Democratic Competition for Rank, Cooperation, and Deception in Small Groups

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Objective. Stratified groups face at least two obstacles in solving collective action problems and producing public goods. Individuals face temptation to free ride, and high-ranking group members face incentives to protect their position at the group's expense. We introduce democratic competition for rank as a solution to the problem of cooperation in groups. We argue that democratic competition for high rank creates incentives for cooperation that are absent in nondemocratic groups. *Methods.* In a small-group behavioral experiment, we contrast groups in which individuals compete for a valuable high-ranking position through democratic elections with groups in which individuals compete for high rank in resource-based competitions. Groups faceda fluctuating external threat, and group members could invest resources in manipulating the apparent (but not actual) level of this threat. *Results.* We find that democratic groups reward high contributors by electing them to the high-ranking position at greater rates than low contributors. We also find evidence that individuals in democratic groups contribute more to the public good than individuals in nondemocratic groups. However, high-ranking individuals in democratic groups exaggerate threats to the group at similar rates to high-ranking individuals in nondemocratic groups. *Conclusion.* The findings suggest that democratic competition increases public goods production and overall group efficiency, but does not eliminate—and may exacerbate—individuals' tendency to deceive their peers

Stratified groups face at least two obstacles in solving collective action problems and producing public goods. Individuals face temptation to free ride, and high-ranking group members face incentives to protect their position at the group's expense. We introduce democratic competition for rank as a solution to the problem of cooperation in groups. We argue that democratic competition for high rank creates incentives for cooperation that are absent in nondemocratic groups. In a small-group behavioral experiment, we contrast groups in which individuals compete for a valuable high-ranking position through democratic elections with groups in which individuals compete for high rank in resource-based competitions. Groups faced a fluctuating external threat, and group members could invest resources in manipulating the apparent (but not actual) level of this threat. We find that democratic groups reward high contributors by electing them to the high-ranking position at greater rates than low contributors. We also find evidence that individuals in democratic groups contribute more to the public good than individuals in nondemocratic groups. However, high-ranking individuals in democratic groups exaggerate threats to the group at similar rates to high-ranking individuals in nondemocratic groups. The findings

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suggest that democratic competition increases public goods production and overall group efficiency, but does not eliminate—and may exacerbate—individuals' tendency to deceive their peers.

Individuals in groups often experience tension between doing what is best for the individual and doing what is best for the group. A person who defends their group against a hostile out-group increases the group's chance of survival but places themself in harm's way (Bornstein, 2003). Similar tensions underlie a wide range of "collective action" problems, including the decision to contribute to public goods (Hardin, 1982; Horne, 2009; Kollock, 1998; Oliver, Marwell, and Teixeira, 1985; Olson, 1965), pay taxes (Komorita and Parks, 1994), or participate in risky social movements (McAdam, 1990).

This tension is exacerbated by the fact that many groups are stratified into ranks that offer varying access to resources and control over the fates of others. Modern bureaucracies are organized into hierarchical ranks of superiors and subordinates (Blau, 1968), as are political parties (Tsebelis, 1990), criminal gangs (Gambetta, 2009), social movement organizations (McAdam, 1990), and many voluntary associations (Putnam, 2000). Because high-ranking positions offer greater rewards, they generate within-group competition for the chance to occupy them (Gould, 2003). This means that individuals with limited resources—time, energy, money—must sometimes choose between investing resources in competing for rank within the group or in helping the group achieve a goal, such as overcoming an external threat (Reeve and Hölldobler, 2007; Reeve and Shen, 2006; West et al., 2006). For example, politicians who tarnish their opponent's reputation in intraparty competition may increase their personal chances of representing the party in a general election, while also decreasing their party's chances of winning that election (Tsebilis, 1990).

Further, individuals who attain high-ranking positions must decide whether to use their position to help the group produce public goods, or to maintain their position at the group's expense. Leaders can promote cooperation in groups by setting and enforcing standards for prosocial behavior (De Cremer and Van Knippenberg, 2002). Accordingly, groups are more likely to relinquish control to a leader when the group fails to solve collective action problems (Samuelson et al., 1984). However, some high-ranking individuals take advantage of their position in order to retain it. High-ranking individuals respond to instability in their position by withholding valuable information from the group and excluding useful contributions from potential rivals (Maner and Mead, 2010). In addition, we (Barclay and Benard, 2013) found that high-ranking group members deceive low-ranking group members by exaggerating the seriousness of external threats, encouraging them to divert resources away from within-group competition for rank, and toward coping with the external threat.

In this article, we investigate how different forms of intragroup competition for valued, high-ranking positions in groups shape the tension between individual and collective interests. We contrast democratic competition, in which individuals attain high rank by winning the votes of in-group members, with resource-based competition, in which individuals attain high rank by investing resources in intragroup competition. We ask whether democratic competition for rank helps to solve both the free-rider problem and the tendency for high-ranking group members to mislead low-ranking group members about potential threats.

We hypothesize that democratic competition will have prosocial effects because it creates a tighter coupling between individual and group interests. Democratic competition creates incentives for individuals to contribute to public goods because groups tend to prefer that high contributors occupy more powerful positions. Prosocial behavior thus provides a

pathway to attaining high rank in democratic groups. Democratic competition also creates incentives for leaders to behave prosocially by making their position dependent on the approval of subordinates.

By investigating the effects of democratic competition on prosocial behavior, we contribute to the existing literature in several ways. Prior work on leadership and public goods focuses on either the conditions under which individuals are willing to create leadership positions (Benard, 2012; Rutte and Wilke, 1985; Samuelson et al., 1984) or how the characteristics or behaviors of existing leaders make group success more likely (De Cremer and Van Vugt, 2002; Lewin, Lippitt, and White, 1939). We focus instead on how the nature of the intragroup political process shapes the behaviors of individuals within the group. In doing so, we test democratic competition as a structural solution to the public goods problem in small groups. A recent paper with a similar approach is Harrell and Simpson (2016), which we discovered after completing this manuscript and presenting it in several places. Like our study, this work also finds that groups prefer to elect cooperative participants, and that democratic groups contribute at greater rates than groups with randomly assigned leaders, suggesting further confidence in our findings. The two papers also differ in a number of substantive and methodological ways, including our incorporation of threats and threat manipulation, and our use of resource-based competition in the nondemocracy condition.

Applications to Innovation

Our approach has implications for the study of innovation in groups. Given the complexity of modern organizations, much innovation takes place in teams. Developing high-performing teams requires more than assembling a group of skilled team members (Woolley et al., 2010). Teams must leverage the expertise of their members to create "synergistic" outcomes beyond those the individual members are capable of (Hall and Watson, 1970; Manago, Sell, and Goar, 2018; Thomas-Hunt and Phillips, 2004). This requires navigating intragroup disagreement and conflict (Berger, Cohen, and Zelditch, 1972; West and Anderson, 1996).

While a moderate amount of task conflict can be beneficial for group performance (de Dreu, 2006), competition for rank can be damaging. Conflict over relative status in groups can lead individuals to withhold contributions from the group, diminishing group productivity (Kilduff, Willer, and Anderson, 2016). Further, groups may fail to identify expert group members and leverage their knowledge (Thomas-Hunt and Phillips, 2004), instead allowing more confident or dominant group members disproportionate influence on group decisions (Kennedy, Anderson, and Moore, 2013; Kilduff, Willer, and Anderson, 2016).

Similarly, we find that competition for rank can lead group members to invest resources in competing with one another, rather than in creating public goods. Providing structures for resolving competitions for rank in groups—such as democratic elections—may reduce these distractions. In addition, democratic competitions could be viewed as more legitimate than dominance-based competitions for rank, potentially encouraging group members to continue contributing to the group even when they do not receive high rank.

Cooperative Behavior in Groups

We examine two types of behavior in groups: contribution to public goods and manipulation of apparent external threats. The first—contribution to public goods—speaks to

a core question in the social sciences. In order to generate valued public goods, such as group defense (Bornstein, 2003; Hardin, 1968), political change (Olson, 1965; McAdam, 1990), natural resource management (Hardin, 1982; Ostrom, 1990), or the maintenance of a voluntary association (Putnam, 2000), individuals must make costly contributions of time, resources, and effort. The puzzle is that individuals fare best when withholding such resources (especially when they can "free ride" on the contributions of others), but if all follow this strategy, individuals fare worse than if all had contributed (Axelrod, 2006; Kollock, 1998; Komorita and Parks, 1994).

The second—manipulation of apparent threats—has been the focus of our earlier work (Barclay and Benard, 2013). Individuals are more likely to cooperate when their groups face external threats, such as hostile out-groups or natural disasters (Bornstein, 2003; Brewer, 2001; Coser, 1956; Simmel, 2010, 1955[1908]; Sherif, 1966; Willer, 2004; reviewed by Benard and Doan, 2011; Van Vugt, Hogan, and Kaiser, 2008). The tendency of groups to cooperate when threatened creates incentives for individuals to mislead the group about the seriousness of external threats. Exaggerating perceived threats can help powerful group members retain their positions, by encouraging subordinates to invest resources in addressing the external threat, rather than competing internally for the high-ranking position.[1] Correspondingly, high-ranking individuals are more likely to invest resources in manipulating apparent threats than low-ranking individuals, especially when they face competition for their position; such manipulation cost-effectively reduces competition for their position (Barclay and Benard, 2013).

Thus, groups face several obstacles to cooperation: all group members face temptation to free ride, and high-ranking group members can protect their position by manufacturing false threats to the group. Mechanisms for promoting cooperation include selective incentives (i.e., rewards and punishments: Horne, 2009; Oliver, 1980; Ostrom, Walker, and Gardner, 1992; Yamagishi, 1986) and appointing leaders (Benard, 2012; Rutte and Wilke, 1985; Samuelson et al., 1984). In this latter approach, individuals are given an opportunity to relinquish control of the group to a leader who can influence group cooperation either by making decisions on behalf of the group, or using selective incentives to encourage cooperative behavior.

Theory and Hypotheses

In this article, we build on these past studies to evaluate a new approach to resolving collective action problems. This approach focuses not on whether groups can grant power to a high-ranking individual but on the intragroup political process—democratic or nondemocratic—through which individuals attain high rank. Our earlier work examined groups in which individuals attain high rank by investing resources in within-group competition. We extend our past findings by contrasting this type of resource-based competition with democratic competition, which awards the high-ranking position through a vote. We expect that, relative to resource-based competition, democratic competition for valued high-ranking positions increases cooperative behavior by incentivizing cooperation. We expect that individuals will prefer to elect cooperative individuals to the high-ranking position, for three reasons.

[1] Political leaders of various party affiliations have been accused of exaggerating of group threats in order to fend off criticism and bolster their political position (e.g., Cirincione et al., 2004; Tisdall and Norton-Taylor, 2010). Indeed, some scholars view threat manipulation as a widely used political strategy for bolstering group cohesion (Fordham, 1998; Johnson, 1985).

First, individuals prefer leaders who will help the group generate public goods (Samuelson et al., 1985). Individuals also tend to endorse fair leaders and criticize selfish ones (Wit and Wilkie, 1988; see also Milinski, Semmann, and Krambeck, 2002). In a public goods setting, an individual's prior contributions signal the extent to which they value the public good over private gain. In our study, because the high-ranking position affords some influence over others' behavior, individuals should prefer high contributors because they expect them to encourage greater levels of public good production and thus benefit other group members materially.

Second, individuals respect and behave deferentially toward high contributors. Contributors to public goods receive more social status, and are more likely to be granted leadership positions by the group (Hardy and Van Vugt, 2006; Milinski, Semmann, and Krambeck, 2002). Similarly, individuals view contributors to the public good as more group-motivated and worthy of respect than noncontributors (Willer, 2009). In turn, individuals are more likely to trust high contributors (Barclay, 2004), and to grant them greater rewards (Kiyonari and Barclay, 2008). In nonautocratic groups, this prestige becomes a pathway to authority (Henrich and Gil-White, 2001).

Third, individuals may receive high rank *in exchange* for contribution. Humans have strong tendencies toward reciprocity (Blau, 1964; Cook and Cooper, 2003; Malinowski, 1920; Molm, 2010). Correspondingly, individuals exchange resources for deference (Bienenstock and Bianchi, 2004), and anthropological fieldwork shows similar patterns (Price, 2003). In this case, individuals are essentially buying rank via their contributions to the group. This differs from the prestige-based mechanism outlined in the preceding paragraph because it is a material exchange.

We do not attempt to empirically distinguish between these three mechanisms, instead, we begin from the prediction that individuals who contribute to the public good will be more likely to be democratically elected to high-ranking positions. Because high-ranking positions offer both greater resources and control over the fates of others, we expect that the chance to occupy the high-ranking position motivates group contribution. Under resource-based competition, in contrast, individuals are more likely (by definition) to obtain the high-ranking position when they withhold resources from the group, and instead funnel those resources into within-group competition for rank (Barclay and Benard, 2013).[2]

As a result, we predict that

H1: Contributing to public goods will be positively associated with election to the high-ranking position, in democratic groups.

If H1 is correct, the net benefit of contributing to the public good is greater in democratic groups, compared to groups characterized by resource-based competition (for concision, we henceforth refer to these groups as "nondemocratic," recognizing that many types of nondemocratic groups exist). For this reason, we predict:

H2: Individuals will contribute to public goods at greater rates in democratic groups compared to nondemocratic groups.

[2]Because our focus is on testing our theoretical argument in a controlled laboratory setting, we can only speculate about the real-world applications of these findings. For example, dictators must invest resources in buying the loyalty of political and military elites (Magaloni and Kricheli, 2010), leaving fewer resources for promoting the public welfare. In organizations, the time and energy that managers invest in their internal competitions for rank with peers can distract them from their daily responsibilities, and lead to worse economic outcomes for their firms (Loch, Yaziji, and Langen, 2001).

We also investigate the effects of democratic competition for rank on the likelihood of investing resources in exaggerating threats to the group. Our prior work on nondemocratic groups found that high-ranking individuals were willing to pay to exaggerate threats to the group. This encourages their low-ranking peers to invest resources in protecting the group from the (perceived) external threat, rather than in within-group competition for rank. This helps high-ranking individuals maintain their position. In democratic groups, at least as defined here, this motivation is absent, because rank is determined by elections. We predict:

H3: Individuals will invest proportionally less in exaggerating the perception of external threats to the group in democratic groups compared to nondemocratic groups.

In addition to these core hypotheses, we examine whether democracy affects how individuals *respond* to external threats. If democracy reduces the incentive to exaggerate threats, and individuals are aware of this, then individuals should expect that any given threat is real at greater rates in democratic compared to nondemocratic groups. For this reason, we predict:

H4: Individuals are more likely to increase their contributions to public goods in response to external threats in democratic versus nondemocratic groups.

In other words, we expect that individuals will find warnings about external threats more credible in democratic groups, and as a result, contribute more in response to threats.

Additionally, we provide a descriptive account of overall welfare of the democratic and nondemocratic groups. We use efficiency, or the proportion of the total public good produced as our measure of welfare. If our prediction of greater contribution in democratic groups holds, then such groups should also experience greater welfare.

Finally, in addition to testing our novel predictions, the study design allows us to replicate several of our past findings (Barclay and Benard, 2013). In prior work, we found that high-ranking individuals contribute proportionally less to the group, and invest proportionally more in manipulating the threat, compared to low-ranking individuals. We also found that individuals increase their contributions in response to external threats to the group.

We test these predictions using a small-group experiment. We adopt an experimental approach because we seek to evaluate a set of abstract, theoretically derived hypotheses. Experiments are ideal for our purposes because they allow us to isolate the theoretical variables of interest net of confounding variables, given that naturally occurring democratic versus nondemocratic groups likely vary on many factors. In addition, the artificial nature of experiments means that we can observe behaviors that would normally be concealed in naturally occurring groups. For example, it is often impossible to observe whether a high-ranking member of a naturally occurring group deliberately exaggerated a threat to the group, or to what extent they benefitted from this exaggeration. Our design allows us to measure such behaviors and outcomes directly. We do not attempt to generalize directly from the experiment to any particular real-world situation; the external validity of our argument can only be assessed through continued theory development and testing using a broad range of methods (Lucas, 2003; Zelditch, 1969).

Methods

Participants

The study participants included 176 paid undergraduate volunteers (109 women, 51 men, 16 unknown) at a large public university in the Midwestern United States.[3] The participants were recruited via flyers advertising payment for participation in an experimental study. Each experimental session included two groups of four participants. Participants interacted with their own group members only; there was no between-group interaction.

Procedure

After arriving at the lab, participants were each shown to a private cubicle, equipped with a networked computer.[4] After participants received information about the study and gave written consent to participate, they received the study instructions. The study instructions included a full, accurate description of the procedures; the study did not use deception or withhold information from participants. To ensure participants understood the study, they received written instructions, took a quiz that required correct answers to proceed, and engaged in three practice rounds that did not count toward their earnings for the study. At all times, research assistants were available to answer questions.

Participants were randomly assigned to four-person groups. On each of 21 rounds of the study, each group engaged in a modified version of a public goods game. Participants interacted live, via computer software, and did not interact face to face. Participants earned "lab dollars" based on their and their group's decisions, and at the end of the study these lab dollars were converted to U.S. dollars at a preannounced rate of 2.25 to 1. On average, participants earned USD \$34.86, $\pm SD$ \$8.17.

In order to create a setting that would allow us to test our hypotheses, we build on a modified version of the public goods game developed in our earlier work (Barclay and Benard, 2013; summarized briefly here and described in detail next). In our prior work, we investigated public goods games in which (1) groups included high- and low-ranking individuals (with the operational definition of rank varying across studies to evaluate whether our hypotheses were robust to different definitions of rank); (2) groups were subject to a randomly fluctuating threat, which if realized eliminated a portion of the group's earnings; and (3) participants could pay to manipulate the apparent (but not actual) threat.

In the present study, we extend our earlier design by randomly assigning groups to either a democracy or nondemocracy condition. In both conditions, the high-ranking group member was initially assigned randomly. In the democracy condition, the group held an election at the end of every third round by voting to determine which group member would assume the high-ranking position. The nondemocratic condition used the resource-competition design from our earlier studies, such that at the end of every third round, the high-ranking position was assigned based on which group member had retained the greatest amount of their personal resources.

This allows us to investigate whether individuals in democratic groups (1) tend to reward cooperative group members by electing them to the high-ranking position, as well as the extent to which democracy in small groups (2) increases cooperation, (3) reduces

[3]Gender was not recorded for two sessions of eight participants each due to an error.
[4]The study was programmed and conducted using the ztree software (Fischbacher, 2007).

manipulation of apparent group threats, (4) increases responsiveness to perceived threats, and as a result (5) increases group welfare.

Producing Public Goods: The Public Goods Game

Our experimental setting is based on a standard public goods game (Hardin, 1968; Olson, 1965). The public goods game is widely used to model settings in which individual and group-level interests are in tension. For example, this includes the decision to defend the group from a hostile out-group, at risk to oneself (Bornstein, 2003), or to contribute to a beneficial but costly community project, such as building a bridge or a library (Komorita and Parks, 1994). On each of 21 rounds of the game, participants received an endowment of money (L$50 for low-ranking individuals; L$100 for high-ranking individuals, see next), and decided whether to contribute some portion of this endowment to a group fund or keep the money for their private benefit. Participants could contribute any amount, in whole dollar increments, up to their total endowment that round. Participants made these decisions simultaneously.

Each round, the total amount contributed to the group fund was multiplied by 1.6 and divided evenly among the four group members. At the individual level, not contributing provides greater benefits, because each participant receives only L$0.40 for each L$1 contributed. At the group level, contributing provides greater benefits, because it increases the total group resources by 60 percent. Thus, individuals fare best by withholding contributions, but if all group members withhold, they collectively do worse than if all group members had contributed (i.e., the group earned total of L$250 if none contributed, versus a total of L$400 if all contributed).

Independent Variables: High- and Low-Ranking Positions

Our hypotheses pertain to settings in which individuals compete for high rank, either through democratic voting or resource-based competition. To allow us to test our hypotheses, each group included one high-ranking position and three low-ranking positions. The notion of social rank is widespread in the social sciences, but the definition, use, and measurement of the concept varies widely. In our earlier work on threat manipulation, our approach has been to vary the definition of rank used in our experiments, to evaluate whether our general argument that high-ranking individuals will tend to manipulate apparent threats is robust to the definition of rank. In prior studies, we have used both a "weak" and a "strong" definition of rank. In the weak version, rank is contestable (it can be won or lost) and provides greater resources to the high-ranking individual (Barclay and Benard, 2013, studies 1 and 2). This relatively minimal definition of rank nonetheless captures two commonly discussed characteristics of high rank—contestability and access to resources (Gould, 2003). In the "strong definition," we add an additional oft-discussed aspect of rank—control over the fates of others. In this definition of rank, we allowed the high-ranking individual complete control over the amount other participants would be paid during the study (Barclay and Benard, 2013, study 3). This allowed us to evaluate our hypotheses using minimal and maximal definitions of rank.

In the present study, we employ a moderate operational definition of high rank that lies between these two poles. As in our prior studies, the high-ranking position is contestable and offers greater access to resources. We also allow the high-ranking person to have some

control over the fates of others, by allowing them to use costly punishment to reduce the earnings of other participants. We chose costly punishment as a characteristic of the high-ranking position for two reasons. First, it afforded participants in the current study more influence over other group members' fates than under our "weak" definition of social rank, but less influence than under our "strong" definition. Second, costly punishment is widely studied in the public goods literature (Fehr and Gachter, 2002; Ostrom, Walker, and Gardner, 1992; Yamagishi, 1986).[5]

Specifically, the high-ranking position offered two benefits not available to the individuals in the low-ranking positions. The participant in the high-ranking position received a greater endowment each round (L$100 versus L$50). In addition, the high-ranking participant could exercise control over the earnings of other members, using costly punishment, whereas the low-ranking individuals did not have access to costly punishment (Ostrom, Walker, and Gardner, 1992; Yamagishi, 1986). After contribution decisions had been made, the high-ranking group member viewed the contributions of each group member and decided whether to punish them by reducing their earnings.

It cost the high-ranking participant L$1 from their endowment to reduce another participant's earnings by L$3, consistent with much prior work on costly punishment (e.g., Fehr and Gachter, 2002).[6] In order to keep individuals' experiences as similar as possible across the high- and low-ranking conditions, low-ranking participants viewed the contributions of others and made judgments about which group members they *would* punish, if they could. In this way, for example, high- and low-ranking individuals expend similar levels of cognitive effort in the study. These positions were randomly assigned on the first round, but could be won or lost every three rounds, as described below. All participants were made aware of the differences between these positions during the initial instructions.

Independent Variables: External Threats to the Group

To test our hypothesis that democratic competition reduces manipulation of apparent threats to the group, we subjected groups to a fluctuating risk of failure each round and allowed group members to manipulate the apparent (but not actual) level of risk. This "threat level" models risks such as the destruction of resources by hostile out-groups (e.g., Bowles, 2006), misuse of resources, or natural disasters. We implemented the threat level using a procedure developed in our earlier work. Each round, the group could fail with a random percentage chance generated by the experimental program, ranging from 0 to 100 percent. If the group failed, they lost their earnings for the present round as well as the prior round. The actual risk of group failure was reduced by group contribution: for every L$1 contributed by participants, the risk of failure was reduced by 0.5 percentage points. For example, if the initial (randomly determined) threat level was 50 percent, and the group contributed L$20, the threat was reduced to 50 percent $-$ 20 $\times$ 0.5 percent $=$ 40 percent.

Participants could also pay to directly increase or decrease the *announced* (but not true) threat level. After the threat level was randomly determined by the experimental software, participants could spend up to L$10 to increase or decrease the announced threat, with each L$1 spent changing the announced threat level by 5 percent. For example, if the

[5]We did not have hypotheses regarding costly punishment. We conducted exploratory analyses for interested readers; these are summarized in the online Supplementary Appendix.

[6]The $3 subtracted from the punished participant was a loss for the target individual; the high-ranking individual did not receive these funds (consistent with prior work on costly punishment).

true threat level was 50 percent, and one participant paid L$5 to increase the threat level, then the *announced* threat level would be 75 percent (i.e., 50 percent + (5 percent × 5)) but the actual risk of group failure would still be 50 percent (minus any contributions to the group fund). The apparent threat level could be increased up to a maximum of 100 percent. Participants were aware that all group members had the capacity to manipulate the threat level, but could not observe whether others had manipulated the threat, and thus could never be sure if they had observed the true threat level. The threat level was presented before participants made their contribution decisions. The instructions used the neutral terms "increasing or decreasing the announced threat level" rather than the term "manipulation."

Independent Variables: Democracy Versus Resource-Based Competition

Our key hypotheses address the effects of democratic versus nondemocratic mechanisms for selecting high-ranking group members on cooperation, manipulating threats, and group success. To test these hypotheses, we experimentally manipulated whether the high-ranking position was selected democratically or nondemocratically.

In the *democracy* condition, the group held an election at the end of every third round. At the end of this round, participants saw a list of group members and their contributions to the group in the previous three rounds. They could then vote for any of the four group members to occupy the high-ranking position, including themselves. Ties were broken randomly. We included contribution information as a basis for voting because in many real-world public goods settings, individuals can observe the contributions of others. For example, in intergroup conflict, individuals can observe which group members fought and which avoided fighting, and individuals in work teams can observe which members are not pulling their weight. In addition, in democratic elections individuals have an incentive to ensure all group members are aware of their contributions. In contrast, we did not provide information on threat manipulation, as efforts to deceive the group are more likely to be conducted in secret. For example, it is difficult for citizens to determine when a leader's warnings of a threat are genuine.

In the *nondemocracy* condition, the high-ranking position was determined through resource-based competition. At the end of three rounds, the current high-ranking individual maintained his or her position if he or she withheld more of his or her initial endowments in those three rounds than the three low-ranking individuals combined. If the high-ranking individual failed to withhold more than the three low-ranking group members a "revolutionary coalition" (Lawler, 1975) could supplant the high-ranking individual. This models the trade-off that individuals in dominance contests for rank face between investing resources in competing for rank within the group, and cooperating to help the group overcome external challenges (Reeve and Hölldobler, 2007).[7]

If the high-ranking individual was replaced, a new high-ranking individual would be selected from among the low-ranking individuals, with a probability proportional to the amount they kept from their endowment. For example, if A (the high-ranking person) kept L$20 when B kept L$10, C kept L$10, and D kept L$20, then A would be supplanted because he or she kept less than B, C, and D combined (L$40). B and C would then have

[7]While we do not seek to model any particular naturally occurring group, it is worth noting that many groups face such tradeoffs between competition for rank and cooperation for collective benefit, including elites residing in dictatorships (Magaloni and Kricheli, 2010), youth gangs (Gould, 2003), prisoners (Gambetta, 2009), as well as many nonhuman societies (Watts, 2010; for a discussion, see Barclay and Benard, 2013).

a one-fourth chance of attaining high rank for the following round, whereas D would have a half chance.

Dependent variables: The dependent variables include (1) whether the participant was elected to the high-ranking position in the democracy condition; (2) percentage of endowment contributed to the group fund (which is always equal or greater than 0); (3) the net percentage of endowment spent on increasing the threat level (i.e., the amount spent to increase threats minus the amount spent to decrease them); and (4) total group earnings; these variables were analyzed separately.

Summary of Each Round

Figure 1 illustrates the sequence of events on each round of the study. On each round, the experimental program first determined the true threat level by randomly generating a number between 0 (no chance of group failure) and 1 (100 percent chance of group failure). Participants received their endowments, and then decided how much of their endowment to invest in altering the announced threat level. Altering the *announced* threat level did not affect the *actual* threat level. Once these decisions had been made, the announced threat level was presented to participants via text on their computer screens. Participants decided how much of their endowment to contribute to the group fund. The high-ranking member then saw all group members' contribution decisions and decided whether to use costly punishment. The low-ranking members similarly saw all group members' contribution decisions, and expressed their opinion regarding how costly punishment should be used (with full knowledge that these expressed opinions did not affect others' earnings).

After participants made their decisions, the actual threat level was adjusted by any contributions for that round. After adjustment for contributions, the threat level was compared to a random number to determine if the group failed or succeeded. If the random number was below the threat level in that round, the group failed, and they lost their earnings for that round and the previous round. Otherwise, the group succeeded, and each member received their remaining endowment, plus their share of the public good, minus any losses from punishment. At the end of every third round, the occupant of the group's high-ranking position could change, either democratically or nondemocratically, according to condition.

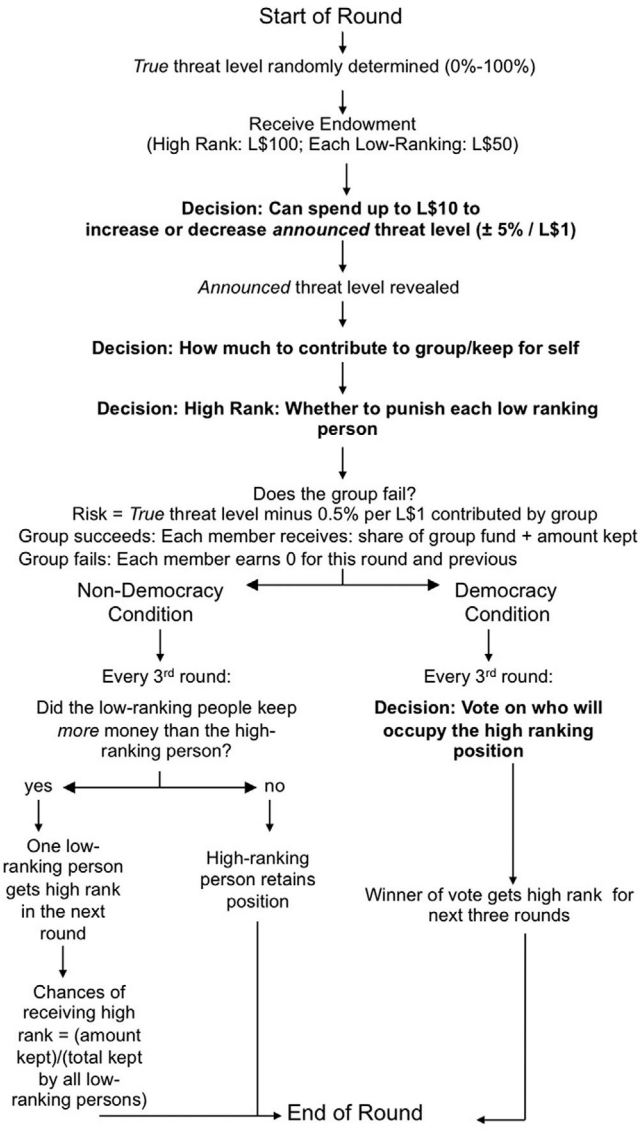
Results

The unit of analysis is one decision by one participant on a given round of the study. In total, our study included 44 four-person groups (176 individuals, 18 groups in the nondemocracy condition, and 26 groups in the democracy condition[8]), interacting for 21 rounds for a total of 3,696 person-rounds. As interdependence within individuals and groups violates the assumptions of standard ANOVA and regression approaches (Luke, 2004), we employ a multilevel model with random intercepts for individuals and groups, using the *mixed* command in STATA 15.1. Predicted probabilities, predicted means, and cluster-corrected confidence intervals are calculated using STATAs *margins* command. We

[8]Due to an error, more sessions were assigned to the democracy condition. This error appeared to be purely random (e.g., a research assistant launching the incorrect version of the program), and so should not affect the results.

FIGURE 1

Outline of One Round of the Experiment



NOTE: Participant decisions are in bold.

also examined alternative model specifications, described next. All presented *p*-values are two-tailed. Descriptive statistics are presented in the main text and in figures. A table with the means and standard deviations for the manipulation and contribution measures, by democracy condition and high/low rank, is available in the online Supplementary Appendix (see Table S1).

TABLE 1

Multilevel Logit Model of Whether Participant Was Elected to High-Ranking Position (1 = Elected), in Election Rounds, Democracy Condition Only

Fixed Effects	Democratically Elected
Average percentage of endowment contributed, prior 3 rounds	0.016**
	(0.004)
High rank	−0.044
	(0.329)
Period	0.003
	(0.004)
Constant	−2.099**
	(0.322)
Random effects	
Group-level random intercept	0.000
	(0.000)
Individual-level random intercept	0.263
	(0.293)
Observations	624
Number of groups	26

NOTE: Robust standard errors are in parentheses;
**$p < 0.01$;
*$p < 0.05$;
+$p < 0.10$.

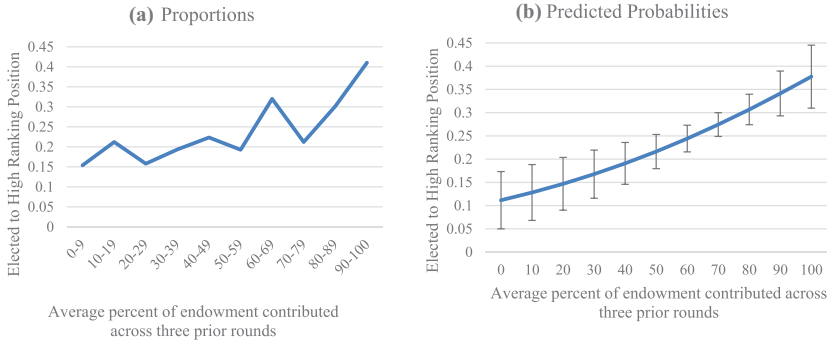
Are High Contributors More Likely to Be Elected?

We predicted that individuals in the democracy condition would prefer to elect high rather than low contributors, creating incentives for cooperation. Consistent with this prediction, those who were elected to the high-ranking position had contributed more on average in the three rounds[9] preceding the election than those who were not elected (L\$117.5 ± *SD* L\$65.2 vs. L\$98.4 ± *SD* L\$54.1). To evaluate the significance of this trend, we estimate a multilevel logit model of whether a participant won the election (1 = won, 0 = lost) based on their rank (high rank = 1, low rank = 0), average percentage contributed across the three rounds prior to the election (since elections were held every three rounds), and a control for round. As shown in Table 1, contributing to the group significantly increases one's odds of being elected to the high-ranking position in the democracy condition (Table 1, row 1: $b = 0.016$, $p = 0.0005$). Substantively, this indicates that for each 1 percent of endowment contributed across the three rounds preceding an election, one's odds of being elected to the high-ranking position increased by approximately 1.6 percent (i.e., the odds increased by a factor of $e^{0.016}$). This pattern is illustrated in Figure 2. Panel (a) of Figure 2 shows the raw proportion of individuals elected to the high-ranking position. Because the raw means and standard deviations do not account for clustering, we present the predicted probabilities with cluster-corrected confidence intervals in panel (b). Both illustrate the positive correlation between contributing a portion of one's endowment and election to the high-ranking position. This supports Hypothesis 1, suggesting that democratic competition creates incentives for contribution, by rewarding high

[9]Votes were held every three rounds. Using contributions in the three rounds *prior* to the election, we have greater confidence that the results do not simply reflect a tendency for those who are elected to subsequently contribute more.

FIGURE 2

Proportion of Individuals Elected to the High-Ranking Position in the Democratic Condition, by Average Percentage of Endowment Contributed Across Three Prior Rounds



NOTE: Panel (a) represents raw means, and panel (b) represents predicted probabilities (with cluster-corrected 95 percent confidence intervals).

contributors with greater likelihood of being elected to the high-ranking position than low contributors.[10] No significant effects of rank or period were predicted or found.

Contributing to the Group

We predicted that individuals in the democracy condition would contribute more (Hypothesis 2) and would increase contributions more in response to threats (Hypothesis 4) than individuals in the nondemocracy condition, due to the former's greater confidence that the threat is real. In addition, we expected to replicate past findings showing that individuals in the high-ranking position contribute proportionally less than individuals in low-ranking positions, and that individuals contribute more at higher threat levels (Barclay and Benard, 2013). Figure 3 presents the observed mean levels of percentage of endowment contributed to the group (panel a) and the predicted means derived from Table 2 with cluster-corrected confidence intervals (panel b), by rank (high or low) and condition (democracy or nondemocracy). We analyze percentages rather than absolute amounts to account for the fact that high-ranking participants received greater endowments. Table 2 reports the results of a multilevel model regressing percentage of endowment contributed to the group on the democracy manipulation (1 = democracy condition, 0 = nondemocracy condition), rank, perceived threat, round, and the rank × democracy interaction. In model 2, we add the democracy condition × perceived threat interaction to test H4, which predicts greater responsiveness to threats in the democracy condition. To measure perceived threat, we subtracted the effect of each participant's own manipulation of the threat level, to accurately reflect the threat level as perceived by each participant.

[10] By contrast, the experimental design for the nondemocracy condition specified that cooperation decreased one's likelihood of winning or retaining rank because one could keep or attain high rank by keeping a greater proportion of one's endowment than the other group members. As a result, people who achieved high rank in the nondemocracy condition necessarily had lower contributions than people who did not achieve high rank, by definition.

FIGURE 3

Percentage of Endowment Contributed to the Group Fund, with Raw Means (a) and Predicted Means with Cluster-Corrected 95 Percent Confidence Intervals (b)

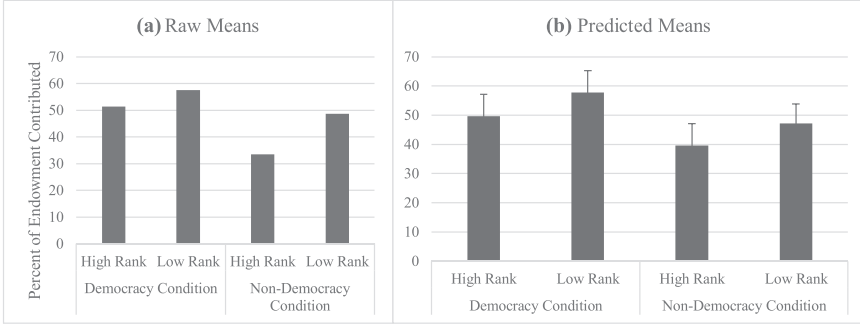


TABLE 2

Multilevel Model Predicting Contributions (as a Percentage of Endowment) to the Group Fund

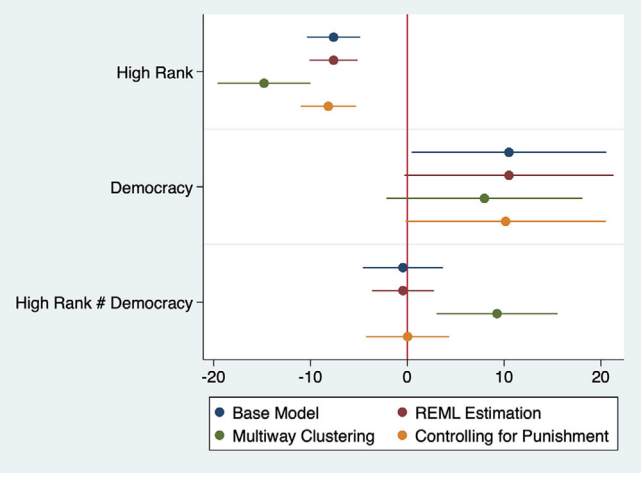
	1 Percent Contributed	2 Percent Contributed, Democracy/Threat Interaction	3 Percent Invested in Increasing Perceived Threat
Fixed effects			
High rank	−7.614**	−7.643**	0.825**
	(1.403)	(1.386)	(0.315)
Democracy condition	10.503*	9.536	0.812+
	(5.131)	(6.074)	(0.424)
High rank × Democracy condition	−0.449	0.392	−0.387
	(2.113)	(2.052)	(0.387)
Perceived threat	0.117**	0.107*	
	(0.026)	(0.044)	
Democracy condition × Perceived threat		0.019	
		(0.055)	
Period	−0.305*	−0.303*	−0.018
	(0.138)	(0.139)	(0.012)
Constant	44.439**	44.945**	−0.122
	(4.057)	(4.688)	(0.402)
Random effects			
Group level	2.791**	2.790**	−19.043
Random intercept *SD* (ln)	(0.140)	(0.140)	(46.865)
Individual level	2.494**	2.495**	0.963**
Random intercept *SD* (ln)	(0.110)	(0.110)	(0.194)
Observations	3,696	3,696	3,696
Number of individuals	176	176	176
Number of groups	44	44	44

**$p < 0.01$;
*$p < 0.05$;
+$p < 0.10$.

NOTE: To measure perceived threat level, we subtract the effects of each participants' own manipulation of the threat level (if any) from the announced threat, to accurately reflect the threat level as seen by each participant. Perceived threat is not included in Model 3 because participants made their decisions about manipulating the perceived threat before the perceived threat was announced. Robust standard errors are in parentheses.

FIGURE 4

Effects of Key Coefficients (with 95 Percent Confidence Intervals) on the Percentage of Endowment Contributed to the Group Fund Across Different Model Specifications (see online Supplementary Appendix (Table S2) for Full Table and Model Descriptions)



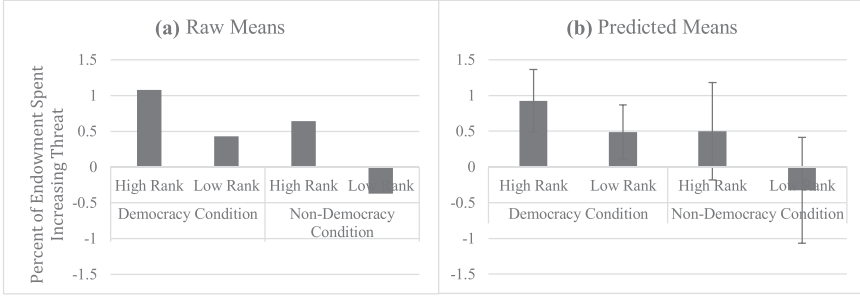
Supporting Hypothesis 2, participants in the democracy condition contributed more on average than did participants in the nondemocracy condition (Table 2, column 1, row 2: $b = 10.503$, $p = 0.041$). Consistent with our past work, high-ranking individuals contributed a significantly lower percentage of their endowments than did low-ranking individuals, as shown by the effect of high rank (Table 2, column 1, row 1: $b = -7.614$, $p = 0.0005$). We found no significant interaction between the democracy manipulation and rank ($p = 0.83$), indicating the magnitude of the democracy effect is similar for high and low-ranking individuals.

We tested alternative model specifications to evaluate the robustness of these findings, including restricted maximum likelihood estimation, the Kenward-Rogers correction for small cluster sizes, multiway clustering with a wild cluster bootstrap, and controls for the amount the high-ranking individual spent punishing. These are described in detail in the online Supplementary Appendix. Most alternative specifications were substantively similar to the base model, but the significance of the democracy effect was reduced from $p = 0.041$ to $p = 0.053$–0.063. One model (multiway clustering) substantively differed, and found a significant ($p = 0.003$) effect of democracy on percent contributed for high-ranking, but not low-ranking participants. This is discussed in more detail in the online Supplementary Appendix. The confidence intervals for key coefficients across these model specifications are summarized in Figure 4.

As in previous studies (Barclay and Benard, 2013), participants contributed more at higher levels of the apparent threat, as shown by the main effect of the perceived threat variable ($b = 0.117$, $p = 0.0005$). Contrary to our prediction (Hypothesis 4), we did not find evidence that individuals in the democracy condition were more responsive to threats, in that the interaction between democracy condition $\times$ perceived threat was substantively small and nonsignificant (model 2, $p = 0.58$). This suggests that individuals are similarly responsive to threats in the democracy and nondemocracy conditions.

FIGURE 5

Percentage of Endowment Spent on Increasing the Announced Threat Level, by Rank and Democracy Condition



NOTE: Panels represent (a) raw means and (b) predicted means with cluster-corrected 95 percent confidence intervals. Positive (negative) values represent a net sum spent to increase (decrease) the announced threat.

Manipulating Apparent Threats

We expected that individuals in the democracy condition would be less likely to manipulate the apparent threat to the group compared to individuals in the nondemocracy condition. Figure 5 presents the means for net percentage of endowment spent increasing the threat (i.e., the measure has negative values if participants invested in *decreasing* the apparent threat), by rank (high or low) and condition (democracy or nondemocracy) in panel (a). Panel (b) reports predicted means with cluster-corrected confidence intervals. In Table 2, model 3 reports the results of a multilevel model regressing percentage of endowment spent increasing the apparent threat on the democracy manipulation, rank, round, and the democracy condition × Rank interaction.

Consistent with our past work, participants in the high-ranking position invested proportionally more in increasing the announced threat level than participants in the low-ranking position; the positive, significant effect of rank (Table 2, model 3, row 2: $b = 0.825$, $p = 0.01$) means that high-ranking participants spent an additional 0.825 percent of their endowment to increase threats than did low-ranking participants. However, contrary to our prediction (Hypothesis 3), the democracy manipulation did not significantly reduce manipulation. After accounting for the interaction of the democracy condition with rank, low-ranking participants actually invested marginally significantly *more* in manipulation on average in the democracy condition than in the nondemocracy condition, as shown by the positive effect of democracy (row 1: $b = 0.812$, $p = 0.056$). However, this effect appears to be driven by a small number of participants. Further analyses, described in the online Supplementary Appendix, show that this effect is nonsignificant and close to 0 when seven influential participants are removed. The rank × democracy interaction (row 3: $b = -0.387$, $p = 0.317$) was not statistically significant.

Democracy Increases Group Welfare

We expected the democracy condition to produce more efficient outcomes, in terms of earnings, than the nondemocracy condition. To examine overall efficiency, we created a

TABLE 3

Multilevel Model Predicting Group-Level Efficiency Each Round (Total Earnings/Maximum Earnings) on Democracy Condition and Time Period

	Group Earnings Efficiency
Fixed effects	
Democracy condition	0.117*
	(0.046)
Period	−0.003^{+}
	(0.002)
Constant	0.663**
	(0.037)
Random effects	
Group level	−1.921**
Random intercept *SD* (ln)	(0.158)
Observations	924
Number of groups	44

**$p < 0.01$;
*$p < 0.05$;
$^{+}$ $p < 0.10$.
NOTE: The unit of analysis is the group-round (44 groups × 21 rounds = 924 observations). Robust standard errors are in parentheses.

measure of efficiency at the group level by dividing the total group earnings each round by the maximum possible group earnings each round (L$400). Because efficiency is a group-level outcome, the data were collapsed at the group level, leaving a sample size of 44 groups observed over 21 rounds ($44 \times 21 = 924$ group-rounds). Efficiency is a function of the level of contribution to the group and how frequently the group fails. Overall, groups failed less often in the democracy condition (5.8 percent of rounds) than the nondemocracy condition (10 percent of rounds). In a multilevel logit model with random intercepts for groups and democracy condition and a control for round as predictors, democratic groups failed less often ($b = 0.815$, $p = 0.039$).

We regressed the efficiency measure on the democracy manipulation and a control for time period using a multilevel model with random intercepts at the group level. As shown in Table 3, democracy significantly increased overall earnings efficiency (Table 3, row 1: $b = 0.117$, $t = 2.55$, $p = 0.011$). In addition, there was a marginally significant tendency for efficiency to decline over time (Table 3, row 2: $b = -0.003$, $t = -1.71$, $p = 0.09$).

Exploratory Analyses: Punishment of Group Members

The online Supplementary Appendix presents exploratory analyses on the high-ranking member's punishment of other group members. These analyses were tangential to our main questions, but may be of interest, so we summarize them here. First, democratically elected leaders spent more on punishment than nondemocratically elected leaders, especially if other group members did not contribute much; this is consistent with models of leadership evolving to promote cooperation within groups (e.g., Pietraszewski 2020). Second, there was more punishment at higher threat levels; this is consistent with data on punishment and reward during real intergroup conflict (Gneezy and Fessler, 2012). Third, after being punished, participants responded more positively (i.e., greater increase

in cooperation) in the democratic condition than in the nondemocratic condition; this is consistent with research showing that punishment is more effective at maintaining cooperation in democratic groups and in societies with a strong rule of law (Grossman and Baldassarri, 2012; Herrmann, Thoni, and Gächter, 2008). However, the effect sizes and significance of these exploratory results often depended on whether influential participants were included (see Supplementary Appendix), so they should be treated with caution.

Discussion

Groups seeking to produce public goods must overcome the free-rider problem. In stratified groups, individuals in high-ranking positions often possess incentives to manipulate or otherwise exploit low-ranking group members. This study examines democratic competition for rank as a structural solution to these obstacles. Under such a system, cooperative behavior can—in theory—provide a pathway to valued, high-ranking positions. Compared to dominance-based competition, we expected democratic competition to create material incentives for cooperative behavior, and correspondingly produce greater cooperation.

Our results indicate that democratic competition improves group cooperation in some ways, but not others. In particular, we find that groups characterized by democratic competition for rank were indeed more likely to reward high (compared to low) contributors by electing them to the high-ranking position. This contrasts with dominance-based groups, in which low contributors are by definition more likely to attain high rank. We also find evidence that individuals in democratic groups contribute to public goods at greater levels than those in nondemocratic groups. Across four of five alternative models tested, *p*-values for this finding ranged from 0.04 to 0.06. In one of the five models, the effect of democracy on cooperation was statistically significant, but only for high-ranking individuals. This variation suggests a need for caution and further research. We also find that democratic groups have greater levels of total welfare than nondemocratic groups. On the whole, this suggests that groups seeking to generate public goods benefit from democratic competition over rank.

At the same time, we did not find support for the hypothesis that democratic groups engage in lower levels of threat manipulation. After accounting for a few highly influential participants, we found no significant relationship between the democracy manipulation and the extent to which participants invested in increasing the group threat. We also did not find support for the hypothesis that democratic groups will cooperate more in response to external threats compared to nondemocratic groups. In retrospect, given that democracy did not reduce threat manipulation—and thus did not increase the genuineness of the threat—it is perhaps not surprising that individuals are not more responsive to threats in democratic versus nondemocratic groups. This suggests that participants are at least somewhat aware that threat manipulation continues to exist in democratic groups.[11]

One possible explanation for why democracy did not reduce threat manipulation is that, unlike contribution, threat manipulation is undetectable. Future research could manipulate whether threat manipulation is observable, to evaluate whether this reduces the tendency for individuals to manipulate threats. This would have real-world analogues in efforts to increase transparency in democratic governments.

[11] Additionally, we investigate whether participants manipulated the threat level prosocially, to encourage contribution. We report analyses investigating this possibility in the online Supplementary Appendix (see Table S5); in short, we find no evidence that increasing perceived threats is associated with being prosocial.

Our work contributes to the broad interdisciplinary literature on both group processes and collective action. A number of studies examine the conditions under which individuals choose to create a (usually autocratic) leadership position as a means to solve collective action problems (Benard, 2012; Rutte and Wilke, 1985; Samuelson et al., 1984). In addition, a number of studies have investigated how either leader traits or leadership styles shape group behavior and outcomes (De Cremer and Van Vugt, 2002; Lewin, Lippitt, and White, 1939). Our study instead examines the intragroup political process as a structural solution to public goods problems, and shows that such processes can make an important difference for group behavior and outcomes. Future work should examine other dimensions of democratic competition in groups, such as whether it can reduce status disagreements (Kilduff, Willer, and Anderson, 2016) or increase synergistic outcomes in groups (Manago, Sell, and Goar, 2019).

More broadly, the results suggest that democratic competition is an institution with clear benefits, but also with less obvious pitfalls. The observation that threat manipulation occurs in democracies is far from new (e.g., Fordham, 1998; Johnson, 1985), but our findings provide one of the few causal tests of this idea.

While our work makes a number of contributions, it also has several limitations. Our design—bringing four-person groups into the lab to interact live for up to two hours—makes the use of a random general population sample unfeasible. In addition, our focus on small groups means we cannot say with certainty whether and to what extent these results might "scale up" to larger, more complex groups. Clearly, adding complexity also introduces a variety of possible moderators or confounding variables that need to be explored systematically. Our contribution lies in demonstrating the causal effect of democratic competition in a way that would not be possible with nonexperimental data. Ultimately, a broad range of studies employing different methods and samples will be the best judge of the robustness of our results.

In sum, our research finds evidence that democratic competition may help solve the collective action problem, eliciting somewhat higher rates of contribution and generating greater overall social welfare. At the same time, democratic competition did not reduce the tendency to exaggerate external threats to the group. These findings underscore the importance and complexity of intragroup political processes for the study of collective action.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1: Means and standard deviations (in parentheses, uncorrected for clustering) for percent of endowment spent increasing the threat level and contributing to the group, by rank and democracy/nondemocracy condition
Table S2: Robustness tests for percent contributed model
Table S3: Robustness tests for percent of endowment invested in manipulated the threat level
Table S4: Multilevel model predicting amount spent on punishment by the high-ranking group member each round; influential participants are included in model 1 and excluded in model 2 (see text).
Table S5: Multilevel model predicting percent of remaining endowment contributed to the group