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### Cooperation and social control

Bakker, Dieko Marnix

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# 1

Introduction and discussion

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## Why do we care about cooperation?

Many species of animals engage in cooperative behavior, ranging from mutually beneficial coexistence to active cooperation in the form of protection or grooming (Bowles & Gintis, 2011). However, the ubiquity of cooperation in human groups and our ability to sustain cooperation among non-kin are unique (Bowles & Gintis, 2011). Large-scale cooperation and a willingness to sacrifice (short-term) self-interest for (long-term) collective gains are central to our societies. We find examples of their importance in many areas of everyday life. On a global scale, cooperation between countries has led to treaties on environmental protection, disarmament, and developmental aid. On a local scale, we find neighbors jointly maintaining public areas, buyers and sellers engaging in mutually beneficial exchange, and prisoners refusing to testify against their accomplices.

Investigations into the nature of cooperative behavior are fascinating and evocative, in part because they connect to fundamental debates on human nature and the organization of society. What are the psychological motivations behind cooperative behavior? Is all cooperation fundamentally self-interested? Do we value other people's well-being? How do we create the conditions under which cooperation develops and can be sustained? When can we expect cooperation to be sustained if we let individuals act on their own interests, and when do we need governing bodies to monitor and direct individuals' actions?

When cooperative behavior results in a net benefit for each individual cooperator, or when cooperative behavior is confined to close family members, its existence does not appear to be much of a puzzle (Bowles & Gintis, 2011). A mutually beneficial exchange provides little incentive to be uncooperative, especially when uncooperative behavior precludes future exchanges of the same nature. Cooperation with close genetic relatives improves the chances that genes similar to your own survive, providing an evolutionary advantage to those predisposed to cooperate with close family members (Bowles & Gintis, 2011).

However, when we look around us, we find many examples of cooperation which is neither clearly self-interested nor directed at close genetic relatives. This type of cooperation concerns situations where individuals bear costs in order to provide a benefit to other individuals or to a group. In laboratory experiments with rules designed so that cooperative behavior is costly, cannot be reciprocated and provides benefits only to complete strangers, many people willingly contribute to the welfare of others (Bogaert, Boone, & Declerck, 2008; Fehr & Gintis, 2007). Outside of the laboratory, we find similar examples of cooperative behavior which is successfully

sustained over long periods of time despite temptations to cheat (Bowles & Gintis, 2011; Fehr & Leibbrandt, 2011; Elinor Ostrom, Walker, & Gardner, 1992). It is this type of cooperation which is particularly interesting, because despite its importance to many areas of social life, and despite its relative prevalence, it is all but self-evident.

### **Why successful cooperation is not self-evident: social dilemmas**

As evidenced by the existence of wars, thieves, and cheaters, cooperation can break down. When individuals have to cooperate toward a collective end, the situation is often characterized by a tension between individual and collective interests (Dawes, 1980; Kollock, 1998; Olson, 1965). The fact that individual sacrifices are required to further the collective good leads to situations in which the collective outcome could be improved, but no single individual is sufficiently motivated to bring about this improvement. Situations which satisfy these characteristics are known as social dilemmas (Dawes, 1980; Kollock, 1998). Cooperation in social dilemmas is not trivially achieved since each individual involved in the situation is tempted to take advantage of the cooperative behavior of others while not behaving cooperatively themselves. This problem is particularly relevant to the production of public goods: collectively beneficial outcomes which depend on the contributions of a number of individuals, and from which non-contributors cannot be excluded. Imagine, for example, the building of a levee to protect a city from the sea. The levee benefits all inhabitants of the city, even if they did not contribute to its construction. Rational selfishness predicts that in the absence of additional social or institutional mechanisms groups will fail to supply such public goods at a collectively desirable level (Olson, 1965).

Many societal problems and familiar social situations fit the definition of a social dilemma. Most will have experienced the difficulties of group work. Inevitably, some group members refuse to pull their weight, preferring to 'free ride' on the hard work of others. On a societal scale, climate change, environmental pollution and the failure to maintain a valuable community resource are typical examples of a lack of cooperation in a social dilemma (Bouma, Bulte, & van Soest, 2008; Hardin, 1968).

Despite these difficulties, cooperation problems are in fact frequently solved (Balliet, Parks, & Joireman, 2009; Kollock, 1998; Elinor Ostrom, 1990; Van Lange, Balliet, Parks, & Van Vugt, 2014). Examples include mass protests to overthrow an oppressive regime (Opp, Voss, & Gern, 1995), effective lobbying associations (Marwell & Oliver, 1993), Wikipedia (Anthony, Smith, & Williamson, 2009), or successful 'self-managing teams' in the workplace (Barker, 1993). Clearly, successful cooperation in social dilemmas is neither self-evident nor impossible. The social scientist's challenge,

then, is to identify the necessary and sufficient conditions for cooperation to develop and be sustained.

## THE FOUR TYPES OF FACTORS THAT INFLUENCE SUCCESSFUL COOPERATION

Fortunately, significant progress has already been made towards the identification of factors relevant to cooperation in social dilemmas. Four broad categories of factors can be distinguished. The first concerns the personal characteristics of the individuals involved in the social dilemma. A person's personality traits, resources, previous experience and beliefs about others all predict whether this person behaves cooperatively. The second concerns the composition and structure of the social group involved in the social dilemma. The interaction between different individuals, who each bring their unique combination of characteristics to the table, influences individual behavior and collective outcomes in sometimes unexpected ways. The third category of factors consists of institutions which govern behavior in the social group. Formal rules, informal norms, and the sanctions which result from them can guide individual behavior toward (or away from) collectively desirable outcomes. Finally, the place of the social group within the broader social structure of a society or organization must be taken into account. Solving a social dilemma in one group can have significant consequences for members of another group, and interdependence between various social groups complicates the decision problems involved in a social dilemma. To each of these categories, I will now devote some more attention, as each category is represented in the chapters of this dissertation. The focus of the dissertation as a whole will be on social control, which is most obviously influenced by the institutions in a group which govern the monitoring and sanctioning of other group members. However, as we will see, the other categories also influence a group's ability or willingness to exercise social control.

### 1. Personal characteristics

A number of personal characteristics influence cooperative behavior. First of all, the resources an individual possesses determine to what extent they can make a valuable contribution to the solution of a social dilemma. Individuals who believe that their cooperative behavior improves the chances of reaching some collectively desirable outcome are more likely to behave cooperatively (Kerr, 1996). The extent to which a person believes their contribution to be valuable is called this person's efficacy (Kerr, 1996). This concept is not only useful in explaining why individuals sometimes do not contribute to collectively beneficial projects (because compared to the overall effort

involved their contribution is minuscule; Kerr, 1989; Olson, 1965) but also in explaining why some individuals cooperate and others do not (Kerr, 1996). Imagine neighbors jointly organizing a street barbeque, and asking for people to participate in an organizing committee. Those who feel like they have a lot to contribute to the success of this joint venture, perhaps because they have a close connection to the local butcher or because they own some of the necessary equipment, are likely to sign up while those who can only make minor contributions tend not to get involved. In addition to a person's material resources, their knowledge of the social context plays a crucial role in such decisions (Dijkstra & Bakker, 2017; Dijkstra & Oude Mulders, 2014). A person's beliefs about the resources and the behavior of others influences how important they expect their own contribution to be. Relatively minor contributions may be decisive given the right social context, such as when a small political party is crucial to the formation of a coalition government (Dijkstra & Bakker, 2017). Both an individual's material resources and their beliefs about the social environment thus influence cooperative behavior.

Meanwhile, there is also evidence for psychological predispositions towards cooperative behavior which are stable across different contexts (Au & Kwong, 2004; Bowles & Gintis, 2011; Peysakhovich, Nowak, & Rand, 2014; Van Lange, Balliet, et al., 2014; Van Lange, Bekkers, Schuyt, & Van Vugt, 2007), and for the existence of strong reciprocators: individuals inclined to cooperate with others and punish those who do not cooperate (Fehr & Gächter, 2002; Fehr & Gintis, 2007; Simpson & Willer, 2015). Evolutionary models describe the conditions under which such cooperative predispositions can develop and persist (Bowles & Gintis, 2004, 2011; Kurzban, Burton-Chellew, & West, 2015). The prevalence of cooperative dispositions differs between personality types (Van der Zee & Perugini, 2006), countries (Henrich et al., 2001; Herrmann, Thöni, & Gächter, 2008) and social groups (Frey & Meier, 2003; Marwell & Ames, 1981; Van Lange, Otten, De Bruin, & Joireman, 1997).

One of the most frequently studied psychological traits in research on social dilemmas is Social Value Orientation (SVO) (Au & Kwong, 2004; Van Lange, Joireman, Parks, & Van Dijk, 2013). Measures of SVO distinguish between several orientations, each determined by the weight individuals place on their own interests relative to the interests of others (Messick & McClintock, 1968). Most commonly, individuals are classified as altruistic, cooperative, individualistic or competitive (Au & Kwong, 2004; Bogaert et al., 2008; Murphy & Ackermann, 2012). A person's SVO predicts behavior in social dilemmas, both in experimental contexts (Au & Kwong, 2004; Balliet et al., 2009; De Cremer & Van Lange, 2001; Dijkstra & Bakker, 2017; Kanagaretnam,

Mestelman, Nainar, & Shehata, 2009; Murphy, Ackermann, & Handgraaf, 2011; Van Lange et al., 2013) and in practical contexts such as volunteering (Pletzer et al., 2018), donating to noble causes (Van Lange et al., 2007) or engaging in pro-environmental behavior (Van Vugt, Van Lange, & Meertens, 1996).

## 2. The composition of and social structure within a group

As sociologists are well aware, social phenomena cannot usually be explained directly based on the traits and behavior of individuals. Individual behaviors interact, in complex and sometimes unexpected ways, to produce outcomes on a collective level (Coleman, 1990; Hedstrom, 2005). In social dilemmas, in particular, decisions made by one person inherently affect the outcomes experienced by others.

One aspect of the complex interaction between individuals is the social structure within a group, which partly governs the ways in which the individuals involved can interact. Social relations between individuals involved in a social dilemma can promote cooperation through the prospect of repeated interaction (Axelrod, 1984; Flache, 2002; Wittek & Bekkers, 2015) and influence which individuals cooperate (Baldassarri, 2015; Bramoullé & Kranton, 2007). The social structure of the group also constrains individuals' ability to accurately monitor the behavior of other group members, which is crucial for the enforcement of cooperative behavior (Grechenig, Nicklisch, & Thöni, 2010; Hechter, 1987).

Another important aspect is the composition of the group involved in a social dilemma, in terms of personalities, social identities (Smith, 2011), interests (Heckathorn, 1993; Reuben & Riedl, 2013), norms (Reuben & Riedl, 2013; Winter, Rauhut, & Helbing, 2012), and resources (Dijkstra & Bakker, 2017; Dijkstra & Oude Mulders, 2014; Reuben & Riedl, 2013).

## 3. Institutions

Institutions are formal rules and informal norms and conventions which govern social interaction (Bicchieri, 2005; North, 1991). In the context of social dilemmas, several types of institutions effectively promote cooperative behavior. First, there are institutions which help the individuals involved coordinate on and commit to a collectively approved strategy. Allowing groups faced with a social dilemma to communicate among themselves before each individual decides how to behave tends to promote cooperative behavior, even when any agreements made during this communication cannot be enforced (Balliet, 2010; Liebrand, 1984; Elinor Ostrom et al., 1992). Second, institutions determine the ways in which and the extent to which



groups can attach consequences to behavior. Reputation systems make it possible to avoid interacting with those who displayed uncooperative behavior in the past. Those who behave cooperatively are rewarded with status (Willer, 2009), trust (Diekmann, Jann, Przepiorka, & Wehrli, 2014; Fehrler & Przepiorka, 2016), and more cooperation (Diekmann et al., 2014; Willer, 2009). Sanctioning systems allow the distribution of rewards (e.g. Flache, 1996; Van Miltenburg, Buskens, Barrera, & Raub, 2014), punishments (e.g. Bowles, Boyd, Mathew, & Richerson, 2012; Chaudhuri, 2011; Fehr & Gächter, 2002), or both (e.g. Rand, Dreber, Ellingsen, Fudenberg, & Nowak, 2009). Rewards are usually directed at those who exhibit cooperative behavior, while punishments tend to be directed at uncooperative individuals, thus incentivizing cooperative behavior (Balliet, Mulder, & Van Lange, 2011; Van Lange, Rockenbach, & Yamagishi, 2014).

#### **4. Broader social structure**

Finally, the success and failure of cooperation in social dilemmas depend on the broader social structure in which groups are embedded. While social dilemmas tend to take place within one social group, the impact of the successful solution of this dilemma frequently extends beyond group boundaries. First, successful cooperation in one group may result in positive or negative externalities for other groups. This is perhaps most noticeable in situations of intergroup competition (Abbink, Brandts, Herrmann, & Orzen, 2010; Bornstein, 2003; Mäs & Dijkstra, 2014). Countries at war, sports teams competing for a trophy and political parties competing for political power all depend on a collaborative effort by their members for their success, and their success is detrimental to other groups. More positively, a community's joint effort to prevent pollution of the local surface water may be intended to make the local lakes suitable for fishing, but also has positive effects on water quality in other areas downstream.

Second, the individuals who compose a social group are likely to also be involved in other groups, which experience their own social dilemmas. Multiple groups can be interconnected in a variety of ways, from minimal overlap in the form of a single shared member to hierarchical structures in which an overarching group is composed of several subgroups which may themselves be interconnected. Individuals on the intersection of multiple groups are faced with difficult decisions when experiencing competing demands. For example, professors experience demands from coauthors who want them to work on joint research projects, while they are also expected to cooperate with other colleagues on the development of a course.

In each group, individuals may be faced with social dilemmas. Successful solutions to the social dilemma in one group affect other groups' abilities to solve their own dilemmas, either because the groups have contradictory interests or because solving the social dilemma in one group required an investment of resources which can now no longer be used in other groups. A professor's time is finite, and any time invested in research projects can no longer be spent on teaching tasks.

The existence of such competing demands, and their importance in social dilemma-like situations has been known for many years (Killian, 1952; Stouffer, 1949). Georg Simmel (Simmel, 1908) considered the shift from concentric circles (in which multiple memberships are nested, as in a close-knit village to which a person's whole life is confined) to intersecting circles (in which multiple memberships are more diverse and individualized) a defining feature of the development of societies. Robert Merton (1957) wrote extensively on role conflicts, a concept which describes very similar competing pressures on an individual (although it does not imply multiple group membership). Overlap in group membership has also been noted as a challenge (Ashforth & Mael, 1989; Williams, 2001) and an opportunity (Lau & Murnighan, 2005; Mäs, Flache, Takács, & Jehn, 2013; Milliken & Martins, 1996; O'Leary, Woolley, & Mortensen, 2011) for organizations.

## IN THIS DISSERTATION

Central to this dissertation is the theme of social control. In the presence of tension between individual and collective interests, a group's ability to exert social control on its members is crucial to ensuring collectively desirable outcomes (Hechter, 1987). The four categories of factors discussed above all influence a group's ability to exercise social control. Three chapters of this dissertation study group-level differences in these factors, which influence the group's ability to enforce cooperative behavior. One chapter, the second, investigates a personal characteristic which informs theories about individual behavior in social dilemmas, on which any theory of social control must ultimately be based.

### Chapter Two: Comparing three measures of Social Value Orientation

In this second chapter, I compare three different measures of Social Value Orientation. As previously noted, SVO predicts behavior and expectations in social dilemmas in experimental and practical contexts (Au & Kwong, 2004; Pletzer et al., 2018). Social Value Orientation is part of the micro foundation for a sociological theory of behavior in social dilemma situations (Coleman, 1990; Raub, Buskens, & van Assen, 2011),

partly explaining how individuals act when faced with a choice between individual and collective interests. Accurate measurement of individuals' Social Value Orientation is thus crucial to our understanding of cooperative behavior. There are a number of approaches to measuring SVO, one of which has been introduced relatively recently. I systematically compare the three most common measures: the 9-item triple dominance measure, the ring measure and the slider measure (Au & Kwong, 2004; Murphy & Ackermann, 2012; Murphy et al., 2011; Pletzer et al., 2018). My co-authors and I look first at theoretical properties of the three measures, such as how fine-grained each measure is and how well each measure manages to exclude invalid responses. We also compare each measure in an empirical longitudinal study, judging to what extent the three measures are consistent with each other and how stable each measure is over time.

We find that there are substantial differences between the three measures, both in how sensitive they are to invalid responses and in how they classify the same individuals. One of the main conclusions we draw is that Social Value Orientations should be assessed on a continuous scale as much as possible, rather than classifying individuals into predetermined categories. We find that there is a lot of variation between individuals classified within the same category and that many individuals do not fit the stereotypical patterns of any categorical SVO type. This finding supports recent calls in the literature to move towards continuous measures of SVO (Murphy & Ackermann, 2012; Murphy et al., 2011; Pletzer et al., 2018). Based on our comparison of the three measures, we recommend the slider measure (Murphy et al., 2011) as the most suitable way to measure SVO among the currently available measures. The slider measure is relatively simple, has the highest test-retest reliability and can be used as a continuous scale. One caveat is that the slider measure is not the most effective at excluding invalid responses. If many invalid responses can be expected, the 9-item triple dominance measure may be more suitable.

### **Chapters Three through Five: Social control**

Chapters three through five focus on groups' ability to exercise social control. Effective social control is often essential to the solution of social dilemmas. Collectively undesirable behavior is often individually rewarding and therefore tempting. When such undesirable behavior is not kept under control it has a tendency to spread (Cialdini, Reno, & Kallgren, 1990; Mäs & Opp, 2016). Effective social control, influencing and controlling the behavior of group members, requires monitoring of group members' behavior and an ability to distribute effective sanctions encouraging

or discouraging certain actions (Hechter, 1987). In chapters three and four, we experimentally investigate different sanctioning systems which may influence a group's ability to enforce collectively beneficial behavior. In chapter five, we experimentally investigate how the group's embeddedness in a broader social environment impacts the group's ability to monitor its members.

### **Chapter Three: Oppositional control in ongoing social relations under a peer punishment institution**

Central to the third chapter is the replication and extension of a prominent article from the literature which called into question the effectiveness of peer punishment. In many laboratory experiments, sanctioning systems which allow individual group members to punish each other have proved to be very effective at promoting cooperative behavior in social dilemmas (Chaudhuri, 2011). These so-called peer punishment systems allow members of a group to distribute punishments to other group members, at a cost to themselves (Guala, 2012; Elinor Ostrom, 2000). Nikiforakis (2008) argued that laboratory studies of peer punishment at the time omitted an important aspect of social interactions which has the potential to make peer punishment systems entirely ineffective. This argument was motivated in part by the observation that while peer punishment is very effective in the lab, sanctioning systems based on costly punishment distributed by individuals are rare (Guala, 2012; Ostrom, 2000; Simpson & Willer, 2015), though not entirely nonexistent (Mathew & Boyd, 2011; Wiessner, 2005), in real-world groups. According to Nikiforakis (2008), the ability to retaliate against punishers might discourage peer punishment so effectively that groups are no longer able to sustain cooperative behavior. Retaliation against peer punishment, which is a form of oppositional control, is frequently possible in real-world groups, but not in laboratory experiments which showed a strong positive impact of peer punishment (Nikiforakis, 2008).

In the third chapter of this thesis, we extend Nikiforakis' (2008) argument on the embeddedness of punishment in ongoing social interactions. We argue that if peer punishment is subject to (negative) responses in an ongoing interaction, the same is likely to be true for retaliation. Given a long-term continued social interaction, the incidence and effectiveness of retaliation might itself be limited by the expectation of future consequences, thus restoring the effectiveness of the peer punishment system. The chapter starts by replicating Nikiforakis' (2008) original experiment and then continues into an extension of this design in which decisions are increasingly embedded in ongoing interactions.

The results from this chapter contradict Nikiforakis' (2008) findings. Contrary to expectations, we find that the possibility of retaliation does not negatively impact the effectiveness of peer punishment, even when retaliation is not itself vulnerable to future consequences. We are able to replicate important steps in the proposed mechanism, finding that retaliation occurs frequently and finding that peer punishment is discouraged by retaliation, but find that the decrease in punishment does not affect contributions.

As a possible explanation for this difference in outcomes, we propose a difference in the composition of the groups in our experiment compared to those involved in Nikiforakis' (2008) study. Retaliation may discourage punishment, but if there are many willing punishers in a social group, high levels of cooperation may be sustained even if some punishers are discouraged. Meanwhile, if there are relatively few willing punishers in a group so that the peer punishment system is only just powerful enough to enforce cooperative behavior, a small amount of discouragement may cause the system to break down entirely. We observe that even in the first round of all treatments, when participants could not have exerted influence on each other yet, there is more cooperative behavior in our sample than in Nikiforakis' (2008) sample. This may be an indication that the balance between individuals inclined to cooperative behavior and individuals not so inclined is different in the two samples. It may well be that, in our study, the relatively small proportion of free riders could be effectively sanctioned despite the presence of retaliation and the subsequent decrease in punishment.

The findings from the third chapter of this thesis illustrate the interaction between characteristics of different individuals, as well as an interaction between the composition of the social group and the institutions applied to guide behavior in this group. Persons who are willing to punish non-cooperative others depend on the presence of sufficient numbers of like-minded individuals to make these punishments effective (Heckathorn, 1989; Yamagishi, 1986). The effectiveness of an institution designed to encourage cooperative behavior similarly depends on the composition of the social group, especially when the implementation of this institution relies on the actions of individuals who compose this group.

#### **Chapter Four: Compliant and oppositional control under peer punishment and institutional punishment institutions**

The fourth chapter of this thesis investigates two alternative institutions, both of which implement a sanctioning system. In the third chapter of this thesis, discussed

previously, we already investigated one possible cause for the relative rarity of peer punishment in real-world groups, namely the possibility of retaliation. Another part of an explanation for the rarity of peer punishment institutions may be that there are other more effective, more efficient, or more resilient institutions available which are preferred to peer punishment. In this fourth chapter, we compare peer punishment to institutional punishment: punishment distributed by designated authorities, in an objective manner, in accordance with predetermined criteria for punishable behavior. In particular, we investigate the idea that institutional punishment is more resilient than peer punishment because it is considered to be more legitimate and it is less vulnerable to the possibility of oppositional control.

Peer punishment systems generally allow more opportunities for oppositional control than institutional punishment systems. For example, institutional punishment systems are less personal than peer punishment systems, limiting opportunities for retaliation. Oppositional control in the case of institutional punishment involves decreasing the ability of the institution to effectively exert control. However, even assuming equal opportunities for oppositional control, we expect less oppositional control to be exercised in institutional punishment systems because institutional punishments are likely to be seen as more legitimate.

The legitimacy of compliant control influences how likely recipients of sanctions are to change their behavior (Baldassarri & Grossman, 2011), and likely also influences the extent to which group members decide to exercise oppositional control. The legitimacy of punishment depends, among other things, on the extent to which compliant control is collectivized (Strimling & Eriksson, 2014) and on the basis from which punishers derive their authority (Baldassarri & Grossman, 2011; Grossman & Baldassarri, 2012). Institutional punishment systems are likely to be considered more legitimate than peer punishments, because of key differences between the two types of institutions.

We find that under the most favorable circumstances a peer punishment institution results in more cooperative behavior than an institutional punishment institution. However, when the effectiveness of punishment institutions can be undermined by oppositional control, institutional punishment proves more resilient than peer punishment. In addition, receiving punishment from a punishment institution has a greater positive effect on contributions than does receiving punishment from a fellow group member. The outcomes of the present study appear to support the importance of legitimacy in explaining differences between the two sanctioning systems.

## Chapter Five: Social dilemma with multiple-group membership

The fifth chapter of this thesis investigates an important complicating factor in groups' ability to exercise social control. Groups experiencing a social dilemma cannot be considered isolated social environments. In reality, group members will be members of many different social circles, each placing demands on group members' resources. This does not only create conditions under which multiple groups may be in competition with each other, but it also makes it more difficult for groups to accurately monitor and sanction their members' behavior. Multiple group membership has not been studied in recent research on social dilemmas. In the fifth chapter of this thesis, we take a first step in investigating social control in social dilemmas with multiple group membership. Social dilemmas involving multiple groups, where individuals are members of multiple groups, will form their own field of research with distinct questions, theories, and experimental designs. However, this field should not be entirely disconnected from existing research on one-group social dilemmas. Rather, we may start by applying findings, theories, and assumptions from existing research on social dilemmas to this new situation. In doing so, we test the limits of existing theories and learn about the applicability of our current knowledge to a more complex social environment. In the fifth chapter, we illustrate this by investigating the extent to which findings on the monitoring of free-riders can be replicated in situation with multiple group membership. We introduce a new experimental design which extends a typical social dilemma (a public good game) to incorporate multiple group membership and develop a sanctioning system which is effective and convenient under these new conditions.

In research on single-group social dilemmas, imperfect monitoring of fellow group members has been shown to hinder the effective distribution of sanctions (Fischer, Grechenig, & Meier, 2016; Grechenig et al., 2010; Van Miltenburg, Przepiorka, & Buskens, 2017) by making it difficult to identify non-cooperative group members. It has been suggested that group members hesitate to distribute punishment when they cannot accurately assess the behavior and intentions of others (Bornstein & Weisel, 2010; Patel, Cartwright, & Van Vugt, 2010; Van Miltenburg et al., 2017). This is consistent with the finding that punishments can be motivated by anger towards uncooperative individuals (Fehr & Gächter, 2002; Gintis, 2000), and that the punisher's judgment of the other's intentions matters (Falk, Fehr, & Fischbacher, 2008).

In a one-group social dilemma, this inability to accurately judge others' intentions from their displayed behavior is usually implemented as noise: random

'errors' in behavior or in how one's behavior is displayed to other group members (Van Miltenburg et al., 2017). When multiple groups with shared members are involved, one major reason why information on the intentions of others is incomplete is that their behavior in other groups is relevant to judge those intentions but difficult to observe. Uncooperative behavior may reflect uncooperative intentions (e.g. staff members not showing up to a meeting because they would rather not attend) or it may reflect cooperative intentions constrained by the competing demands of another group (e.g. staff members not showing up to a meeting because they have a previously scheduled meeting in another department) (Patel et al., 2010). Crucially, judging intentions from behavior is only difficult when the multiple groups place competing demands on the individuals involved. When individuals are involved in multiple groups, but it is common knowledge that cooperative individuals can completely satisfy the demands of both groups, uncooperative behavior clearly reflects uncooperative intentions.

We find some evidence that group members refrain from punishing when apparently uncooperative behavior may represent cooperative behavior in another group. However, this effect is relatively small and does not lead to a decrease in the total amount of cooperative behavior observed. What is perhaps more interesting, we find that when the interests of multiple groups are in conflict tacit coordination emerges at levels of cooperation which are sustainable in each group and result in a mostly equal division of resources across groups. These results illustrate how the applicability of knowledge gathered in studies on isolated social dilemmas may not be applicable to groups which are embedded in a broader social environment. It appears that imperfect monitoring as a result of noise and imperfect monitoring with origins in the social structure in which a group is embedded may not have the same effects on behavior in social dilemmas. Exploring the origins of these different effects may be an interesting topic for future studies.

Apart from testing the limits of our existing knowledge, and improving the external validity of research on social dilemmas, studies which take into account a broader social structure with multiple group membership can also test new hypotheses and connect to other fields. There are open questions which relate specifically to situations in which multiple groups intersect. For instance, when groups compete for an individual's resources, what determines which group wins out? Are individuals able to sustain membership in groups with competing interests? How do people reconcile competing demands? There are many apparent opportunities for research in these directions.



## CONCLUSIONS

The four chapters of this dissertation show the diversity of factors influencing outcomes of social dilemmas. The chapters show individual differences, point to the relevance of the composition of groups involved in a social dilemma, and show the impact of a group's ability to monitor and sanction its members on successful cooperation.

From chapter two, we learned the extent to which a person is inclined towards cooperative behavior differs strongly between individuals. As theories about individual behavior often form a crucial step in explanations of social phenomena (Coleman, 1990; Raub et al., 2011), accurate measurement of these individual tendencies is important when predicting and explaining social dilemma behavior.

From chapter three, we learned, first of all, the potential vulnerability of peer punishment systems to retaliation. Opportunities to retaliate against punishers are frequently used and in the presence of retaliation the use of sanctions to enforce collectively beneficial behavior declines. However, chapter three also shows that this vulnerability does not necessarily render the sanctioning system ineffective. We speculate that the composition of the group in terms of cooperatively inclined and uncooperatively inclined individuals is one of the relevant factors determining whether opportunities to retaliate result in the breakdown of cooperation under peer sanctioning systems.

From chapter four, we learned that an institutional punishment system may be less vulnerable to retaliation (or, more generally, oppositional control) than a peer punishment system. In chapter four we do observe that the possibility of retaliation results in a lower level of cooperative behavior in a peer punishment system, while opportunities for oppositional control do not appear to have an impact on the effectiveness of an institutional punishment system. Notably, cooperation rates are higher under the peer punishment system than under the institutional punishment system if oppositional control is not possible.

From chapter five, we learned that the broader social structure in which a group is embedded the group's ability to monitor the behavior of other group members. Specifically, we investigated a situation where every group member also has obligations to another group and there is no other overlap in group membership. Under these conditions, groups have no information on the behavior of their members in other groups, which reduces the group's ability to assess the intentions behind their members' behavior. We find that under these conditions very low contributions are less likely to be punished than when group members have no conflicting obligations,

presumably because low contributions may indicate free-riding but may also indicate very high contributions given to another group. Generally, we showed that groups' embeddedness in a broader social environment is relevant to behavior in social dilemmas.

Looking back on this discussion of the many factors involved in the success and failure of cooperation, the social scientist's challenge to identify the necessary and sufficient conditions for sustained cooperation may seem daunting. Successful cooperation required the right characteristics to be present in the individuals involved, the right composition and social structure for the group in which they cooperate, the right institutions to encourage cooperative behavior, and a social environment around the group which does not constrain group members' behavior. To make matters even more complicated, factors from each of these categories may interact. In the third chapter of this thesis, for example, we see how the effectiveness of a sanctioning institution may depend on the distribution of social preferences within the group. In other studies, we have seen how behavior in social dilemmas depends on the cultural context (Henrich et al., 2001; Herrmann et al., 2008) and on the framing of the situation (Andreoni, 1995; Fleishman, 1988). As we expand research on social dilemmas into increasingly realistic but also increasingly diverse situations, as for example in the fifth chapter of this thesis and in various field experiments (e.g. Balafoutas & Nikiforakis, 2012; Baldassarri & Grossman, 2011; Englmaier & Gebhardt, 2016; Fehr & Leibbrandt, 2011; Kraft-Todd, Yoeli, Bhanot, & Rand, 2015; Noussair, van Soest, & Stoop, 2015; Winking & Mizer, 2013), we find the relative importance of different factors to be strongly dependent on the specifics of the situation.

### What's next?

Where, then, do we go from here? Well, there is a lot left to do. We can continue on the established paths and discover more about the factors which determine whether cooperation succeeds and can be sustained. For example, we can investigate more thoroughly the advantages and disadvantages of various institutions intended to promote cooperative behavior, and the conditions under which different institutions are favored. There are many opportunities to expand our knowledge, especially regarding the broader social structure in which groups are embedded. The chapters of this dissertation are devoted to studies of what my coauthors and I believe to be interesting questions along this path.

However, definitive answers about the 'right' conditions for solving social dilemmas are elusive, given the many factors involved and the even more numerous

ways in which they interact. Continuing to work along the many, often unconnected, strands of research currently established adds more factors which can matter but gives little guidance as to their relative importance or the scope of their applicability. Attempting to compare and reconcile the available literature means having to align different theoretical paradigms and conceptualizations of factors, which is a difficult task in itself. Studying such an integrated framework experimentally leads to practical difficulties (an experiment can only have so many different treatments). Attempting to construct a unified theory of social dilemma behavior seems unlikely to lead to accurate predictions for any but the most abstract situations.

There are, therefore, several reasons to complement this fundamental research with attempts to solve practical problems. Extensive knowledge is already available on cooperation in social dilemmas, both in laboratory experiments (Chaudhuri, 2011) and in the field (Kraft-Todd et al., 2015). The field of social dilemmas seems to offer plenty of opportunities for practical applications, of which there have so far been very few. First, social dilemmas are common and recognizable, and there is likely to be interest in their solution. Not only do major societal problems such as climate change and resource depletion (e.g. Hardin, 1968) fit the criteria of social dilemmas, similar problems occur on a smaller scale in many organizations. Organizations have strong incentives to resolve social dilemmas in the workplace, as a breakdown in cooperation has clear negative effects on productivity (Cohen & Bailey, 1997; Hamilton, Nickerson, & Owan, 2003; Petersen, 1992). Fundamental research can directly inform investigations into practical problems. For example, when attempting to tackle problems of stress and burnout among employees and students, it seems important to recognize the existence of competing demands from the multitude of groups of which these individuals are members (e.g. Chapter 5; Stouffer, 1949) This creates opportunities for industry-academia partnerships.

Second, social dilemmas are not trivially solved (e.g. Kollock, 1998). As is evidenced by previously given examples of unsuccessful cooperation, and by the myriad of potential factors involved, and by the fact that research on social dilemmas (including this thesis) often produces unexpected results, solving social dilemmas is sufficiently difficult to justify a genuinely scientific approach (Watts, 2017). Finally, while social dilemmas are not trivially solved, it is likely that small-scale social dilemmas can be solved with carefully designed interventions. Many social dilemmas are not so complicated as to require a complete understanding of society (Watts, 2017). Nor do all social dilemmas play out on so large a scale that implementing a solution is impractical. Designing solutions for social dilemmas which play out on a

global scale may not be feasible (yet), but many social dilemmas take place in relatively simple social environments. Teams of co-workers, or students working together on a research project, are often relatively small in scale, operate under clearly defined rules to generate outcomes which can be objectively evaluated, and are situated in a well-defined social structure with relatively few outside influences. The crucial difficulty in developing generally applicable solutions to social dilemmas and broadly-targeted interventions to encourage cooperative behavior is that their effectiveness may differ strongly between groups. Targeting a specific group means carefully investigating the conditions under which the social dilemma takes place, identifying which factors strongly influence behavior under those conditions, selecting factors which can feasibly be changed given the structural and institutional constraints applicable to the group and targeting these factors.

Providing practical solutions to problems in these relatively simple and well-defined environments can be a stepping stone towards the solution of larger societal problems (Watts, 2017). Not only is this a valuable endeavor in itself, but in attempting to solve practical problems we may also discover more about the relative importance of the many potentially influential factors identified by fundamental research (Watts, 2017). By cataloging the contents and effectiveness of practical solutions to social dilemma problems, we may get a better picture of which factors are relevant in nearly all groups and which are highly situational. Hopefully, opening up this second avenue of exploration can add significantly to the field of social dilemma research.

