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Abstract

The question to what extent social environment affects how individuals govern their groups, has received no special academic attention, yet. Within the framework of a ten-period public goods experiment we analyse how social identity affects subjects' choice of punishment: They may either sanction group members by monetary and/or by non-monetary sanctions bearing different consequences on welfare. What is more, we are also the first to address how emotions influence the effectiveness of punishment in terms of maintaining contributions. Our results show that under the threat of both punishments identity-heterogeneous (out-) groups tend to contribute more to the public good than identity-homogenous (in-) groups. Nevertheless, subjects of out-groups are more likely to govern their group via monetary, in-group members rather via non-monetary punishment. What is more, we demonstrate that emotions of guilt and anger differently affect subsequent contributions dependent on the social environment.

Keywords: public goods; social identity; monetary and non-monetary peer-punishment; emotions.

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1 Introduction

In the private provision of public goods the long-term maintenance of cooperation is a real challenge. Experimental research has shown that contributions to common goods decrease over time (see e.g. Keser and van Winden 2000, Fischbacher and Gächter 2010, Lankau et al. 2013). Nevertheless, the possibility of peer-punishment imposed by group members without a central authority has been investigated as an effective institution providing incentive for compliance and enforcing long-term cooperation in social dilemma games. In a public good context, after observing the individuals' voluntary contributions, every subject has the possibility to punish other group members. In terms of the costs incurred by punishment two instruments are distinguished: Monetary punishment (MP) and non-monetary punishment (NMP). Firstly, assigning MP points to individuals reduces the earnings of the offender. Consequently, by lowering yields of self-interested behaviour it creates a monetary threat forcing subjects to increase their contributions (Noussair and Tucker 2005). Yet, MP also functions as a communication tool by signalling disapproval of an individuals' behaviour. This implies social pressure[1] or social disapproval (the more points assigned, the greater the disapproval), which may equally raise contributions. Overall, MP has been considered as successful in overcoming the problem of shirking (see Ostrom et al. 1992; Fehr and Gächter 2000, 2002; Fehr and Fischbacher 2004). Nevertheless, its influence on social welfare is less clear-cut since MP points are costly not only for the offender but also for the punisher. Secondly, the assignment of points to group members without monetary consequences (NMP) also constitutes social pressure. NMP is also considered to be effective in boosting cooperation compared to situations without punishment (see experimental research of Masclet et al. 2003; Gächter and Fehr 1999, and former works e.g. of Barron and Gjerde 1997; Kandel and Lazear 1992). Nevertheless, especially in long-term interactions it appears to be hardly as effective as MP (cf. Noussair and Tucker 2005; Dugar 2013). Yet, due to the costliness of MP, the level of social welfare under threat of MP and NMP is comparable (see Noussair and Tucker 2005).

Summing up, MP and NMP create different strengths of threat for subjects and their application has diverging consequences for social welfare. Correspondingly, an analysis of an institutional environment including both sanctioning mechanisms (BP institution) helps to disentangle whether subjects choose to exert social pressure per se or rather additional monetary pressure. Clearly, in some cases NMP alone could be sufficient to influence subjects´ contribution behaviour, which should affect especially those who are sensitive to social pressure. In these instances signalling disapproval by MP could even be too severe and counterproductive. However, in other cases disciplining subjects could require stronger social pressure that also implicates monetary consequences. To our best knowledge, there exists only one single study that combines MP and NMP in a public good context (see Noussair and Tucker 2005). Yet, it provides insights only for groups whose members are randomly selected and thus neglects the social environment in which subjects interact. However, extensive research has shown that group composition in terms of social identity does influence subjects´ behaviour and impacts decisively on social welfare (e.g. Chen and Li 2009; Lankau et al. 2012). Therefore, the aim of this article is to gain evidence on which forms and strengths of governance groups tend to use dependent on the social environment. In particular,

[1] The impact of social pressure on behavior has been incorporated in several economic models. See Akerlof (1980) and Lindbeck et al. (1999).

within the framework of a ten-period public goods game we analyse how subjects in identity-homogenous and identity-heterogeneous groups apply monetary and non-monetary sanctions and how this influences cooperation and social welfare. To this purpose, we induce group identity in the lab with the help of an identity group task based on Ibañez and Schaffland (2012),[2] and apply three different matching protocols. Subjects either interact with common identities (in-group matching) or with individuals of different identities (out-group matching). Our control groups are randomly assigned without any identification (partner matching). Another novelty of our paper – besides the recognition of the specificity of social environment under BP institution – lies in the fact that we are the first to address the punished subject's emotions of anger and guilt and their influence on subsequent contributions. Generally, emotions have been proven to motivate behaviour (Hopfensitz and Reuben 2009). Consequently, our research sheds light on how these influence decision making in different social contexts and to what extent they determine long-term cooperation.

The article proceeds with deriving hypotheses based on previous literature (Section 2). Section 3 presents the experimental design. We discuss the main results of the experiment in Section 4. Its first section investigates the effectiveness of the identity group task, followed by the demonstration of the influence of social identity on contribution behaviour and social welfare. Afterwards, we analyze the form of governance via MP and NMP. The final section discusses the role of punishment and emotions on subsequent contributions. Lastly, the article summarizes and concludes in Section 5.

2 Related Research and Hypotheses

The recent stream of research on social identity has proved that the importance ascribed to the sense of belonging to a particular group influences individuals' connotations and behavior towards their own group (in-group) as well as towards other groups they do not belong to (out-group) (Bicskei et al. 2013a).[3] In particular, when subjects interact in identity-homogenous groups they are likely to cooperate more with individuals that share the same identity than in identity-heterogeneous groups (see e.g., Solow and Kirkwood 2002; Wit and Wilke 1992; Lankau et al. 2012). What is more, they reciprocate the contributions of group members to a higher degree than out-group members (Lankau et al. 2012). Overall, in-group subjects are regarded as having a higher proclivity to make social welfare maximizing choices as opposed to subjects in out-groups (Chen and Li 2009). Moreover, recent empirical evidence suggests that social identity also affects subjects´ behavior under the threat of peer-punishment. Particularly, Bicskei et al. (2013b) find that subjects anticipating MP behave differently in in- and out-groups. Under the threat of MP they observe a comparably higher increase in cooperativeness in out- than in in-groups, which even eliminates the in-group bias that is commonly observed without punishment. The authors claim that this is due to out-group members anticipating harsher punishment than in-group members. More importantly, Bicskei et al. (2013a) establish that in case anti-social behaviour is observed, in-group members punish less frequently and with lower intensity than out-group members. They confirm the findings of Chen and Li (2009) who demonstrate that group members are more forgiving towards defection by an in-group member and reveal less negative reciprocity. Currarini et al. (2012) also find in two-person interactions that subjects are less likely to punish misbehaviour when caused by an in-group

[2] Herewith we thank M. Ibañez and E. Schaffland for providing us with their identity group task protocol.

[3] The social identity theory was pioneered by Tajfel and Turner (1979). See Chen and Li (2009) for an overview of theoretical and empirical evidence on social identity.

member than by an out-group member. Based on these studies, we thus assume that the social environment influences how subjects disclose their disapproval when both MP and NMP are available. Especially, we expect that in-group members rather apply NMP than MP since it constitutes a lower level of negative reciprocity.

Hypothesis 1 (Governance): *Compared to out-groups, subjects in in-groups are more likely to govern each other by NMP than by MP.*

Prior research suggests that in-groups are more likely to reveal higher cooperation level than out-groups. Based on Hypothesis 1, we thus expect that in-groups also gain higher social welfare than out-groups, since NMP does not reduce subjects' earnings.

Hypothesis 2 (Social Welfare): *Under the possibility of both MP and NMP identity-homogeneous groups reach higher social welfare than identity-heterogeneous groups.*

Recently, a bulk of research demonstrated that emotions play a determinant role in decision making. In particular, various contributions investigated how emotions such as anger and irritation influence punishment behaviour in general (see Reuben and van Winden 2008; Bosman et al. 2005; Bosman and van Winden 2002). Yet, Bicskei et al. (2013a) highlight that emotions have different action tendencies based on the group composition. Specifically, they establish that anger-like emotions (anger, contempt and irritation) fuel punishment in out-groups more than in in-groups. They conclude that in-group matching mitigates the role of these negative emotions in triggering punishment. The question, however, of how emotions influence the effectiveness of punishment in terms of maintaining contributions has still been neglected in the literature. In fact, when an offender is detected through punishment internal peer pressure in form of guilt may cause disutility to this individual (Elster 1989).[4] Such an emotion has, however, a high action tendency. It requests atonements or confession (Elster 1998). Therefore, we assume that in-group members are striving to maintain a positive social identity (Tajfel and Turner 1979). Feeling guilty forces them to rectify their selfish behaviour by increasing their contributions in the next period. Thus, in identity-heterogeneous groups the influence of guilt on subsequent contributions is likely to be much lower.

Hypothesis 3 (Guilt): *In in-groups the emotion of guilt in reaction to being punished is more influential in motivating changes in subsequent contributions than in out-groups.*

Being punished can trigger feelings of anger as well, which also tend to motivate behaviour (Zeelenberg et al. 1998; Hopfensitz and Reuben 2009). Whether it fosters or even lowers subsequent contributions is still an unanswered question. Yet, based on prior findings we know that in-group members are more forgiving than out-group members. Moreover, they are able to mitigate the impact of anger-like emotions on their behaviour (Bicskei et al. 2013a). Consequently, we expect that anger will affect contributions less in in-groups than in out-groups.

Hypothesis 4 (Anger): *In in-groups the emotion of anger in reaction to being punished is less influential in motivating changes in subsequent contributions than in out-groups.*

[4] Evidently, being detected through punishment can also trigger external peer pressure, thus shame (Elster 1989). This, however, forces subjects to hide and disappear. Due to the design specificity of a public good game in which punishment that a subject receives is only visible for this particular subject, the emotion of shame is assumed to be not of relevance.

3 Experimental Design

To test these hypotheses the experiment consisted of two stages (Stage A and B, see Table 1). In each stage participants were assigned to groups consisting of four subjects. We conducted four treatments: An In-group and an Out-group treatment (together referred to as ID treatments or ID matchings), and two additional treatments. The RMID treatment served as a control for Stage A, and the Control treatment for Stage B.

Stage A had the purpose of inducing social identity in the lab. Both in In- and Out-group treatments participants were assigned randomly to groups distinguished with a particular color.[5,6] Group members had to jointly solve a simple group task (ID task) of finding hidden objects in a picture and enter their coordinates within a given time of 8 minutes. They were in connection via chat so that they could discuss solutions anonymously. Importantly, an answer was only counted as a correct if each group member entered the objects' coordinates correctly, which intensified the interaction within the groups. Whichever group found most objects won this task. However, we communicated the outcome only at the end of the experiment in order to eliminate the negative consequences of not being in the winning group.[7] To test the effectiveness of our ID task we designed the RMID treatment in which subjects were randomly assigned to groups. Yet, they had to solve this task individually. No colors were assigned and there was no possibility of communication with the group members. In the Control treatment, we excluded Stage A altogether (see Table 1).

Stage B consisted of a ten-period linear public goods game combined with MP and NMP institutions and a stable group membership over all periods of the game.

Treatment	n	Session #	Stage A		Stage B	
			ID Task	Matching Protocol	PGG	Matching Protocol
In-group (IN)	80	6	Picture puzzle jointly to solve	Random + Color labeling	10 periods PGG with Punishment	In-group
Out-group (OUT)	72	4	Picture puzzle jointly to solve	Random+ Color labeling	10 periods PGG with Punishment	Out-group
Control (CONT)	52	4	-	-	10 periods PGG with Punishment	Random (Partner)
RMID	52	4	Picture puzzle to solve individually	Random	-	-

Table 1: Design of the Experiment

In the In-group treatment, group composition was identical to Stage A. Thus, subjects remained in the groups comprised of their in-group members (of the same color) with whom they solved Stage A's task. In the Out-group treatment, however, subjects were assigned to groups consisting of four different identities, hence of four different colors.[8] The Control treatment is actually the replication of the BP treatment of Noussair and Tucker (2005) and comprised groups randomly assigned without

[5] After being assigned to groups of four each group member was provided with two colors to vote for as a group color. The color chosen by the majority of group members won. In case of standoff a random mechanism determined the group color.

[6] This task served the purpose of generating more interaction between the group members. During the experiment the color of the group was always signalled by a flag.

[7] The winning group received only a congratulation message. Finishing this task, we asked four questions related to group attachment, which will be discussed in Section 4.1.

[8] The matching protocols for the ID treatments were only revealed at the beginning of Stage B.

any identification and any color-labeling (partner matching).[9] At the beginning of Stage B every subject received an initial lump-sum payment of 100 ECUs (Experimental Currency Units) in order to account for possible costs incurred during the game and reducing the possibility of bankruptcy. It was common knowledge that group composition remained stable throughout Stage B and that the game consisted of 10 periods. Each of these periods comprised two decisions parts. At first, each group member received an endowment of 20 ECUs, which could be invested in a project (c_i) benefitting each group member equally. Each ECU, which a subject did not invest in the project, was automatically deposited on his private account (20-c_i). The payoff associated with this investment decision is given by the following function (Formula 1):

$$E_i = 20 - c_i + 0.4 \times \sum_{k=1}^{4} c_k$$

Formula 1: Payoff Function of Part 1

At the beginning of the second part, subjects were informed on how much each of their group members contributed to the project.[10] Afterwards, they had the opportunity to indicate their disapproval of the other group members' decision by distributing MP and/or NMP points to them. In each case the scale ranged from 10 points for the most to 0 points for the least disapproval.[11] Each MP point distributed to a particular player lowered his or her payment by 10%. However, the punisher incurred cost for allocating MP points, as well, which is detailed in Table 2.

Monetary points (P)	0	1	2	3	4	5	6	7	8	9	10
Cost of monetary points (K)	0	1	2	4	6	9	12	16	20	25	30

Table 2: Monetary Points and the Cost of these Monetary Points in ECU

At the same time subjects could also distribute NMP points. However, in contrast to MP, NMP points neither affect the punisher´s earnings nor the earnings of the player receiving the NMP points. Subsequently, subjects were informed on the total amount of MP and NMP points they received and were required to indicate on a 7-points Likert-scale how intensely they felt (1-not at all, 7-very intensely) each of the following emotions:[12] Shame, gratitude, irritation, happiness, guilt, surprise, disappointment and anger.[13]

[9] Here we gratefully acknowledge that C. Noussair and S. Tucker provided us with their instructions. We also asked for their data but it seemed to be not recoverable. The instructions used in this experiment are available upon request.

[10] The subject´s contribution was displayed in the first column, while the contributions of the other group members of the period were shown in the remaining three columns. The contributions of the other group members were randomly listed and changed in each period. Thus, subjects were not able to track the behavior of one particular group member during the periods. This eliminated the possibility of direct retaliation against one particular group member. Also, subjects could not build a reputation in terms of their contribution during the periods.

[11] We framed the 0 punishment point as least disapproval, since we were interested in the impact of a punishment threat and did not want subjects to perceive 0 point as a reward (see argumentation in Dugar 2013).

[12] Ben-Shakhar et al. (2007) establish that the use of self-reports is adequate to assess emotions.

[13] To eliminate an experimenter demand effect the list of emotions included different emotions both of negative and positive valence based on insights of Hopfensitz and Reuben (2009) and Reuben and van Winden (2008).

At the end of each period the screen displayed the income from that particular period (see Formula 2), the total income from all periods inclusive that period and the lump-sum payment in terms of ECU. In order to keep each group members' identity as determined in Stage A salient, each subjects' group color was always signalled by a colored flag in the ID matchings throughout Stage B. Moreover, at the beginning of period 6 subjects were reminded of Stage A's group task and were asked to guess how many objects they found in Stage A. In case they guessed correctly, which was communicated only at the end of the experiment, they earned 2 ECUs. At the end of the experiment the entire earnings from the experiment (including the lump-sum payment and the show-up fee) was converted to Euros and immediately paid to the subjects in cash.

$$E_i = \left(20 - c_i + 0.4 \times \sum_{k=1}^{4} c_k\right) \times \frac{\max\left\{0,10 - \sum_{k \neq i} P_{ki}\right\}}{10} - \sum_{k \neq i} K\left(P_{ik}\right)$$

Formula 2: Income of a Particular Period

4 Results

The experiments were conducted during July and August of 2012 in the Göttingen Laboratory of Experimental Economics (GLOBE) at the University of Göttingen.[14] We recruited 256 subjects through the ORSEE system of the University of Göttingen and at the canteens of the campus. 80 subjects participated in In-group, 72 in Out-Group and 52 in the Control as well as in the RMID treatment (see Table 1). The sessions took approximately one hour (including the final payment) and participants earned approximately 12 EUR including the 2.5 EUR show-up fee.

4.1 Induction of Social Identity

The question of what drives possible treatment effects is very important. In this section, we analyse whether the induction of social identity was successful and thus whether we can assume social identity to have causal effects. We approach it by comparing subjects´ self-reported identification with the particular group in Stage A between the pooled data of the ID matchings[15] and the RMID treatment. In the latter we created the least possible group cohesion by assigning subjects to a group without any labeling and with no interactions between group members.[16] Please note that subjects were asked for their feeling of identification with their group immediately after Stage A in order to prevent experiences of ID matchings made in Stage B to bias judgement to statements including: (1) "I feel attached to this group"; (2) "I am an important member of this group". The answers were assessed on a 7-point Likert-scale (1-not at all, 7-very much). As the number of objects found in Stage A was disclosed only at the end of the experiment, we do not expect being unsuccessful in solving the task to influence the feelings of group attachment. Our data reveals that subjects of the RMID treatment felt significantly less attached to their group than in case of ID treatments ($p_{IDvsRMID}<0.001$).

[14] We designed our experiments with the software Z-tree (Fischbacher 2007).

[15] Both in In- and Out-group treatments the identical task was in effect and answers are statistically not different using Mann-Whitney Test (p=0.50). If not noted otherwise, we henceforth always use Mann-Whitney Test.

[16] Please recall that subjects had the possibility to vote for a group color. To prove whether this task had a negative influence on group attachment, we compare the intensity of group attachment of those who were assigned a group color other than the one they voted for and those whose wish came true. We find no significant difference (p=0.84) between individual group attachments.

What is more, they felt themselves to be a significantly less important member of the group, which is not surprising ($p<0.001$).

In sum, this signals that the group task of Stage A with anonymous interactions between group members and a salient social identity highlighted by colored flags evokes stronger feelings of group attachment than in case of being simply assigned to a group in which no interactions take place. Since we find clear differences between reported group attachment of ID matchings and the RMID treatment, we consequently assume that our ID task of Stage A was successful. Thus, treatment effects are likely to be due to differing degrees of group attachment in our treatments.

Result 1: *The induction of social identity successfully created higher feelings of group attachment in ID matchings than in the RMID treatment.*

4.2 Contributions to the Public Good and the Level of Social Welfare

At first, we analyze the evolution of contributions to the public. As Figure 1 shows, the presence of BP institution eliminates the often documented downward trend of contributions over time (see Fehr and Gächter 2000; Keser and van Winden 2000; Vyrastekova 2011; Lankau et al. 2013), independent of the social environment.[17]

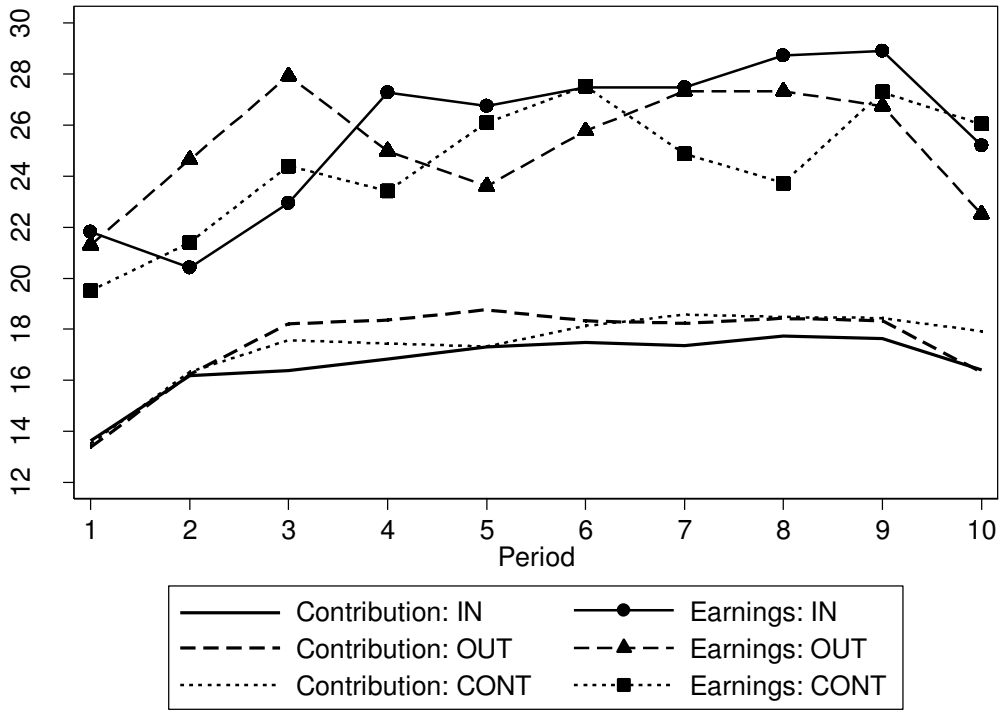


Figure 1 – Average per Period Contribution and Earnings by Treatment Type

The average contributions of the first period range between 55% and 68% of total endowment. Although starting contribution levels are very akin in the first two periods of all treatments, looking at the full time horizon, we find that out-group contributions lay above those of in-groups from period 3 onward till the penultimate period ($p<0.1$).[18] Except for period 2, contributions of the Control treatment lay between the ID treatments in the first 6 periods. Towards period 9, they

[17] For the evolution of each groups' average contributions per treatment, see Table A.1.
[18] The unit of observation was average individual contributions between periods 3 to 9.

converge to the level of out-groups. For periods 3 to 9 contributions of out-groups are only marginally greater than those of random groups (p=0.1). Although contributions of the Control treatment are above those of in-groups for almost the entire time period, we do not find statistically significant differences. Lastly, since subjects were informed about the exact length of the game, not surprisingly, we observe a moderate end-game effect. Subjects' lowered their contributions in the last period, most likely because they did not anticipate subsequent punishment. The final contributions are not significantly different between the treatments.

Result 2a: *In- and out-groups show different patterns of cooperation under the presence of both punishment institutions. Apart from the starting and last periods, out-group contribution levels are higher than those of in-groups.*

Although under BP threat contributions in out-groups are different from in-groups for specific periods, we do not find that these elevated contributions increase social welfare in these periods significantly (see Figure 1). In particular, we find that average per period earnings are similar in each treatment.[19] This indicates already that out-group members' punishment behaviour must differ from that of in-groups. Especially, the application of MP, which affects individual payoffs decisively, must be responsible for the equal welfare in both ID matchings.

Result 2b: *In- and out-group members achieve similar per period welfare under BP disregarding the end-game effect.*

Concluding, we have to reject our Social Welfare-Hypothesis that under the possibility of both MP and NMP identity-homogeneous groups reach higher social welfare than identity-heterogeneous groups.

4.3 Governance via MP and NMP

To gain evidence on how subjects in different social environments govern their groups, first of all, we analyze the relationship of MP and NMP assigned across treatments. In all treatments the average quantity of MP subjects assign is lower than of NMP (see Figure 2), and these differences are significant in each treatment (Wilcoxon signed-rank tests, p<0.001).[20] This difference is not surprising since in contrast to MP distributing even very high amounts of NMP does not affect the punisher´s payoffs.

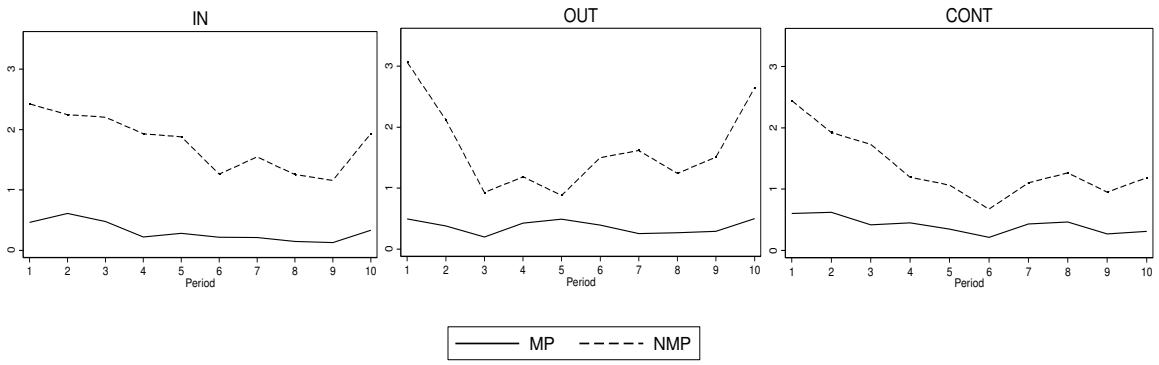


Figure 2 – Average Level of MP and NMP Points Assigned

[19] We find differences in per period individual earnings only in the last period: IN vs. OUT (p<0.001); IN vs. CONT (p<0.1); OUT vs. CONT (p<0.001).

[20] The unit of observation is the average individual MP and NMP received over the 10 periods.

As Figure 2 suggests, the evolution of MP and NMP is not completely correlated, which is most apparent in out-groups. This provides a hint that MP and NMP are rather used as substitutes than as complements. As a proof of this conjecture, Table 3 shows the number of instances in which subjects assigned a particular number of MP and NMP points per treatment.[21] We find that in each treatment punishment occurs in very similar shares of possible punishment cases (29.2, 29.3 and 28.7 percent in the In-group, Out-group and Control treatment, respectively). What is more, the share of punishment involving both MP and NMP (BP) points at the same time only amounts to approximately one third of all punishment cases and is very similar in all treatments.[22] Thus, if subjects choose to punish their peers' (mis-) behaviour they most often prefer using either MP or NMP alone than by combining them (BP). Consequently, our results oppose Noussair and Tucker (2005) who find that subjects who were not assigned any NMP did not receive MP either. In each of our treatments there are many cases in which only MP (NMP) points were distributed without assigning any NMP (MP) points. As Table 3 illustrates, the exclusive application of NMP is most favoured in in-groups (412 obs.) accounting for 59 percent of all punishment cases. In out- and random groups this amounts to 50 and 52 percent, respectively. On the contrary, the exclusive use of MP is the highest in out-groups representing 15 percent of punishment cases, followed by the Control treatment with 10 percent. In in-group only a very small proportion of punishing subjects inflict MP exclusively (4 percent). Accordingly, the frequency of NMP regardless whether applied alone or combined with MP is significantly higher in in-groups compared to out- and random groups.[23] The occurrence of MP (alone or together with NMP) is significantly higher in out-groups as well as in random groups compared to in-groups.[24]

		IN						**OUT**						**CONT**					
		Range of MP						Range of MP						Range of MP					
		[0]	[1-2]	[3-4]	[5-6]	[7-10]	Total	[0]	[1-2]	[3-4]	[5-6]	[7-10]	Total	[0]	[1-2]	[3-4]	[5-6]	[7-10]	Total
Range of NMP	[0]	1,700	16	5	3	7	1,731	1,527	55	19	11	8	1,620	1,112	23	4	5	12	1,156
	[1-3]	146	25	2	0	1	174	129	24	0	0	1	154	132	29	9	0	1	171
	[4-7]	104	28	6	13	6	157	58	30	3	1	0	92	40	34	6	4	4	88
	[7-10]	162	133	22	15	6	338	132	89	54	17	2	294	63	50	15	5	12	145
	Total	2,112	202	35	31	20	2,400	1,846	198	76	29	11	2,160	1,347	136	34	14	29	1,560

Table 3 – Frequency of MP and NMP Points

Result 3a: *NMP is more frequently used in in-groups than in out- and random groups.*

Result 3b: *The frequency of MP is higher in out- and random groups compared to in-groups.*

With regard to the strength of punishment Figure 3 depicts the evolution of NMP (left panel) and MP (right panel) over periods and across treatments. Obviously, the application of punishment in the last period cannot affect group members' behavior. Nevertheless, we observe a clear increase both in NMP and MP as a consequence of a drop in contributions in the last period (see Figure 1, Section 4.2). This is in line with Noussair and Tucker (2005) and Bochet et al. (2006) who argue that sanctions

[21] Overall, we have 6,120 possible punishment cases: 204 subjects can punish each of their three group mates in each period (204x3x10).

[22] Cases of BP over any punishment: IN=257/700=36.7%, OUT=221/663=33.3%, CONT= 169/448=37.7%.

[23] Pearson's chi-square test, $\chi^2(1)=41.5$, $p_{IN\ vs\ OUT}<0.001$; $\chi^2(1)=13.01$, $p_{IN\ vs\ CONT}<0.001$. The application of NMP in Control treatment is more frequent than in out-groups: $\chi^2(1)=5.62$, $p_{CONT\ vs\ OUT}<0.05$.

[24] Pearson's chi-square test, $\chi^2(1)=9.61$, $p_{IN\ vs\ OUT}<0.01$; $\chi^2(1)=4.55$, $p_{IN\ vs\ CONT}<0.05$. Significant difference in the infliction of MP between the Control and Out-group treatment is, however, not found.

are mainly of non-strategic nature, since the last period´s punishment will have no possible gains to the punisher.

Irrespective of the last period, NMP in in-groups follows a downward trend during almost the entire ten-period horizon, probably since corresponding contribution levels increase. In the first half of the game apart from the initially higher NMP level in out-groups, the average NMP is clearly higher in in-group than in out-group ($p<0.001$) as well as in the Control treatment ($p<0.1$).[25] What is more, due to a drastic drop from period 1 to period 3, NMP of the out-group is also smaller than of the Control treatment ($p<0.1$). In the second half of the game we observe a similar trend of NMP in each treatment. Nevertheless, as the upward trend of contributions starts to stagnate (see Figure 1), subjects of out-groups in order to boost cooperation tend to distribute higher NMP points than in-groups ($p<0.01$) as well as control groups ($p<0.001$).[26]

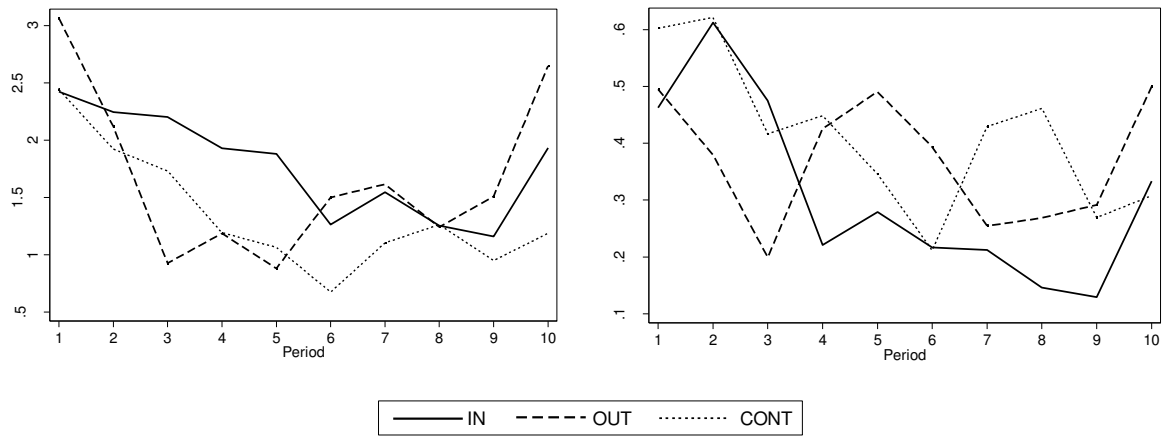


Figure 3 – Average NMP (left panel) and MP (right panel) Points Assigned (all subjects)[27]

The quantity of MP associated with monetary costs is very changeful over the periods (Figure 3, right panel). However, as with NMP, MP also reveals a clear downward trend in in-groups since contributions increase. Overall, the strengths of MP distributed on average is greater in out-groups compared to in-groups taking the average over all periods as a whole ($p<0.1$). This is somehow unexpected since contribution levels in out-groups are higher than in in-groups. It enlightens, however, why the welfare in out-groups does not exceed the welfare of in-groups.[28] Although contributions do not differ between them, looking at the entire game as a whole the strength of MP of the Control treatment is significantly higher than of in-groups ($p<0.1$). Lastly, there are no significant differences between MP of the Control and the Out-group treatment ($p=0.61$).

Result 3c: *The level of NMP in in-groups is higher than in out- and random groups in the first half of the game. In the second half the level of NMP of out-groups exceeds in- and random groups.*

Result 3d: *The strength of MP in in-groups is lower than in out- and control groups.*

[25] Unit of observation is the average individual NMP point assigned over periods 1 to 5.
[26] Unit of observation is the average individual NMP point assigned over periods 6 to 10. The hypothesis that the NMP level of In-group and Control treatments is equal in the second half cannot be rejected.
[27] See also Table A.2.
[28] Although the cost function of punishment is non-linear, the average cost of punishment shows a similar pattern in the treatments as the level of MP suggests (see Figure A.3).

Summing up, our Governance-Hypothesis cannot be rejected. We find that subjects in in-group favour governance via NMP rather than via MP. Conversely, interaction in groups with different identities or with random subjects creates an environment in which subjects are prone to reveal their disapproval by MP with higher frequency and with greater intensity than in in-groups. In this respect the availability of both punishment institutions equalizes welfare in in- and out-groups, which is not typical for situations without any punishment mechanisms at all (see Chen and Li 2009; Lankau et al. 2012; Eaton et al. 2011).

4.4 The Impact of Punishment and Emotions on Contributions

The threat of punishment per se raises contributions to common resources in one-shot interactions (Bicskei et al. 2013b). Nevertheless, in long term interactions the reactions to punishment will determine its effectiveness in maintaining cooperation (Hopfensitz and Reuben 2009). Thus, we firstly investigate how subjects actually respond to received punishment dependent on the social environment. In particular, we are interested in whether in-groups are more sensitive to NMP as they are more likely to govern their groups by such a punishment institution. Secondly, we analyse the relationship of punishment and emotions and the effect of their interaction on subsequent contributions.

To begin with the former, we estimate the effect of received MP and NMP per se on the changes in contributions from period *t* to *t+1*. As previous research has evidenced, both received punishment and the deviations of a subject' own contributions from the group´s average $(c_{kt} - \bar{c})$ may have an effect on subsequent contributions (e.g. Masclet et al. 2003; Fehr and Gächter 2000; Noussair and Tucker 2005). As punishment is also dependent on deviation from group´s average (see Table A. 4) they could not be included into the same equation. Therefore, we measure the effect of MP and NMP on contributions isolated of any effect of deviations of a subject' own contributions from the group´s average (for a similar approach see Noussair and Tucker 2005). Thus, the independent variables of our estimation (φ_{kt} and ω_{kt} in Formula 3c) represent MP and NMP points subject *k* receives in period *t* excluding the effect of deviations in contribution from the group's average on punishment (see in Formula 3a and b). Yet, as punishment is clearly equally dependent on the height of contributions subjects provide to public goods (e.g. Masclet et al. 2003; Fehr and Gächter 2000; Noussair and Tucker 2005), we conduct this regression separately for low contributors contributing less than the group´s average and for high contributors who contributed at least the same amount as the group´s average, as well as for the entire sample of the treatments (see Table 4).

$$(a)\ MP_{kt} = \alpha_0 + \alpha_1(c_{kt} - \bar{c}) + \varphi_{kt}$$

$$(b)\ NMP_{kt} = \alpha_2 + \alpha_3(c_{kt} - \bar{c}) + \omega_{kt}$$

$$(c)\ c_{kt+1} - c_{kt} = \beta_0 + \beta_1 \sum_k \varphi_{kt} + \beta_2 \sum_k \omega_{kt} + \varepsilon_t$$

Formula 3 – Estimation of the Average Change in Contribution

Our results for the Control treatment, which is equivalent to the BP treatment of Noussair and Tucker (2005), do not confirm their findings on the overall positive effect of MP. Moreover, the effect on high contributors is significantly negative, which opposes their results, as well. Yet, the significant

and positive coefficient of MP reinforces their findings that low contributors increase their contribution upon receiving MP (Table 4, column 9).

Dep.Var.: Average Change in Individual Contribution (t+1)-(t)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		IN			OUT			CONT	
	ALL	High Contr.	Low Contr.	ALL	High Contr.	Low Contr.	ALL	High Contr.	Low Contr.
MP	-0.245**	-0.214*	-0.0496	-0.147	-0.434***	0.116	-0.0503	-0.429***	0.667***
	(0.108)	(0.114)	(0.180)	(0.0990)	(0.138)	(0.173)	(0.0864)	(0.150)	(0.131)
NMP	0.0616*	-0.0663**	0.0345	0.150***	0.0342	0.0421	0.107**	0.0569	-0.0244
	(0.0342)	(0.0260)	(0.0444)	(0.0391)	(0.0266)	(0.0928)	(0.0425)	(0.0509)	(0.0576)
Constant	0.271**	-0.788***	2.940***	0.442***	-0.628***	3.777***	0.645***	-0.316	3.082***
	(0.107)	(0.128)	(0.349)	(0.135)	(0.173)	(0.532)	(0.163)	(0.213)	(0.341)
Observations	720	537	183	648	522	126	468	358	110
R-squared	0.017	0.070	0.002	0.036	0.045	0.010	0.020	0.100	0.160

Robust standard errors in parentheses, clusered around individuals.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 4 – Change in Average Individual Contribution in Response to the Receipt of MP and NMP

Very importantly, the results for both ID matchings as well as the Control treatment show that the social environment influences the effects of punishment on contributions. In particular, for identity-homogenous groups we even identify an overall significant negative effect of MP on contributions. In identity-heterogeneous groups MP has no significant effect. What is more, in both ID matchings high contributors are likely to decrease their contribution due to received MP, which seems to be more severe in out- than in in-groups. The influence of MP on low contributors is ineffective in both ID matchings compared to randomly assigned groups. Generally, NMP has a positive effect on contributions when all subjects are looked at, which seems most influential in out-groups. Yet, in contrast to out-groups high contributors in in-groups even reduce their contributions by a very a small amount upon receiving NMP (see NMP, column 2). This suggests that highly cooperative subjects in in-groups are more sensitive to NMP than subjects in out- or control-groups. In particular, receiving NMP despite comparably high contributions could be perceived as unfair. This in turn could lead to a negative reciprocation by lowering contributions in the next period.

Summing up, we find evidence that, overall not MP but NMP maintains contributions in the following period although these effects seem to be quite moderate.[29] Moreover, in in-group members even show an overall negative reaction to MP in terms of subsequent contributions. Both MP and NMP induce high contributors of in-groups to lower their subsequent contributions. Consequently, our assumption that identity-homogenous groups tend to be more sensitive to NMP and increase their contributions to a public good to a higher extent, is not supported by our data. In contrast, out-group members tend to show a stronger reaction to NMP.

Result 4a: *Receiving NMP has an overall significant and positive influence on subsequent contributions. While the application of MP per se is ineffective in boosting cooperation in out- and randomly assigned groups, it even leads to decreasing contributions in in-groups.*

[29] Please recall that these observations reflect the effect on MP and NMP that cannot be explained by deviations from group´s average. Nevertheless, if deviations from group´s average are also taken into consideration, with other words, if the effect of MP and NMP is not isolated from it, we gain similar tendencies (see Table A.5).

Result 4b: *Both MP and NMP induce high contributors of in-groups to lower their subsequent contributions.*

Next, we will investigate to what extent emotions of guilt and anger are responsible for such differences in reactions to punishment. Firstly, Figure 4 illustrates how the type of punishment received influences subjects' emotions, which were elicited directly after being informed about the total MP and NMP points subjects received.[30] The fact that the average strength of anger is comparatively low when receiving only NMP in not surprising since NMP is not associated with costs. We find, however, that the intensity of anger in case of receiving BP is significantly higher in in-group and random matchings than in out-groups ($p_{INvsOUT}<0.001$, $p_{CONTvsOUT}<0.001$). Nevertheless, the feeling of anger when receiving only MP or NMP points does not differ between the treatments.

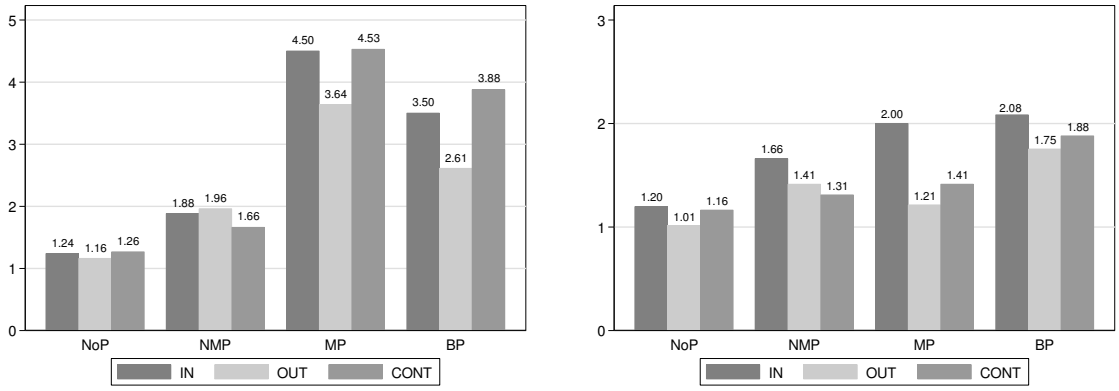


Figure 4 – Intensity of Anger and Guilt dependent on Punishment
(NoP-No punishment, NMP-NMP only, MP- MP only, BP-Both Punishments)

With respect to the emotion of guilt, we establish that in-group subjects report a significantly higher level of guilt when they receive punishment than out- or control subjects ($p_{INvsOUT}<0.001$ and $p_{INvsCONT}<0.01$). No matter whether subjects receive solely NMP, solely MP or both punishments at the same time, being punished always triggers a higher intensity of guilt in in-group than in out-group matching (for NMP: $p_{INvsOUT}<0.1$, MP: $p_{INvsOUT}<0.1$, and BP: $p_{INvsOUT}<0.05$). Guilt is also greater in in-groups than in control groups when receiving NMP or BP (for NMP: $p_{INvsCONT}<0.1$ and BP: $p_{INvsCONT}<0.05$). This highlights that subjects in in-groups are more emotionally sensitive to NMP than subjects of the Out-group and the Control treatment.

Secondly, Figure 5 illustrates how this emotional sensitivity influences the effectiveness of punishment in different social environments. In particular, it depicts the change in contributions dependent on whether subjects were punished and whether they indicated feelings of anger and guilt.[31] To this purpose, we classify subjects as angry and feeling guilty when they indicated an intensity of at least two on a seven-point Likert-scale.[32] Our results show that when subjects were punished, contribution changes of angry and non-angry subjects differ neither in identity-homogenous nor in randomly assigned groups ($p_{IN}=0.94$, $p_{CONT}=0.61$). Nevertheless, in out-groups

[30] We find that in case subjects received punishment disregarding type and strength, they had significantly higher intensity of negative emotions (shame, irritation, guilt, disappointment and anger) and a significantly lower intensity of happiness, gratitude and surprise ($p<0.001$ for all treatments).
[31] For details about the effect of particular punishment types, see Table A.6 and Figure A.7.
[32] This classification yields similar results to choosing the mean of all subjects as a benchmark.

anger induced subjects to contribute comparatively lower amounts to the public good as opposed to non-angry subjects ($p_{OUT}<0.05$). Consequently, the emotional reaction to receiving punishment does shape out-group members' subsequent contribution. This documents that especially in this matching condition effects of punishment on contribution are not homogenous. In case subjects did not receive any punishment the feeling of anger triggered even lower level of contributions in the following period. In contrast to in-group matching, in the Out-group and Control treatment we even find that this difference between angry and non-angry subjects is significant, thus the decrease is more severe ($p_{OUT}<0.001$, $p_{CONT}<0.05$, $p_{IN}=0.15$). In sum, these insights suggest that in-group members are less susceptible to their anger than subjects of groups comprised of heterogenous identities or random subjects, who tend to lower subsequent contributions when angry upon punishment. Consequently, our Hypothesis on Anger, in which we assumed in-group members' emotion of anger to have less impact on subsequent contribution changes than those of out-group members, cannot be rejected. This finding is in line with Bicskei et al. (2013a), who find that a similar intensity of anger-like emotions influences behaviour less when individuals are matched with members of common identities than with members of different identities.

Result 4c: *After being punished, the presence of anger does not influence subsequent contributions in in-groups. In groups of different identities and in randomly assigned groups it even leads to lower subsequent contributions.*

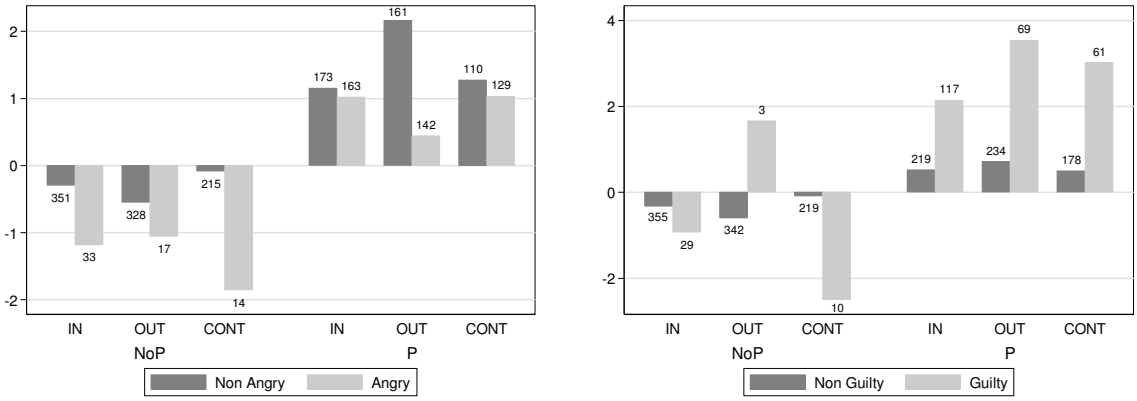


Figure 5 – Average Change in Contribution based on Emotions and Punishment Received (number above the bars indicate frequencies)[33]

Regarding guilt, we demonstrate that in each treatment if subjects were punished, they were more likely to increase their contributions if they felt guilty than if they did not (Pearson's chi-square test yielding $p<0.001$ for each treatment).[34] Moreover, these subjects increased their contribution to the public good to a greater extent than those who felt no guilt ($p_{Guilty\ vs\ NonGuilty}<0.001$ for each treatment). We notice, however, that punished out-group members who felt guilty were more likely to increase their contributions than in-group members feeling guilty (Pearson's chi-square test, $\chi^2(1)= 4.7$, $p<0.05$). In this regard, the average increase in contributions is also significantly higher in out-groups than in in-groups ($p_{INvsOUT}<0.1$).[35] Unpunished subjects in in-groups who had no feelings of

[33] In out-group all negative deviations from the average were punished, thus the occurrence of observations, when no punishment was received but guilt was felt, is not expected (we have only 3 observations).
[34] See also Table A.6 and Figure A.7 for differences between punishment types.
[35] For the robustness check, see Table A.8.

guilt decreased their contribution to a similar extent as subjects of randomly assigned groups ($p_{INvsCONT}$=0.27). This decrease was, however, weaker than that of out-group ($p_{INvsOUT}$<0.1, $p_{OUTvsCONT}$<0.01). Interestingly, if subjects did not receive any punishment, although they had feelings of guilt, no differences can be found between in- and out-groups ($p_{INvsOUT}$=0.11, $p_{INvsCONT}$=0.22, $p_{OUTvsCONT}$<0.1). Thus, we establish that the presence of guilt forces subjects to increase their contributions in each treatment if punishment was assigned. In particular, out-group members feeling guilty when punished reveal stronger increases in their contributions than in in-groups. Consequently, our Hypothesis on Guilt, according to which subjects in in-groups tend to contribute more to the public good in the next period than out-groups if they feel guilty upon punishment, is not supported.

Result 4d: *Although the level of guilt felt by subjects is significantly higher in in-groups as opposed to out-groups in case of receiving punishment of any kind, feeling guilty induces significantly higher positive changes in subjects' contributions in out- than in in-group matching.*

Result 4e: *When receiving punishment, the feeling of guilt triggers higher positive changes in subjects' contributions in the Control treatment than in the In-group treatment.*

5 Conclusion

This article provides initial insights on whether subjects in different social environments govern their groups rather by monetary sanctions or simply by non-monetary sanctions. Our data reveals that under the threat of both punishments, apart from the initial periods, identity-heterogeneous groups tend to contribute more to a public good than identity-homogeneous groups. This could be due to an anticipation of more severe punishment in out-groups as opposed to in-groups. Indeed, we establish that out-groups subjects display their disapproval more frequently and with greater intensity by monetary-punishment as opposed to in-groups. On the contrary, in-group subjects rely more on non-monetary punishment. In total, these counteracting differences in contributions and in the application of monetary- and non-monetary punishment bear the consequence that identity-homogeneous and identity-heterogeneous groups reach a similar social welfare.

In connection with the question of how subjects actually respond to these governance mechanisms, we demonstrate that the application of monetary-punishment alone is ineffective in boosting cooperation, which contradicts previous findings. Rather the amount of NMP received positively influences subsequent contributions. Yet, contrary to our hypothesis subjects in identity-homogeneous groups are not outstandingly affected. Moreover, both monetary- and non-monetary punishment induce highly cooperative in-group members to lower their subsequent contributions, probably because they perceive punishment by in-group members as particularly unfair and retaliate by lowering contributions.

Furthermore, we establish that the social environment alters how anger drives subjects´ behavior. Indeed, while after being punished the presence of anger does not influence subsequent contributions in in-groups, in out- and random groups it has a negative impact. Equally, the feeling of guilt when being punished differently affects subsequent contributions depending on the social

environment. Surprisingly, when interacting in identity-heterogeneous groups, guilt leads subjects to increase subsequent contributions to a higher extent than in identity-homogenous groups.

From economic policy perspective our findings are of high relevance. We demonstrate that groups in different social environments make use of different forms and strengths of governance. Thus, the availability of both monetary and non-monetary punishment institutions leads identity-homogenous and identity-heterogeneous groups to achieve similar levels of social welfare. This is important, since it is typically lower in fragmented societies than in homogeneous ones. Moreover, in both social environments welfare is higher than typically observed without any punishment institution. All in all, an institutional environment, which combines both sanctioning systems, is beneficial in terms of social welfare in the long run.

Acknowledgement

We would like to thank Marcela Ibañez Diaz, Claudia Keser, András Dobó, Maximilian Riedl and Nadine Behncke for their valuable comments to the experimental design and previous versions of this article.

6 Appendix

Table A.1: Average Group Contribution Level over Periods

	Period										
	1	2	3	4	5	6	7	8	9	10	Total
Group Nr.											
IN											
1	17.5	17.5	19.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.5
2	13.8	16.3	16.0	15.5	14.0	12.5	9.3	10.0	10.0	10.0	12.7
3	13.8	20.0	15.0	16.3	19.3	17.5	16.3	17.0	15.3	8.5	15.9
4	13.3	18.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.2
5	17.5	17.5	15.0	18.8	20.0	20.0	20.0	20.0	20.0	20.0	18.9
6	18.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9
7	17.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	15.0	19.3
8	15.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.5
9	11.3	14.5	15.3	15.8	16.5	17.3	18.8	19.8	20.0	19.3	16.8
10	14.5	18.0	18.8	19.5	19.5	19.0	18.5	19.8	20.0	19.0	18.7
11	11.0	15.0	17.0	18.8	19.5	20.0	20.0	20.0	20.0	19.8	18.1
12	13.8	16.0	18.8	19.8	19.5	20.0	20.0	20.0	20.0	15.0	18.3
13	10.8	13.0	14.3	14.5	14.5	14.8	15.3	15.8	16.8	18.5	14.8
14	12.5	15.0	18.8	20.0	17.5	20.0	20.0	20.0	20.0	20.0	18.4
15	16.3	18.5	18.8	18.8	19.3	20.0	20.0	20.0	20.0	16.3	18.8
16	8.8	12.5	13.5	14.0	16.0	17.3	17.5	18.0	18.0	19.3	15.5
17	16.3	16.3	16.3	15.0	20.0	20.0	20.0	20.0	20.0	20.0	18.4
18	12.5	16.3	15.0	15.0	16.3	17.5	16.3	20.0	20.0	20.0	16.9
19	12.5	10.0	11.3	11.8	12.0	11.8	13.5	12.5	10.5	6.3	11.2
20	5.5	8.8	4.5	3.5	2.3	2.0	1.8	2.0	2.0	1.3	3.4
Total	13.6	16.2	16.4	16.8	17.3	17.5	17.4	17.7	17.6	16.4	16.7
OUT											
1	13.0	15.0	17.8	15.5	17.3	15.3	17.3	18.5	14.3	16.8	16.1
2	13.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4
3	8.8	12.3	14.5	18.3	19.3	20.0	20.0	20.0	20.0	18.8	17.2
4	15.5	20.0	20.0	20.0	20.0	19.8	20.0	20.0	20.0	15.0	19.0
5	18.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9
6	15.0	16.3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.8	19.0
7	10.5	11.5	14.5	15.3	14.5	14.0	14.5	14.8	11.3	10.3	13.1
8	9.5	10.3	13.5	14.8	15.3	16.0	16.5	16.8	17.3	17.5	14.7
9	13.8	17.5	17.8	20.0	20.0	19.8	20.0	20.0	20.0	15.0	18.4
10	9.5	15.0	20.0	17.5	20.0	20.0	20.0	19.8	19.8	19.8	18.1
11	15.0	19.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4
12	14.3	19.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	14.5	18.8
13	14.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	17.5	19.2
14	12.5	14.8	19.5	15.5	16.3	12.0	14.0	11.5	15.8	15.5	14.7
15	14.5	13.8	19.0	20.0	20.0	18.3	12.5	16.3	16.8	16.3	16.7
16	17.0	19.8	20.0	20.0	20.0	20.0	20.0	20.0	20.0	15.0	19.2
17	14.3	15.0	16.5	17.0	18.0	18.5	18.5	18.5	19.3	14.5	17.0
18	10.8	12.5	15.0	16.8	17.3	16.5	15.0	15.8	15.8	8.8	14.4
Total	13.4	16.2	18.2	18.4	18.8	18.3	18.2	18.4	18.3	16.3	17.5
CONT											
1	14.3	18.3	19.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.2
2	18.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8
3	11.3	13.3	18.0	11.3	2.5	13.0	17.3	17.5	14.5	10.0	12.9
4	12.8	13.0	13.5	12.8	12.8	12.5	13.0	12.8	11.3	9.3	12.4
5	9.8	11.3	12.8	13.5	14.5	15.8	17.0	18.5	18.8	19.5	15.1
6	9.3	14.3	16.8	19.0	20.0	20.0	20.0	20.0	20.0	20.0	17.9
7	15.0	18.3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3
8	15.5	18.8	20.0	20.0	20.0	18.8	18.8	20.0	18.8	17.0	18.8
9	17.8	18.0	19.5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.5
10	13.3	17.5	16.3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.7
11	17.3	19.0	20.0	15.0	20.0	20.0	19.8	15.0	20.0	20.0	18.6
12	13.5	16.0	17.0	17.3	18.0	18.0	18.0	17.8	17.8	17.8	17.1
13	8.3	14.8	15.3	18.0	17.5	17.8	17.8	18.8	18.8	19.5	16.6
Total	13.5	16.3	17.6	17.4	17.3	17.4	18.6	18.5	18.4	17.9	17.4

Table A.2: Average Punishment Points Assigned

Treatment		Period										
		1	2	3	4	5	6	7	8	9	10	**Average**
IN	MP	1.39	1.84	1.43	0.66	0.84	0.65	0.64	0.44	0.39	1.00	**0.93**
	NMP	7.28	6.74	6.61	5.79	5.64	3.79	4.64	3.76	3.48	5.80	**5.35**
OUT	MP	1.49	1.14	0.60	1.28	1.47	1.18	0.76	0.81	0.88	1.50	**1.11**
	NMP	9.19	6.36	2.78	3.56	2.64	4.50	4.85	3.72	4.53	7.94	**5.01**
CONT	MP	1.81	1.87	1.25	1.35	1.04	0.63	1.29	1.38	0.81	0.92	**1.23**
	NMP	7.33	5.77	5.19	3.58	3.19	2.02	3.31	3.79	2.85	3.56	**4.06**

Figure A.3: Cost of Punishment

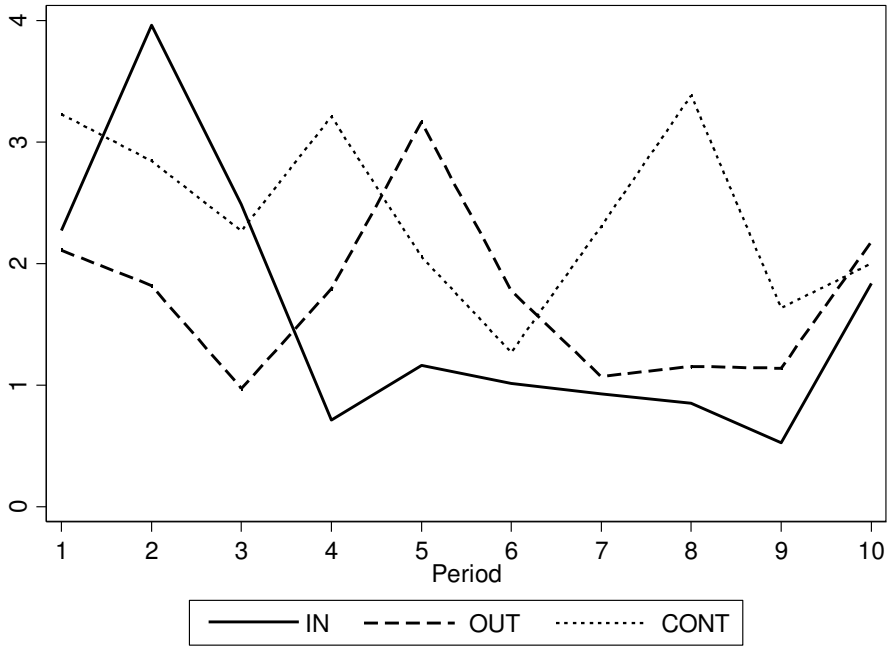


Table A.4: Determinants of punishment of Period 1

Dep.Var.: Punishment assigned by subject i to subject k in Period 1

	(1)	(2)	(3)	(4)	(5)	(6)
	IN		OUT		CONT	
	MP	NMP	MP	NMP	MP	NMP
Neg. Deviation from Group Avg.	0.540***	1.148***	0.304***	0.811***	0.413***	1.012***
(c_k - $\bar{c}$ <0)	(0.149)	(0.175)	(0.084)	(0.098)	(0.130)	(0.155)
Neg. Deviation from Group Avg.	0.071	-0.200	-0.305*	-0.659***	-0.263	-0.388
(c_k - $\bar{c}$ >0)	(0.240)	(0.283)	(0.172)	(0.175)	(0.220)	(0.286)
Others Average Contribution	0.082	-0.252*	0.001	-0.533***	0.016	-0.161
(excluding subject k)	(0.168)	(0.145)	(0.133)	(0.203)	(0.200)	(0.187)
Constant	-7.678**	0.119	-2.932	6.398**	-3.747	0.960
	(3.202)	(2.360)	(2.062)	(2.733)	(2.705)	(2.921)
Sigma Constant	5.004***	5.641***	3.349***	5.635***	4.191***	4.763***
	(0.889)	(0.544)	(0.532)	(0.691)	(0.899)	(0.481)
Observations	240	240	216	216	156	156
Log-likelihood	-177.5	-365.7	-182.9	-355.2	-150.4	-255.8
Pseudo R2	0.0381	0.116	0.0788	0.131	0.0454	0.115

Robust standard errors in parentheses. Tobit estimation with lower censoring.

*** p<0.01, ** p<0.05, * p<0.1; c-Contribution

Table A.5: Average Change in Contribution based on Punishment received

Dep.Var.: Average Change in Inidividual Contrribution ((t+1)-t)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		IN			OUT			CONT	
	ALL	High Contr.	Low Contr.	ALL	High Contr.	Low Contr.	ALL	High Contr.	Low Contr.
MP	-0.162	-0.239**	-0.0222	-0.140*	-0.390***	0.0837	-0.0542	-0.456***	0.640***
	(0.116)	(0.119)	(0.193)	(0.0815)	(0.143)	(0.180)	(0.117)	(0.160)	(0.141)
NMP	0.166***	-0.0332	0.106**	0.226***	0.0938**	0.0552	0.248***	0.122*	0.0763
	(0.0305)	(0.0256)	(0.0421)	(0.0475)	(0.0354)	(0.0883)	(0.0548)	(0.0674)	(0.0600)
Constant	-0.423***	-0.419***	1.686***	-0.580***	-0.544***	2.860***	-0.461**	-0.274	0.948
	(0.154)	(0.133)	(0.363)	(0.175)	(0.166)	(0.829)	(0.208)	(0.182)	(0.619)
Observations	720	537	183	648	522	126	468	358	110
R-squared	0.092	0.034	0.039	0.146	0.039	0.021	0.159	0.100	0.254

Robust standard errors in parentheses, clustered around individuals.

*** p<0.01, ** p<0.05, * p<0.1

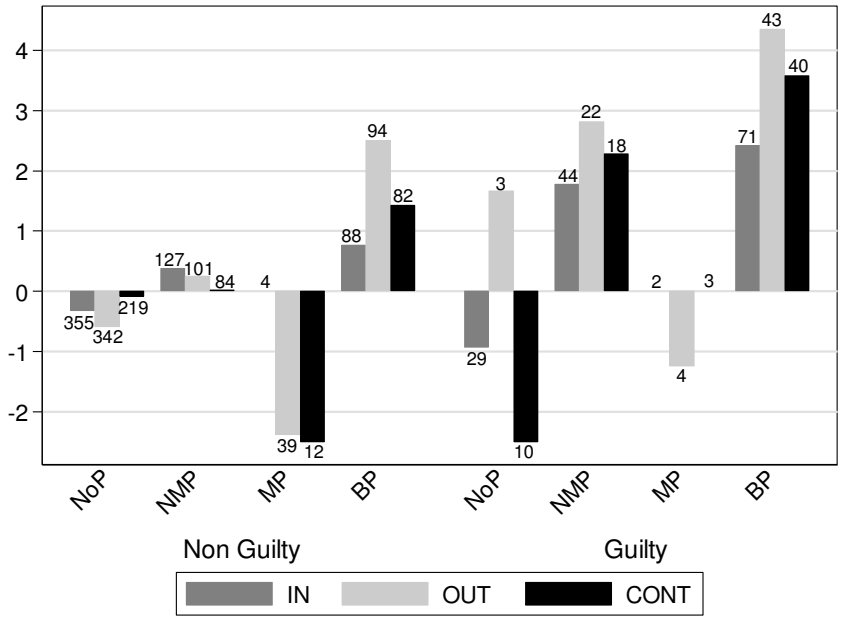
Table A.6: Average Change in Contribution based on Emotions and Punishment received

(Avg. Change, Standard Deviations, and Frequencies)

	IN					OUT					CONT				
	NoP	NMP	MP	BP	Total	NoP	NMP	MP	BP	Total	NoP	NMP	MP	BP	Total
Non-Angry	-0.30	0.88	0.00	1.79	0.18	-0.55	1.21	-2.62	4.48	0.34	-0.08	0.49	0.00	2.92	0.38
	2.42	3.76	0.00	5.83	3.31	2.91	2.61	5.62	6.05	3.91	1.81	2.00	0.00	5.85	2.75
	351	120	1	52	524	328	86	13	62	489	215	71	3	36	325
Angry	-1.18	0.39	0.00	1.36	0.65	-1.06	-0.46	-2.13	1.92	0.28	-1.86	0.26	-2.5	1.8	0.75
	3.35	2.81	0.00	5.51	4.61	2.36	6.09	4.28	5.3	5.32	3.7	3.17	6.22	6.65	5.92
	33	51	5	107	196	17	37	30	75	159	14	31	12	86	143
Total	-0.37	0.74	0.00	1.50	0.31	-0.58	0.71	-2.28	3.08	0.33	-0.19	0.42	-2.00	2.13	0.49
	2.52	3.50	0.00	5.60	3.71	2.89	4.04	4.66	5.77	4.29	2.01	2.4	5.61	6.42	4.00
	384	171	6	159	720	345	123	43	137	648	229	102	15	122	468

	IN					OUT					CONT				
	NoP	NMP	MP	BP	Total	NoP	NMP	MP	BP	Total	NoP	NMP	MP	BP	Total
Non-Guilty	-0.33	0.38	0.00	0.76	0.00	-0.60	0.25	-2.38	2.50	-0.06	-0.09	0.02	-2.50	1.43	0.18
	2.44	3.37	0.00	5.70	3.36	2.89	3.58	4.84	5.93	4.00	1.79	1.59	6.22	7.17	3.81
	355	127	4	88	574	342	101	39	94	576	219	84	12	82	397
Guilty	-0.93	1.77	0.00	2.42	1.53	1.67	2.82	-1.25	4.35	3.46	-2.50	2.28	0.00	3.58	2.24
	3.29	3.71	0.00	5.38	4.67	2.89	5.30	2.50	5.25	5.21	4.25	4.18	0.00	4.22	4.58
	29	44	2	71	146	3	22	4	43	72	10	18	3	40	71
Total	-0.37	0.74	0.00	1.50	0.31	-0.58	0.71	-2.28	3.08	0.33	-0.19	0.42	-2.00	2.13	0.49
	2.52	3.50	0.00	5.60	3.71	2.89	4.04	4.66	5.77	4.29	2.01	2.40	5.61	6.42	4.00
	384	171	6	159	720	345	123	43	137	648	229	102	15	122	468

Figure A.7: Average Change in Contribution based on Emotions and Punishment received



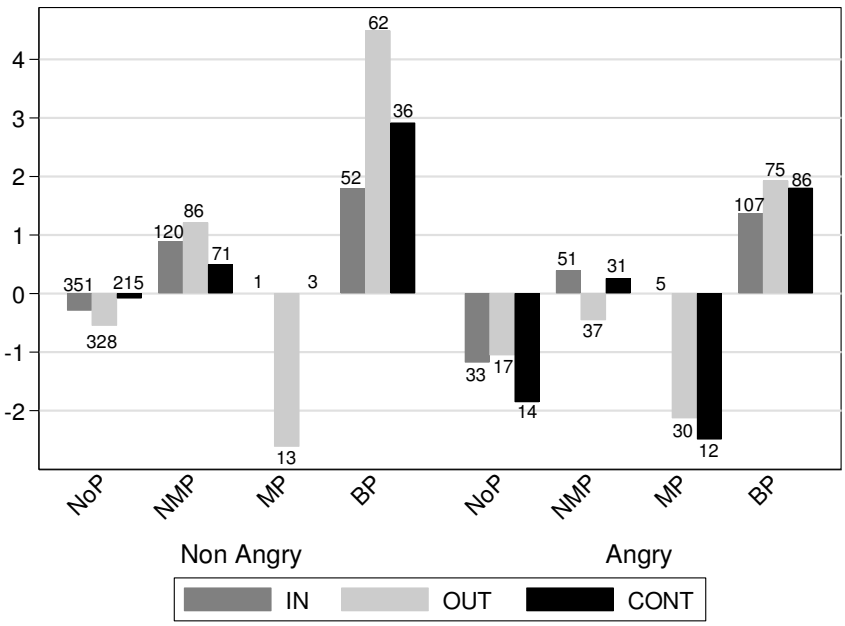


Table A.8: Average Change in Contribution based on Guilty (if Punishment received>0)

Dep.Var.: Average Change in Indiv.Contr.	
Guilt	0.514***
	(0.152)
OUT	-0.565
	(0.587)
CONT	-0.329
	(0.553)
OUTxGuilt	0.645*
	(0.344)
CONTxGuilt	0.323
	(0.270)
Constant	0.119
	(0.382)
Observations	878
R-squared	0.049

Robust standard errors in parentheses.
Clustered around individuals.
*** p<0.01, ** p<0.05, * p<0.1

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