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Individual versus Group Play in the Repeated Coordinated Resistance Game

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Abstract

This paper reports an experiment to evaluate the effectiveness of repeated interactions in deterring leaders from using divide-and-conquer strategies to extract surplus from their subordinates, when every decision-maker involved is a group instead of an individual. We find that both the resistance rate by subordinates and the divide-and-conquer transgression rate by leaders are the same in the group and individual repeated coordinated resistance games. Similar to the individual game, adding communication to the group game can help deter opportunistic behavior by the leaders even in the presence of repetition.

Keywords: Communication, coordinated resistance, divide-and-conquer, laboratory experiment, repeated games, group decision-making.

MOTIVATION AND THE HYPOTHESIS

This paper reports an experiment to evaluate the effectiveness of repeated interactions in deterring leaders from using divide-and-conquer (hereafter DAC) strategies to extract surplus from their subordinates, when every decision-maker involved is a group instead of an individual. Our hypothesis is that compared to an environment in which every decision maker is an individual, group play will lead to more aggressive DAC "transgression" by the leaders.

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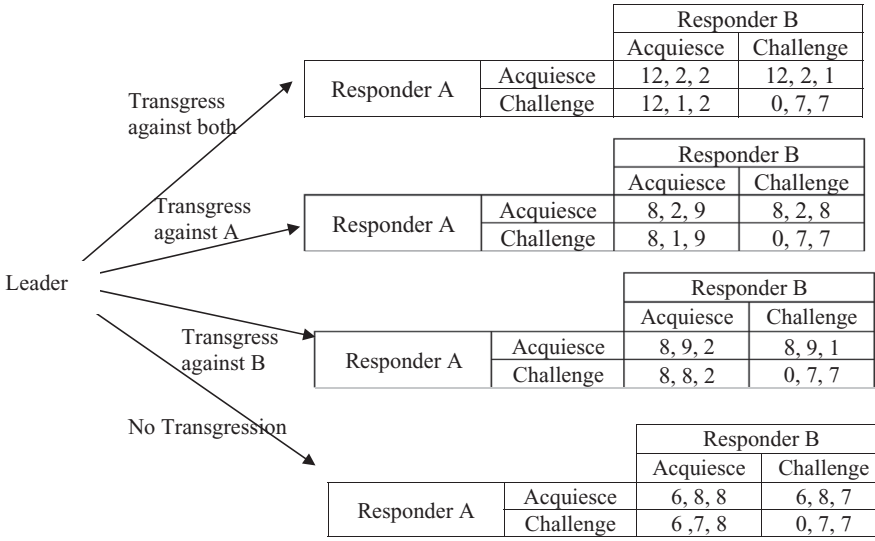

Figure 1

The Divide-and-Conquer Coordinated Resistance Game (payoffs are for (Leader, Responder A, Responder B))

A sizable literature has emphasized that successful economic development requires mechanisms that deter the predatory behavior of the state. If political leaders can confiscate the wealth of citizens without any repercussions, no one will have the incentive to engage in costly production and investment (Acemoglu and Robinson 2012; Greif 2006; North 1990; North and Weingast 1989; Weingast 1995, 1997). Coordinated resistance by citizens is a key to deter leader expropriation (Acemoglu and Robinson 2006, chapter 11; Weingast 1995, 1997). A leader may expropriate wealth from a "victim" and share it with a "beneficiary" (Acemoglu et al. 2004; Weingast 1995, 1997). The beneficiary benefits from such DAC transgression and thus has the incentive to support it, making DAC strategies difficult to defeat.

Weingast's pioneering work (1995, 1997) emphasizes the importance of repeated interaction in deterring DAC. He considers the Coordinated Resistance (hereafter CR) game illustrated in Figure 1 that captures the following ideas. First, successful transgression reduces the subordinate's payoff by six but only increases the leader's *private* payoff by three, as some surplus is destroyed in the process. Second, challenging a transgression is costly regardless of whether it succeeds, and the transgression will fail if and only if *both* responders incur the cost to challenge. Third, the leader can either transgress against both responders, or attempt to DAC. When the leader adopts DAC, he shares some of the surplus expropriated from the victim with the beneficiary to gain her support.

Weingast (1995, 1997) emphasizes how repetition allows the responders to use "trigger strategies" to facilitate CR. These strategies specify that regardless of

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whether she is a victim or a beneficiary, a responder will challenge any transgression, and any failure to challenge will lead both responders to acquiesce any transgression thereafter. Cason and Mui (2014) point out that repetition can also enable the leader to punish a beneficiary who refuses to acquiesce to the transgression and this can deter CR. Recent studies of the CR game find that social preferences can affect behavior even in the one-shot CR game (Cason and Mui 2007; Rigdon and Smith 2010). Cason and Mui (2014) show that in both the finitely and indefinitely repeated CR game, even with social preferences,[1] there exists an equilibrium in which the leader's threat of punishing the challenging beneficiary can deter CR. Facing such a threat, a beneficiary knows that if she challenges the leader in the current period, she will be targeted as the victim in the next period and if the other citizen (who will then be the beneficiary) does not challenge the leader, this beneficiary who challenges in the current period can be trapped as a victim forever. This possibility can deter a beneficiary from challenging the leader in the repeated CR game, even if she has social preferences and prefers that the DAC transgression be defeated.

Cason and Mui (2014) also report an experiment employing treatments that involve both indefinite and finite repetition of the CR game. They find that in all of these repeated game treatments, leaders target beneficiaries who previously challenge DAC. Overall, both indefinite and finite repetition reduce DAC compared to the one-shot game, and by similar rates. Leaders, however, still choose DAC at least half the time. Despite the theoretical literature's emphasis on repetition in deterring DAC (Weingast 1995, 1997), these empirical results show that repetition alone is far from sufficient to significantly reduce DAC, and adding communication reduces expropriation significantly even in the presence of repetition. Cason and Mui (2014) conclude that research aiming to identify mechanisms that can deter DAC transgression should avoid focusing on repetition alone. Instead, researchers should consider repetition in conjunction with communication or other mechanisms that may enable potential challengers of DAC to coordinate their actions.

In Cason and Mui (2014) and all previous empirical studies of the CR game, every player is an individual. In many situations, however, transgression decisions are made by a group of elites, and each responder can be a group of citizens. This study considers the repeated group CR game in which each decision maker is a group. If the earlier finding in the individual CR game that repetition has limited effectiveness in deterring DAC transgression also holds in the group CR game, then it will strengthen the case that researchers should consider repetition in conjunction with other coordinating mechanisms that can deter DAC transgressions.

In the past two decades, a literature has examined the implications of group decision making in games, mainly by comparing behavior in the same game

[1]Specifically, they consider a model in which responders consider the leader's transgression illegitimate, with utility that is decreasing in the leader's payoff. If this social preference is strong enough, beneficiaries may act against their own material interest to challenge the DAC transgression when they expect that the victim will also challenge.

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when all decision-makers are individuals to the case when all decision-makers are groups.[2] Insko et al. (1988) and Schopler and Insko (1992) find that groups are less cooperative in the prisoner's dilemma than individuals. This finding regarding the prisoner's dilemma has been referred to as the "discontinuity effect" and has also been found in subsequent studies (Bornstein and Ben-Yossef 1994; Morgan and Tindale 2002; Wildschut and Insko 2007).

Cason and Mui (1997) find that in the team dictator game in which team members communicate face-to-face, there is no difference in the allocation chosen by the teams and individuals, but when team members differed in their individual dictator game choices, the more other-regarding member exerts a stronger influence on the team decision. Luhan et al. (2009) considers a team dictator game in which team members communicate through anonymous electronic chat, and finds that teams are more self-regarding than individuals in this setting. Bornstein and Yaniv (1998) report that in the ultimatum game, group proposers offer less than individual proposers, while group responders are more willing to accept a low offer than individual responders. Results are mixed in the trust game, as Cox (2002) finds that group and individual trustors behave similarly while group trustees returned less than individual trustees, whereas Kugler et al. (2007) find that group trustors transferred less than individual trustors but groups and individuals trustees returned the same percentage of the amount sent.

Davis and Harless (1996) find that groups perform better than individuals in a monopolist price-searching experiment. Cooper and Kagel (2005) show that groups behave more strategically than individuals in the limit-pricing game, and Kocher and Sutter (2005) find that groups learn faster than individuals in the beauty contest game. Feri et al. (2010) find that groups coordinate more efficiently than individuals. Using a large number of normal form games designed to measure strategic sophistication, Sutter et al. (2013) report that groups are strategically more sophisticated than individuals.[3]

Summarizing the main lessons from recent experimental studies on group decision making, Charness and Sutter (2012) argue that overall, groups are cognitively more

[2]Appendix D discusses some notable exceptions that consider mixed decision-makers when players of a game consist of both individuals and groups.

[3]Researchers have also compared individual to group decision making in games such as the gift exchange game (Kocher and Sutter 2007), contests (Abbink et al. 2010), duopoly games (Müller and Tan 2013), and auctions (Cox and Hayne 2006), among others. We refer the reader to this work and the references cited there, as well as the two recent literature reviews by Charness and Sutter (2012, including the on-line appendix) and Kugler et al. (2012) for more references and detailed description of each of the games studied in this literature. Most of this literature is published in economics, psychology, and organizational studies journals, and this question of whether groups behave differently than individuals in the same strategic interaction has not received much attention in the political science literature. For example, no contribution to the recent *Cambridge Handbook of Experimental Political Science* (Druckman, et al. 2011) focuses on this question. We were also unable to find any paper that focuses on this question either in the *American Political Science Review* or the *American Journal of Political Science* from 2000 to the most recent issue (as of October 2014).

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Table 1
Experimental Design (450 Subjects, 50 Statistically Independent Observations)

	Individual	Groups of three
Between responder communication	14 matching groups (126 subjects) *I-BRC*	12 matching groups (108 subjects) *G-BRC*
No communication	8 matching groups (72 subjects) *I-NC*	16 matching groups (144 subjects) *G-NC*

sophisticated and also more self-regarding than individuals. In another recent survey Kugler et al. (2012, 477) conclude that "the majority of experimental findings reveal that group behavior in games is more in line with rational and selfish predictions than individual behavior is." For members of the beneficiary group, discussions with fellow members may increase their concerns for the material well-being of their in-group, so that a group acting in the role as the beneficiary may be less inclined to act against their material interest to challenge DAC than an individual. Furthermore, discussion among members of a leader group may make a leader group more likely to recognize how they can deter resistance than an individual leader. Thus compared to individual play of the CR game, repetition may be even more ineffective in deterring DAC under group play. Contrary to this hypothesis, however, our experiment reveals that group and individual play are statistically indistinguishable. We also use group communications to provide some direct evidence of strategic reasoning.

EXPERIMENTAL DESIGN AND PROCEDURES

Experimental Design

Table 1 summarizes the four treatments of the experimental design. In the *Between Responder Communication* (hereafter BRC) condition, the responders have the opportunity to send free form messages through a chat window after they observe the choice made by the leader but before they make their actual choices. The leader does not observe these messages. In the *Group* condition each decision is made by a three-person group, and within each group all individuals earn the same payoff displayed in Figure 1. Group decisions are determined through a unanimity voting rule, following private, intra-group chats. If group members disagree on their choice, they have five more voting rounds to reach a unanimous decision, but with no additional opportunity to chat during these rounds.[4] After every voting round, subjects learned each group member's vote so they could observe whether they were in the majority or minority. The vast majority of group decisions were made in the first voting round (see Appendix B). In the Group treatment, the intra-group chats followed the BRC.

[4]Failure to reach a decision across these rounds resulted in a random selection from one of the group members' preferred choices.

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Each session was separated into three, 12-period finitely-repeated games. The treatment interventions occurred in the middle games (Periods 13–24) of each session. The first and last repeated games (Periods 1–12 and Periods 25–36) always included baseline individual-agent CR games. The first game was intended to familiarize subjects with this strategic environment, and the last game was to investigate whether the intervening treatment manipulations had a persistent influence on behavior. Leader and Responder roles remained unchanged throughout each experimental session.

Each matching group consisted of nine subjects, who all interacted in the Group condition in the nine-person game during Periods 13–24. In the early- and late-period individual-agent CR games, subjects were matched into new three-person groups, and never with individuals who were fellow group members in the middle periods. This was explained in the experiment instructions, which are available in the online supplemental materials. Each session had 18 participants, so two independent matching groups of nine were present in the lab simultaneously.

Procedural Details

Sessions were conducted in 2007 and 2008 at Purdue and Monash Universities, both large public universities with diverse student bodies, and it was fully computerized using zTree (Fischbacher 2007). All subjects were inexperienced in the sense that they participated in only one session of this study, although some had participated in other completely unrelated experiments.[5] Subjects were recruited through email, classroom announcements, and online and hardcopy posters. Their average age was 22.2 and 51% were female. The sessions were conducted in dedicated experimental laboratories with privacy screens and standardized procedures to ensure subject anonymity. Data were de-identified as they were recorded, and subjects provided informed consent as required by the local IRB and ethics committee regulations at each university.

The experiment instructions (see Appendix A) employed neutral terminology. For example, the leaders chose "earnings square" A, B, C or D—which was the transgression decision—and then the responders simultaneously selected either X or Y—which was the challenge decision. Subjects' earnings were designated in "experimental francs." They were paid in cash for all periods, converted to

[5]The literature that compares individual and group play in games also mainly uses college students as subjects. Studies using student subjects can provide a useful baseline for future work. If a researcher believes that specific considerations can make certain non-student decision makers behave differently than students in a particular game, the underlying reasons can be articulated and tested in new experiments. For example, if one believes that because experienced political actors are more used to exercise their power than students and hence are more likely to practice DAC transgressions than students, one can conduct CR game experiments using experienced political actors as leaders. Note that because students play important roles in coordinated challenges against leaders, student subjects are no less appropriate than non-student subjects for the role of responders in the CR game. For a discussion of the issues and scientific merits of using student subjects to study political behavior, see Druckman and Kam (2011).

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either Australian or U.S. dollars at exchange rates that resulted in earnings that considerably exceeded their opportunity costs. The per-person earnings typically ranged between US$25 and US$40 for the Purdue sessions and between A$30 and A$60 for the Monash sessions.[6]

Content Analysis

We use content analysis to quantify the statements made by subjects in the chat rooms. We employed two coders, who were undergraduate students at Purdue and Monash Universities, to classify all the statements (25,836 lines of messages in 1,656 chat rooms). These coders were trained using pilot data and they coded the chat statements independently. They were unaware of the research questions addressed in this study and did not know the leaders' or responders' decisions. The coders judged whether each individual line fit into 50–60 different specific meaning categories and subcategories (shown in Appendix C), depending on the treatment. Individual chat lines could be assigned to multiple categories. We use Cohen's Kappa (Cohen 1960; Krippendorff 2003) to assess category classification reliability.

EXPERIMENTAL RESULTS

Group and Individual Behavior

Figure 2 presents the leader transgression rates for the three, 12-period supergames in the four treatments.[7] Appendix B presents the complete time series of transgression and resistance rates for each of the 36 periods for the four treatments. Recall that the first and last supergame always included only individual decision-makers, and no communication. No statistically significant differences exist across the four treatments in the first and last supergames. As indicated on the figure, the treatment interventions only occur during the middle supergame (periods 13–24). In this middle supergame, the transgression rate is not significantly different between the Group and Individual treatments with No Communication (nonparametric Mann–Whitney test p-value $= 0.71$), nor is it significantly different between the Group and Individual treatments with Between-Responder Communication (p-value $= 0.76$). Allowing for Between-Responder Communication, however, lowers the leaders' transgression rate significantly both for Individuals and for Groups (both Mann–Whitney p-values < 0.01).

[6]The exchange rate between U.S. and Australian dollars was approximately 1 AUD = 0.75 USD, when the experiment was conducted.

[7]The vast majority of transgressions are the DAC type. Leaders sometimes attempt to transgress against both responders during the first few periods of the first supergame. This type of transgression is usually met with coordinated, joint resistance, and the rate of this joint transgression quickly drops below 10%. In the middle supergame that is our primary interest, transgressions against both responders occur less than 5% of the time in all treatments.

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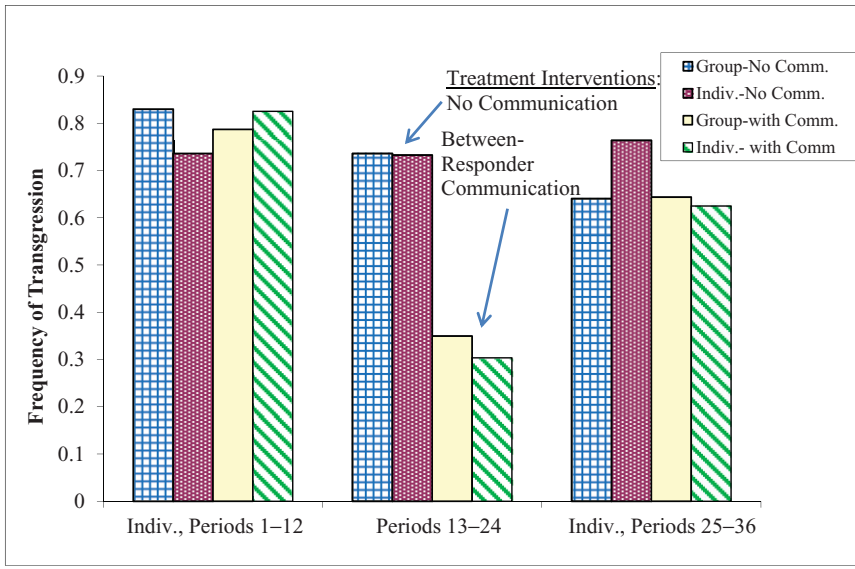

Figure 2
Transgression Rates for the 12-Period Supergames (Color online)

Communication lowers the transgression rate and also significantly increases the responder resistance rate. Figure 3 summarizes the transgression and DAC resistance rates for the middle supergame, subdivided into the early six and late six periods to highlight the within-game time trend. The transgression rate shown on the far left declines across the supergame in all treatments. Victims of DAC transgression resist more frequently than do the beneficiaries who receive a monetary transfer from the leaders. Joint resistance occurs when both responders simultaneously resist the DAC transgression. The far right of Figure 3 shows that this occurs only 10–20% of the time when the responders cannot communicate. Joint resistance is always significantly higher with Between-Responder Communication (Mann–Whitney p-value < 0.01 for individuals and p-value $= 0.02$ for groups). As with the transgression rates, no type of resistance (victim, beneficiary, or joint) is significantly different between the Group and Individual treatments, with or without communication. The only apparent difference between groups and individuals is that individuals' resistance rates always decline on average across the supergame while groups' resistance rates often increase from the early to the late periods.

Content of Group Chats

The group discussions provide insight into the strategic factors that leaders and responders consider when choosing whether to transgress and resist. Moreover, since behavior is similar between the individual and group treatments, the group chats can provide suggestive evidence about how individuals reason in this game.

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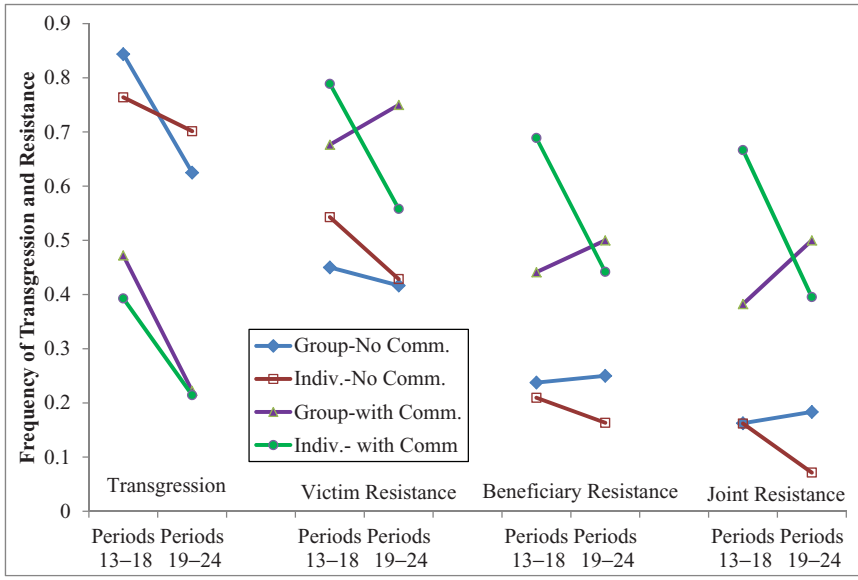

Figure 3
Transgression and Resistance in Middle (Treated) Supergame (Color online)

In the following discussion, we consider only the types of chat statements that are coded reliably. Additional details and statistical tests are provided in Appendix C.

In the Group treatment without responder communication, leaders who transgress, discuss strategies that are used in repeated interactions more frequently than leaders who do not transgress. In particular, leaders who transgress discussed strategies and expectations that involved repeated interactions in 54% of the chat rooms, compared to 33% for the leaders who chose to not transgress. These repeated game strategies included alternating between transgressing against the two groups, as well as more sophisticated proposals that include direct evidence of leaders targeting responders who previously challenge DAC, such as: "If one of the two groups goes y [resist], we will choose another in their favro [sic] another round . . . see if we can gang up on one team."

The leaders in this treatment also discuss responder decisions more often (42% of the chat rooms) compared to leaders in the treatment with responder communication (24%). These leaders facing responders who cannot communicate also more frequently (6%) express positive concerns about the well-being of responder groups compared to the treatment with responder communication (1%). Overall, however, leaders do not frequently express either positive or negative concerns about responders' welfare.

Similarly, responder groups rarely discuss explicitly either positive or negative concerns for the welfare of the other responders or the leaders (generally well

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below 10% of all chat rooms). In the treatment without responder communication, significant differences in communication exist between victims and beneficiaries of DAC transgression. Victim groups chat more actively, typing on average 15% more lines than beneficiary groups. Victims also more frequently discuss the decisions made by the other groups (67%) compared to beneficiaries (42%), and they discuss strategies relevant for repeated interactions (36% of chat rooms) more often than do beneficiaries (22%).

Charness and Sutter (2012) and Sutter et al. (2013) argue that groups are strategically more sophisticated than individuals. Although the group chats provide a window into their strategic reasoning and sophistication, we cannot directly compare this with individuals' strategic reasoning. A comparison of the inter-responder chat communications in the Individual and Group treatments, however, does indicate the strategy information that responders share with the other responder. The groups tend to be more specific in their chats. For example, members of beneficiary groups explicitly communicate to the victim group that they intend to resist or acquiesce 62% and 49% of the time, respectively; individual beneficiaries make these intentions explicit only 36% and 27% of the time. (These are per-subject percentages for the statements so they can be meaningfully compared across the individual and group chats.) Beneficiary groups also more frequently reference the leader's choice (19%) than do beneficiary individuals (5%). These differences are consistent with the view that groups use the chats to coordinate their actions more intensively than individuals.

CONCLUDING REMARKS

This paper compares group and individual behavior in the repeated CR game in two empirically important settings, namely, when all decision-makers are individuals and when all decision-makers are groups. We find that transgression and resistance rates do not differ across the individual and group repeated CR games. As in the individual CR game, repetition alone is of limited effectiveness in deterring DAC in the group CR game, and adding communication helps deter DAC even in the presence of repetition.

Besides the *single-type decision-makers* environment in which every decision-maker is either an individual or a group, a *mixed decision-makers* environment that features both individual and group decision-makers is also empirically important. For example, sometimes the transgression decision is made by a single leader who dominates all other elites, while one or all citizen decision makers are groups. Furthermore, when moving from an all-individual decision-maker to an all-group decision-maker environment, two things occur. First, the decision-maker changes from an individual to a group. Second, the decision maker now faces an opponent who is a group instead of an individual. The existing literature—including this

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study—largely focuses on the single-type decision-makers environment.[8] In the current study, we find that behavior does not change when moving from the all-individual to an all-group decision-maker environment. This could be due to the fact that both effects are zero, or that these two effects are offsetting. Future research can consider the repeated CR game with mixed decision-makers to evaluate these two competing hypothesis.

While the literature that compares individual and group behavior in games is sizable, most existing work conducts this comparison for one-shot games. Some recent notable exceptions exist, but all these studies consider two player games, while the CR game considered here is a three player game that has interesting role asymmetry endogenously determined by the first-mover.[9] In particular, Cason and Mui (2014) point out that repetition can enable the leader to deter coordinated challenge by threatening to punish a challenging beneficiary. This possibility of "dynamic divide-and-conquer" may be the dominant force in the repeated CR game. This could explain why possible differences between group and individual behavior—for example, even if a group beneficiary is more self-regarding than an individual beneficiary—are not strong enough to be detected in a repeated game setting.

Our objective was to study whether *repetition* is also of limited effectiveness in deterring DAC transgression in the empirically important setting when all decision makers are groups. It was therefore natural to consider the group *repeated* CR game and compare it to the individual *repeated* CR game. In light of the findings reported here, however, future research can also compare the one-shot group CR game to the one-shot individual CR game. By removing the potential dominance of dynamic DAC in a repeated game, such comparison may provide a better test of whether groups are more self-regarding than individuals in the CR game.

SUPPLEMENTARY MATERIALS

To view supplementary material for this article, please visit http://dx.doi.org/10.1017/XPS.2015.3.

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[8]Appendix D reviews recent notable exceptions that consider the mixed-decision makers environment.
[9]Appendix D reviews recent notable exceptions that compare individual and group decision-making in repeated games.

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