



Universiteit
Leiden
The Netherlands

Uncertainty in social dilemmas

Kwaadsteniet, E.W. de

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Group size uncertainty

Chapter 3

Group Size Uncertainty¹⁰

Social dilemmas are situations in which people face a conflict between their personal interests (called *defection*) and the interests of their group (called *cooperation*). In such dilemmas, people thus have to choose whether to defect or to cooperate. A choice to defect yields the best payoff to individual group members (i.e., in at least one of the possible outcome configurations; Liebrand & Messick, 1996), whereas all individual group members are better off if all cooperate than if all defect (see Komorita & Parks, 1995; Kopelman, Weber, & Messick, 2002, for reviews).

A well-known type of social dilemma is the *common resource dilemma* (or commons dilemma). In this type of social dilemma, a group of people have access to a limited common resource. A real-life example of such a resource dilemma is the environmental problem of over-fishing. In this resource dilemma, a group of fishermen have access to a natural common resource, namely the fish population. When individual fishermen choose to further their self-interest by catching as much fish as they can, the collective interest is jeopardized because excessive fishing increases the chance of the resource becoming depleted. So whereas individual fishermen may be tempted to overuse the common resource, the collective interest calls for moderate use. Moreover, to further complicate matters, fishermen often do not know how large the fish population is or how many fishermen are fishing from the same pool (Ostrom, 1990; Takigawa & Messick, 1993).

Many real-life social dilemmas are thus characterized by *environmental uncertainty*, or uncertainty regarding the characteristics of the task environment of a social dilemma (Messick, Allison, & Samuelson, 1988). Earlier research has shown that environmental uncertainty can have a large impact on people's choice behavior. For instance, earlier studies have repeatedly shown that uncertainty regarding the size of the resource (i.e., *resource size uncertainty*) leads to over-harvesting (e.g., Budescu, Rapoport, & Suleiman, 1990; De Kwaadsteniet, Van Dijk, Wit, & De Cremer, 2006; Gustafsson, Biel, & Gärling, 1999a; Hine & Gifford, 1996; see Van Dijk, Wit, Wilke, & Budescu, 2004, for an overview of the effects of uncertainty). However, until now very little experimental research has been done to investigate other types of environmental uncertainty, such as uncertainty about the number of group members sharing a resource (see Au & Ngai, 2003, for an exception).

In real life, group sizes are often uncertain. In many social dilemma situations, people do not know precisely how many group members there are. For instance, water

¹⁰ This chapter is based on De Kwaadsteniet, Van Dijk, Wit and De Cremer (conditionally accepted).

consumers often do not know how many people are consuming water in their water district (see Ostrom, 1990; Takigawa & Messick, 1993, for numerous other real-life examples). Therefore, more experimental research is needed to obtain more insight into this type of environmental uncertainty (Van Dijk et al., 2004). In the present research, we will investigate how *group size uncertainty* influences choice behavior in common resource dilemmas.

Earlier Research on Group Size Uncertainty

To our knowledge, only one experimental study has been conducted to investigate group size uncertainty in social dilemmas. In an earlier study, Au and Ngai (2003) investigated the effects of group size uncertainty in a single choice step-level common resource dilemma under different protocols of play. Each of their participants made only one harvesting decision in a series of successive rounds, either in a pre-specified order (called a *sequential protocol*) or whenever (s)he decided to do so (called a *self-paced protocol*). Overuse of the common resource would destroy its value and none of the harvests would be granted. In the group size certainty condition, participants were told that the group size was five. In the group size uncertainty condition, they were told that their group was equally likely to be any size between three and seven persons. In all conditions, after the first round participants were fully informed about the combined harvests of all the preceding players in the sequence, but in the self-paced protocol participants were also informed about the number of players who had made requests in the previous round.

The authors were primarily interested in effects on total requests, i.e., effects at the collective level. Their analyses showed that collective overuse was less likely to occur under group size uncertainty than under group size certainty. Under group size uncertainty, participants apparently acted as if the group size was large and requested less, to avoid collective overuse. Ancillary analyses showed that in the self-paced protocol of play, group size uncertainty resulted in participants delaying their harvest decision to a later round until they knew the combined harvests of all the preceding players in the sequence, reducing the risk of collective overuse. By contrast, participants who were certain that the group size was five did not wait and were more likely to make a request in the first round. Given that they – on average – requested somewhat more than their equal share (i.e., 1/5th of the common resource) the pool was more likely to be overused under group size certainty than under group size uncertainty. It may be suggested that the self-paced protocol allowed participants to coordinate their actions. Under group size uncertainty, a participant could gain useful information about the number and the (combined) size of others' requests by delaying his or her own harvest decision to a later round. This raises the question as to what will happen if uncertainty about the number and size of other's requests cannot be reduced by strategic timing of one's decisions.

In order to disentangle the effects of group size uncertainty on the *size* and on the *timing* of participants' harvests, the present study uses a simultaneous protocol of play, in which participants will not be informed about the harvests of their fellow group members. By doing so, we can obtain more insight into the inhibiting effects of group size uncertainty on tacit coordination. Moreover, to answer the question as to how people make decisions when the possibility for tacit coordination is limited, we draw on Snyder and Ickes' (1985) framework of strong versus weak situations. On the basis of this conceptual framework, we will argue and demonstrate that under group size uncertainty people base their harvesting decisions on their own social value orientations.

Tacit Coordination and Group Size Uncertainty as a Weak Situation

In social dilemmas such as the one described above, it is important for people to coordinate their choice behavior effectively (e.g., Van Dijk & De Cremer, 2006; Van Dijk & Wilke, 1996). In resource dilemmas, it is best for people to coordinate their decisions in such a way that the collective resource does not become depleted, which would be detrimental to individual as well as collective interests. However, effective coordination is hampered when group members do not know what their fellow group members will decide. This uncertainty about the decisions of other group members is called *social uncertainty* (or strategic uncertainty, Messick et al., 1988). Earlier research has shown that people can often deal with such social uncertainty by means of *tacit coordination* (Schelling, 1960; Van Dijk & Wilke, 1996). That is, group members can predict their fellow group members' decisions by using so-called tacit coordination rules (such as the equal division rule; see also Allison & Messick, 1990). Furthermore, people also use such coordination rules to determine their own choice behavior.

Imagine a resource dilemma with the same payoff structure as to the one Au and Ngai used (2003). In this dilemma, a group of five people own a collective resource of 500 coins. Each individual group member can request a number of coins from this resource. However, if the total group request exceeds the number of coins available in the collective resource, the resource becomes depleted and no-one receives any coins. The five group members cannot communicate with one another and do not know what their fellow group members will decide (i.e., social uncertainty). Research has shown that people tend to solve this social dilemma by using a tacit coordination rule, in this case the *equal division rule*. In other words, most group members will request an equal share from the collective resource (e.g., Allison & Messick, 1990), in this case 100 coins. If all group members decide to do so the resource is optimally used and all group members receive 100 coins. Thus, under uncertainty in a resource dilemma, people can tacitly coordinate their decisions by applying the equal division rule.

In order to apply the equal division rule, however, people need specific and

accurate information about the task environment of a social dilemma. To calculate an equal share people have to divide the size of the collective resource by the number of group members. In order to do so, they need to know exactly how large the resource is and how many people the group consists of. Thus, when the group size is uncertain it becomes much more difficult for group members to apply the equal division rule. So what do people base their decisions on under such group size uncertainty?

The answer to this question may be found in Snyder and Ickes' framework of weak versus strong situations (1985; see also Roch & Samuelson, 1997; Van Lange, 1997). Snyder and Ickes distinguish two types of situations. Strong situations are situations that provide salient cues for people to base their decisions on. In strong situations, people base their decisions on these salient environmental cues. As a result, strong situations lead to little interpersonal variation in their decisions. Weak situations, by contrast, do not provide people with such salient environmental cues. In weak situations, people cannot use external cues to base their decisions on, but they base their decisions on their own dispositional preferences.

When we apply this framework to group size (un)certainty in social dilemmas, we can characterize social dilemmas with group size certainty as strong situations. After all, under group size certainty most people may decide to base their choice behavior on the equal division rule. By contrast, social dilemmas with group size uncertainty can be characterized as weak situations that do not provide people with the salient cues to apply the equal division rule. Under group size uncertainty, we can therefore expect people to base their decisions on their own dispositional preference for either cooperation or non-cooperation, i.e., their social value orientation.

Social value orientation (SVO) is a personality variable that indicates how people evaluate outcomes for themselves and others (Messick & McClintock, 1968; Van Lange & Liebrand, 1991). Generally, a distinction is made between three types of social value orientations (e.g., Van Lange, 1999): (a) cooperation, i.e., the preference to maximize joint outcomes and establish an equal distribution, (b) individualism, i.e., the preference to maximize own outcomes, and (c) competition, i.e., the preference to maximize the relative advantage of own outcomes. Cooperators are commonly referred to as prosocials, and individualists and competitors as proselfs. In social dilemmas, prosocials generally show more cooperative behavior than proselfs (e.g., Kramer, McClintock, & Messick, 1986).

Study 3.1

Hypotheses

Based on the above, we can formulate the following hypotheses. First, we predict an interaction between group size uncertainty and SVO on individual requests. Under group size certainty (i.e., a strong situation), we expect that proselves as well as prosocials will base their harvesting decisions on the equal division rule and therefore we predict a limited difference between proselves' and prosocials' individual requests (Hypothesis 3.1). Under group size uncertainty (i.e., a weak situation), by contrast, we expect that participants will base their decisions on their own social value orientation, and therefore we predict a (significant) difference between the individual requests of proselves versus prosocials, i.e., prosocials' requests being lower than those of proselves (Hypothesis 3.2).

Second, although not our primary aim, besides testing hypotheses about people's individual harvests, we will also test whether proselves and prosocials differ in their estimates of the size of their group. Earlier research on resource size uncertainty (e.g., De Kwaadsteniet et al., 2006) has shown that proselves and prosocials give different estimates of the size of an uncertain common resource. That is, earlier findings showed that proselves - besides harvesting larger amounts than prosocials - also gave higher estimates of the size of the common resource than prosocials. When we generalize this finding to group size uncertainty, we can expect group size estimates also to be affected by social value orientations: Prosocials will give higher estimates of the size of the group than proselves (i.e., when the group is large there are less resources available per group member; Hypothesis 3.3).¹¹

Method

Participants and Design

Participants were 120 students at Leiden University (15 men and 105 women, *M* age = 20.80 years) who volunteered for the study. At the beginning of the experiment each participant's SVO was assessed. Group size uncertainty was manipulated as a within-subjects factor. Accordingly, a 2 (SVO: Proselfs vs. Prosocials) × 2 (Group Size Uncertainty: No vs. Yes) factorial design with repeated measures on the latter factor was used.

¹¹ Another possibility is that people are over-optimistic about the size of the group under group size uncertainty (i.e., the outcome-desirability explanation; cf. Gustafsson et al., 1999). If this is the case, we can expect that people will give relatively low group size estimates. However, this explanation would not predict a difference between the group size estimates of proselves versus prosocials, also because earlier research has shown that proselves and prosocials do not differ in dispositional optimism (De Kwaadsteniet et al., 2006).

Procedure

The participants were invited to participate in a study on “group decision making”. Upon arrival at the laboratory they were seated in separate cubicles, each containing a personal computer. This computer was used to give instructions to the participants and to register the dependent measures.

Assessment of Social Value Orientation

At the beginning of the experimental session, participants completed the nine-item version of the decomposed games measure to assess their social value orientations (Van Lange, De Bruin, Otten, & Joireman, 1997). The decomposed games measure has excellent psychometric qualities. It is internally consistent (e.g., Parks, 1994), reliable over substantial time periods (Eisenberger, Kuhlman, & Cotterell, 1992), and not related to measures of social desirability (e.g., Platow, 1994). The task consists of nine items, each containing three alternative outcome distributions with points for oneself and an anonymous other. For each of these nine items the participants had to choose which of the three distributions they preferred. Each item contained a prosocial (e.g., self: 500, other: 500), an individualistic (e.g., self: 560, other: 300), and a competitive option (e.g., self: 490, other: 90).

Participants were classified as prosocial, individualistic, or competitive when at least six out of nine choices were consistent with one of these three orientations (e.g., Van Lange & Kuhlman, 1994). Out of 120 participants, 54 (45%) were classified as prosocials, 40 (33%) as individualists, and 12 (10%) as competitors. Fourteen participants (12%) could not be classified and were therefore excluded from further analyses. As in many earlier studies (e.g., Kramer, McClintock, & Messick, 1986; McClintock & Liebrand, 1988; Van Lange & Kuhlman, 1994), individualists and competitors were combined to form one group of proselfs ($n = 52$; 43%). After completing the SVO measure, participants responded to some filler questionnaires. Next, they were presented with the resource dilemma.

The Resource Dilemma

Participants were informed that they would be part of a group of people, that each group member was sitting in a separate cubicle and that there was no communication possible among participants. Furthermore, participants were not aware of the identity of their fellow group members. Decisions had to be made privately and anonymously.

The participants were presented with two similar resource dilemmas that only differed in the degree of group size uncertainty. Participants learned that at the end of the experimental session a computer would randomly select one of these two situations and that this selected situation would be used to calculate the amount of

money each individual group member would earn. Each of these two situations was thus an independent single-trial resource dilemma.

In each of these resource dilemmas, each group member could request any number of coins from a collective resource of 500 coins. Each coin was worth € 0.01 (€ 1 was approximately US \$ 1.65). For each of these resource dilemmas it held that if the group's collective request would be smaller than or equal to the resource size, the requests would be granted and each group member would earn the amount of money he or she had requested in that situation. However, if the group's collective request would exceed the resource size all group members would earn zero outcomes. This resource dilemma is similar to the one used by Au and Ngai (2003) but in the present study participants had to make their decisions simultaneously. Moreover, during and between the two resource dilemmas no feedback was given about the decisions of the other group members nor about the group's collective request.

Manipulation of Group Size Uncertainty

The two situations only differed in the degree of uncertainty about the size of the group. Group size uncertainty was manipulated by varying the range of the uniform distribution of the group size. The midpoint of these ranges was kept constant across the two conditions, namely five. Under *No Uncertainty*, the group size was certain, namely five group members (midpoint = 5, range = 0). Under *Uncertainty*, the group would consist of at least two and at most eight group members (midpoint = 5, range = 6). Participants learned that the exact size of the group in the uncertainty condition would be randomly drawn from these uniform distributions by a computer at the end of the experimental session (i.e., participants were told that their group was equally likely to be any size between two and eight persons). The two conditions were counter-balanced to check for order effects. Preliminary analyses revealed no significant order effects on any of the dependent variables (all $F_s < 1$).

After the participants had read the instructions of the resource dilemmas, three practice questions were posed to ensure comprehension of these dilemmas. For example, participants were asked how much each group member would earn if the total group request would exceed the size of the collective resource. Ninety-nine % of all participants answered all three questions correctly. After each question the correct answer was disclosed and the most important characteristics of the dilemmas were repeated. After that, the two dilemmas were presented.

Dependent Measures

In both (un)certain conditions, exactly the same questions were posed. In each condition, participants requested a number of coins from the common resource and they were asked to estimate the size of the group.

At the end of the experimental session, which lasted about half an hour, all participants were debriefed, thanked and paid for their participation. In the debriefing, we explained that we would pay all participants the same amount of money for their participation, namely € 6 (i.e., approximately US \$ 10), plus the extra money they had earned in one of the two the resource dilemmas. All participants agreed with this payment procedure.

Results

Manipulation Checks

Unless stated otherwise, all analyses were performed with 2 (SVO) $\times$ 2 (Group Size Uncertainty) ANOVAs with repeated measures on the latter factor.

In each of the two conditions, we asked participants to indicate how uncertain they were about the size of the group (1 = very certain; 7 = very uncertain). A 2 $\times$ 2 ANOVA on this measure only yielded a highly significant main effect of Group Size Uncertainty, $F(1, 104) = 2417.61$, $p < .0001$, $\eta^2 = .96$. As expected, participants were more uncertain about their estimates under Group Size Uncertainty ($M = 6.25$) than under No Group Size Uncertainty ($M = 1.10$). These results show that we were successful in manipulating group size uncertainty.

Individual Requests

In each of the two conditions, the participants individually requested a number of coins from the common resource (See Table 3.1). A 2 $\times$ 2 ANOVA on participants' individual requests yielded a significant main effect of SVO, $F(1, 104) = 5.07$, $p < .05$, $\eta^2 = .05$, which was qualified by a significant SVO $\times$ Group Size Uncertainty interaction effect, $F(1, 104) = 6.18$, $p < .05$, $\eta^2 = .06$. It should be noted, however, that in accordance with our expectations, the variance in the Group Size Uncertainty condition was considerably larger than the variance in the No Group Size Uncertainty condition. In order to reduce this heterogeneity of variances, we applied a square root transformation on participants' individual requests in all conditions. After applying this transformation, which successfully reduced the heterogeneity of variances, a 2 $\times$ 2 ANOVA still yielded a significant main effect of SVO, $F(1, 104) = 4.93$, $p < .05$, $\eta^2 = .05$, and a significant SVO $\times$ Group Size Uncertainty interaction effect, $F(1, 104) = 7.01$, $p < .01$, $\eta^2 = .06$, as well as a significant main effect of Group Size Uncertainty, $F(1, 104) = 8.32$, $p < .01$, $\eta^2 = .07$, which was also qualified by the interaction.

Table 3.1. *Individual Requests by Social Value Orientation and Group Size Uncertainty*

Social Value Orientation	Group Size Uncertainty	
	No	Yes
Proselfs ($n = 52$)	95.15 (16.92)	100.25 (70.36)
Prosocials ($n = 54$)	95.26 (26.44)	73.17 (33.23)

Note. Higher scores denote higher individual requests. Standard deviations are given in parentheses.

To interpret the interaction effect, we tested whether the individual requests of proselfs differed from those of prosocials in each condition of Group Size Uncertainty. In accordance with Hypothesis 3.1, independent t-tests on the individual requests showed no significant difference between proselfs and prosocials under No Uncertainty ($M = 95.15$ vs. 95.26 , respectively), $t(104) = 0.02$, $p = .98$. Under Uncertainty, however, prosocials requested significantly lower amounts of coins than proselfs ($M = 100.25$ vs. 73.17 , respectively), $t(104) = 2.55$, $p < .01$. This latter finding corroborates Hypothesis 3.2.

Further, we also looked at the effect of group size uncertainty for proselfs and prosocials separately. To do so, we conducted two separate repeated measures ANOVAs (i.e., one for each SVO) with Group Size Uncertainty as the independent variable (i.e., No vs. Yes) and individual requests as the dependent variable. These analyses showed that the requests of proselfs did not differ significantly between the two uncertainty conditions, $F(1, 51) = .27$, $p = .61$, $\eta^2 = .01$, whereas prosocials requested significantly lower amounts of coins in the Uncertainty condition than in the No Uncertainty condition, $F(1, 53) = 18.44$, $p < .001$, $\eta^2 = .26$.¹² Thus, prosocials respond more strongly to group size uncertainty than proselfs. We will elaborate on this finding in the discussion.

Group Size Estimates

After participants had made their individual requests, they were asked to estimate the size of the group (See Table 3.2). The No Uncertainty condition was excluded from the analysis of these estimates. After all, in this condition, participants knew the exact size of the group with certainty. An ANOVA on participants' group size estimates under Uncertainty yielded a significant effect of SVO, $F(1, 103) = 8.14$, $p < .01$, $\eta^2 = .07$. In accordance with Hypothesis 3.3, prosocials gave significantly higher estimates of the group size than proselfs ($M = 6.26$ vs. 5.37 , respectively).

¹² These analyses were also done on proselfs' and prosocials' transformed requests (i.e., transformed by applying square root transformations), which yielded the same results.

Table 3.2. *Group Size Estimates by Social Value Orientation under Group Size Uncertainty*

Social Value Orientation	Group Size Uncertainty
Proselfs ($n = 52$)	5.37 (1.60)
Prosocials ($n = 54$)	6.26 (1.63)

Note. Higher scores denote higher group size estimates. Standard deviations are given in parentheses.

The Relation between Individual Requests and Group Size Estimates

To investigate the relationship between individual requests and group size estimates, we looked at the correlations between participants' individual requests and their group size estimates. These analyses showed that there was a highly significant negative relation between their requests and their estimates, which was similar for proselfs and prosocials (both $r_s < -.61$, both $p_s < .001$). Thus, participants who requested less from the common resource made higher group size estimates.

Additionally, to assess to what degree participants anchored their decisions on the equal division rule in the two Group Size (Un)certainly conditions, we investigated to what extent their individual requests deviated from an equal share. In the Uncertainty condition we calculated this equal share by dividing the resource size (i.e., 500 coins) by the participants' own group size estimates. After that, we calculated the absolute difference between participants' individual requests and this equal share (for a similar procedure to assess adherence to coordination rules, see e.g., Van Dijk & Wilke, 2000). A 2×2 ANOVA on the deviation scores only yielded a significant main effect of Group Size Uncertainty, $F(1, 103) = 8.12$, $p < .01$, $\eta^2 = .07$: Participants' requests deviated significantly more from an equal share under Group Size Uncertainty ($M = 18.05$) than under No Group Size Uncertainty ($M = 7.98$). This finding further corroborates our reasoning that under group size uncertainty people anchor their decisions less strongly on the equal division rule than under group size certainty.

Discussion

In the present chapter, we investigated the influence of group size uncertainty and SVO in social dilemmas. First, we showed that under group size uncertainty, people may harvest less for themselves than under group size certainty. Second, we showed that that group size uncertainty has important consequences for how people tacitly coordinate their behavior. Under group size certainty, people can effectively coordinate their behavior by applying the equal division rule. By contrast, under group size uncertainty tacit coordination is hampered because the task environment does not

provide people with the salient cues to apply the equal division rule. In that case, people rely on internal cues (i.e., their SVO) to determine their harvesting decisions.

Thus, on the one hand our results show that group size uncertainty hampers effective coordination. At the same time, however, our results corroborate and extend Au and Ngai's (2003) findings by showing that group size uncertainty is not necessarily detrimental to collective interests, even when people make their harvesting decisions simultaneously (and they cannot know their fellow group members' decisions). Interestingly, whereas earlier research has shown that uncertainty about the size of the common resource leads to non-cooperative behavior, the present findings indicate that uncertainty about the size of the group may lead to more cooperation. Thus, not all types of environmental uncertainty necessarily lead to non-cooperative behavior. But why may group size uncertainty lead to cooperation? Two possible explanations may be derived from earlier research.

Au and Ngai (2003) suggested that group size uncertainty may lead to cooperation because lower harvests have a higher expected utility. In an appendix to their paper (i.e., Appendix B), they calculated the rational strategy under group size uncertainty, suggesting that individual requests should decrease as the size of the group becomes more uncertain. A group member's expected utility is largest when he/she determines his/her harvesting decision based on the largest possible group size (assuming that all group members use the equal division rule). In other words, if group members want to maximize their own payoffs, it is best for them to determine their individual harvests by dividing the common resource by the largest group size possible.

Suleiman, Rapoport and Budescu (1996) suggested that people tend to perceive the variability and central tendency (i.e., the mean) of probability distributions to be positively correlated. In other words, when faced with probability distributions with higher levels of variability, people are perceptually biased towards overestimating the central tendency (mean) of these distributions (see also Gustafsson et al., 1999a). Suleiman and colleagues used this perceptual bias to explain why people overestimate the size of an uncertain common resource. In the present study, this perceptual bias may explain why people overestimate the uncertain group size. Whereas overestimation of the size of an uncertain common resource leads to over-harvesting, overestimation of the size of the group leads to relatively low individual harvests. After all, when there are more group members there are fewer coins available per group member.

Note, however, that the observed effect of group size uncertainty in our study was particularly due to prosocials' self-restraint. This raises the question as to whether the above explanations can also explain why prosocials respond more strongly to group size uncertainty than proselves. At first glance, there seems to be no reason to assume that the above-mentioned two explanations are more applicable to prosocials

than to proselves. However, what our data as well as these two explanations do imply is that group size uncertainty may induce a drive towards self-restraint. When group size uncertainty induces such a drive, it is plausible that prosocials will respond more strongly to this drive than proselves. After all, this drive is in line with the dispositional preference of prosocials to cooperate. Thus, based on this line of reasoning it seems plausible that prosocials are more affected by group size uncertainty than proselves.

For the current purposes, it is especially worthwhile to acknowledge the fact that the data provide firm support for the suggestion that Snyder and Ickes' (1985) weak-strong distinction is highly applicable to social dilemma situations (see also Van Lange, 1997; Roch & Samuelson, 1997). In the present research, we showed that when the task environment of a social dilemma provides a salient cue to guide behavior, people will base their decisions on that cue (e.g., the equal division rule under group size certainty), whereas they will base their decisions on their own disposition when the task environment does not provide such a cue (e.g., their SVO under group size uncertainty). These findings thus clearly show that Snyder and Ickes' framework (1985; see also Van Lange, 1997; Roch & Samuelson, 1997) on strong vs. weak situations can be fruitfully used to explain and predict choice behavior in social dilemmas.

Although not our primary focus, we also investigated people's estimates of the size of their group (i.e., their group size estimates). In accordance with Hypothesis 3.3, we found that prosocials did not only harvest less than proselves under group size uncertainty, but that they also gave higher estimates of the size of the group. These findings can be related to findings from an earlier study on resource size uncertainty (De Kwaadsteniet et al., 2006), in which it was found that proselves not only harvested more from an uncertain common resource than prosocials, but also gave higher resource size estimates. These earlier findings suggest that proselves tried to justify their relatively high harvests by means of their own estimates of the size of the resource (called egoism-justification, see also Gustafsson et al., 1999a; Hine & Gifford, 1996). In other words, they might have justified their "egoistic" behavior by reasoning: "I may have harvested a lot but I just thought that there were a lot of coins in the collective resource." In the present study, however, it may be less appropriate to speak about egoism-justification. Namely, we found that under group size uncertainty people do not show over-harvesting and therefore they do not have to justify their "egoistic" behavior by means of their group size estimates. What our data do show is that people who harvest relatively small amounts give relatively high group size estimates, inducing prosocials to give higher estimates than proselves.

In an additional analysis, we took a closer look at the relationship between participants' group size estimates and their individual requests. In this analysis, we looked at participants' (absolute) deviations from an equal share. Under group size uncertainty we calculated this equal share by dividing the resource size (i.e., 500

coins) by the participants' own group size estimates. When we compared participants' individual requests with this equal share, their requests appeared to deviate more from an equal share under group size uncertainty than under group size certainty. These results further corroborate our idea that under group size uncertainty people are less inclined to base their decisions on the equal division rule than under group size certainty.

To summarize, the present study has generated a number of interesting findings. First, we showed that group size uncertainty may induce people to show more self-restraint and that this type of uncertainty is not detrimental to collective interests. Second, we showed that group size uncertainty hampers effective coordination, inducing people to base their decisions on internal cues (i.e., their SVO) instead of external ones (i.e., the equal division rule), which corroborates the suggestion that Snyder and Ickes' (1985) weak-strong distinction can fruitfully be applied to social dilemmas. Third, we showed that prosocials respond more strongly to group size uncertainty than proselves, inducing prosocials to lower their harvests and to make higher group size estimates under uncertainty. Taken together, by investigating the topic of group size (un)certainly in social dilemmas and relating this topic to tacit coordination and social value orientation, the present study has generated a number of new insights into this largely unexplored type of environmental uncertainty.