were payoff-relevant, leaving the third group member with their conditional contribution in effect.[9] Subjects did not receive any information about the outcome of Stage A in order to avoid any income

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[7] We gratefully acknowledge C. Noussair, S. Tucker and U. Fischbacher for providing us with their experimental instructions.
[8] During the course of the experiment we talked about points. The total number of points earned during the experiment was converted in Euros at the end of the experiment. The conversion rate was: 1 point = 15 eurocents.
[9] A die was rolled by one participant in the session determining the respective group member. This served the purpose of making clear to the subjects that both investment decisions were potentially payoff-relevant and to be taken seriously.

effects. Stage A served the main purpose to classify subjects according to their revealed preferences[10] into different cooperation types (see in detail in Section 4.4), unaffected by social identity and/or punishment. This classification allows us to observe to what extent subjects with different preferences adjust their behavior dependent on group composition.

Stage B was in effect only in the in-group and out-group treatments. In order to induce social identity subjects were randomly reassigned to groups of three and they were asked to jointly solve a simple group task within 10 minutes time. An online chat tool allowed anonymous communication among the group members to create positive group experiences (Eckel and Grossman, 2005). By developing this task, we relied on insights of Eckel and Grossman (2005) and Chen and Li (2009) and applied a design pioneered by Ibañez and Schaffland (2012). For this task, the participants of the experiment were assigned to groups of different colors. To avoid any income effects and to prevent negative associations with this task, only the winning group received a congratulating message at the end of the whole experiment.

Advancing to the next stage, treatment groups were either comprised of members from groups of the same color and thus of the same identity as in the previous stage (in-group treatment), or from groups with different colors and identities (out-group treatment). Additionally, we added a control treatment where participants were simply randomly assigned to the groups. In order to make group identity salient, the color of an individuals' group as well as the color of their group members were clearly indicated during the game both in in-group and out-group matching. Stage C contained a one-shot public good game, the same as Stage A, but combined with the institution of peer punishment. After subjects stated their unconditional and conditional contributions and a random mechanism determined the payoff relevant decisions, they received information on how much each of their group members contributed to the project (anonymously). Simultaneously, they were asked to indicate how intensely they feel each of the listed emotions towards *each* of the other two players after knowing the amount that the others invested into the group account.[11] In order to avoid an experimenter demand effect the list included many different emotions both of negative and positive valence based on Hopfensitz and Reuben (2009) and Reuben and van Winden (2008): admiration, anger, contempt, disappointment, envy, gratitude, irritation, happiness, pride, sadness, shame and surprise. After having indicated the intensity of specific emotions on a 7 point Likert-Scale (1=not at all, 7=very strongly), subjects had an opportunity to register their disapproval of each other group member's decision by distributing points (P_{ik}) between 0 and 10 to each group member. Specifically, 10 points for the most disapproval, 0 points for the least disapproval.[12] For each point a subject received (P_{ki}) his/her income from this stage was lowered by 10 percent. If a group member received 10 or more points his/her income from this stage was reduced by 100 percent (see Formula 2). However, allocating points were costly (see Table 2).

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[10] We are aware of the fact that preferences are not directly observable. Subjects´ decisions are assessed first and preferences are then presumed from these observations (cf. Sen, 1973).

[11] Self-reports have been successfully applied in investigating subjects' emotional states. For detailed description see Reuben and van Winden (2008, pp. 37–38).

[12] In the course of the experiment we used the phrase disapproval to be as neutral as possible when talking about punishment.

$$E_i = \left(20 - c_i + 0.4 \sum_{k=1}^{3} c_k \right) \times \frac{max\{0, 10 - \sum_{k \neq i} P_{ki}\}}{10} - \left(\sum_{k \neq i} K(P_{ik}) \right) + lumpsumpayment$$

Formula 2 – Payoff function of stage C

In order to account for increased costs, subjects received a lump-sum payment of 60 points in addition to the basic endowment of 20 points from this stage (see Formula 2).

P_{ik}	0	1	2	3	4	5	6	7	8	9	10
$K(P_{ik})$	0	1	2	4	6	9	12	16	20	25	30

Table 2 – Punishment points (P_{ik}) and cost of punishment (K)

This one-off payment could be used to pay for possible costs during this task. Afterwards, subjects had to state how many punishment points they expected to receive in sum from the other group members. At the end of Stage C subjects were informed about their income from Stage A and C and their final payment converted into Euro including the 2.5 Euro show-up fee.

The experimental instructions were handed out successively. After all subjects have completed the exercise questions regarding the one-shot public good game without punishment at the beginning of the experiment, they received the detailed instructions of stage A. At the beginning of stage C participants had to complete another exercise concerning punishment's income effects. Finally, subjects were asked to fill out a post-experimental questionnaire before receiving payment.[13]

4   Results

The experiment was conducted during June and July of 2012 in the Göttingen Laboratory of Behavioral Economics (GLOBE) of the University of Göttingen applying the Z-tree software (Fischbacher, 2007). The subjects were recruited through the ORSEE database of the University of Göttingen and at the campus' cafeterias. In sum, we observed the decisions of 207 subjects. In particular, 84 subjects participated in the in-group, 75 in the out-group and 48 in the control treatment. 50.2 percent of the subjects were female. The average age of the subjects was 23.4 years. The sessions took approximately 1.5 hours and the subjects on average earned 16.4 Euro including the show-up fee.

The main results of the experiment are represented in four parts. Firstly, the effectiveness of our induction of social identity is demonstrated, followed by the presentation of the effects of social environment on negative reciprocity. Afterwards the intensity of specific emotions and their influence on punishment are discussed. Finally, the punishment behavior of specific cooperation types of subjects is investigated.[14]

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[13] The Instructions are available upon request.
[14] Please note that within this article we do not address the question of how punishment affects the willingness to cooperate in the different treatments. Consequently, we do not analyze unconditional and conditional contributions per se. For research on this subject see Bicskei et al. (2013).

4.1 Induction of Social Identity

Clearly, the induction of social identity is a crucial point in our study. Based on prior literature we assume that social identity is successfully induced when subjects feel more attached to groups that are comprised of members of their own identity than to groups whose members belong to different identities. Accordingly, we compared subjects' self-reported group attachment within in-groups and out-groups.[15] Specifically, in the post-experimental questionnaire subjects were required to indicate how much they felt attached to their group of the same color (in-group treatment) and to their group composed of individuals of different colors (out-group treatment) on a 7 point Likert-Scale (1=not at all, 7=very strongly). In order to capture a possible indifference to the question, subjects could indicate an answer "I don't care".[16] Using the Mann-Whitney two-sample test and excluding the answers of indifference we find that group attachment to in-groups is significantly higher than to out-groups (p=0.0002).[17] The average level of group attachment was 4.1 in in-groups and 2.9 in out-groups.

RESULT 1:   *The identity induction was successful. Subjects felt significantly more attached to their in-group than to the group made up of different identities.*

4.2 Dependency of Negative Reciprocity on Social Environment

Initially, we compare the level of punishment points assigned between the treatments in case group members contributed less than the subject. Subjects assigned on average 1.5 points in in-groups and 2.3 points both in the out-group and control treatments. Overall, in-groups' punishment level is significantly lower as compared to the out-group (p=0.0260) as well as to the control treatment (p=0.0072). However, we cannot reject the hypothesis that subjects in the out-group and control conditions impose different levels of punishment. With regard to the frequency of sanctioning other group members when they contributed at least one point less than the subject, we find that within in-groups punishment occurred in only half (50.7 percent) of the cases. In contrast, out-group members punished significantly more frequently, namely in 67.7 percent of the cases.[18] Likewise, in the control treatment – where no social identity was induced – punishment occurred at a significantly higher rate (80 percent) as compared to the in-group treatment.[19] Furthermore, we notice that punishment is also present in situations when the group members contributed the same amount or even more to the public good than the subject did. The presence of the so called spiteful punishment is not entirely surprising and has been documented by many authors.[20] However, neither

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[15] The same method was used in Yamagishi and Kiyonari (2000).

[16] We are aware of the fact that the answers to these questions may be biased by subjects having learned their income at the end of the experiment (prior to the questionnaire). Yet, profits realized in both matching protocols in stage C are statistically not different (Mann-Whitney two-sample test, p=0.1124). Moreover, the variables group attachment and earnings are not even correlated (corr. coeff. = 0.0958, sign.=0.1669). We thus assume that the results on self-reported group attachment are to be attributed to the group identity task in stage B.

[17] Throughout the paper, unless it is noted otherwise we always use a Mann-Whitney two-sample test.

[18] Pearson Chi-square test, chi2(1)= 4.0733, $p_{\text{in vs out}}$ = 0.044.

[19] Pearson Chi-square test, chi2(1)= 9.4239, $p_{\text{in vs cont}}$ = 0.002; chi2(1)=1.8345, $p_{\text{out vs cont}}$=0.176.

[20] See footnote 4.

the frequency nor the strength of such punishment was significantly different between the treatments.[21]

The comparison of the relative punishment costs subjects were willing to incur serves as another measure of the differences in punishment behavior. These are expressed by the average share of punishment cost over profit earned in stage C before punishment decisions were taken. Considering these, we find that in-group members dedicated the smallest share of their profit to punishment when their group members contributed inferior amounts than the subjects themselves. They were willing to devote only 14.1 percent of their income to signal their disapproval, while out-group and control members spent significantly more, specifically, 26.4 percent and 21.1 percent ($p_{in \ vs \ out}$=0.0219, $p_{in \ vs \ cont}$=0.0034 and $p_{out \ vs \ cont}$=0.5128) of their income on punishment.[22]

RESULT 2a: *On average in-group members punish each other less and less frequently than out-group and control members.*

RESULT 2b: *On average in-group members are willing to invest smaller shares of their profit in punishment than out-group and control members.*

Result 2a and 2b confirm the findings of Chen and Li (2009) highlighting that subjects matched with in-group members engage in less negative reciprocity than when interacting with out-group members. Consequently, these results contradict the findings of McLeish and Oxoby (2007, 2011) according to which punishment is greater within in-groups due to the perceived identity-threat caused by deviant behavior. Likewise, they oppose Reuben and van Winden (2008) who identified that there is an elevated propensity of in-group members to punish each other as compared to strangers in three-player power-to-take games.

For support of Result 2a we test first of all, whether there is a higher probability to engage in negative reciprocity in groups comprising individuals of different identities or unrelated individuals as compared to in-groups. Here, the dependent variable is coded as 1 when a subject engaged in negative reciprocity; otherwise it takes the value of 0 (Model A). Secondly, we investigate whether there is a higher probability of revealing higher negative reciprocity within out-groups as compared to in-groups. In this case the dependent variable equals 1 if the amount of punishment points the subject distributed is higher than the average punishment level (of the whole sample), and 0 otherwise (Model B). The results of these logistic estimations are summarized in Table 3. In both models, we included explanatory variables for treatments, different emotions, department and gender.

Our results support the previous finding that negative reciprocity is dependent on the social environment. In particular, within out-groups and stranger groups there is a significantly higher probability of being punished for behavior perceived as unkind than is the case within in-groups. For instance, the odds of punishing out-group members over the odds of punishing in-group members are 2.6. Moreover, there is a significantly higher probability for receiving punishment in randomly assigned groups than in identity homogeneous groups. Additionally, we are able to show that there is

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[21] Please note that spiteful punishment distributed towards subjects contributing more than the punisher is not to be rationalized as "true" negative reciprocity. In case a subject contributes the same or higher amount to the public good than the punisher, it generates at least the same or even more income for the punisher. Therefore, this act is not to be perceived as "unkind". Consequently, only punishment, which is not of spiteful interest, is considered in the analysis.
[22] Again, for spiteful punishment we did not find any significant treatment effect.

a significantly higher likelihood of engaging in higher negative reciprocity in identity heterogeneous groups than in identity homogeneous groups. Similarly, the probability for higher negative reciprocity is much higher in the control treatment than in groups where group members share the same group identity. Summing up, we conclude that Hypothesis 1 cannot be rejected. Based on our data, we show that social environment decisively influences negative reciprocity. Lastly, our models point towards a significant influence of ALEs on negative reciprocity. An in-depth analysis of the ALEs´ role on punishment will be provided in the next section.

Logistic Regressions

Variable	Model A - Negative Reciprocity			Model B - Higher Negative Reciprocity		
	Odds Ratio	Robust Std. Error	p-value	Odds Ratio	Robust Std. Error	p-value
Out-group	2.644**	1.1662	0.028	2.521**	1.0712	0.030
Control	4.132***	2.2517	0.009	2.902**	1.4054	0.028
Anger-like emotions	1.497***	0.1849	0.001	1.529***	0.1648	0.000
Constant	0.279**	0.1337	0.008	0.160***	0.0754	0.000
Number of Obs.	177			177		
Log pseudolikelihood	-101.76933			-107.10792		
Wald chi2(3)	16.83			18.59		
Pseudo R2	0.1255			0.1265		
Prob > Chi2	0.0008			0.0003		

Note: Variables: Out-group, Control are indicator variables, when In-group = 1.
Anger-like emotions are calculated as a mean of emotions of anger, irritation and contempt
Clustered standard errors over Individuals. Stat. Sign.:*p<0.1, **p<0.05, ***p<0.01

Table 3 – Logistic regression estimates[23] on the probability of engaging in negative reciprocity (Model A) and of engaging in higher negative reciprocity (Model B)

4.3 The Role of Anger-Like Emotions in Negative Reciprocity

In order to explain the differences in punishment behavior, in this section we address the question of whether the intensity of specific emotions differs between in-group and out-group members when facing unkind acts.[24] We especially focus on anger-like emotions (anger, contempt and irritation) since they have a particularly high tendency to motivate punishment (see Elster, 1998, Zeelenberg et al., 2008, Hopfensitz and Reuben, 2009). In contrast, negative emotions such as disappointment and sadness are assumed as rather passive in the sense that they impact mainly on subjects' general negative mood (cf. Zeelenberg et al., 2008, Zeelenberg et al., 1998). Since anger, contempt and irritation are highly correlated emotions (see Appendix A), in subsequent analyses we combine these emotions into one variable by using their aggregate mean.

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[23] We are aware of the fact that the standard errors of logit regressions could be biased (see Ai 2003). In our case the sign of the treatment variables is of crucial importance and must be interpreted according to the research hypothesis.

[24] Generally, we identify a relationship between negative emotions and punishment: pooling all subjects of all treatments, punishers report significantly higher intensities of negative emotions, while non-punishers report higher positive emotions. The emotion of surprise can be of dual valence. Evidently, as can be seen in Appendix B it seems to be irrelevant for punishment.

Comparing the level of ALEs across the treatments, we find that the intensity of ALEs does not vary based on the matching protocol in case of negative deviation from a subject's own contribution ($p_{in\ vs\ out}$=0.124, $p_{in\ vs\ cont}$=0.5635 and $p_{out\ vs\ cont}$=0.1706). Consequently, our observation of differing punishment behavior depending on the social environment (see previous section) cannot be directly attributable to subjects' ALEs. Thus, we conjecture that group composition affects how a particular emotional intensity shapes behavior.[25]

In order to examine our conjecture, we subsequently investigate to what extent punishment is dependent on negative emotions. To this purpose, we classify subjects according to whether they indicated anger-like emotions. In particular, subjects who revealed ALEs higher than or equal to 2 are classified as "angry" subjects, while the remaining ones are defined as "non-angry" subjects.[26] This classification allows us to capture the basic impact of ALEs on punishment.
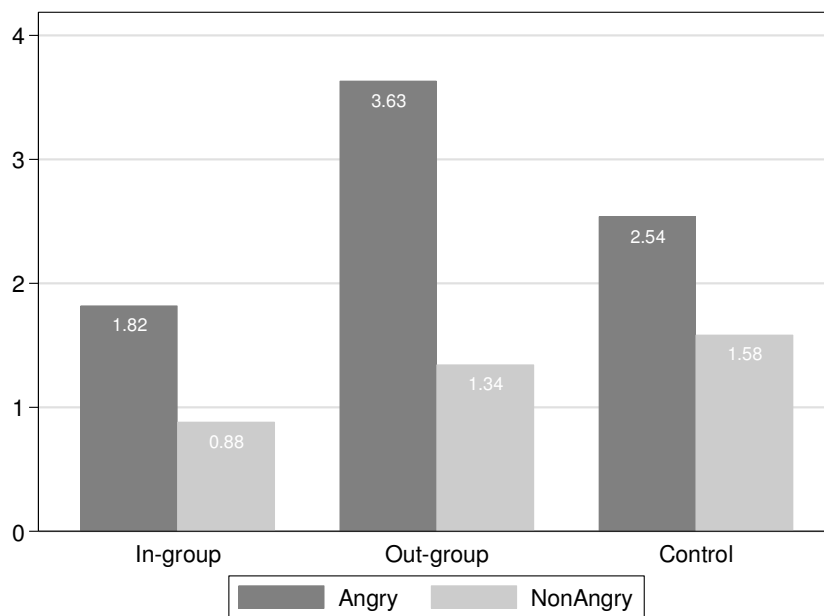

Figure 1 – Punishment dependent on anger-like emotions

As can be seen in Figure 1, across all treatments average levels of punishment points imposed by angry subjects are always higher than those of non-angry subjects. However, in contrast to the ID treatments in which these differences are highly significant (p_{in}=0.015; p_{out}=0.0002), we do not find a marked difference between angry and non-angry punishment in the control matching (p=0.1124). Moreover, the effect of ALEs tends to be strongest in out-group matching. While in-group subjects distributed approximately one punishment point more when they were angry, in out-group matching, this difference averaged 2.3 points. In addition, angry punishment within in-groups is significantly lower relative to angry punishment within out-groups and control groups (p=0.0013, p=0.0292, respectively), yet non-angry punishment does not differ significantly between the ID treatments (p=0.1809). In sum, these results signalize that subjects are much more influenced by their emotional states when interacting in identity heterogeneous than in identity homogeneous groups.

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[25] We tested whether the difference between a subject's own contribution and the contribution of the other group members triggers different levels of ALEs, but did not find statistically significant interaction terms. See Appendix C.

[26] Please recall that the intensity of specific emotions was indicated on a 7-point Likert-Scale (1 = not at all, 7 = very strongly). Thus, level 2 on this scale means the presence of ALEs.

Regarding the occurrence of punishment (see Figure 2) we find that in all treatment conditions punishment is more frequent by angry than by non-angry subjects. In in-groups angry subjects imposed sanctions in 60 percent of the cases, while non-angry subjects distributed punishment points only in every fourth case. Compared to that, in identity heterogeneous groups there is a much higher proportion of angry subjects who distributed disapproval points for contributing less than they did, namely 90 percent.[27] Non-angry punishment among out-group members occurred half as many times as angry punishment. In the control treatment the difference in the frequency of assignment of disapproval points among angry and non-angry subjects is less prominent than in case of the ID treatments. Nevertheless, control punishment among angry subjects is also more frequent than in-group angry punishment.[28]
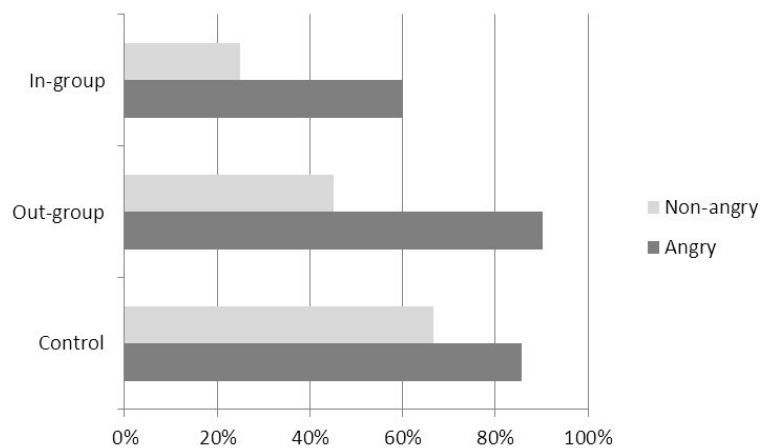

Figure 2 –The frequency of punishment among angry and non-angry subjects

These findings provide twofold insights about emotions and group composition. On the one hand, the high frequency of punishment among angry subjects and the relative high level of punishment points given in identity heterogeneous groups compared to identity homogeneous ones provide a hint that ALEs play a much more prominent role in motivating punishment behavior of out-group members than of in-group members. Put differently, we could conclude that in spite of the presence of ALEs, in-group members hesitate to punish other group members compared to subjects who interact in identity heterogeneous groups. This indicates that group identity impacts on how subjects control their emotions. On the other hand, the effect of ALEs on punishment seems to be strongly present only when identity affiliation is salient.

In order to provide further support to what extent these conjectures are valid, we evaluate the influence of ALEs on punishment in the different matchings employing multivariate linear regressions (see Table 4).[29] Beside ALEs, model C1 also includes the emotions of envy and shame as explanatory variables.[30] We used control variables for gender and department (only in Model C1) and included interaction terms in order to detect differences in the impact of ALEs on punishment across treatments. Model C2 includes only the interactions terms.

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[27] Pearson chi2(1)=8.8407, $p_{in \, vs \, out}$ = 0.003 (angry punishment).
[28] Pearson chi2(1)=5.7029, $p_{in \, vs \, cont}$ = 0.017 (angry punishment).
[29] Poisson estimation yields similar results, see Appendix E.
[30] Emotions of disappointment and sadness are omitted from the model due to their very high correlation with ALEs (see Appendix D).

Linear Regressions (OLS)

Variable	Model C 1			Model C 2		
	Coefficient	Std.Error	p-value	Coefficient	Std.Error	p-value
Dependent Variable: Punishment Points						
ALEs*Ingroup	0.3734***	0.1310	0.005	0.435***	0.0803	0.000
ALEs*Outgroup	0.686***	0.1467	0.000	0.718***	0.1226	0.000
ALEs*Control	0.485***	0.1519	0.002	0.553***	0.1041	0.000
Envy	-0.021	0.1548	0.892			
Shame	0.159	0.1987	0.425			
Economics	0.068	0.3477	0.846			
Male	-0.127	0.3620	0.727			
ALEs*Ingroup - ALEs*Outgroup=0	$F_{(1, 118)}=4.57$; Prob > F = 0.0345			$F_{(1, 118)}=3.72$; Prob > F = 0.0562		
ALEs*Outgroup - ALEs*Control=0	$F_{(1, 118)}=1.43$; Prob > F = 0.2339			$F_{(1, 118)}=1.05$; Prob > F = 0.3082		
ALEs*Ingroup - ALEs*Control=0	$F_{(1, 118)}=0.62$; Prob > F = 0.4334			$F_{(1, 118)}=0.81$; Prob > F = 0.3709		
Number of obs	177			177		
$F_{(7, 118)}$	15.48			30.62		
Prob > F	0.000			0.000		
R-squared	0.5164			0.5114		
R-squared adj.	0.4965			0.5030		
Root MSE	2.12			2.11		

Note: Clustered standard errors over Individuals.

Stat. Sign.:*$p<0.1$, **$p<0.05$, ***$p<0.01$; Male = 1 if male, 0 if female;

Economics = 1 if field of economics, 0 otherwise;

Table 4 – The impact of anger-like emotions on negative reciprocity

First of all, our results show that ALEs significantly impact punishment behavior independent of whether subjects interact within in-group, out-group or randomly matched individuals. In line with our conjecture, the post-estimation Wald-tests of Models C1 and C2 support that the effect of ALEs on punishment is greater in out-groups relative to in-groups. An equivalent increase of ALEs by one unit yields a higher increase in punishment in out-groups than in in-groups. Therefore, we conclude that ALEs indeed affect negative reciprocity more in identity heterogeneous than in identity homogeneous groups. However, contrary to the initial conjecture, the effect of ALEs on punishment in the control treatment does not differ significantly from the ID treatments.

The results of this section can be summarized as follows:

RESULT 3a: *Based on the social environment there is no significant difference in the intensity of anger-like emotions when facing unkind acts.*

Consequently, we can reject our Hypothesis 2 that acts that are deemed unkind trigger different emotional intensities based on the social environment. Our data rather suggest that ALEs' impact on negative reciprocity varies based on the social environment. ALEs result in different action tendencies dependent on the group composition.

RESULT 3b: *Anger-like emotions drive members of identity heterogeneous groups much more strongly to engage in negative reciprocity than members of identity homogeneous groups.*

RESULT 3c: *In identity homogeneous groups angry subjects distribute less punishment points and punish less frequently than angry subjects of identity heterogeneous groups.*

4.4 Cooperation Types and Punishment Behavior

Having seen how anger-like emotions affect negative reciprocity in different group compositions, we now examine to what extent differences in punishment behavior are driven by certain cooperation types. These were identified based on their initially revealed preferences in Stage A without any influence of social identity and/or peer punishment. Specifically, we distinguish four cooperation types based on subjects' entries in the conditional contribution table. "Perfect conditional cooperators" (PCC) are individuals who exhibit a significant Spearman rank correlation coefficient higher than 0.8 (p<0.1) between own conditional contributions and others' average contributions (0-20) and do not contribute to the public good in case the others´ average contribution is zero. This restriction allows eliminating a possible altruistic motivation for cooperation. Accordingly, these subjects are almost perfectly willing to reciprocate their group members' behavior. In order to be classified as "weak conditional cooperators" (WCC) conditional contributions and others' average contributions need to be only positively correlated (p<0.1) allowing for greater deviations in contributions. Thus, individuals of this group are willing to reciprocate the behavior of group members only to a limited extent. Subjects are classified as self-interested "free-riders" (FR) in case they invest all their endowment (both conditionally and unconditionally) in their private account, thus contributing nothing to the public good. Remaining subjects were classified as "others" (OT).

As can be seen in Table 5, the level of punishment points distributed by perfect conditional cooperators is 1.8 points on average in all matching protocols. Moreover, the frequency with which PCCs distributed punishment points is similar, as well.[31] Consequently, we assume that the punishment behavior of subjects with high levels of revealed reciprocal preferences was not influenced by the ID matching protocol, and PCCs do not drive differences in punishment behavior.

Treatment Type	Cooperation Type			
	PCC	WCC	FR	OT
In-group				
Punishment	1.8	2.0	0.0	0.5
Frequency	58%	55%	0%	33%
Out-group				
Punishment	1.8	2.5	3.6	2.6
Frequency	67%	67%	80%	57%
Control				
Punishment	1.8	3.2	0.0	3.0
Frequency	69%	100%	0%	100%

Table 5 – Average punishment points assigned by cooperation types and the frequency of punishment

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[31] Pearson chi-square test, chi2(1)=0.6356, $p_{in\,vs\,out}$ =0.425; chi2(1)=0.9172, $p_{in\,vs\,cont}$=0.338; chi2(1)=0.0438, $p_{out\,vs\,cont}$ =0.834.

Weak conditional cooperators behaved slightly differently dependent on the matching protocol. They punished group members with lower contributions more in out- and control groups than in in-groups. However, these differences cannot be verified as statistically significant ($p_{in\ vs\ out}$=0.5023, $p_{in\ vs\ cont}$=0.2174). Regarding the frequency of punishment, we only find differences between in-group and control treatments.[32] As a result, we conclude, that WCCs are not responsible for possible differences in punishment behavior between in- and out-groups, either.

As Table 5 illustrates, free-riders exhibit considerable differences in punishment depending on the matching protocol. Before interpreting the data, please note that free-riders identified in Stage A[33] contributed positive amounts to the public good under punishment (in stage C). Especially, while they were willing to invest in the project on average 3.5 points in the in-group and 2.25 in the control treatment, in out-groups they increased their contributions to the public good up to 9.1 points ($p_{in\ vs\ out}$=0.0153).[34] On the one hand, this provides a hint that the fear of being punished for misbehavior is greater in out-groups than in in-groups (cf. Bicskei et al., 2013). On the other hand, it clarifies why the frequency of punishment by free-riders in in- and random groups is zero. In the analysis we pay attention only to non-spiteful punishment, thus inflicting sanctions for lower contributions. Since free-riders of the mentioned groups contributed very low amounts, their group members' cooperation was higher. Thus, in control treatment not a single free-rider allocated punishment points. In in-groups there was only one free-rider fulfilling this, however, he did not assign any punishment points to the other group members for contributing less than he did. In out-groups 8 of 10 free-riders distributed punishment points (4.5 points on average).[35] Due to the low number of punishing in-group free-riders, the difference in punishment between in- and out-groups is not significant (p=0.1965). Nevertheless, we conjecture that the difference in punishment level of in-groups and out-groups might be partly driven by the behavior of free-riders.

Subjects, classified as "others", disclose different punishment attitudes based on social environment, as well ($p_{in\ vs\ out}$=0.0804, $p_{in\ vs\ cont}$=0.0002, $p_{out\ vs\ cont}$=0.4799). The frequency of punishment among these subjects varies also depending on the matching protocol.[36] Therefore, this class also accounts to some extent for detected differences in punishment attitudes between identity homogeneous and heterogeneous groups or groups of unrelated individuals.

RESULT 4:   *Differences in negative reciprocity between identity homogeneous and heterogeneous groups or groups of unrelated individuals cannot be solely explained by cooperation types.*

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[32] Pearson chi-square test, chi2(1)=0.3540, $p_{in\ vs\ out}$=0.552; chi2(1)=3.8636, $p_{in\ vs\ cont}$=0.049; chi2(1)=2.5714, $p_{out\ vs\ cont}$=0.109.

[33] In stage A an identical number of free-riders was found both in in-groups and out-groups (18 subjects).

[34] Furthermore, free-riders in out-group expected higher average group contribution (10.1 points) than free-riders in in-group (5.7 points). The hypothesis, however, that these amounts are equal cannot be rejected (p =0.2224).

[35] The fact that under punishment free-riders adjust their behavior and contribute to the public good, seems to be rational since they want to avoid monetary losses. The fact, however, that they engage in punishment in spite of the costs involved in one-shot interactions, is quite surprising.

[36] Pearson chi2(1)=1.1905, $p_{invsout}$=0.275; chi2(1)=9.9048, $p_{in\ vs\ cont}$=0.002; chi2(1)=4.2857, $p_{out\ vs\ cont}$= 0.038.

5   Summary and Conclusion

"The endogeneity of preferences implies that not only individual preferences […] determine economic outcomes, but also that the economic, social, legal, and cultural structure of society affects preferences" (Palacios-Huerta and Santos, 2004, p. 601). Within this article our aim is to show how the social environment in which interactions take place affects negative reciprocity. In particular, our interest is, first of all, to contribute to the understanding of how social identity shapes punishment behavior in identity homogeneous and heterogeneous groups when providing public goods. Secondly, we pay particular attention to the role of anger-like emotions as they account for negative reciprocity depending on the social environment. We conducted one-shot public good games with in-group, out-group and random matching protocols to investigate these questions.

At the start we demonstrate that in-group subjects clearly engage in the lowest degree of negative reciprocity. In particular, we find that contributions perceived as unkind are punished less frequently and with lower intensity among subjects who share the same identity than in out- and stranger groups. Interestingly, in contrast to our expectations, deviant behavior does not evoke different intensities of anger-like emotions (anger, contempt, irritation) depending on the matching protocols. Thus, we argue that these emotions could not be responsible for the differences in punishment behavior. Building on these findings, we investigated the dependency of negative reciprocity on ALEs across treatments. Generally, we demonstrate that negative emotions have a decisive impact on punishment. In case group identities are salient, however, marked differences emerge between the ID matching protocols. Specifically, we posit that anger-like emotions fuel negative reciprocity in in-groups much less than in out-groups signaling that identity homogeneous matching situations can mitigate the effect of emotions on punishment. Thus, group-identity impacts on how subjects control their emotions to the benefit of their group. Summing up, our results suggest that subjects in identity heterogeneous groups will engage in negative reciprocity with higher probability when they are confronted with an act they perceive as unkind than in identity homogeneous groups. In addition, anger-like emotions exhibit a particularly higher propensity to invoke negative reactions in such situations.

Accordingly, our findings deliver an additional explanation of why the level of social welfare achieved in identity heterogeneous groups tends to be lower than in homogeneous groups.[37] On the one hand, previous research revealed that members of homogeneous groups reciprocate cooperation of their in-group members by much higher own cooperation than members of heterogeneous groups among each other (Chen and Li, 2009, Lankau et al., 2012), which increases social welfare. Our results show clearly, on the other hand, that social identity creates an environment in which negative reciprocal preferences are differently affected depending on group composition, as well. Heterogeneous groups tend to react more negatively to defections than homogeneous groups. This bears the consequence of decreasing social welfare as engaging in negative reciprocity is costly for both the punished and punishers. Moreover, if we assume that a determining part of human behavior is mostly of reciprocal nature (cf. Falk and Fischbacher, 2000, Falk, 2003), our results provide an additional explanation of why real life instances of negative reciprocity such as crime and exploitation of common goods are rather widespread in fragmented and polarized (heterogeneous) societies (Eaton et al., 2011).

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[37] For experimental evidence see Lankau et al. (2012). The empirical non-experimental evidence is nicely overviewed by Eaton et al. (2011).

Thus, understanding the nature of social identity and its impact on reciprocity is of crucial importance in improving economists' ability to predict behavior in order to draw policy recommendations. In particular, our study delivers insights about the impact of group composition when public policy addresses one's social identity. This is of high relevance since next to positive reciprocity subjects' preferences for negative reciprocity are affected, as well. We demonstrate that this may equally result in losses of social welfare depending on the group composition.

6   Appendix

A.   *Correlation matrix of anger-like emotions*

	Anger	Contempt	Irritation
Anger	1.0000		
Contempt	0.8419***	1.0000	
Irritation	0.7814***	0.7730***	1.0000

Significance (Sign.).: ***p<0.01

B.   *Emotions of Punishers (P) and Non-Punishers (NP) (all subjects)*

	Admiration(1)	Anger(2)	Contempt(3)	Disappointment(4)	Envy(5)	Gratitude(6)
In-group	-	NP<P***	NP<P***	NP<P***	NP<P*	P<NP*
Out-group	P<NP***	NP<P***	NP<P***	NP<P***	NP<P*	P<NP***
Control	p<NP***	NP<P***	NP<P***	NP<P***	-	P<NP***
Total	P<NP***	NP<P***	NP<P***	NP<P***	NP<P***	P<NP***

	Irritation(7)	Joy(8)	Pride(9)	Sadness(10)	Shame(11)	Surprise(12)
In-group	NP<P***	P<NP***	-	NP<P*	-	-
Out-group	NP<P***	P<NP***	P<NP**	NP<P***	-	-
Control	NP<P***	P<NP***	P<NP*	NP<P***	NP<P*	-
Total	NP<P***	P<NP***	P<NP***	NP<P***	NP<P*	-

Sign.: *p<0.1, **p<0.05, ***p<0.01

C. Comparison of the effect of contribution difference on anger-like emotions between the treatments

Linear Regression

Variable	Coefficient	Std.Error	p-value
Dependent Variable: ALEs			
Negative Devition from own contribution	0.2026***	0.0411	0.000
Positive Devition from own contribution	-0.0259	0.0183	0.158
Field of economics	0.2456	0.1844	0.184
Male	0.0222	0.1889	0.907
Outgroup	-0.1249	0.2101	0.553
Control	-0.0245	0.2510	0.922
Outgroup*Neg.Dev.	-0.0272	0.0604	0.653
Control*Neg.Dev.	0.0072	0.0638	0.911
Constant	1.7354***	0.2172	0.000
F(8, 206)	10.22		
Number of Obs.	414		
Prob > F	0.000		
R-squared	0.281		
Root MSE	1.4793		

Note: Clustered standard errors over Individuals.

Stat. Sign.:*$p<0.1$, **$p<0.05$, ***$p<0.01$; Male = 1 if male, 0 if female;

Economics = 1 if field of economics, 0 otherwise;

Outgroup, Control are indicator variables, when In-group = 1.

D. Correlation of the determinants of punishment

	ALEs	Disappointment	Sadness	Envy	Shame
ALEs	1.0000				
Disappointment	0.7827***	1.0000			
Sadness	0.5822***	0.4913***	1.0000		
Envy	0.3400***	0.2166***	0.3953***	1.0000	
Shame	0.2870***	0.2468***	0.5054***	0.3844***	1.0000

Sign.:***$p<0.01$

E. The impact of anger-like emotions on negative reciprocity

Poisson Regression

Variable	Coefficient	Std.Error	p-value
	Model C 1		
Dependent Variable: Punishment Points			
ALEs*Ingroup	0.1570***	0.0602	0.009
ALEs*Outgroup	0.2575***	0.0426	0.000
ALEs*Control	0.2052***	0.0562	0.000
Envy	-0.0404	0.0692	0.560
Shame	0.0496	0.0812	0.541
Economics	-0.0296	0.1765	0.867
Male	-0.1875	0.1893	0.322
ALEs*Ingroup - ALEs*Outgroup=0	chi2(1)= 3.58 Prob > chi2=0.0585*		
ALEs*Outgroup - ALEs*Control=0	chi2(1)= 1.0 Prob > chi2=0.3163		
ALEs*Ingroup - ALEs*Control=0	chi2(1)= 0.85 Prob > chi2=0.3559		
Number of obs	177		
Wald chi2(7)	107.02		
Prob > F	0.000		
Log pseudolikelihood	-353.04806		

Note: Clustered standard errors over Individuals.

Stat. Sign.:*p<0.1, **p<0.05, ***p<0.01; Male = 1 if male, 0 if female;

Economics = 1 if field of economics, 0 otherwise;

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