CESifo Working Papers

www.cesifo.org/wp

Teams Punish Less

Heike Auerswald
Carsten Schmidt
Marcel Thum
Gaute Torsvik

CESIFO WORKING PAPER NO. 4406
CATEGORY 1: PUBLIC FINANCE
SEPTEMBER 2013

CESifo *Working Paper No. 4406*

Teams Punish Less

Abstract

Many decisions in politics and business are made by teams rather than by single individuals. In contrast, economic models typically assume an individual rational decision maker. A rapidly growing body of (experimental) literature investigates team decisions in different settings. We study team decisions in a public goods contribution game with a costly punishment option and compare it to the behavior of individuals in a laboratory experiment. We also consider different team decision-making rules (unanimity, majority). We find that teams contribute significantly more and punish less than individuals, regardless of the team decision rule. Overall, teams yield higher payoffs than individuals.

JEL-Code: H540, Q540, Q580.

Keywords: group decision making, public good, experiment, punishment.

Heike Auerswald
Faculty of Business and Economics
Technical University Dresden
Germany – 01062 Dresden
heike.auerswald@tu-dresden.de

Carsten Schmidt
University of Mannheim
L 7, 3 – 5
Germany – 68131 Mannheim
cschmidt@sfb504.uni-mannheim.de

Marcel Thum
Faculty of Business and Economics
Technical University Dresden
Germany – 01062 Dresden
marcel.thum@tu-dresden.de

Gaute Torsvik
Department of Economics
University of Bergen
Postboks 7800
Norway – 5020 Bergen
gaute.torsvik@econ.uib.no

We thank Dirk Engelmann, Henrik Orzen, and Bengt-Arne Wickström for helpful comments and suggestions. The usual caveat applies. Financial support from the German Federal Ministry of Education and Research is gratefully acknowledged.

1. Introduction

Important, real-world decisions are often made by teams rather than individuals. A family jointly decides were to live and work, the board of directors selects a firm's investments, and countries send teams of delegates to negotiate international treaties. In contrast, most economic models of decision-making assume an individual decision maker. The rapidly growing (experimental) literature on team decisions attempts to fill this gap by analyzing how teams make decisions and whether they make different decisions than individuals.

Our focus is on teams that jointly provide a single public good. We analyze whether teams contribute significantly more or less than individuals in a standard public goods game with and without a punishment option.[1] We extend the standard public goods game with four players to a setting with four teams jointly providing the public good. Each team consists of three individuals. We analyze team behavior under different decision-making rules (majority and unanimity rule) and assess the extent to which these behaviors differ from the individual reference treatment. We analyze the contributions to the public good, the use of punishment and the final payoff.

Teams in our experiment contributed significantly more to the public good than individuals, if there was no punishment option, and teams punished significantly less than individuals. In terms of net profits, teams performed better than individuals, partly because reduced punishment increases profits.

In section 2, we develop our working hypotheses. Section 3 describes the experimental setting in detail. Section 4 discusses the findings and their significance. Section 5 concludes and provides suggestions for further research.

2. Literature and Hypotheses

Charness and Sutter (2012) and Kugler, Kausel and Kocher (2012) provide recent surveys on team decisions. According to Charness and Sutter, the majority of research concludes that teams tend to behave more in line with game theoretic predictions than individuals. They identify three reasons for the difference between decisions made by teams and individuals (p. 171). First, individual knowledge is aggregated in teams, and thus teams make qualitatively

[1] Punishment also plays an important role in real world politics; for example, trade restrictions are linked to cooperation in international environmental policy. In general, the restriction of trade per se has no benefit for the home country but is employed as a punitive measure if the foreign country does not contribute sufficiently to the public good, 'global environmental quality'. Among others, Barrett (2003), discusses this linkage in the context of international environmental agreements.

better decisions (e.g., investment decisions). Second, teams exhibit more detailed reasoning when making strategic decisions (e.g., the beauty contest game, the trust game). Teams are better able to anticipate the reaction of the other player and his/her best strategy. Third, groups have a stronger focus on payoffs. Fairness and reciprocity seem to play a lesser role in team decision-making, perhaps because the other members of one's own group – rather than members of the other groups – serve as reference points; thus in-group thinking replaces out-group thinking. Kugler, Kausel and Kocher (2012) also examine the determinants of team decisions in detail. They argue that the process of aggregating individual preferences into team decisions facilitates the expression of less altruism towards the other players. The list of games analyzed in this context is long, but it lacks the standard public goods game, which is the game-theoretic mirror image of numerous real-world problems – environmental protection, climate negotiations, combating maritime piracy and financial stability are among the numerous relevant examples.

The interactive tasks in which team behavior more closely resembles the predictions of standard economic theory include the ultimatum game (Robert and Carnevale, 1997, Bornstein and Yaniv, 1998), the dictator game (Luhan et al., 2009), the beauty contest game[2] (Kocher and Sutter, 2005), the centipede game (Bornstein et al., 2004), the gift-exchange game (Kocher and Sutter, 2007), and the trust game (Kugler et al., 2007). However, there are also two experiments in which teams behaved more selfishly or were less able to process information efficiently. Cason and Mui (1997) were among the first to study team decisions in an experimental framework. In a dictator game, they find that team decisions are primarily driven by the most other-regarding player. Thus, social preferences seem to be more important than rationality in team decisions. However, their experimental setting has been widely criticized by, e.g., Luhan, Kocher and Sutter (2009), who attribute the result to the special framing of the experiment.[3]

The second study deviating from the main stream of literature is Cox and Hayne (2006), who study a common value auction with risky outcomes. They identify a 'curse of information'. If additional information is provided on the value of the auctioned item, individuals and teams bid less rationally, with teams acting even less rationally than individuals.

[2] Groups tend to perform better during the game due to improved reasoning abilities but not in the first period.

[3] The experiment by Cason and Mui was conducted face-to-face with teams of only two players in a classroom. Identification and communication were possible and may have had a significant effect on the results. To illustrate this effect, Luhan, Koch and Sutter repeated the dictator game in a more neutral environment (no face-to-face, no communication, 3-person teams). They find that teams act more selfishly and that the most selfish player on a team has the strongest influence, which is in line with group polarization theory.

In summary, studies conducted thus far analyzed team decisions with respect to rationality, performance and the decision-making process within teams. We extend this work and apply it to a public goods framework. Our aim is to address the following research question: Do teams outperform individuals in a public goods setting with and without punishment? To answer this question, we examine the level of cooperation (contributions). We will test for rationality in the context of punishment levels. We will also assess whether the decision-making process within a team affects performance; therefore, we implement different decision-making rules, namely majority and unanimity.

The standard, textbook public goods models assume a purely selfish individual and predict extensive free-riding. The level and structure of cooperation observed in experiments indicate that players are partly driven by other factors, such as altruism, fairness or reciprocity. From the experimental literature, we expect teams to behave in a more competitive and self-oriented manner when competing with other teams than individuals competing against individuals (see Charness and Sutter 2012). We also know that teams behave more in line with game theoretic predictions in many interactive tasks. Thus, our working hypothesis addressing cooperation is:

H1: Teams contribute less.

If average contributions in treatments with teams are lower than in the individual treatment, this would provide support for this hypothesis.

We expect teams to punish less in the presence of a punishment option. Punishment is costly and destroys resources. The literature provides evidence that teams are more rational in many different situations, and in our setting, not punishing at all is rational. Our second working hypothesis is:

H2: Teams punish less.

While there is an incentive to free-ride on the others' contributions to a public good in the standard economic decision-making model, contributions increase *welfare* from a collective perspective. In line with recent approaches (Gächter et al., 2008, Ambrus and Greiner, 2012), we also account for the welfare effects of different treatments. We abstract from potential warm glow effects and altruism, which may enter the welfare function, and focus on payoffs as our welfare measure. The overall outcome depends on both contributions and punishment. In the absence of a punishment option, a corollary of hypothesis H1 is that teams should perform worse. For the treatment with a punishment option, the conclusion is less straightforward. As contributions are typically close to the maximum level when a punishment option is available, we expect the type of decision maker (team vs. individual) to be of minor importance for contributions. More rational team decisions, however, would imply that teams punish less, which would lead to higher payoffs ceteris paribus. We state the following hypothesis:

H3: Teams yield lower payoffs in the absence of punishment but perform better in the presence of punishment

We are also interested in the question of whether the decision rule itself makes a difference. Decision-making processes within teams remain a largely neglected field in economic research; as Kugler et al. (2012, 25) note: “Economic theory is surprisingly silent about decision making of unitary groups, […].” A plausible first hypothesis regarding decision-making in the majority-rule treatment is that the median voter prevails. However, we lack a widely accepted theory concerning unanimous decisions. A priori, it is far from obvious whether the de facto veto power in the unanimity treatment provides an advantage to homo economicus players or players emphasizing social norms. The literature provides ambiguous results (Kerr and Tindale, 2004 (p. 641), Blinder and Morgan, 2005 and Gillet, Schram and Sonnemans, 2009). Gillet, Schram and Sonnemans (2009) can only identify a minor advantage with respect to the quality of decisions made under the unanimity rule compared to decisions reached by majority rule.

If the quality of the decision-making process is more or less the same in the unanimity and majority treatments, we might nevertheless observe a difference in the punishment patterns. The punishment stage can be used to sanction low contributions that are regarded as anti-social behavior. In the unanimity case (as in individual play), punishment affects players demonstrating a low willingness to contribute. In the majority treatment, however, the punishment may also affect innocent bystanders. If the majority decides in favor of a low contribution, a minority of the team may nevertheless have favored a high contribution. Therefore, we might expect punishment to be employed more cautiously in the majority treatment.

H4: For a given level of team contributions, the punishment imposed by the other teams will be lower in the majority treatment than in the unanimity treatment.

With respect to the time required for team decisions, Blinder and Morgan (2005) find that teams deciding by majority rule derive decisions faster. We would expect the same for our setting:

H5: Teams deciding by majority rule reach decisions more rapidly than teams deciding by unanimity rule.

3. Experimental Design and Procedure

The general framework is a standard public goods game (Ledyard, 1997) with and without punishment (Fehr and Gächter, 2000). An experimental group of four teams/individuals was formed. Each team consisted of three players. Each team/individual received the same endowment (20 tokens) in each round and had to decide how many (integer) tokens to invest in the public good. The marginal per capita return (MPCR) for each token invested in the public good was 0.4, which accrued to each of the four groups.[4] All tokens not invested in the public good were retained by the team/individual; this was equivalent to a marginal return of 1 for the investment in the private good. In the public goods game with punishment, the contribution stage was followed by a punishment stage. In line with the recent literature on punishment, we implemented the following punishment technology: a 3-token reduction in the payoff of another participant cost the punishing participant 1 token (see Gächter, Renner and Sefton, 2008). We set up three between-subject treatments: individual (IND), majority team (MAJ), and unanimity team (UNA). In unanimity teams, all members had to agree on contribution and punishment. In the majority treatment, a minimum of two out of three team players had to agree.

Subjects were informed that the experiment consists of several parts, and instructions for each part were distributed at the beginning of the part (surprise restart). In part I, all participants played an individual, one-shot public goods game. This one-shot game reveals some information about the type of the player, e.g., regarding his/her selfishness.[5] No feedback was provided in part I to avoid learning at this stage. At the beginning of part II, participants were assigned to treatments (IND, MAJ, UNA). In the team treatments, assignment to teams was determined randomly. Then, participants played a 10-period standard public goods game as a

[4] The individual payoff of a team member is equal to the team result. Technically, the experimenter tripled the team's profit and awarded an equal share to each team member. Thus, the incentives in the individual and team treatments were identical.

[5] The degree of selfish or altruistic preferences is certainly not the only determinant of contribution levels. In particular, conditional cooperation, which is endogenous to other players' behavior, is crucial in determining contributions; see Fischbacher and Gächter (2010).

team member or an individual.[6] After each period, every player received feedback concerning his/her results and anonymized information on the decisions of the other teams/individuals. In part III, participants were re-matched within their treatments (MAJ, UNA) such that no participant was matched with a former teammate. This procedure was common knowledge. The re-matching ensured that participants had no prior information concerning the cooperative behavior of his/her teammates. Participants played a 10-period public goods game with punishment. Again, all team players remained on the same team for 10 periods. After each contribution and punishment stage, each player received feedback on his/her results and anonymized information on the decisions of the other teams/individuals. After part III had been completed, we disclosed the results of part I.

We implemented a structured method of team decision-making in the spirit of Gillet, Schram, and Sonnemans (2009). At the beginning of each period, each team member could propose a contribution to his/her teammates. Specifically, each team member had to type in a number (0…20) as his/her proposed contribution to the public good. Once all three team members had entered their numbers, the proposals were shown to the team. Under majority rule, two out of the three proposals had to be equal to result in a decision. Under unanimity rule, all three proposals had to be equal. If an agreement was reached according to the team decision rule, it was automatically implemented as the team decision. In total, 10 rounds of proposals could be made before a default rule applied. If a team had not reached a decision after 10 proposals, the decisions of another team that has reached a compromise was randomly selected as the undecided team’s selection, and the team’s payoff for this period was set to zero. The restriction to 10 proposals was non-binding in the vast majority of cases. At the contribution stage, coordination failures occurred in only 15 cases out of a total of 1600 team decisions. At the punishment stage, teams failed to agree on the assignment of punishment points in 8 out of 800 cases. Participants had full information about the default rule.

At the punishment stage, individuals/teams could penalize the decisions of other individuals/teams. When all decisions regarding contributions had been made, each participant (team or individual) received anonymous feedback concerning the contributions of the other participants. Then, the participants could decide on the allocation of punishments to the other three participants. Reducing the payoff of another participant by three tokens cost the punishing participant 1 token. Each of the three other teams was allowed to purchase a maximum of 5 tokens; as in the contribution stage, players were only allowed to select integer

[6] Individuals were assigned to the same treatment for all 10 periods.

values when choosing the number of tokens. In team decisions, each player on a team could propose a punishment schedule, for example team A 0 tokens, team B 1 token, and team C 5 tokens. If the punishment schedules of two (three) team-members were identical, the team-decision was automatically implemented by the program according to majority (unanimity) rule. The default rule was the same as in the contribution decision.

The experiment was programmed and conducted using z-tree software (Fischbacher 2007). Sessions were held in the experimental laboratory at the University of Mannheim from September to October 2012. Subjects were recruited using a database of volunteers (Greiner, 2003). In all treatments, subjects were invited to participate for 90 minutes. In general, baseline sessions lasted approximately 60 minutes, sessions using the majority treatment lasted 75 minutes and those using the unanimity treatment up to 90 minutes. In total, 280 students, approximately half of whom were bachelor-level business administration students, participated in the experiment. After being randomly seated in separated cubicles in front of a computer, which was subsequently used to run the experiment, participants received the instructions for part I. The experiment began after all subjects had passed a quiz ensuring that all subjects understood the instructions. The instructor answered questions individually and in private. No communication among participants was allowed during the experiment. The exchange rate for tokens was 2 Eurocents per token. Payments were made anonymously in cash immediately following the experiment, with an average payoff of 11.04 Euro.

4. Results

Table 1 contains the summary statistics on the number of subjects in each treatment, the number of sessions, average contributions, average punishment (when applicable) and average net profits. Each experimental group of 4 individuals/teams provides us with one independent observation. Thus, we have 10 observations for each treatment and each decision rule. We now test the 5 hypotheses from the previous section by analyzing these data in detail.

Table 1: Summary statistics: average contributions, punishment, and net profits in the treatments

		Part I	Part II		Part III		
		One-shot PG w/o feedback	10 period PG with feedback		10 period PG with punishment and feedback		
	N participants	avg. contribution	avg. contribution	avg. net profits	avg. contribution	avg. punishment[a]	avg. net profits
Unanimity	120	9.08	9.76	25.24	16.24	0.53	27.27
Majority	120	9.62	8.98	25.39	14.95	0.59	26.62
Individual	40	8.95	7.56	24.54	14.89	1.11	24.51
Teams[b]	240	9.35	9.37	25.32	15.60	0.56	26.95

Note: [a] Average number of assigned punishment points; equals the average cost of punishment; [b] "Teams" consists of the majority and unanimity treatments.

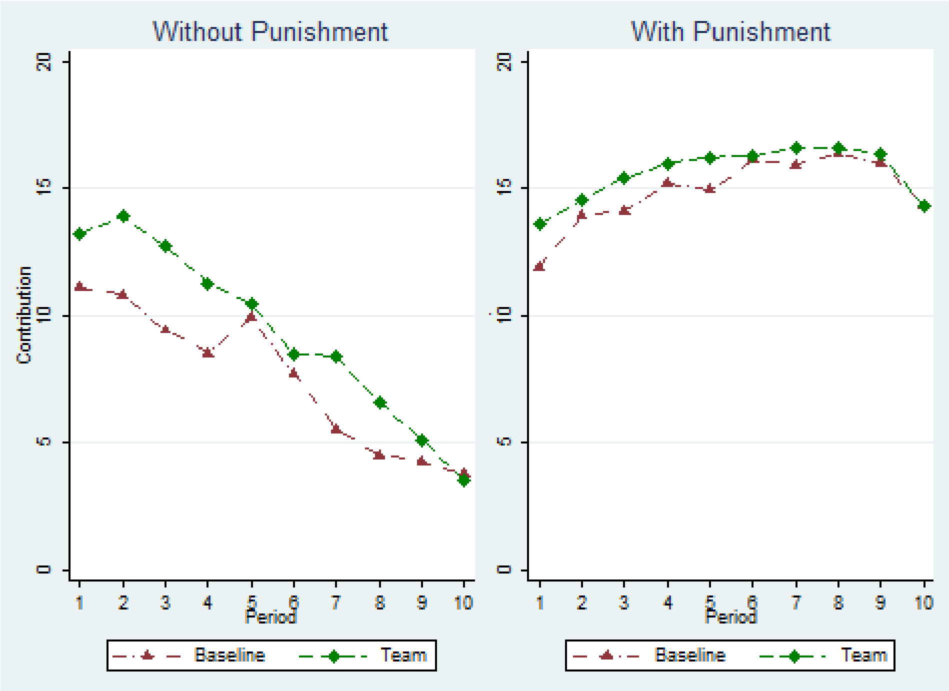
4.1 Comparing teams and individuals

H1: Teams contribute less.

First, we turn to the question of whether teams differ from individuals in terms of contributions. For this purpose, unanimity and majority decisions are uniformly treated as team decisions. Whether there are differences according to the decision rule will be discussed below.

Figure 1 depicts the average contribution for each round. The left panel refers to the treatments without a punishment option and the right panel to the treatments with punishment. The two panels exhibit well known properties in finite-horizon, repeated prisoner's dilemma games. Without punishment, cooperation erodes over time and contributions decline. With punishment, cooperation can be sustained (Fehr and Gächter 2000). Our focus is on the effects of team decisions. An initial inspection of the curves for teams and individuals suggests that teams contribute more. In contrast to other experiments, the formation of teams does not shift the outcome towards more selfish behavior.

Figure 1: Average Contributions in the Treatments with and without Punishment



This finding is corroborated by the regression analysis in Table 2 (columns 1 and 3). Without punishment, teams contribute significantly more than individuals. The effect is not only statistically but also economically significant. On average, teams contribute 20 percent more than individuals. The regression analysis also reveals that player type matters. We take the contribution from the 1-shot game in part I as an indicator of an individual's selfishness or other-regarding preferences. A low contribution indicates an orientation towards selfish behavior. In the case of teams, we calculate the average 1-shot contribution across the three team members. The variable "Contribution in 1-shot game" is highly significant in the treatment without punishment and falls just short of significance at the 10 percent level in the treatment with punishment. The economic effect is quite large. A 1-token increase in the contribution in the 1-shot game translates into a .8-token greater contribution in the repeated game.

In the discussion that follows, it will be important to bear in mind that team decisions only lead to additional contributions in cases where there is no punishment. With punishment, the team structure makes no difference.

Table 2: Regression Results

	Without Punishment		With Punishment		
	Contributions[a] (1)	Profits[a] (2)	Contributions[a] (3)	Punishment[b] (4)	Profits[a,c] (5)
Intercept	6.30*** (1.57)	23.85*** (1.05)	8.02* (4.25)		17.92*** (3.73)
Contribution in 1-shot game	0.80*** (0.13)	0.47*** (0.09)	0.64 (0.38)	-0.04** (0.02)	0.57 (0.35)
Period	-1.06*** (0.10)	-0.64*** (0.07)	0.21** (0.10)	-0.04*** (0.01)	0.27** (0.11)
Team	1.50* (0.87)	0.59 (0.55)	0.45 (1.80)		2.21 (1.87)
Majority				-0.18** (0.09)	
Unanimity				-0.33*** (0.09)	
N	300	300	300	300	300
(Pseudo-) R^2	0.51	0.43	0.09	0.03	0.11

***** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level, [a] OLS, [b] Tobit (marginal effects), [c] Profits net of punishment costs and punishment received.**

What are the possible explanations for this seemingly striking result that teams contribute more? One potential explanation is that the median team member's willingness to contribute is above the average willingness to contribute, and thus the distribution is skewed. In the majority treatment in particular, we expect that the median voter on the team would prevail. Suppose that the individual willingness to contribute of the three team members amounts to (0, 15, 15). Then, a majority vote would lead to a contribution of 15. If these three payers had participated in an individual treatment, we would have observed an average contribution of 10. Thus, with a skewed distribution, the formation of teams may increase contributions. To test whether such skewness could be responsible for our result, we consider each team player's contributions in the 1-shot game as a proxy for his/her willingness to contribute. There is slight skewness in the distribution, as the median contribution is 10 while the average is 9.3.

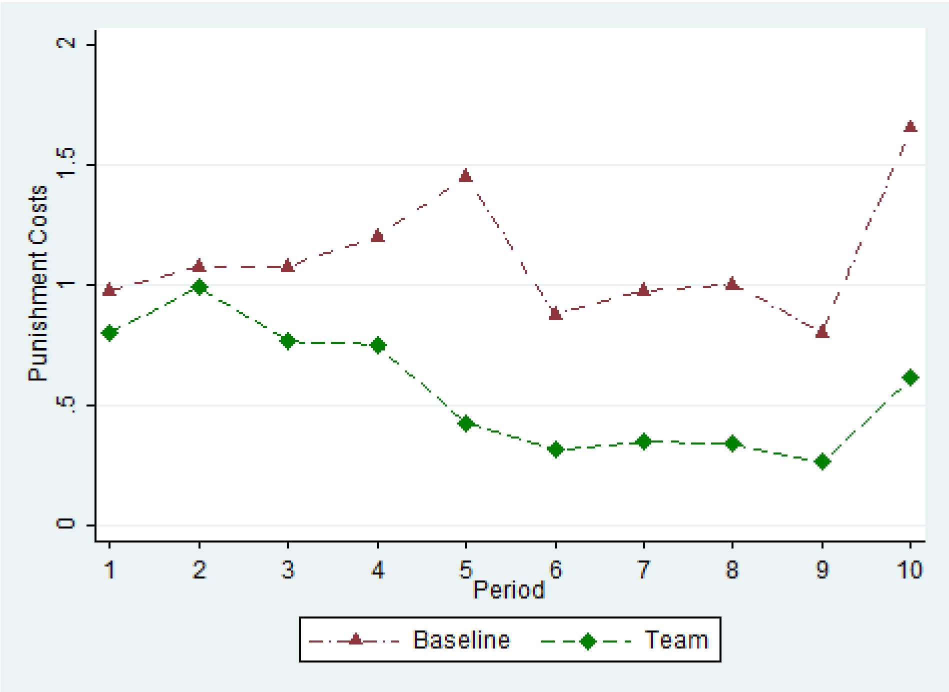
An alternative explanation is that team coordination triggers social conformity. It is a well-established result that a desire for social approval can increase cooperation among strangers (Rege and Telle 2004). In contrast to Rege and Telle's experiments, the identity of the player is not revealed to the others in our setting. However, the team members demonstrate their willingness to behave cooperatively to their fellow team members, and in contrast to individual treatments, this revelation has no immediate consequences for the payoffs. The weaker the link between one's own actions and the payoff, the more likely it is that individuals will behave according to social norms.[7] If this hypothesis has explanatory power, we should observe that players' initial proposals in team treatments are higher than their contributions in the one-shot game. There is strong evidence for this effect in the team decisions (without punishment): The average contribution in the one-shot game amounts to 9.3, as mentioned above. The average first proposal in the team setting, however, amounted to 12.3. In individual treatments, the average contribution in the first round (without punishment) was only 11.1. Thus, the team members signaled a much higher willingness to contribute to their team members compared to their individual contributions in the one-shot game and the first-round contribution in individual treatments. Despite the anonymity of individual players, social approval may have played a role in generating the larger contributions of teams.

H2: Teams punish less.

If teams exhibit a higher degree of rationality, we should observe less punishment in a team setting. Punishment is costly for the punisher and the punished. Independent of whether players are selfish or have other-regarding preferences, destroying resources should not be in the interest of a rational player. Figure 2 depicts the average punishment costs in the team and individual treatments for each period. The level of punishment remains nearly constant over time in the individual treatment and declines slightly in the team treatments. The striking finding here is the large difference in the levels of punishment imposed by teams and individuals.

[7] See Goodin and Roberts (1975) for the example of the "ethical voter".

Figure 2: Average Punishment Costs



Again, we explore this difference using regression analysis. Because of the left-censored data, a Tobit analysis was used, as is standard in the literature on punishment (Ambrus and Greiner 2012). The left-hand side variable is the average punishment cost incurred by the teams. Column 4 in Table 2 indicates that punishment was significantly less common in the majority and unanimity treatments than in individual decisions. Punishment was least common under unanimity rule. Note that, in general, the lower level of punishment imposed by teams is not due to reduced contributions that might in turn trigger punishment. Teams and individuals did not differ significantly in terms of contributions in the punishment treatment. As with contributions, the players' types matter. Higher contributions in the 1-shot game in part I are associated with reduced punishment. Players who are more inclined towards others and are less selfish are also less willing to punish others for free-riding.

H3: Teams yield lower payoffs in the absence of punishment but perform better in the presence of punishment

Next, we compare the (net) profits realized in the different treatments. The net profits of each team/individual are calculated by adding the returns from the public good to the retained tokens and then subtracting the costs of punishing and being punished. Figure 3 displays the average net profits over the 10 periods separately for the treatments without and with punishment (the left and right panels, respectively).

Overall, teams performed better. In the treatment without punishment, the team net profit curve is slightly above that of individuals. The improved performance is due to the higher contributions of teams. In the punishment treatment, the individual and team contributions did not differ. In this case the lower level of punishment imposed by teams leads to increased net profits. If we interpret the results in terms of economic welfare, teams generate higher welfare.

Figure 3: Net Profits

Again, we complement the investigation of net profits with regression analysis. Columns 2 and 5 in Table 2 indicate that the team dummy is positive but insignificant at conventional levels in both treatments. The regression also illustrates the already familiar pattern in the other variables. A higher contribution in the 1-shot game in part I led to higher net profits in the "no punishment" treatment.[8] In this treatment, profits declined over time, whereas net profits increased over time with the punishment option.

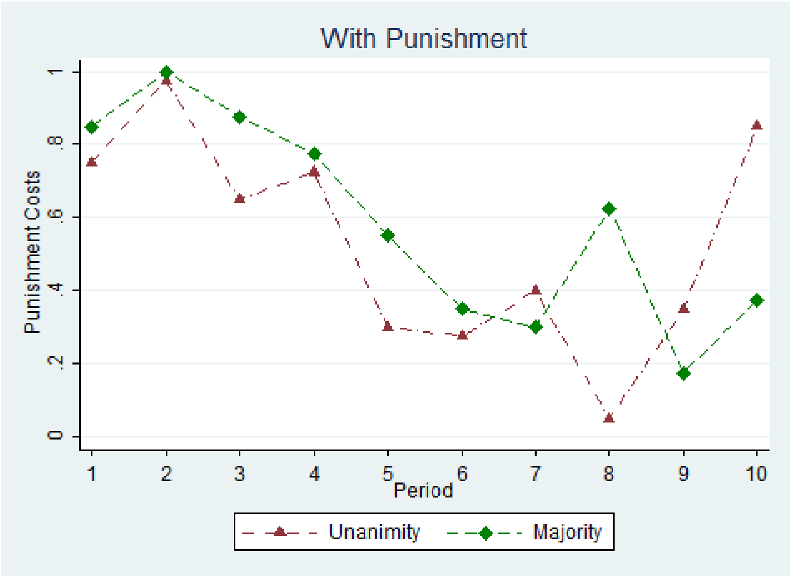
[8] Note that the "contributions in the 1-shot game" captures the average of the entire group. Thus, a group consisting of less selfish players generated higher profits, but this does not imply that a single individual/team gained from being less selfish.

4.2 Team decision process

H4: For a given level of team contributions, the punishment imposed by the other teams will be lower in the majority treatment than in the unanimity treatment.

We found that teams punish significantly less than individuals. The low number of coordination failures suggests that the complexity of reaching agreements does not drive this result. Rather, the lower level of punishment may be attributed to the higher degree of rationality in team decision-making. In addition, the type of decision-making process itself may matter. Individuals may be more reluctant to punish an anonymous and possibly heterogeneous group than individuals. If the other group consists of heterogeneous individuals, the punishment may harm individuals in the other group who sought higher contributions. In this case, we should observe more punishment under unanimous decision-making than in majority decisions, as no casual bystanders are present in the former case. Figure 4 separately depicts the punishment costs for the majority and unanimity treatments. According to the averages, the decision rule seems to make no difference. Punishment levels are of the same magnitude in the unanimity and majority treatments.

Figure 4: Punishment Costs in the Majority and Unanimity Treatments



H5: Teams deciding by majority rule reach decisions more rapidly than teams deciding by unanimity rule.

Overall, coordination was achieved fairly rapidly, as Figure 5 illustrates. Under majority rule, the teams required 1.6 and 1.3 rounds to reach a decision on average without and with punishment, respectively. Moreover, even in the much more complicated treatment with unanimity, 80 percent of teams reached agreement in 5 rounds or fewer. Here, the average number of rounds was 3.9 and 2.7 without or with punishment, respectively. One reason for the high coordination rate – despite the broad range of possible contributions from 0 to 20 – is certainly that there are clear focal points. Most participants suggested a contribution of 0, 10 or 20.

Figure 5: Average Number of Proposals Necessary to Reach an Agreement on the Contribution

5. Conclusions and Outlook

To our knowledge, this is the first paper to analyze team decisions in a public goods setting. The outcomes of our experimental study confirm some but not all of the results of previous studies on team decisions in other games. First, as in prior work, we also find that teams exhibit a higher degree of rationality. Teams punish significantly less than individuals; as punishment wastes the resources of the punisher and the punished, punishment is not a rational choice. Second, our results diverge from most other studies, in that teams do not behave in a manner more similar to game theoretic predictions. In contrast to our initial expectation and our working hypothesis, teams contribute more to the public good than individuals. Overall, teams outperformed individual players.

This study suggests several promising avenues for future research. First, we could only make an initial attempt to explain the strikingly high contributions of teams. A more elaborated setting would allow further hypotheses to be tested regarding the high level of cooperation observed in the team setting. Second, mixed treatments where individuals play against teams might be very fruitful in exploring the reasons for the divergent behavior reported here. For instance, we would like to know whether teams are less willing to punish or whether individuals find it more difficult to punish a team (rather than individuals). Third, we would like to study team coordination in greater detail. This will require allowing for controlled communication among team members. For instance, such a setting would help to gain a better understanding of the decision-making process under the requirements of unanimity.

References

Ambrus, Attila and Ben Greiner (2012): "Imperfect Public Monitoring with Costly Punishment – An Experimental Study", *American Economic Review*, forthcoming.

Barrett, Scott (2003): *Environment and Statecraft: The Strategy of Environmental Treaty-Making*, Oxford University Press, New York, 2003.

Blinder, Alan S. and John Morgan (2005): "Are Two Heads Better than One? Monetary Policy by Committee", *Journal of Money, Credit and Banking* 37(5), 789-811.

Bornstein, Gary, Tamar Kugler and Anthony Ziegelmeyer (2004): "Individual and Group Decisions in the Centipede Game: Are Groups More 'Rational' Players?", *Journal of Experimental Social Psychology* 40(5), 599-605.

Bornstein, Gary and Ilan Yaniv (1998): "Individual and Group Behavior in the Ultimatum Game: Are Groups More 'Rational' Players?", *Experimental Economics* 1(1), 101-108.

Cason, Timothy N. and Vai-Lam Mui (1997): "A Laboratory Study in Group Polarisation in the Team Dictator Game", *The Economic Journal* 107(444), 1465-1483.

Charness, Gary and Matthias Sutter (2012): "Groups Make Better Self-Interested Decisions", *Journal of Economic Perspectives* 26(3), 157–176.

Cox, James C. and Stephen C. Hayne (2006): "Barking Up the Right Tree: Are Small Groups Rational Agents?", *Experimental Economics* 2006(9), 209-222.

Fehr, Ernst and Simon Gächter (2000): "Cooperation and Punishment in Public Goods Experiments", *American Economic Review*, 90(4), 980-994.

Fischbacher, Urs (2007): “z-Tree: Zurich Toolbox for Ready-made Economic Experiments”, *Experimental Economics* 10(2), 171-178.

Fischbacher, Urs and Simon Gächter (2010): “Social Preferences, Beliefs, and the Dynamics of Free Riding in Public Goods Experiments“, *American Economic Review* 100(1), 541–556.

Gächter, Simon, Elke Renner and Martin Sefton (2008): “The Long-Run Benefits of Punishment”, *Science* 322, 1510.

Gillet, Joris, Arthur Schram and Joep Sonnemans (2009): “The Tragedy of the Commons Revisited: The Importance of Group Decision-making”, *Journal of Public Economics* 93, 785–797.

Goodin, Robert E. and Kevin W. S. Roberts (1975): “The Ethical Voter”, *American Political Science Review* 69(3), 926-928.

Greiner, Ben (2003) “An Online Recruitment System for Economic Experiments”. In: Kurt Kremer, Volker Macho (Eds.): *Forschung und wissenschaftliches Rechnen.* GWDG Bericht 63, Göttingen : Ges. für Wiss. Datenverarbeitung, 79-93.

Kerr, Norbert L. and R. Scott Tindale (2004): “Group Performance and Decision Making”, *Annual Review of Psychology* 55, 623-655.

Kocher, Martin G. and Matthias Sutter (2005): “The Decision Maker Matters: Individual versus Group Behaviour in Experimental Beauty-contest Games”, *The Economic Journal* 115, 200-223.

Kocher, Martin G. and Matthias Sutter (2007): “Individual versus Group Behavior and the Role of the Decision Making Procedure in Gift-Exchange Experiments”, *Empirica* 34, 63-88.

Kugler, Tamar, Gary Bornstein, Martin G. Kocher and Matthias Sutter (2007): “Trust Between Individuals and Groups: Groups are less Trusting than Individuals but just as Trustworthy”, *Journal of Economic Psychology* 28(6), 646-657.

Kugler, Tamar, Edgar E. Kausel and Martin G. Kocher (2012): *Are Groups more Rational than Individuals? A Review of Interactive Decision Making in Groups,* CESifo Working Papers, No. 3701, January 2012.

Ledyard, John O. (1997): “Public Goods: A Survey of Experimental Research”, in: Kagel, John H. and Alvin E. Roth (eds), *The Handbook of Experimental Research*, Princeton University Press, 1997.

Luhan, Wolfgang J., Martin G. Kocher and Matthias Sutter (2009): “Group Polarization in the Team Dictator Game Reconsidered”, *Experimental Economics* 12(1), 26-41.

Rege, Mari and Kjetil Telle (2004): “The Impact of Social Approval and Framing on Cooperation in Public Good Situations”, *Journal of Public Economics* 88, 1625-1644.

Robert, Christopher and Peter J. Carnevale (1997): “Group Choice in Ultimatum Bargaining”, *Organizational Behavior and Human Decision Processes* 72(2), 256-279.