

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 with or without communication. 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.

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1. 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 a higher level of aggressive DAC "transgression" by the leaders.

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 (North and Weingast, 1989; North, 1990; Weingast, 1995, 1997; Greif, 2006; Acemoglu and Robinson, 2012). Coordinated resistance by citizens is key to deter leader expropriation (Weingast, 1995, 1997; Acemoglu and Robinson, 2006, chapter 11). A leader may expropriate wealth from a "victim" and share it with a "beneficiary" (Weingast, 1995, 1997; Acemoglu et al., 2004). 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 6 but only increases the leader's *private* payoff by 3, 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 divide-and-conquer. When the leader adopts DAC he shares some of the surplus expropriated from the victim with

the “beneficiary” to gain her support.

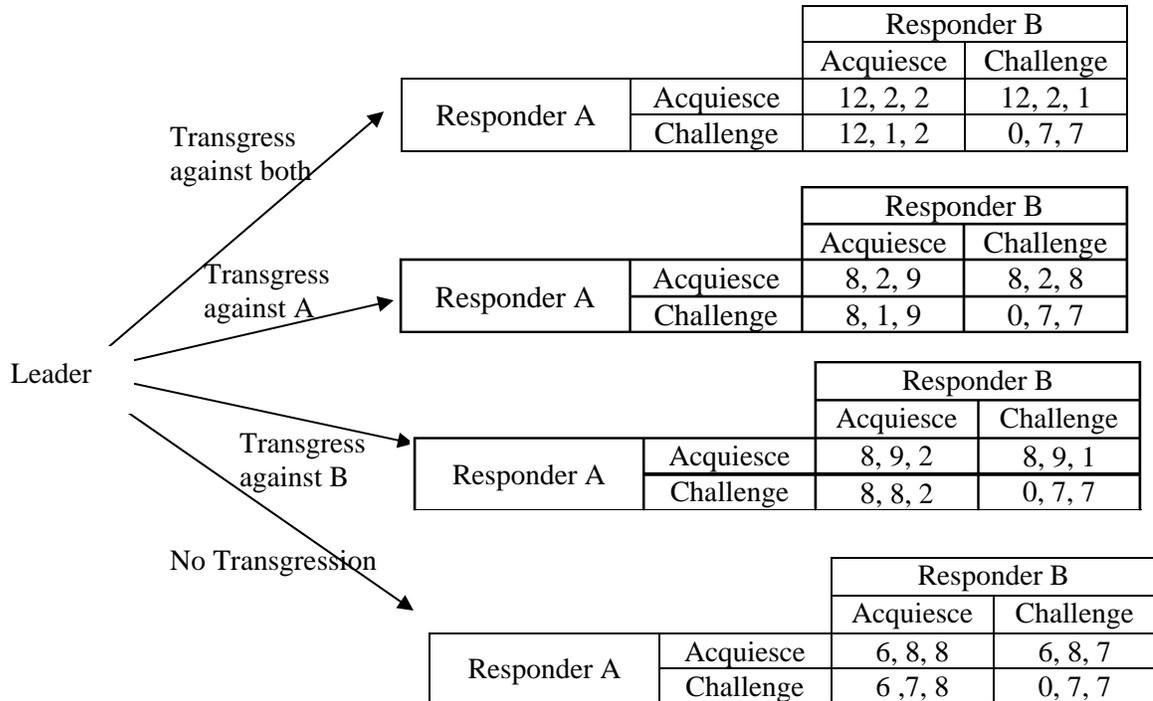


Fig. 1. The Divide-and-Conquer Coordinated Resistance Game (payoffs are for (Leader, Responder A, Responder B))

Weingast (1995, 1997) emphasizes how repetition allows the responders to use “trigger strategies” to facilitate coordinated resistance, which specify that regardless of 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) points out that repetition can also enable the leader to punish a beneficiary who refuses to acquiesce to the transgression and this can deter coordinated resistance. 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) shows 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 coordinated resistance.

Cason and Mui (2014) also reports 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 repetitions 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), repetition alone is far from sufficient to significantly reduce DAC.

In 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 group CR game in which each decision maker is a group. Summarizing the main lessons from recent experimental studies on group decision making, Charness and Sutter (2012) argues that overall, groups are cognitively more sophisticated and also more self-regarding than individuals. Suppose that a leader group is more likely to recognize repeated game strategies that can be effective in deterring resistance, and a group acting in the role as the beneficiary is less inclined to act against their material interest to challenge DAC than an individual. 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 show how group communications provide direct evidence of strategic reasoning.

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, then beneficiaries will be willing to act against their own material interest to challenge the DAC transgression when they expect that the victim will also challenge.

2. Experimental Design and Procedures

2.1 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 5 more voting rounds to reach a unanimous decision, but with no additional opportunity to chat during these rounds.² The vast majority of group decisions were made in the first voting round. In the Group treatment the intra-group chats followed the Between Responder Communication.

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 9 subjects, who all interacted in the Group condition in the 9-person game during Periods 13-24. In the early- and late-period individual-agent CR games

² Failure to reach a decision across these rounds would have resulted in a random selection from one of the group members' preferred choices.

subjects were matched into new 3-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 9 were present in the lab simultaneously.

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

	Individual	Groups of Three
Between Responder Communication	14 matching groups (126 Subjects) <i>I-BRC</i>	12 matching groups (108 Subjects) <i>G-BRC</i>
No Communication	8 matching groups (72 Subjects) <i>I-NC</i>	16 matching groups (144 Subjects) <i>G-NC</i>

2.2 Procedural Details

Sessions were conducted at Purdue and Monash Universities, using inexperienced subjects, and they were fully computerized using zTree (Fischbacher, 2007). The experiment instructions 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 for all periods, and their cumulative balance was converted to 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.³

2.3 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

³ The exchange rate between U.S. and Australian dollars was approximately 1 AUD = 0.75 USD when the experiment was conducted.

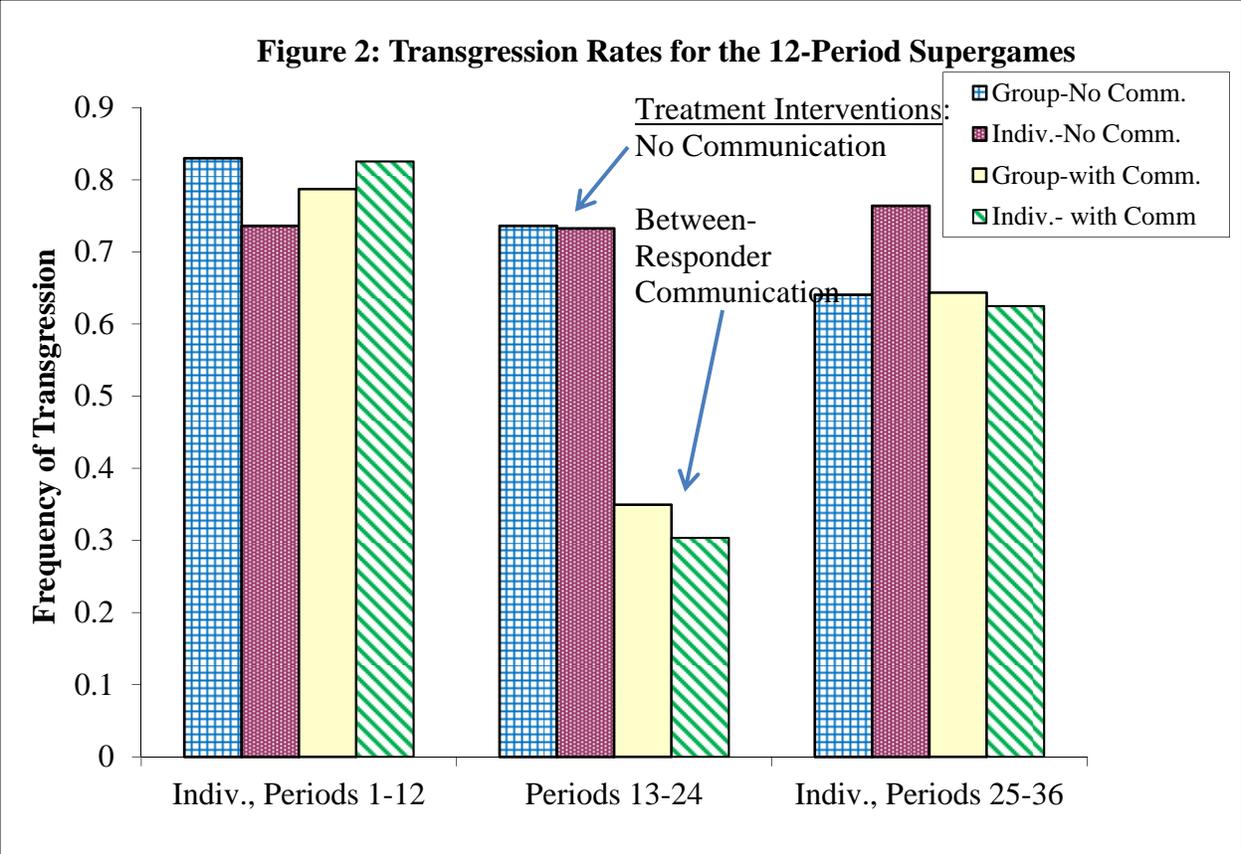
classify all the statements (25,836 lines of messages in 1,656 chat rooms). These coders were trained using pilot data and they coded the chat statements independently. They were unaware of the research questions addressed in this study and did not know the leaders' or responders' decisions. The coders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

3. Experimental Results

3.1 Group and Individual Behavior

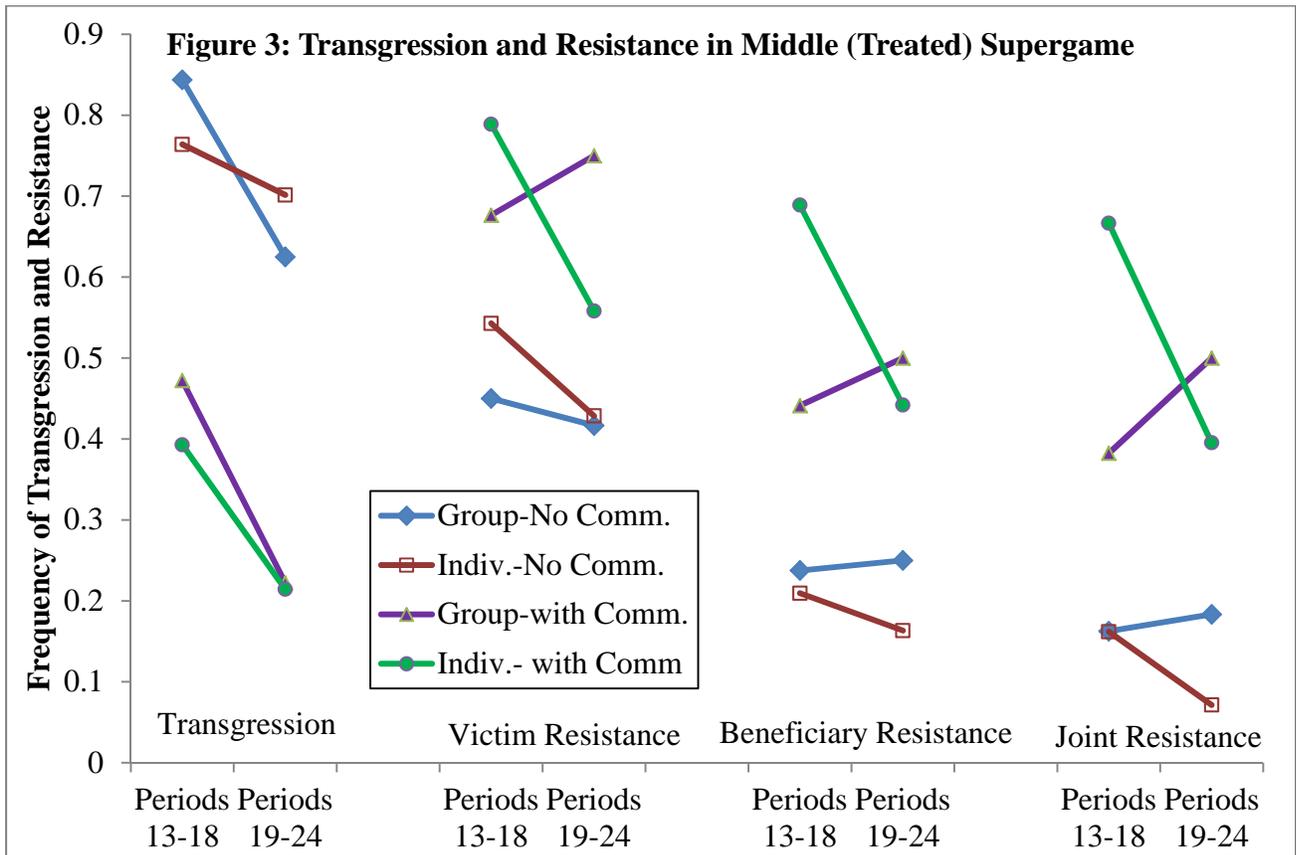
Figure 2 presents the leader transgression rates for the three, 12-period supergames in the four treatments.⁴ Recall that the first and last supergame always included only individual decision-makers, and no communication. No statistically significant differences exist across the four treatments in the 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).

⁴ The vast majority of transgressions are the divide-and-conquer 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 percent. In the middle supergame that is our primary interest, transgressions against both responders occur less than 5 percent of the time in all treatments.



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 6 and late 6 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 to 20 percent 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.



3.2 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. In the following discussion we consider only the types of chat statements that are coded reliably.

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 2 groups goes y [resist], we’ll 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 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. 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 are strategically more sophisticated.

4. Concluding Remarks

Theoretical analysis on divide-and-conquer emphasizes the importance of repetition in deterring DAC (Weingast 1995, 1997). Cason and Mui (2014) reports experimental evidence that repetition is far from sufficient in deterring DAC in the individual CR game. Inspired by findings in the recent experimental literature on group decision making, we conjecture that repetition can be even less effective in deterring DAC when all decision makers in the CR game are groups. Our experiment results do not support this hypothesis. We find that both the resistance rate by responders and the divide-and-conquer transgression rate by leaders are the same in the individual and group repeated CR games with or without communication. We also find that similar to the individual CR game, adding communication can help deter DAC even in the presence of repetition. These findings strongly suggest that researchers should consider the effects of repetition *in conjunction with* communication or other mechanisms that may also help potential challengers to divide-and-conquer to coordinate their actions.

References

- Acemoglu, D. and Robinson, J. (2006). *Economic Origins of Dictatorship and Democracy*, Cambridge: Cambridge University Press.
- Acemoglu, D. and Robinson, J. (2012). *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*, New York: Crown Publishers.
- Acemoglu, D., Robinson, J. and Verdier, T. (2004). 'Kleptocracy and divide-and-rule: A model of personal rule,' *Journal of the European Economic Association*, vol. 2, pp. 162-192.
- Cason, T. and Mui, V.-L. (2007). 'Communication and coordination in the laboratory collective resistance game,' *Experimental Economics*, vol. 10, pp. 251-267.
- Cason, T. and Mui, V.-L. (2014). 'Coordinating Resistance through Communication and Repeated Interaction,' *Economic Journal*, vol. 124, pp. F226-F256.
- Charness, G. and Sutter, M. (2012). 'Groups Make Better Self-Interested Decisions,' *Journal of Economic Perspectives*, vol. 26, pp. 157-176.
- Cohen, J. (1960). 'A Coefficient of Agreement for Nominal Scales,' *Educational and Psychological Measurement*, vol. 20, pp. 37-46.
- Fischbacher, U., (2007). 'z-Tree: Zurich toolbox for readymade economic experiments,' *Experimental Economics*, vol. 10, pp. 171-178.
- Greif, A. (2006). *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*, Cambridge: Cambridge University Press.
- Krippendorff, K. (2003). *Content Analysis: An Introduction to Its Methodology*, (Second Edition) Thousand Oaks, CA: Sage Publications.
- North, D. (1990). *Institutions, Institutional Change, and Economic Performance*: Cambridge: Cambridge University Press.
- North, D. and Weingast, B. (1989). 'Constitutions and commitment: The evolution of institutions governing public choice in seventeenth century England,' *Journal of Economic History*, vol. 49, pp. 803-832.
- Rigdon, M. and Smith, D. (2010). 'The role of solidarity and reputation building in coordinating collective resistance,' Working Paper, University of Michigan.
- Sutter, M., Czermak, S. and Feri, F. (2013). 'Strategic sophistication of individuals and teams: Experimental Evidence,' *European Economic Review*, vol. 64: pp. 395-410,

Weingast, B. (1995). 'The economic role of political institutions: Market-preserving federalism and economic development,' *Journal of Law, Economics, and Organization*, vol. 11, pp. 1-31.

Weingast, B. (1997). 'The political foundations of democracy and the rule of law,' *American Political Science Review*, vol. 91, pp. 245-263.

Appendix: Experiment Instructions

(Group and Between-Responder Communication Treatment)

Instructions – Part I (Periods 1-12)

This is an experiment in the economics of multi-person strategic decision making. The National Science Foundation has provided funds for this research. If you follow the instructions and make appropriate decisions, you can earn an appreciable amount of money. The currency used in the experiment is francs. Your francs will be converted to U.S. Dollars at a rate of 8 francs to one dollar. At the end of today's session, you will be paid in private and in cash.

It is important that you remain silent and do not look at other people's work. If you have any questions, or need assistance of any kind, please raise your hand and an experimenter will come to you. If you talk, laugh, exclaim out loud, etc., you will be asked to leave and you will not be paid. We expect and appreciate your cooperation.

The experiment consists of 36 decision making periods. The experiment is divided into three parts, and each part consists of 12 decision making periods. We are now reading the instructions for Part I, and instructions for the other parts will be made available later. The 18 participants in today's experiment will be randomly split between three equal-sized groups, designated as **Person 1**, **Person 2** and **Person 3** groups. If you are designated as a Person 1, then you remain in this same role throughout all the three parts of the experiment. Participants who are not designated as a Person 1 switch randomly between the Person 2 and Person 3 roles at specific points in the experiment when the participants are re-grouped, as explained later.

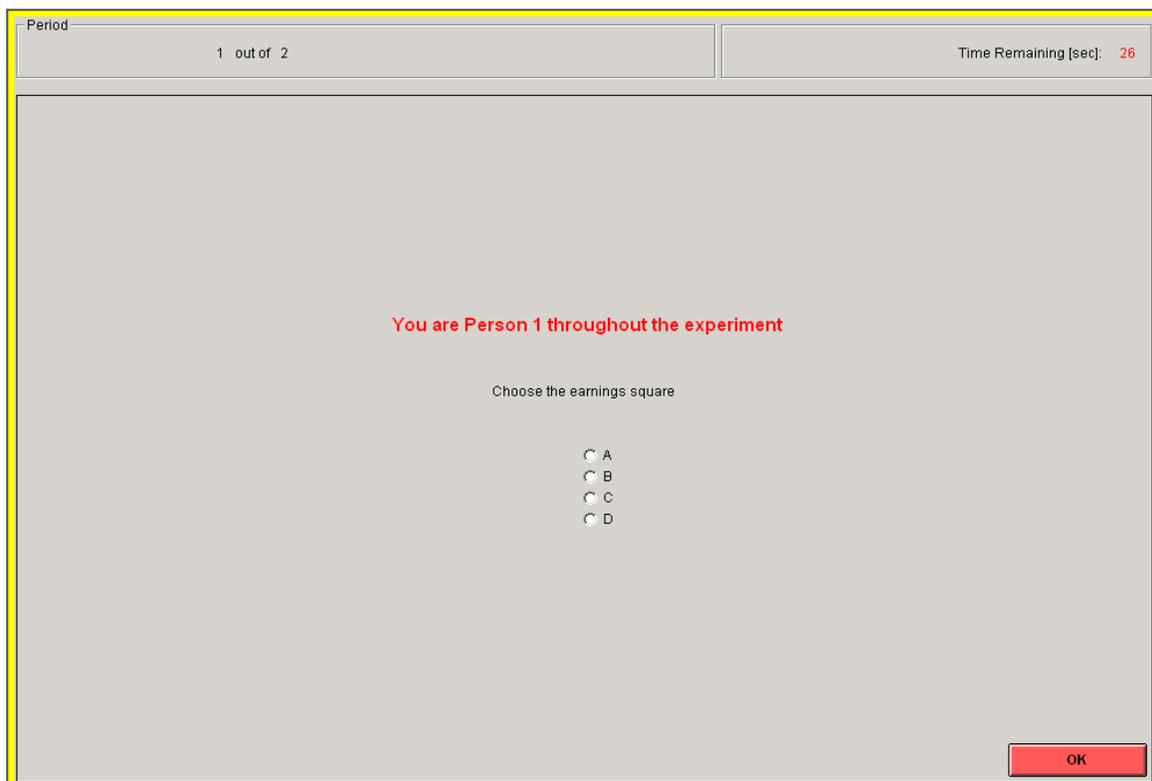
At the beginning of this experiment you will be randomly grouped with two other participants to form a three-person group, with one person of each type in each group. You will be grouped with these same two participants for 12 periods throughout Part I of the experiment. At the end of the 12th period, all participants will be re-grouped, as explained later after the completion of Part I of the experiment.

Your Choice in Part I

During each period, you and all other participants will make one choice. Earnings tables are provided on separate papers which tell you the earnings you receive given the choices that you and others in your group make during Part I of the experiment. If you are **Person 1** then you choose the earnings square, either **A**, **B**, **C** or **D**. You make this choice before the other two

people in your group make their choice, on a decision screen as shown in Figure 1 on the next page.

After learning which earnings square the Person 1 chose, then **Persons 2 and 3** make their choices, on a decision screen as shown in Figure 2 on the next page. They make this choice simultaneously; for example, if you are Person 2 then you do not learn the choice of Person 3 until after you make your choice. Both Persons 2 and 3 may choose either **X** or **Y**.



Decision Screen for Person 1

Period: 1 out of 2 Time Remaining [sec]: 23

You are Person 2 this period

Person 1 chose earnings square A

Everyone's earnings depend on the choices made by you and Person 3 as shown below

		Person 3	
		X	Y
You	X	Person 1 receives: 12 You receive: 2 Person 3 receives : 2	Person 1 receives: 12 You receive: 2 Person 3 receives : 1
	Y	Person 1 receives: 12 You receive: 1 Person 3 receives : 2	Person 1 receives: 0 You receive: 7 Person 3 receives : 7

What do you wish to choose? X Y

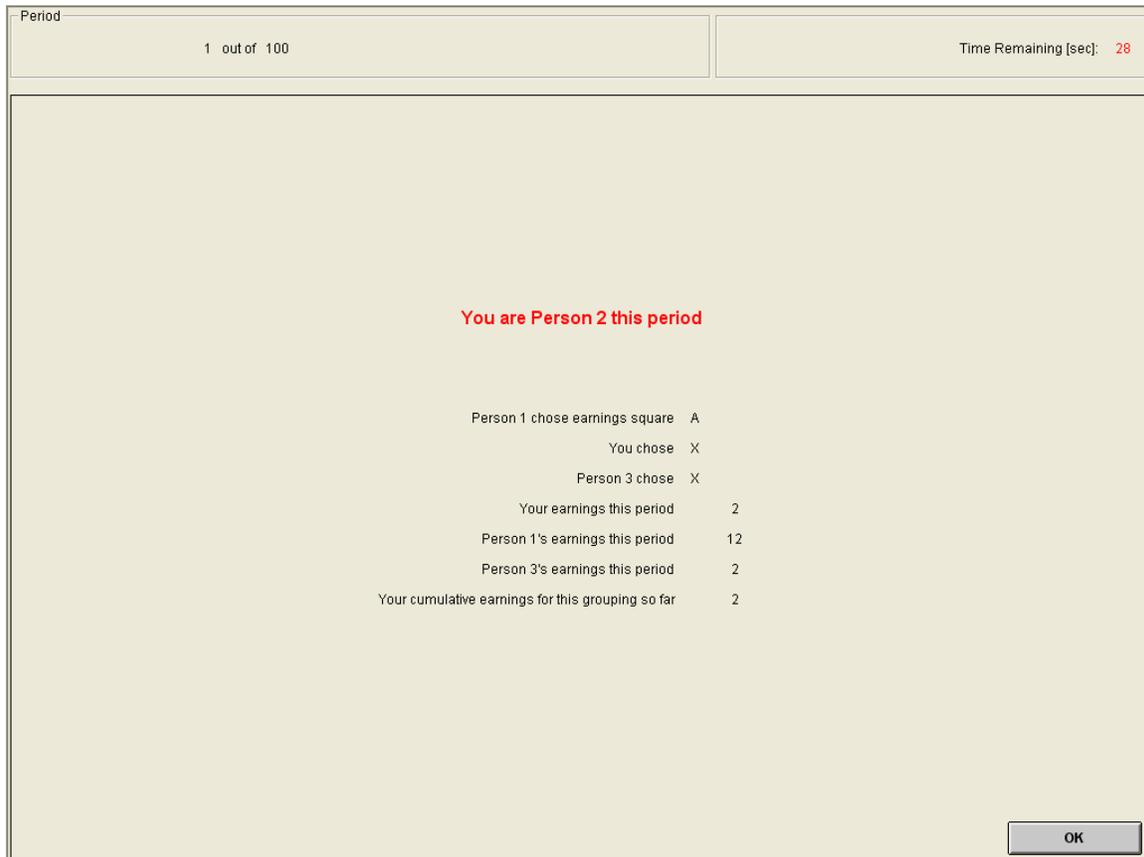
OK

Decision Screen for Person 2 (Person 3's is very similar)

Your earnings from the choices each period are found in the box determined by you and the other two people in your group. If both Persons 2 and 3 choose **X**, then earnings are paid as shown in the box in the upper left on the screen. If both Persons 2 and 3 choose **Y**, then earnings are paid as shown in the box in the lower right on the screen. The other two boxes indicate earnings when one chooses **X** and the other chooses **Y**. To illustrate with a random example: if Person 1 chooses earnings square **A**, Person 2 chooses **X** and Person 3 chooses **Y**, then Person 1 earns 12, Person 2 earns 2, and Person 3 earns 1. You can find these amounts by looking at the appropriate square and box in your page of earnings tables.

The End of the Period in Part I

After everyone has made choices for the current period you will be automatically switched to the outcome screen, as shown below. This screen displays your choice as well as the choices of the people in your group. It also shows your earnings for this period and your earnings for Part I of the experiment so far.



Example Outcome Screen (Shown for Person 2)

Once the outcome screen is displayed you should record your choice and the choice of the others in your group on your Personal Record Sheet for Part I. Also record your current and cumulative earnings for this period. Click on the *OK* button on the lower right of your screen when the experimenter instructs you.

The Ending to Part I

Recall that Part I will last for 12 periods, that is, from periods 1-12 of the experiment. You will be grouped with the same two participants for 12 periods throughout Part I of the experiment. At the end of the 12th period, the current grouping for Part I will be terminated.

We will now pass out a questionnaire to make sure that all participants understand how to read the earnings tables and understand other important features of these instructions for Part I of the experiment. Please fill it out now. Raise your hand when you are finished and we will collect it. If there are any mistakes on any questionnaire, I will summarize the relevant part of the instructions again. Do not put your name on the questionnaire.

Earnings Tables– Person 1

Earnings Square A:

		Person 3's Choice	
		X	Y
Person 2's Choice:	X	Person 1 receives 12 Person 2 receives 2 Person 3 receives 2	Person 1 receives 12 Person 2 receives 2 Person 3 receives 1
	Y	Person 1 receives 12 Person 2 receives 1 Person 3 receives 2	Person 1 receives 0 Person 2 receives 7 Person 3 receives 7

Earnings Square B:

		Person 3's Choice	
		X	Y
Person 2's Choice:	X	Person 1 receives 8 Person 2 receives 2 Person 3 receives 9	Person 1 receives 8 Person 2 receives 2 Person 3 receives 8
	Y	Person 1 receives 8 Person 2 receives 1 Person 3 receives 9	Person 1 receives 0 Person 2 receives 7 Person 3 receives 7

Earnings Square C:

		Person 3's Choice	
		X	Y
Person 2's Choice:	X	Person 1 receives 8 Person 2 receives 9 Person 3 receives 2	Person 1 receives 8 Person 2 receives 9 Person 3 receives 1
	Y	Person 1 receives 8 Person 2 receives 8 Person 3 receives 2	Person 1 receives 0 Person 2 receives 7 Person 3 receives 7

Earnings Square D:

		Person 3's Choice	
		X	Y
Person 2's Choice:	X	Person 1 receives 6 Person 2 receives 8 Person 3 receives 8	Person 1 receives 6 Person 2 receives 8 Person 3 receives 7
	Y	Person 1 receives 6 Person 2 receives 7 Person 3 receives 8	Person 1 receives 0 Person 2 receives 7 Person 3 receives 7

Earnings Tables - Use this sheet when designated as Person 2

Earnings Square A:

		Person 3's Choice	
		X	Y
You	X	Person 1 receives 12 You receive 2 Person 3 receives 2	Person 1 receives 12 You receive 2 Person 3 receives 1
	Y	Person 1 receives 12 You receive 1 Person 3 receives 2	Person 1 receives 0 You receive 7 Person 3 receives 7

Earnings Square B:

		Person 3's Choice	
		X	Y
You	X	Person 1 receives 8 You receive 2 Person 3 receives 9	Person 1 receives 8 You receive 2 Person 3 receives 8
	Y	Person 1 receives 8 You receive 1 Person 3 receives 9	Person 1 receives 0 You receive 7 Person 3 receives 7

Earnings Square C:

		Person 3's Choice	
		X	Y
You	X	Person 1 receives 8 You receive 9 Person 3 receives 2	Person 1 receives 8 You receive 9 Person 3 receives 1
	Y	Person 1 receives 8 You receive 8 Person 3 receives 2	Person 1 receives 0 You receive 7 Person 3 receives 7

Earnings Square D:

		Person 3's Choice	
		X	Y
You	X	Person 1 receives 6 You receive 8 Person 3 receives 8	Person 1 receives 6 You receive 8 Person 3 receives 7
	Y	Person 1 receives 6 You receive 7 Person 3 receives 8	Person 1 receives 0 You receive 7 Person 3 receives 7

Personal Record Sheet for a Person 2 or 3-Part I (Periods 1-12)

Period	Person 1's Choice (circle one)	Your Person Number (circle)	Your choice (circle)	Other Person 2 or 3's choice	Your earnings this period	Total earnings in Part I of the experiment so far
1	A B C D	2 3	X Y	X Y		
2	A B C D	2 3	X Y	X Y		
3	A B C D	2 3	X Y	X Y		
4	A B C D	2 3	X Y	X Y		
5	A B C D	2 3	X Y	X Y		
6	A B C D	2 3	X Y	X Y		
7	A B C D	2 3	X Y	X Y		
8	A B C D	2 3	X Y	X Y		
9	A B C D	2 3	X Y	X Y		
10	A B C D	2 3	X Y	X Y		
11	A B C D	2 3	X Y	X Y		
12	A B C D	2 3	X Y	X Y		

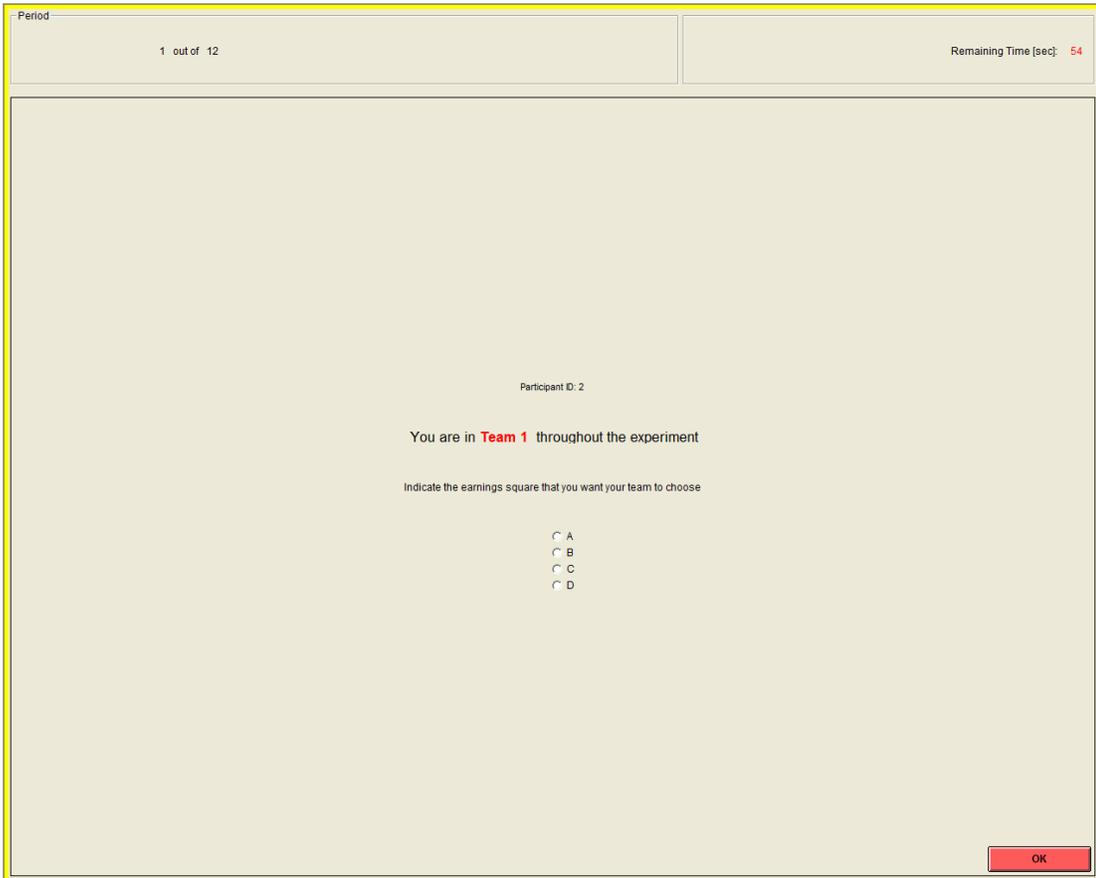
Total earnings in Part I: _____(Francs)

Instructions--Part II (Periods 13-24)

At the beginning of the 13th period, you will be randomly grouped with eight other participants to form a nine-person group. Each nine-person group will consist of three of those participants who were randomly chosen to be person 1 in the beginning of the experiment, and six of those participants who were chosen as persons 2 or 3 in the beginning of the experiment. The three person 1 participants will form a three member Team 1 for Part II of the experiment. Three of the other six participants who were chosen as persons 2 or 3 in the beginning of the experiment will be randomly grouped together to form a Team 2, and the remaining other three participants will be grouped together to form a Team 3. You will be grouped with these same eight participants for 12 periods throughout Part II of the experiment, that is, from periods 13-24 of the experiment, and you will always belong to the same three-person team that you are randomly assigned to in the beginning of Part II of the experiment. At the end of the 24th period, all participants will be re-grouped, as explained later at the beginning of Part III.

Your Choice in Part II

During each period, you and all other participants will make one choice. Earnings tables for Part II are provided on separate papers, which tell you the earnings each participant receives given the choices that your team and the other two teams in your group make. Your earning in each period will be one-third of your team's earning in that period. **Team 1** chooses the earnings square, either **A**, **B**, **C** or **D**. **Team 1** make this choice before the other Teams 2 and 3 make their choice. Before making their team's actual choice, members in Team 1 have an opportunity to privately communicate with each other for 1 minute in a chat window. (After period 16 of the experiment this chat period will be reduced to 40 seconds.) After the communication, each member of Team 1 will indicate the earning square he/she wants his/her team to choose in an individual decision screen for members of Team 1 shown in the figure below.



Decision Screen for a member of Team 1

If all members of Team 1 agree on a particular earning square, then the computer will implement this as the action chosen by Team 1. If there is disagreement, then members of Team 1 will have 5 more rounds to reach a unanimous decision, but with no additional opportunity to chat during these rounds. During each round, members of Team 1 will be asked to indicate the earning square that he/she wants his/her team to choose. If a unanimous decision is reached in any round, then that unanimous decision will be implemented by the computer. If members of Team 1 fail to reach a unanimous decision after 6 rounds, the computer will randomly choose one of the earning squares among those that were indicated as preferred choices by members of Team 1 in the last (that is, the 6th) round.

After learning which earnings square **Team 1** chose, then **Teams 2 and 3** make their choices simultaneously. That is, if you are a member of Team 2 then you do not learn the choice of Team 3 until after you make your choice. Both Teams 2 and 3 may choose either **X** or **Y**. However, after learning **Team 1**'s earnings square choice but before making their team's actual choice, the *six* participants who are designated as members of Team 2 or Team 3 will have the

opportunity to privately communicate among themselves in a chat window for 90 seconds.(After period 16 of the experiment this chat period will be reduced to 1 minute.). Although we will record the messages that you send, only you and the other participants who are designated as members of Team 2 or Team 3 in your nine-person group will see them. The participants who are designated as members of Team 1 will not observe these chat messages.

After the six participants who are designated as members of Team 2 or Team 3 privately communicate among themselves, each member in Team 2 and Team 3 has an opportunity to privately communicate with other members in his/her own three-person team for 1 minute in a separate chat window. (After period 16 of the experiment this chat period will be reduced to 40 seconds.) That is, this communication will only take place separately in two chat windows among *the three members of a Team 2 or Team 3*. After this communication, each member of a Team 2 or Team 3 will indicate the action he/she wants his/her team to choose in an individual decision screen as shown in the figure below.

Period: 1 out of 12 | Remaining Time [sec]: 38

Participant ID: 6

You are in this Team 2 throughout the experiment

Team 1 chose earnings square A

Everyone's earnings depend on the choices made by your team and Team 3 as shown below

		Team 3	
		X	Y
Your Team	X	Team 1 member receives: 12 Team 2 member receives: 2 Team 3 member receives: 2	Team 1 member receives: 12 Team 2 member receives: 2 Team 3 member receives: 1
	Y	Team 1 member receives: 12 Team 2 member receives: 1 Team 3 member receives: 2	Team 1 member receives: 0 Team 2 member receives: 7 Team 3 member receives: 7

Indicate the action you want your team to choose: X Y

OK

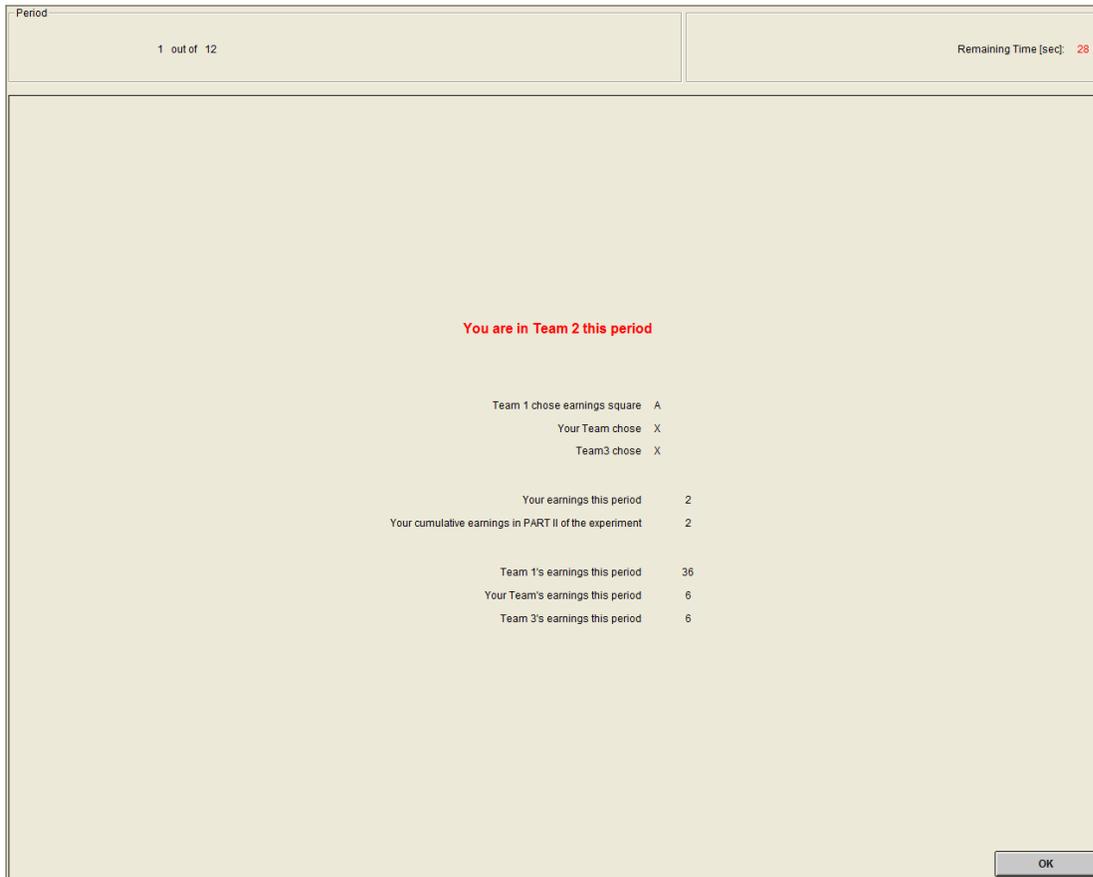
Decision Screen for a member of Team 2 (Team 3 member's is very similar)

If all members of a Team 2 or Team 3 agree on a particular action, then the computer will implement this as the action chosen by the team. If there is disagreement, then members of a Team 2 or Team 3 will have 5 more rounds to reach a unanimous decision, but with no additional opportunity to chat during these rounds. During each round, members of a Team 2 or Team 3 will be asked to indicate the action he/she wants his/her team to choose. If a unanimous decision is reached in any round, then that unanimous decision will be implemented by the computer. If members of Team 2 or Team 3 fail to reach a unanimous decision after 6 rounds, the computer will randomly choose one of the actions among those that were indicated as preferred choices by members of the team in the last (that is, the 6th) round.

To sum up, regardless of what team you are in, before you indicate your preferred choice for your team, you will have the opportunity to privately communicate with the other two persons *in your own team*. Although we will record the messages that you send, *only you and the other two persons in your own team will see them*. For example, if you are a member of Team 1, you will be communicating with the other two members in your team, but members in Team 2 and Team 3 will not observe your chat messages. In addition, after learning **Team 1's** earnings square choice, the six participants who are members of Team 2 or Team 3 will have the opportunity to privately communicate among themselves. The participants who are members of Team 1 will not observe these chat messages. This communication between the six participants who are members of Team 2 or Team 3 will take place after they learn **Team 1's** earnings square choice but before the separate communication that will take place between the three members of a Team 2 or Team 3. Note, in sending messages back and forth between you and the other persons we request that you follow two simple rules: (1) Be civil to each other and use no profanity and (2) Do not attempt to identify yourself in any way.

The End of the Period in Part II

After every team has made choices for the current period you will be automatically switched to the outcome screen, as shown on the next page. This screen displays each team's choice as well as the choices of the other teams in your group. It also shows your team's earnings and your earnings for this period and your earnings for Part II of the experiment so far. Once the outcome screen is displayed you should record the relevant information on your Personal Record Sheet for Part II.



Example Outcome Screen (Shown for a member of Team 2)

The Ending to Part II

Recall that Part II will last for 12 periods, that is, from periods 13-24 of the experiment. You will be grouped with the same eight participants throughout Part II, and you always remain in the same team. At the end of the 24th period, the current grouping for Part II will be terminated.

We will now pass out a questionnaire to make sure that all participants understand how to read the earnings tables and understand other important features of these instructions for Part II of the experiment. Please fill it out now. Raise your hand when you are finished and we will collect it. If there are any mistakes on any questionnaire, I will summarize the relevant part of the instructions again. Do not put your name on the questionnaire.

Instructions--Part III (Periods 25-36)

At the beginning of the 25th period, you will be randomly grouped with two other participants to form a three-person group, with one person of each type in each group. You will be grouped with these same two participants for 12 periods throughout Part III of the experiment, that is, from periods 25-36 of the experiment. You will make choices according to the same rules as those in Parts I and II, however *you will not be matched with any of the two participants that you were matched with in either Part I or Part II to form the three person group in this last Part of the experiment.*