THE EFFECT OF BARGAINING SEQUENCE AND TYPE OF PAYOFF UPON COALITION STRUCTURE AND STABILITY IN THE TRIAD

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ABSTRACT

THE EFFECT OF BARGAINING SEQUENCE AND
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AND STABILITY IN THE TRIAD

By David Kline

Coalition formation theories make predictions about the two person alliances that will form in three person groups, and the manner in which the payoff will be divided between alliance partners. The predictions are based on the initial resources possessed by each participant in a given situation. The situation investigated the most often is that in which 1) all participants have different initial resources, 2) no participant has a majority of the resources, and 3) the combination of the resources of any two persons yields a majority control of the resources. This situation is called the Type 5 coalition situation.

The research studies investigating the Type 5 situation have presented evidence for two different coalition processes: 1) the two weak players unite against the strong player and divide the payoff in proportion to their relevant resources; and 2) the three possible types of coalitions occur equally often and the payoff is divided equally. An examination of these research studies revealed that their results could have been produced by three extraneous factors.

The three extraneous factors were: 1) unequal status--the player with the largest resource value had greater status than the other two players because he could win by himself if no coalition formed; 2) time pressure--since the first two players to make an agreement on dividing the payoff were the winning coalition, there was a pressure to form a quick coalition regardless of its terms; and 3) experimental demand characteristics--since the game's payoff was of little value to the participants, the subjects played the game in order to obtain the experimenter's approval and not the game's reward. It was hypothesized that the removal of these extraneous influences would produce a more equal distribution of initial contacts, initial coalitions, and payoff splits than previously obtained, and result in coalitions more resistant to dissolution (i.e., coalitions that are more stable).

Unequal status was eliminated by employing a coalition-bargaining game in which only a two-person coalition could win. The time pressure was alleviated by requiring each player to have preliminary negotiations with each of his two opponents prior to attempting to form a winning coalition. The experimental demand characteristics were obviated by creating a game payoff of significant value to the subjects, i.e., $9 in real money.

The results indicated that preliminary negotiations resulted in payoffs being divided more equally than when no preliminary negotiations were allowed. Real money payoffs, as opposed to play money payoffs, resulted in a more equal distribution of initial contacts, and initial coalitions, as well as payoff splits. In addition, real money increased the stability of the coalitions. However, real money payoffs did produce

distributions of contacts and coalitions that were significantly different from chance. The only condition in which these distributions were not significantly different from chance was the condition combining real money payoffs and preliminary negotiations. It was concluded that while real money payoffs contributed the most influence in producing equal coalition outcomes in the Type 5 coalition situation, equal status and preliminary negotiations were also necessary conditions for producing outcomes more in line with chance distributions.

Additional results indicated that real money payoffs and preliminary negotiations resulted in the players taking less time to reach an agreement.

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Any time two or more persons enter into a relationship in which each person is dependent on the other person(s) in order to attain his own goals, that relationship can be characterized as a mutual dependence relation. Many social psychological experiments have investigated mutual dependence behavior. These experiments have examined behavior ranging from simple reciprocal behavior between two persons, to more complex two person bargaining behavior, to the extreme in mutual dependence behavior--coalition formation. In coalition formation a common-fate alliance is formed between two or more persons, and from that point on the alliance acts as a single unit. Theories to explain the coalition formation process have been proposed by Caplow (1956) and Gamson (1961a). These theories make predictions about the manner in which triads will divide into a two-unit coalition and an isolate. The following assumptions about the coalition situation are made by either one or both of these theories: (1) it is a mixed-motive situation (i.e., a person is reward for both competitive and cooperative behavior); (2) each person's goal is to maximize his outcome (payoff); (3) no person has dictator power (i.e., can control the outcome by himself); (4) Gamson, but not Caplow, makes the assumption that no person has veto power (i.e., is required to be a member of a coalition in order for it to win); (5) all participants have equal information about the situation; and (6) the payoff to all coalitions is constant.

The predictions of the theories are expressed in terms of the relevant resources initially possessed by each participant in a given situation. The theories assume that each participant's expectations and demands in a situation are determined by the proportion of relevant resources he controls in the situation. For this reason, the theories of Caplow and Gamson will be referred to as "Resource" theory (RT) in this paper. Caplow's and Gamson's predictions as to which coalition will form, given a certain resource distribution, are presented in Table 1.

Table 1. Caplow and Gamson's predicted coalitions in triads of varying initial resources

Type No.	Distribution of Resources	Example	Predicted Coalition	
			Caplow	Gamson
1	A=B=C	1-1-1	any	any
2	A>B, B=C; A<(B+C)	3-2-2	BC	BC
3	A<B, B=C	1-2-2	AB, AC	AB, AC
4	A>(B+C); B=C	3-1-1	none	none
5	A>B>C; A<(B+C)	4-3-2	AC, BC	BC
6	A>B>C; A>(B+C)	4-2-1	none	none
7	A>B>C; A=(B+C)	3-2-1	AB, AC	inapplicable
8	A=(B+C); B=C	2-1-1	AB, AC	inapplicable

The eight resource distributions can be divided into two classifications: (1) those in which any two-party coalition can control a majority of the resources (Types 1, 2, 3, and 5); and (2) those in which one participant has either dictator or veto power (Types 4, 6, 7, and 8). Since dictator

and veto situations are of little research interest, most of the research has focused on Types 1, 2, 3, and 5. Of these four distributions, the only distribution for which the theories of Caplow and Gamson make variant predictions is Type 5 (4-3-2). For this reason, and also because of the veridicality of the all-different distribution, most of the research testing resource theory has focused on the Type 5 distribution.

The general nature of the prediction as to which coalition will form in a Type 5 situation can be summarized in the statement that the greater the combined resources of two players, the less likely it is for those two players to form a coalition (i.e., 3 and 2 will ally most often, and 4 and 2 will ally more often than 4 and 3). This effect is often described as the "strength is weakness" (SIW) effect. Most of the coalition research to date that has used the conventional research paradigm, in which the first two-person coalition that forms is the winner and all coalitions have the same probability of future success, has reported obtaining the SIW effect (Vinacke and Arkoff, 1957; Vinacke, 1959; Gamson, 1961b; Bond and Vinacke, 1961; Chertkoff, 1966; and Phillips and Nitz, 1968).

An additional prediction of RT is that the division of the payoff between the coalition partners will be proportional to the amount of relevant resources contributed to the coalition by each partner. The research evidence obtained for the division of the payoff does not support the prediction of RT very strongly. Most of the coalition experiments have yielded an ambiguous and inconclusive pattern of results for the division of the payoff.

A second theoretical approach to coalition formation is akin to the "game theory" concepts of von Neumann and Morgenstern (1944), and Shapeley

and Shubik (1954). No formal definition of this theoretical position has been presented, but the basic tenets of this approach to coalition formation have been presented in a number of various research publications (Vinacke and Arkoff, 1957; Kelley and Arrowood, 1960; and Vinacke, Crowell, Dien, and Young, 1966). This explanation for coalition formation is based on the assumption that each person acts in a purely rational and objective manner in the coalition situation. For the purposes of this paper this explanation of coalition formation will be called the rational-objective theorem (R-O-T). The R-O-T states that in a three-person competitive game each player is able to determine at the outset of the game the optimal strategy of each of his opponents, and thus select that strategy for himself that will maximize his outcome in the game. A rational-objective analysis of the conventional coalition situation reveals that since any two-party coalition can control a majority of the game's resources, the differences between the participant's initial resource values bear no real significance in determining which coalition will form and how the payoff will be divided. In actuality, each player has the same amount of pivotal power (Shapeley and Shubik, 1954), or pivotal resources (i.e., each player can make a coalition a winning coalition as often as any other player). Therefore, the three possible two-party coalitions should occur with equal frequency, and the payoff should be divided equally between the two coalition partners.

The primary objective of three of the more important coalition studies (Vinacke and Arkoff, 1957; Kelley and Arrowood, 1960; and Vinacke, Crowell, Dien, and Young, 1966) has been to determine whether RT or the R-O-T offers the best explanation of what goes on in a three-person social situation in

which any two-person coalition can win.

The experimental game used in these three experiments was a modified parchesi game and is described below by Kelley and Arrowood (1960).

> Three subjects play a game in which each moves his counter along the spaces of a game board. The first one to reach the goal receives a prize of 100 points. On successive trials, the experimenter rolls a single die and each player advances a number of spaces determined by the product of two numbers: (a) the number of pips turned up on the die and (b) a "weight", ranging from 2 to 4, which was randomly assigned him at the beginning of the game. For example, in one game Player A may have weight 4, Player B, weight 3, and Player C, weight 2. Since all players start at the same point on the board and move each time the die is cast, the person assigned the largest weight automatically wins. A further rule, however, enables any pair of players to form a coalition by combining their weights at any time during the game. When they do so, they are given a single counter placed at a position equal to the sum of the distances the two have attained at that time. On subsequent rolls, they advance according to the sum of their two weights. The formation of a coalition is acknowledged by the experimenter only when the two players have agreed upon how they will divide the 100 point prize, should they receive it; and, once formed, a coalition is indissoluable for the remainder of that game. Thus, the individual or coalition that can mobilize the largest weight automatically wins that game and there is really no need for going through the motions of rolling the die [p. 231].

The three research studies, previously mentioned, that used the above described experimental paradigm confined their investigation to male subjects.

Vinacke and Arkoff (1957) were the first to use the parchesi paradigm in testing RT versus R-O-T. These experimenters had each of thirty triads play the modified parchesi game 18 times, each of the six different types of initial resource distributions being used three times. Each set of six games that had different initial resource distributions was played in a Latin square order to offset order effects. Before each game, each player drew a counter which determined the weight he would have for that game. The order of draw was counter-balanced so that each player drew first, second, and third an equal number of times.

The coalition results confirmed the SIW hypothesis. In the Type 5 situation 67% of the coalitions were 3-2 coalitions. The results for the division of the payoff, on the other hand, offered very little support for RT predictions. Vinacke and Arkoff reported that the players in the Type 5 situation split the payoff equally about 47% of the time, and split the payoff unequally about 53% of the time. One problem with this data is that it is not presented according to the proportion of the payoff obtained by each player in the coalition. Instead, the data was collapsed across all players and games, and categorized according to 50/50 and non-50/50 splits. This procedure assumes that any deviation from an exact 50/50 split is an indication that the subjects divided the payoff in proportion to their initial resource values. Such an assumption is probably too stringent since it does not allow for any deviation from an equal split as a result of error, chance, or compromise.

Kelley and Arrowood (1960) discount the Vinacke and Arkoff findings as spurious results. According to Kelley and Arrowood, subjects in the Vinacke and Arkoff experiment became confused about how to play the game because the resource distributions were changed between each of the 18 games. Consequently, the subjects never had ample opportunity to perceive the objective character of the situation, and they erroneously equated the initial power weights with each subject's actual power in the situation. Kelley and Arrowood offered the hypothesis

> that with a simpler procedure, subjects will acquire an adequate understanding of the true power relations and act more in accord with a rational analysis of the situation than the Vinacke and Arkoff data would suggest. (1960, p. 233)

Kelley and Arrowood tested this hypothesis by having 30 triads play the parchesi game using only the Type 5 (4-3-2) resource distribution. The

number of games played by each triad varied from 10 to 70 and averaged approximately 24 games. Each player kept the same weight throughout the series of games his triad played. The implication of this statement, even though Kelley and Arrowood do not specifically say so, is that each subject played against the same two opponents in all the games he played. Kelley and Arrowood also gave their subjects extensive formal instructions and an orientation for each subject to maximize his payoff without regard to the other players in his group.

The results obtained by Kelley and Arrowood revealed a distribution of coalitions for the first three games that was significantly closer to a chance distribution than that obtained by Vinacke and Arkoff in their three games. Kelley and Arrowood's coalition distribution for the first three games, however, was significantly different from a chance distribution ($.01<p<.02$). On the other hand, the coalition distribution for the last three games each triad played was not significantly different from chance ($.20<p<.30$). As Kelley and Arrowood indicate, however, the chi-square tests used to obtain these significance values are not legitimate since each triad played a series of games and the observations are, therefore, not independent. No data was presented by Kelley and Arrowood about the manner in which the payoff was divided.

Kelley and Arrowood conclude that simplifying and clarifying the experimental procedure will result in the subjects perceiving the situation more objectively and forming coalitions more in accord with a chance distribution.

Vinacke, Crowell, Dien, and Young (1966) reject the conclusions of Kelley and Arrowood for the following reasons:

1. allowing each player to have the same resource value for all games caused subjects to become bored, and, consequently to mix up their alliances to alleviate the boredom.

2. playing against the same players with the same resource values for a series of games is highly similar to the experimental procedure used by Vinacke (1959) and Emerson (1964) in their cumulative score games. The cumulative score experiments revealed that keeping a cumulative score tends to result in a coalition process where the persons with the smallest scores are the most likely to get into the next coalition. This means that if the weak players initially ally against the strong, at some point they will surpass the strong member in cumulative score and then the strong member will be the most likely player to get into a coalition, and so forth. This process would eventually equalize the frequency of occurrence of each possible coalition, which is the result claimed by Kelley and Arrowood to be due to clarifying the experimental procedure.

Vinacke et al. conducted an experiment that was intended to test Kelley and Arrowood's hypothesis under experimental conditions not subject to the above criticisms. These researchers conducted a study in which triads were directly informed of the rational-objective approach to coalition formation and of the conventional resource theory approach, and were then allowed to choose which of the strategies they wanted to use in the experimental game. This experiment used the same paradigm as the Vinacke and Arkoff (1957) experiment except that: 1) each triad played 48 games, 12 games of each of four types of resource distributions; 2) the 48 games were divided into two phases:

a) Phase 1 - the first 24 games (six games of each of the four types of distributions) were played under the conventional paradigm instructions and rules.

b) Phase 2 - either one, two, or all three players in a triad were randomly selected and received the special information describing the two strategies that could be used to play the game. Each triad then played another series of 24 games (six games of each of the four types of distributions).

3) all six games of each distribution type were played consecutively; 4) the order in which the four resource distributions were played was randomized; and 5) data was reported for only two resource distributions (Types 2 and 5).

Vinacke, et al., interpret their results as supporting RT and not the R-O-T. It should be pointed out, however, that because of the manner in which the results are reported, it is difficult to verify Vinacke, et al.'s interpretation of the data. For example, the coalition data was presented for the combined 3-2-2 (Type 2) and 4-3-2 (Type 5) distributions, summed across all games. This procedure confounds the interpretation of the 4-3-2 data. For example, in two previous experiments that employed all six types of resource distributions (Vinacke and Arkoff, 1957; Vinacke, 1959), the distribution that yielded the highest frequency of SIW coalitions was the 3-2-2. This is probably a result of the fact that in addition to being the two weakest players, 2-2 are also equal in power and may be more attracted to each other as a result of some similarity bias. Therefore, collapsing the 3-2-2 distribution with the 4-3-2 distribution most likely inflates the SIW result. In addition, the coalition data is not reported in terms of the number or percentage of weak coalitions that were formed but, instead, in terms of the number of triads that formed weak coalitions more often than chance or less often plus equal to chance across all games. This method of presenting the results destroys most of the comparability between this experiment and the Vinacke and Arkoff and Kelley and Arrowood experiments.

A comparison of the first three games in the Vinacke, et al. experiment with the last three games revealed an exception to the SIW effect. Triads in which all three members were informed of the two strategies available to them formed significantly fewer weak alliances in the last three games than they did in the first three games. Vinacke, et al., reject the interpretation of the above result that greater experience in playing the games or greater understanding of the game situation led to a rational strategy of game playing.

Instead, Vinacke, et al., offer an alternate explanation.

In the post-game questionnaire each player was asked if he "tried to win", and he was also asked three questions to measure his understanding of the special strategy information. The percentage of subjects that received the special strategy information, who said they tried to win, was much greater for the subjects who showed they had a partial or good understanding of the strategy information than for the subjects revealing a poor understanding of the information. Vinacke, et al., concluded that

> this means then, that the procedure whereby one or more members of the group were provided with special information led to an expression of stronger motivation to win, as well as accomplishing our original aim to instruct players in the two alternative strategies. (1966, p. 187)

In addition, Vinacke, et al., report finding, but without the use of a significance test, that as the number of triad members who had a desire to win increases, the incidence of weak coalitions decreases. From all of this information, these authors conclude that "the formation of weak alliances (as an aspect of strategy) is a function not of understanding the true character of the power situation but of desire to win." (1966, p. 187).

It is difficult for this writer to determine by what scientific process Vinacke, et al., arrived at this conclusion. It seems just as easy to argue, and more likely to be true, that the subjects who came into the game with a greater desire to win were motivated to learn more from the special strategy information, and, as a result, understood the situation better. This sequence of events could have produced fewer weak coalitions. Vinacke, et al., present no evidence to indicate the causal order of events that produced the obtained results, and, therefore, they have no legitimate basis for suggesting that higher motivation leads to fewer weak alliances, instead of better under-

standing leading to fewer weak alliances.

Current state of resource theory and rational-objective theorem controversy

What conclusions can be stated about the evidence that has been presented to date to explain the coalition process in the Type 5 situation?

1. Both resource theory and the rational-objective theorem have received partial support from the empirical data that has been reported. None of the evidence that has been reported validates either one of the theoretical positions.

2. The data on the division of the payoff is inconclusive as to whether it supports resource theory or the rational-objective theorem.

3. The coalition experiments that have examined resource theory and the rational-objective theorem are all open to criticism for inadequately controlling their experimental design and procedure.

4. The experimental game that has been used to investigate coalition formation is too complicated for effective scientific investigation. A new game is needed that players can comprehend in one trial.

5. The empirical support for the rational-objective theorem has been attributed to both a greater understanding of the experimental situation and to a greater motivation to win.

PROBLEM

The critical question facing coalition theory at the present time is this: Is the coalition process operating in the Type 5 situation based on the belief that the participant's initial resources are actually different (RT), or, instead, is it based on the belief that the three players have equal resources (R-O-T)? The problem with the present state of coalition research is that there is evidence for affirmative responses to both parts of this question. It must be concluded, therefore, that either there are two coalition processes in operation and the contradictory evidence is the result of these dual processes, or the evidence supporting one or both theories is artifactual. This investigator believes that the latter is the correct explanation for the contradictory results.

It was the fundamental tenet of this study that the coalition-bargaining games used in most of the previous coalition experiments created a pseudo-coalition situation in which the most likely outcome was that predicted by resource theory. The two main coalition-bargaining games used were 1) Vinacke and Arkoff's (1957) modified parchesi game and 2) Gamson's (1961b) political convention game. The characteristics of both of these games that contributed to the creation of this pseudo-coalition situation were:

1) the initial resource values were randomly assigned;[1]

2) the first two players to reach an agreement were declared the winning coalition;

3) the payoff for the game was of little value to the participants.

In addition, the modified parchesi game has a rule that the player with the largest resource value will win the game by himself if no coalition is formed. A game with this rule is called a non-forced coalition game. The non-forced coalition paradigm also contributed to the artifactual RT outcomes. The Gamson political convention game is called a forced coalition game since only a two-person coalition can win, that is, four can not win by himself. In spite of this difference between these two games the forced coalition game produced the SIW effect. (Gamson, 1961b; and Chertkoff, 1966)

In order to substantiate the above criticisms and conclusions about previous coalition research, the following three questions were examined and answered:

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[1]It has been the assumption of all previous research studies on coalition formation that the random assignment of initial resource values would not significantly alter the character of the coalition process. There is no empirical evidence to suggest that this is a correct assumption. In fact, it is very likely that random assignment could suggest to the player a lack of difference in initial resources that would produce a more equal distribution of coalitions and payoffs. On the other hand, random assignment could suggest to the subjects a lack of reality in the game resulting in the subjects playing the game with little earnestness or desire to win. This loss of motivation and reality could cause the subjects to play the game the easiest or most plausible way just to get it over with. The most plausible way to play the game is to use the initial resources to decide whom to choose for a coalition partner, otherwise why even assign them. Further discussion of this problem is presented in later parts of the Problem section. In order to compare the experiment described in this paper with previous experiments, this experiment will also assume that random assignment of initial resource values makes no difference to the coalition process.

1) What were the prevailing conditions in the conventional research paradigm that produced the Resource theory outcomes? Were these conditions extraneous factors in the experimental paradigm?

2) If so, can the experimental conditions be altered so that the coalition process is not affected by these extraneous factors and is instead the result of a more veridical process that is experimentally controlled?

3) If so, what will be the coalition process outcomes in such a situation?

Conditions producing Resource theory outcomes

There are three factors in the conventional research paradigm that contributed to the RT outcomes. The first factor is the demand characteristics of the experimental situation. Since the conventional game's payoff was of little value to the players, the main reward in the situation was demonstrating to the observers of the game (i.e., other players and the experimenter) how well one could play the game. Good performance in an experimental competitive game demonstrates two types of competence: 1) ability to perceive the experimenter's purpose in conducting the study and 2) skill in competitive game playing. In a psychology experiment the first of these expressions of competence is usually the most important to the participants. In order for a player to be able to demonstrate that he has perceived the true purpose of the study, he must play the game the way it is supposed to be played. In order for the player to prove that he has played the game correctly, he must determine what it is the experimenter wants him to do in the experiment, and then obtain the experimenter's positive evaluation of his performance. In the coalition-bargaining game the subject usually decided the experimenter wanted him to use the initial resource values in deciding whom to choose as a coalition partner. The player

reasoned that if this were not the case, the experimenter would not have assigned these values. In addition, the experimenter must have wanted the subject to take into account the difference in value of the resources of each participant, otherwise every subject would have been given the same value. The subject further reasoned that the experimenter, therefore, must have wanted to see if the participants perceived that they could maximize their winnings by choosing the player with lesser votes, instead of the player with greater votes. Also, since the players chose on the basis of initial resource values, they divided the payoff according to initial resources. Such strategy resulted in RT outcomes.

Another possible result of the conventional game's payoff being of little value was for the participants not to care how they performed in the game. In this case, the players looked for the easiest and most plausible way to complete the game. According to the rationale just described, that would have been to play the game the way it obviously should be played. Therefore, this set of circumstances also caused the players to use the initial resource values to determine their choice of partners and payoff division. As stated above, using the initial resource values resulted in the outcomes predicted by RT.

The second factor producing RT outcomes was <u>time pressure</u>. The winning coalition in the conventional research paradigm was defined as the first two players who reached an agreement on dividing the payoff. This definition pressured players into forming a coalition with the person who would make the quickest deal, instead of seeking a coalition with the player who would make the best deal. Data from previous experiments (Chertkoff, 1966; and Gamson, 1961b) supported this conclusion since most winning coalitions

were formed by the first two players to choose each other. This time pressure reinforced the subject's existing tendency, which was a result of the demand characteristics in the situation, to choose the weaker of the two opponents. Since the player had to make a quick deal, he did not have time to probe the other two players about possible terms for an agreement, and then make the choice of his preferred partner. Instead, the player had to choose, the first chance he got, the opponent most likely to choose him. Each player reasoned that the other players must also perceive the situation in this way. Since the time pressure did not allow the subjects an opportunity to develop a new strategy, the players selected the most obvious strategy for determining which opponent to choose. This strategy was to choose a partner on the basis of the initial resource values. Therefore, each subject chose the opponent with the smallest resources. In addition, the two players who chose each other did not want to risk failing to reach an agreement and losing the coalition. As a result, they divided the payoff the most obvious way--according to initial resource values. Such strategy resulted in RT outcomes.

The third factor contributing to RT outcomes was unequal status among the participants. Unequal status occurred only in the non-forced coalition situation. By allowing the player with a resource value of four to win the game if no coalition forms, four was elevated to a position of greater status than the other two players. This status difference engendered an "underdog" feeling between three and two, and increased the chances of these two players forming the winning coalition. Such an outcome was the same as that predicted by resource theory. At the same time, this "underdog" feeling created an equality between three and two. This

equality may have accounted, in part, for the subject's tendency, in previous experiments, to split the payoff equally more often than predicted by RT.

An examination of the initial partner choices that each subject is likely to make in the conventional game situation may further clarify these points. If each player's goal is to maximize his share of the game's payoff and each player uses the initial resources to determine his optimum payoff, the following partner choices will be made--four will choose two, three will choose two, and two will choose three. However, maximization, in this situation, does not only mean obtaining the largest absolute share of the payoff one can possibly get; it also means being a member of the winning coalition at any price so that one obtains something rather than nothing. Each subject, therefore, must take this time pressure into account and make sure he selects the subject who selects him. In this regard, four is sure three will choose two, and four thinks it may be possible that two will choose four; therefore, four chooses two. Three is quite sure four will not choose him but feels that two will most likely choose three. Therefore, three chooses two. Two figures that both four and three will probably choose him. If two desires to maximize his payoff on the basis of initial resource values, he will choose three, but if two is anti-competitive or wants to form the largest and most certain majority, he will choose four. In the modified parchesi game there is another factor that will influence two's decision. Since four can win if no coalition forms, four is "top-dog" and three and two are "underdogs"; therefore, two usually chooses three. The above rationale accounts for the SIW effect that has been obtained in previous studies. As can be seen, almost everything in

the conventional experimental situation was structured in favor of producing RT outcomes. Therefore, RT outcomes were not a result of the player's strategy decisions being based on a belief in the viability of the initial resource values. Instead, they were the result of each player's belief that the experimenter wanted him to use the initial resource values in choosing his coalition partner, and of the fact that using the resource values to determine one's strategy was the most obvious way to play the game. A more adequate test of coalition theories would be to examine coalition behavior in a situation in which the player's decisions would be free of the effects of artifacts.

If the preceding assumptions and rationale are correct, then the experiments of Vinacke and Arkoff (1957) and Vinacke, et al. (1966) were not adequate tests of resource theory. Since Kelley and Arrowood used the modified parchesi game to collect their data, neither was their experiment a valid test of the rational-objective theorem.

The object of this experiment, therefore, was to demonstrate that the rationale presented above was an accurate description of what takes place in coalition experiments using the conventional research paradigm. The best way to test the validity of this description was to remove the undesirable extraneous influences in the conventional research paradigm and then observe the resultant coalition behavior.

The general hypothesis of this experiment was that the elimination of these extraneous influences would result in the coalition formation outcomes predicted by the rational-objective theorem.

Elimination of extraneous influences and the resultant hypotheses

Unequal status. The influence of four's greater status, because he could win the game alone, was eliminated by constructing a new forced coalition experimental game. In this new game the only means of winning was to form a two-person coalition. This change by itself, however, could not eliminate the RT outcomes (Chertkoff, 1966; and Gamson, 1961b).

Time pressure. The time pressure exerted on the players to be a member of the first possible coalition regardless of desirability was alleviated by altering the bargaining and negotiation method. Each player was allowed preliminary bargaining contact with each of his opponents prior to making his selection of a coalition partner. An S should have been more satisfied with his coalition agreement, using this negotiation method, than he was in the conventional coalition research situation. A measure used to ascertain the subjects' satisfaction with an agreement was to examine the stability of coalitions. Coalition stability was investigated by permitting coalitions to dissolve, if they wanted to, and new coalitions to take their place.

H_1: Players allowed preliminary bargaining contact with each other before choosing their preferred partner will tend to form 4-3, 4-2, and 3-2 coalitions with more equal frequency, split the payoff more equally, and form coalitions that are more stable, than players that have no preliminary bargaining contact.

Demand characteristics of situation. The demand characteristics of the situation were obviated by making the game's payoff of significant value to the subjects. Under this condition, each subject should have played the game for its reward, and not to impress the other players or the experimenter. The game's payoff was made of high value to the sub-

jects by rewarding the subjects who formed the winning coalition with real money. Subjects winning real money in the coalition-bargaining game should be more careful about the agreements they make and also be more reluctant to take any risks that would jeopardize their winnings. As a result, coalitions formed in the real money condition should be more stable than coalitions formed in the play money condition.

H_2: Player's receiving their payoff in real money will tend to form 4-3, 4-2, and 3-2 coalitions with more equal frequency, split the payoff more equally, and form coalitions that are more stable than players who play the game for play money.

H_3: The effects of bargaining sequence and incentive will combine so that the greatest equality in the formation of 4-3, 4-2, and 3-2 coalitions, the most equal payoff splits, and the most stable agreements will occur under the preliminary contact-real money condition.

A variable, heretofore unexamined in coalition research, that is quite likely related to some of the independent and dependent variables used in coalition research is the amount of time required to reach the agreement for forming the first coalition. Preliminary contact should lessen the time required to reach an agreement for forming the first coalition since the players will have already discussed possible agreement terms.

H_4: Players allowed preliminary bargaining contact will take less time to reach an agreement than players that have no preliminary contact.

Real money should increase the incentive of the players to reach an agreement and, thus, shorten the time required to make an agreement.

H_5: Players receiving their payoff in real money will take less time to reach an agreement than player's receiving their payoff in play money.

H_6: Bargaining sequence and incentive will combine so that the preliminary contact--real money groups will take the least time to reach a first agreement.

Time required to reach the first agreement should also be related to the stability of agreements. The more time required to reach an agreement, the more conflict and disagreement that probably occurs in reaching that agreement. Coalitions are probably less stable the more that conflict and disagreement occur in the process of reaching an agreement.

H_7: The less time taken to reach an agreement in each experimental condition, the more stable the agreement.

Alternate hypotheses. Kelley and Arrowood (1960) suggested that simplifying the experimental game and having subjects play only one type of resource distribution would result in the outcomes predicted by the rational-objective theorem. The game used in this experiment was very simple and the subjects played the game only once. If understanding of the situation, per se, would produce the R-O-T results it should have produced them under these conditions. In order to test Kelley and Arrowood's hypothesis, the no preliminary negotiation-play money condition was examined to determine if simplifying the game would produce R-O-T results.

ALT-H_1: Simplifying the coalition bargaining game and the experimental procedure will result in equally frequent coalitions, equally split agreements, and stable coalitions.

A control condition was used in which triads played the coalition-bargaining game a second time. The second game was played against different opponents. If experience or learning could produce a more equally frequent distribution of coalitions, agreements that were more equally split, and agreements that were more stable, the effect should have been observable in this condition.

ALT-H_2: Playing the coalition-bargaining game twice will result in a more equal frequency of 4-3, 4-2, and 3-2 coalitions, payoffs that are more equally divided, and agreements that are more stable.

In a second control condition, subjects signed up for a two-hour experiment to ensure that the pressure of time would not be a factor in producing the stability of coalitions.

ALT-H_3: When the time limit of the experiment is not approached during the playing of the game, the coalitions will be less stable than when the time limit is approached, reached, or exceeded.

Additional problems

Previous coalition research has used the symbols A, B, and C as names for players during the experiment. Since these symbols also represent value judgments about how well students are performing in college, there is good reason to believe that college students have some preconceived preferences for one or more of these symbols. These preferences probably add extraneous "noise" to the data collected in coalition research. In the study proposed in this paper, nonsense symbols were used in place of the letters A, B, or C.

In order to collect as much information as possible about the coalition bargaining process, detailed records were kept of the offers, acceptances, and rejections of the players during negotiations. The new coalition-bargaining game used in this study allowed much more information about the bargaining process to be collected.

In order to reduce the effect of such extraneous factors as cheating, passing information to opponents without the experimenter knowing it, a feeling that the experimenter was one of the players in the game, position of subjects in relation to each other, etc., a physical divider was used

during the game. This divider would not allow subjects to see what the other players were doing, but the subjects were able to see each other's face.

A post-game questionnaire was administered to each subject in order to ascertain each player's perception of the experiment and to collect information about the subjects' social and economic backgrounds.

METHOD

Subjects

Subjects were 312 male students enrolled in introductory psychology classes at Michigan State University. Subjects participated in the experiment in groups of three players. Eighty-four triads comprised the experimental conditions and 18 triads made up the control conditions. Two triads that signed up for the experiment were not used because some of the members knew each other.

Design

A 2 X 2 factorial design was used. The two factors that were experimentally varied are (1) bargaining sequence and (2) type of payoff (Table 2).

Bargaining sequence. One level of bargaining sequence was the previously described conventional bargaining method in which the subjects were not allowed bargaining contacts prior to indicating their preferred coalition partner. This level was referred to as the single stage (SS) condition. The second level of bargaining sequence was that in which each player participated in a preliminary negotiation session with each of his opponents prior to selecting his preferred partner. This level was referred to as the multi-stage (MS) condition.

Type of payoff. One level of the payoff factor was that in which the payoff was expressed in terms of play money (PM). The payoff in this condition was $900 in play money. The second level of the type of payoff factor was a real money (RM) payoff. The payoff in this condition was $9 in real money.

Table 2. 2 X 2 factorial design of the experiment

Bargaining sequence	Single stage		Multi-stage	
Type of payoff	Play money	Real money	Play money	Real money
Number of observations	24 triads	18 triads	24 triads	18 triads

Apparatus

Coalition-bargaining game table divider. The three players and the experimenter sat around a 2 1/2' X 5' table in a 6' X 9' room. On top of the table was a divider that separated all three subjects from each other and from the experimenter. The portion of the divider that separated all three subjects from each other and from the experimenter. The portion of the divider that separated the subjects from the experimenter was 6" higher than the divider between the subjects in order to make a more acute separation of the experimenter from the game. During the first part of the game the subjects could see each other over their dividers but no subject could see what the other players were doing. During the second part of the experiment, 10" extensions were put on top of the dividers separating the subjects so that the subjects could not see each other. There was a slot at the bottom of the experimenter's divider for each subject's compartment, through which all communications were passed. A diagram of the divider is given in Figure 1.

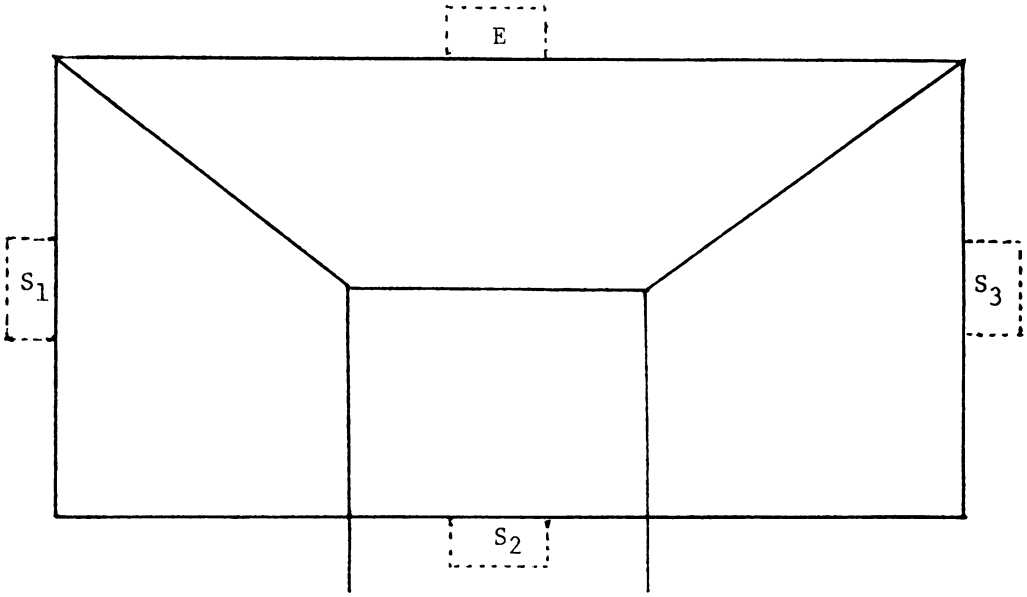

Figure 1. Table divider (top view)

Procedure

Coalition-bargaining game. Subjects signed up voluntarily for a one-hour experiment on sign-up sheets posted in their psychology classes. The Ss in the real money condition were not informed that real money could be won in the experiment until they arrived to participate in the experiment. Each subject received one-hour's research credit for his participation, which was used as extra credit in his psychology class. When the subjects arrived for the experiment, they took their places around the playing table and were told that they were going to participate in a competitive game. The subjects were also informed that if the game did not take the full hour, they would play a second, non-competitive game, separately, to fill out the one hour's credit (see Appendix B for a record of the instructions). Each subject was then assigned a nonsense symbol (VAF, YOV, or ZEJ)[2] which was used as a means of referring to each player during the game. Each symbol name was assigned approximately the same number of times to each of the three positions around the table.

[2]These nonsense syllables were selected from the list comprised by Glaze (1928). The association value of all three syllables was zero.

The experimenter then presented three envelopes to the subjects and asked each subject to draw one envelope. The order in which the subjects drew the envelopes was randomized and the envelopes were shuffled prior to each game. In the envelopes were cards with either "4 votes," "3 votes," or "2 votes" typed on them. The card a subject drew indicated the number of votes he would have in the game. Each subject then wrote his own symbol name and his number of votes, and his opponents symbol names and their numbers of votes, on a record sheet (see Appendix C, part 1). The object of the game was to obtain control of a majority of the votes and thereby win the payoff (either $900 in play money or $9 in real money). The players were informed that presently none of them had a majority of the votes but that if any two players would pool their votes and form an alliance, that pair would be the winner of the game. The only condition for declaring that a winning alliance had been formed was that two players mutually agree on how to divide the payoff. In addition, subjects were informed that the amount of money won by each player would be compared with the amount of money won by all previous players of the game who began the game with the same number of votes as they did.

The procedure for determining which two players would form an alliance varied according to condition. In the single stage bargaining condition the subjects secretly wrote on a special form (see Appendix C, part 2) the symbol name of the player they would prefer to form an alliance with, and passed the form to the experimenter. In the multi-stage bargaining condition each of the three pairs of players was given two minutes for preliminary verbal negotiations. The order in which the three pairs bargained was counter-balanced. No final agreement could be reached during the preliminary negotiations, but offers and

counter-offers could be made by each player. Preliminary agreements, if any were made, did not have to be honored later in the game. Following the preliminary negotiations the multi-stage subjects secretly filled in the forms indicating their partner preferences. From that point on the two conditions were identical.

The first two players to choose each other were given three minutes to verbally negotiate the terms of an agreement. Subjects were told that if no reciprocation occurred during the course of the game, there would be no winner. Whenever two players were negotiating (either in the single stage or multi-stage condition) the third player left the room and the two remaining players negotiated at the game table. The experimenter remained in the game room, but he could not be seen by the negotiators nor did he enter into the negotiations. If the pair of players negotiating reached an agreement, they had to record the terms of the agreement on a contract form. Both subjects were required to sign the form (see Appendix C, part 3). If the signed form was not passed to the experimenter within three minutes, the agreement was not valid. If a pair of players did not reach an agreement in three minutes, the third player returned and the process of balloting and negotiating was repeated. When an agreement was reached, the third player was brought back into the room and the terms of the agreement were announced by the experimenter. Each player then wrote the terms of the agreement on a record sheet (see Appendix C, part 4). At this time, the experimenter put the divider extensions in place so that the subjects could not see each other. The player who was not a member of the coalition was then allowed to offer the coalition partners terms for a new coalition agreement. The excluded player was

permitted to make a maximum of two written offers, one at a time, to each coalition partner. The offers could be sent in any order to the two coalition partners. If either of the alliance partners accepted an offer, the existing coalition was dissolved and a new coalition was formed. However, if a coalition broke a penalty of $100 in play money (or $1 in real money) was assessed against the game's payoff. When a coalition broke, the members lost all of their winnings in the game. The player left out of the new coalition, however, was allowed to make offers to each coalition partner for forming another coalition. If a coalition partner accepted, a new coalition was formed and the new partners split the payoff, less the amount of the penalty. This process continued until either all of the money was gone or the two partners in a given alliance each rejected the two offers received from the excluded player.

No talking was allowed during the second part of the game. All offers during this part of the game were written on special forms (see Appendix C, part 5). The forms were passed to the experimenter, who checked them for legality and delivered them to the player to whom they were addressed. A maximum of two mintues was permitted for each offer and reply. An alliance partner receiving an offer from the excluded player could make a counter-offer or comment in responding to the offer from the excluded player, but he could not initiate an offer to the excluded player. The alliance partners were allowed to send messages to each other, as many as they wanted, and whenever they wanted. The only restriction was that the partners could not change the terms of their present agreement. These rules were summarized and given to the subjects on typed 4" X 6" cards (see Appendix D).

The bargaining sessions were tape recorded for most of the groups. Most of the subjects were unaware that the sessions were being tape recorded. At the end of the game the subjects filled out a questionnaire (see Appendix E) and if their winnings were in real money, the money was given to them. Finally, all subjects were asked to say nothing about the experiment to anyone.

Control groups

Groups playing game a second time (Repeat/SS/RM). A record was kept of the names and phone numbers of the 54 subjects in the 18 SS/RM groups. From these 54 subjects, 27 subjects were randomly selected to form 9 triads that participated in the identical experiment a second time. No subject played the game a second time with either of the two subjects with whom he participated in the first experiment.

Two-hour/multi-stage/play money groups (2-hour/MS/PM). Thirty subjects (10 triads) signed up for a two-hour experiment. The extended time limit was used to determine whether subjects stopped breaking coalitions in the 1-hour experiment because 1) they wanted to conclude the experiment as quickly as possible or 2) the one hour time limit had almost expired or had been exceeded. The experimental procedure was identical to the MS/PM Condition.

It was decided prior to running the play money conditions that if no differences were found between the 1-hour and 2-hour groups, they would be combined. This procedure is legitimate since the only difference in the two conditions is the length of time for which subjects signed up.

Single stage/real money groups with extended divider (SS/RM/DIV.). After observing the behavior of the subjects in the SS/RM groups, the experimenter ran 9 triads in which the subjects could not see each other

prior to indicating their partner preference. In addition, the subjects were informed only of how many votes went with each nonsense syllable name; they did not know which of the other two players had which name until after two subjects had chosen each other as their preferred partner. The remainder of the experiment was identical to the SS/RM condition.

Operational definition of dependent variables.

The experimental hypotheses, previously stated, referred to four dependent variables--the formation of coalitions, the division of the payoff, the stability of the coalitions, and the time required to reach an agreement for forming the initial coalition. An operational specification of the type of data that was collected for each of these dependent variable processes is presented below.

Coalition process. Data on the coalition process was collected in two forms: 1) contact data and 2) coalition data. Contact data is a specification for each player of the opponent with whom each subject indicated he would prefer to form a coalition. This data was collected, trial by trial,[3] until two players chose each other. For the purposes of this study, contact choices on the initial trial were the only data analyzed. Coalition data is a specification of which two players formed the initial coalition in each game. Initial contact choices are probably a more sensitive measure of the actual perceptions and strategies of the subjects than coalition data. Coalition data may be confounded by extraneous factors, such as personality conflicts during bargaining, need for a specified amount of money, and other interferences created in a face-to-face bargaining situation that would prevent the first reciprocal

[3]A trial is defined as the simultaneous specification by each player of his preferred coalition partner.

pair from forming a coalition.

Division of the payoff. For each coalition, another measure of the subject's interdependent expectations and strategies is how the two coalition partners divided the payoff. Since there is only one degree of freedom in specifying the amount of money won by two coalition members, it is only necessary to record the amount of money won by one of the coalition partners. However, the partner whose winnings are recorded must be the same partner, in reference to some unit of analysis, across all observations. In this study, the payoff winnings were recorded for the partner with the greatest number of votes in the coalition. The amount of money won by the subject with the greatest number of votes was compared not only among experimental conditions but also with a mean of $450 ($4.50 in the real money condition) to see how it differed from an equal division of the payoff. Another item of data relevant to testing the hypotheses about the division of the payoff is whether or not the person with the greater number of votes in the initial coalition received an amount of money equal to or greater than his partner. If the payoff is divided according to the initial resource values then there should not be any payoff reversals (i.e., the person with more votes should not receive less money). If the votes are not important to how the payoff is divided, there should be a number of payoff reversals.

Stability of the coalitions. Two independent measures of coalition stability were used. The first measure was the amount of money in the final agreement (the more money, the greater the stability). This measure includes information about initial coalition breakage, as well as about the number of coalitions broken subsequent to the initial coalition breaking. This measure is the most sensitive measure of coalition stability.

The average number of offers to break a coalition and form a new alliance that are rejected, per agreement, is a second measure of coalition stability (the more offers rejected, the greater the stability).

Time for first agreement. The amount of time taken to make the first agreement was recorded in minutes and hundredths of seconds.

RESULTS

Uncommon statistical procedures

Exact probability tests. Since the unit of analysis for much of the coalition process is a three-person group, the number of independent observations in this study was fairly small. The type of data collected about the coalition process was, for the most part, a tabulation of the frequency with which a given event occurred (e.g., type of coalition formed). The significance test most commonly used to test for differences between the experimental conditions in this type of data is the Chi-square statistic. The Chi-square statistic is also used to test for the goodness-of-fit of one distribution to another (e.g., the fit of the distribution of type of coalitions to the uniform chance distribution). However, there are certain instances in which the continuous Chi-square distribution is not a good approximation to the discrete distribution of the Chi-square statistic. The most important instance is that when the expected values in the Chi-square formula are less than five, the approximation is unreliable. There were a number of instances in this experiment in which the expected values were less than five. Therefore, the Chi-square statistic was not an appropriate statistical test for much of the data in this experiment.

The alternative to Chi-square is to calculate the empirical probability (exact probability) of obtaining a given response distribution for some event. In order to do this, each possible response distribution for the

event must be enumerated and the number of ways calculated in which each response distribution could be formed. The sum across all possible response distributions of the number of ways each response distribution could be formed equals the numbers of ways the event could have occurred. The probability of obtaining the observed response distribution is equal to the sum of the number of ways the observed response distribution could be formed plus the sum of all response distributions less likely to occur, divided by the total number of ways the event could occur.[4]

As is apparent, calculating these permutations requires the use of a computer. In order to calculate exact probabilities for all effects of interest in this experiment, a set of computer programs was assembled (Kline, Anderson, Lawton, and Phillips, in preparation). The set of programs was comprised of three parts. First, for the purpose of performing a goodness-of-fit test, a computer program was written that calculates according to the method previously described, the probability of obtaining a one-dimensional distribution.[5] Second, as a means of performing a test of independence on two-dimensional distributions, a program was obtained that calculates the exact probabilities for two-dimensional tables in which each dimension may have two or more levels. This computer program is based on a method devised by Freeman and Halton (1951), which is an extension of Fisher's exact test for the 2 X 2 contingency table.[6] Third, a computer program was written that

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[4] This procedure is based on the method devised by Fisher for calculating the exact probability of a 2 X 2 table of distributions.

[5] This program was written for the computer by John Morris, a member of the staff of the Computer Institute for Social Science Research, Michigan State University.

[6] This program was written for the computer by Joseph L. Zinnes of the Department of Psychology, Indiana University.

calculates the exact probability of distributions with three or more dimensions.[7] This program was based on a method devised by Myers (1958), which was an extension of the Freeman and Halton concept.

Sutcliffe (1957) has described a method for partitioning Chi-square in order to obtain independent significance tests for each effect in a factorial design. This same result can be accomplished in terms of exact probability by combining the three programs previously described. Some of the effects in the factorial design may be fixed and, therefore, would not be calculated. In addition, since each effect is calculated independently, there would be no need to calculate effects irrelevant to the hypothesis tested. However, any effects in a factorial design that one desires to statistically investigate by means of exact probability can be calculated by these programs.

Interpretation of significance values

In this paper significance values between .055 and .104 will be interpreted as indicating that it was unlikely for the obtained statistical value to have occurred by chance only. In other words, in addition to chance some other process was operating to produce the obtained difference between the observed factors. These statistical values will be denoted by one asterisk. Significance values between .015 and .054 will be interpreted as indicating that it was very unlikely for the obtained statistic to have occurred by chance. In other words, the chance process contributed a very small part, if any, in creating the observed differences in the dependent variables. These statistical values will be denoted

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[7] This computer program was written by John Anderson and David Kline of the Human Learning Research Institute, Michigan State University.

by two asterisks. Significance values less than .015 will be interpreted as indicating that it was extremely unlikely for the obtained value of the statistic to have occurred by chance. In other words, any observed differences in the dependent variables were due to some process other than chance. These statistical values will be denoted by three asterisks.

Whenever a specific decision is to be made on the basis of significance values the critical significance value used will be .05.

Two-hour experiment

No significant differences were found between the one-hour and two-hour MS/PM groups in any of the dependent variables. The significance values of the statistical tests for differences between the two groups ranged from .25 to 1.0. Since none of the significance values even approached the .05 significance level, the two conditions were collapsed, yielded 24 groups.

Comparison with previous coalition results

The condition in this experiment most similar to the conventional coalition formation paradigm (e.g., Vinacke and Arkoff, 1957; and Chertkoff, 1966) was the SS/PM condition. The primary difference between the SS/PM condition and the conventional parchesi game paradigm was that no player could win unless he was a member of a two person coalition. Other differences, of lesser importance, between the SS/PM condition and the parchesi paradigm and/or the political convention paradigm were 1) the commodity used as resources, 2) the seating position of the subjects in the game, 3) the type of coalition-bargaining game used, 4) the method of bargaining, and 5) permitting the coalitions to break. In order to determine if these changes would produce results not supporting

RT, the SS/PM condition was compared with two previous coalition studies that supported RT predictions. First, a comparison was made with the Vinacke and Arkoff (1957) experiment (non-forced coalition paradigm). Second, results obtained by Chertkoff (1966) in his forced coalition experiment were compared with the SS/PM results.

Comparison with Vinacke and Arkoff experiment. The two types of data common to both Vinacke and Arkoff's experiment and this experiment were coalitions formed and, to some extent, the division of the payoff. Table 3 reveals that there was no significant difference in the distribution of initial coalitions for the two experiments. The data on the division of the payoff in the initial coalition was not reported in the same form in the Vinacke and Arkoff experiment as in the experiment being analyzed here. In order to compare the results of this experiment with Vinacke and Arkoff's results, the data in this experiment were retabulated and analyzed according to Vinacke and Arkoff's system. The data in Table 4 show that the payoff was divided 50/50 significantly more often in Vinacke and Arkoff's experiment than in this experiment.

Comparison with Chertkoff's experiment. Since Chertkoff used a forced coalition paradigm, his experiment is more comparable to the experiment being analyzed here than Vinacke and Arkoff's study. Chertkoff presents comparable data for contacts and initial coalitions. Tables 5 and 6 reveal no significant differences between the two experiments in either initial contacts or initial coalitions.

Restatement of experimental hypotheses

The seven experimental hypotheses tested in this experiment were:

Table 3. Exact probability test for independence between the initial coalition distribution in the single stage/play money condition and the initial coalition distribution in Vinacke and Arkoff's experiment

Experiments / Initial coalition	Single stage/play money	Vinacke and Arkoff	Totals	Exact probability
4-3	2	9	11	
4-2	6	20	26	1.0000
3-2	16	59	75	
Totals	24	88	112	
Exact probability test for uniformity of column distribution	.0020***	< .0001***		

*** extremely unlikely distribution

Table 4. Exact probability test for independence between the payoff distribution in the single stage/play money condition and the payoff distribution in Vinacke and Arkoff's experiment

Experiments / Payoff split[a]	Single stage/play money	Vinacke and Arkoff	Totals	Exact probability
50/50	2	41	43	
30/70 to 49/51	22	39	61	.0001***
1/99 to 29/71	0	8	8	
Totals	24	88	112	
Exact probability test for uniformity of column distribution	<.0001***	<.0001***		

[a]Three payoff division categories devised by Vinacke and Arkoff

***extremely unlikely distribution

Table 5. Exact probability test for independence between the initial contact distribution in the single stage/play money condition and the initial contact distribution in Chertkoff's experiment

Player contacted \ Experiments	Single stage/play money	Chertkoff	Totals	Exact probability
Greater votes	16	18	34	
Fewer votes	56	54	110	.8447
Totals	72	72	144	
Exact probability test for uniformity of column distribution	<.0001***	<.0001***		

***extremely unlikely distribution

Table 6. Exact probability test for independence between the initial coalition distribution in the single stage/play money condition and the initial coalition distribution in Chertkoff's experiment

Initial coalition \ Experiments	Single stage/play money	Chertkoff	Totals	Exact probability
4-3	2	1	3	
4-2	6	9	15	.5725
3-2	16	14	30	
Totals	24	24	48	
Exact probability test for uniformity of column distribution	.0020***	.0015***		

***extremely unlikely distribution

H_1: Players allowed preliminary bargaining contact with each other before choosing their preferred partner will tend to form 4-3, 4-2, and 3-2 coalitions with more equal frequency, split the payoff more equally, and form coalitions that are more stable, than players that have no preliminary bargaining contact.

H_2: Player's receiving their payoff in real money will tend to form 4-3, 4-2, and 3-2 coalitions with more equal frequency, split the payoff more equally, and form coalitions that are more stable than players who play the game for play money.

H_3: The effects of bargaining sequence and incentive will combine so that the greatest equality in the formation of 4-3, 4-2, and 3-2 coalitions, the most equal payoff splits, and the most stable agreements will occur under the preliminary contact-real money condition.

H_4: Players allowed preliminary bargaining contact will take less time to reach an agreement than players that have no preliminary contact.

H_5: Players receiving their payoff in real money will take less time to reach an agreement than player's receiving their payoff in play money.

H_6: Bargaining sequence and incentive will combine so that the preliminary contact--real money groups will take the least time to reach a first agreement.

H_7: The less time taken to reach an agreement in each experimental condition, the more stable the agreement.

Analysis of experimental hypotheses.

The data collected to test the seven experimental hypotheses will be presented according to dependent variable in the following order: 1) coalition data; 2) division of payoff data; 3) stability data; and 4) time for first agreement data.

Coalition data. Data collected to analyze the coalition process consists of two types--initial contact frequencies and initial coalition frequencies.

The contact data is presented in Table 7. The exact probabilities for the factorial analysis of contacts are presented in Table 8. An examina-

Table 7. Frequency with which each player contacted the opponent with the greater number of votes or the opponent with the fewer number of votes

Bargaining sequence	Single stage						Multi-stage						
Type of payoff	Play money			Real money			Play money			Real money			
Contactee \ Initiator	4	3	2	4	3	2	4	3	2	4	3	2	Totals
Greater votes	4	5	7	3	6	9	7	3	6	8	4	9	71
Fewer votes	20	19	17	15	12	9	17	21	18	10	14	9	181
Totals	24	24	24	18	18	18	24	24	24	18	18	18	252
Exact probability test for uniformity of row sums of column distribution	<.0001***			.0198**			<.0001***			.1337			

**very unlikely distribution

***extremely unlikely distribution

Table 8. Factorial design exact probabilities of contacting the opponent with the greater number of votes or the opponent with the fewer number of votes

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Subject's votes (C)	fixed effect
DV - contacts (D)	<.0001***
A x B	fixed effect
A x C	fixed effect
A x D	.7510
B x C	fixed effect
B x D	.0163**
C x D	.0792*
A x B x C	fixed effect
A x B x D	.7781
A x C x D	.1072
B x C x D	.7165
A x B x C x D	1.0000

*unlikely distribution
**very unlikely distribution
***extremely unlikely distribution

tion of Table 8 reveals that in the entire experiment players chose the weaker opponent significantly more often than the stronger opponent. There was not a significant difference between the bargaining sequence conditions and, therefore, Hypothesis 1 for the contact data was not supported. Players in the real money condition chose the stronger opponent significantly more often than did players in the play money condition. This result confirmed Hypothesis 2 for the contact data. However, further analysis revealed that the players in the real money condition chose the weaker opponent significantly ($p = .0050$) more often than they chose the stronger opponent. The almost significant interaction between contact choice and number of votes suggests there was a tendency for the player with two votes to contact the opponent with the greater number of votes more often than do the players with three or four votes. In order to test the validity of Hypothesis 3 for the contact data, simple effects in the A x B x D interaction were analyzed. Table 9 reveals that the subjects in the MS/RM condition chose the opponent with the greater number of votes significantly more often than did the subjects in either the SS/PM or MS/PM condition. However, the difference between the MS/RM and SS/RM conditions was not significant ($p = .6889$) for this dependent variable. Therefore, Hypothesis 3 was not confirmed for the contact data. Some support for Hypothesis 3 was revealed in the fact that the MS/RM condition was the only condition in which the distribution of contact choices was not significantly different from chance.

The pattern of results for the coalition data is much the same as that obtained for the contact data. An inspection of Table 10 and 11 reveals a significant main effect for the type of coalition formed and a significant

Table 9. Exact probability test for independence between the initial contact distribution in the multi-stage/real money condition and the initial contact distribution in the single stage/play money and the multi-stage/play money condition

Contactee \ Condition	Multi-stage/real money	Single stage/play money and Multi-stage/play money	Totals	Exact probability
Greater votes	21	16	37	.0496**
Fewer votes	33	56	89	
Totals	54	72	126	

** very unlikely distribution

Table 10. Frequency of formation of initial coalitions in the experimental design conditions

Bargaining sequence	Single stage		Multi-stage		
Type of payoff / Initial coalitions	Play money	Real money	Play money	Real money	Totals
4-3	2	1	1	4	8
4-2	6	10	7	7	30
3-2	16	7	16	7	46
Totals	24	18	24	18	84
Exact probability test for uniformity of column distribution	.0020***	.0193**	.0004***	.6426	

** very unlikely distribution
*** extremely unlikely distribution

Table 11. Factorial design exact probabilities of formation of initial coalitions in the experimental design conditions

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
DV - Initial coalitions (C)	.0000004***
A x B	fixed effect
A x C	.7694
B x C	.0418**
A x B x C	.4238

** very unlikely distribution
*** extremely unlikely distribution

Table 12. Exact probability test for independence between the initial coalition distribution in the multi-stage/play money condition and the initial coalition distribution in the multi-stage/real money condition

Condition / Initial coalition	Multi-stage/ play money	Multi-stage/ real money	Totals	Exact probability
4-3	1	4	5	
4-2	7	7	14	.1094
3-2	16	7	23	
Totals	24	18	42	

interaction between type of payoff and initial coalition type. The main effect difference for the type of coalition formed indicates that the three types of possible coalitions (4-3, 4-2, and 3-2) were not formed with equal frequency. Instead, the overall design confirms the SIW hypotheses that the 3-2 coalition occurs most often, the 4-2 coalition next most often, and the 4-3 coalition least often. The significant interaction between type of payoff and type of coalition formed indicates that more strong coalitions (4-3 and 4-2) were formed in the real money condition than in the play money condition. This result confirmed Hypothesis 2 for the coalition data. However, the real money subjects did not form the three types of coalitions with equal frequency ($p = .0292$). Hypothesis 1 was not confirmed for the coalition data since no difference was found in the distribution of coalitions between the two levels of the bargaining sequence factor. In order to test Hypothesis 3 it was necessary to examine the simple effects in the A x B x C interaction table. The two most discrepant distributions of initial coalitions are presented in Table 12. Even though the difference between the two distributions was in the hypothesized direction, it was not a statistically significant difference. Therefore, Hypothesis 3 was not confirmed for the coalition data. It should also be noted that the only distribution of initial coalitions in the four experimental conditions that was not significantly different from chance was the distribution in the multi-stage real money condition.

Division of the payoff. The amount of money won by the player with the most votes in the initial coalition was used to determine whether there were any differences between experimental conditions in the way the payoff was divided. The closer to 4.50 the amount of money won by this player,

the more equally divided the payoff. The means and standard deviations are presented in Table 13. The analysis of variance[8] (AOV) presented in Table 14 shows a significant main effect for bargaining sequence and type of payoff. The difference between the single-stage and multi-stage bargaining conditions was in the hypothesized direction and confirmed Hypothesis 1 for the payoff data. The difference between the play money conditions and real money conditions was also in the hypothesized direction and confirmed Hypothesis 2 for the payoff data. In order to test Hypothesis 3 for the payoff data multiple comparison t tests were made between all pairs of means in the 2 X 2 design.[9] Table 13 reveals that the mean payoff value for the player with the most votes in the initial coalition was the closest to the point of equality (4.50) in the MS/RM condition. However, this mean payoff was significantly different from the mean payoff of only the SS/PM condition (Table 15). This result did not confirm Hypothesis 3 for the payoff data. The mean payoffs in all conditions were significantly different from the equal split mean of 4.50.

Payoff reversals (i.e., where the player with more votes in the initial coalition receives the lesser amount of money) were observed in only the

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[8]Because there was not an equal number of replications in each cell of the 2 X 2 factorial design, a least squares method was used for all analyses of variance. The computer program used was made available by the Agricultural Experiment Station at Michigan State University (Ruble, 1966). The method of analysis was that described by Winer (1962). Since in an unequal N design the factors are correlated, the mean square for any given effect is not the same when analyzed with different sets of factors; it fluctuates according to its correlation with the factors that are included in the design. For this reason any factor, other than the two basic factors in the experimental design, that yielded no significant main effect or interactions was discarded from the analysis of a given dependent variable, and the analysis was recalculated on N-1 factors.

[9]Scheffé's test (Edwards, 1967)

Table 13. Means, standard deviations, and Ns for amount of money won by player with greatest number of votes in initial coalition

Bargaining sequence	Single stage		Multi-stage	
Statistics \ Type of payoff[a]	Play money	Real money	Play money	Real money
Mean	5.2208	4.9306	4.9650	4.7889
Std. dev.	.4286	.4778	.3926	.4289
N	24	18	24	18
t test for difference of column mean from 4.50	8.2397 df=23 $p < .01$	3.8233 df=17 $p < .01$	5.8032 df=23 $p < .01$	2.8574 df=17 $p < .02$

[a]The amount of money is expressed in hundreds of dollars in the play money condition and in dollars in the real money condition.

Table 14. Analysis of variance of amount of money won by player with the greatest number of votes in initial coalition

Source of variance	SS	df	Mean square	F	Significance value
Bargaining sequence (A)	.8126	1	.8126	4.399	.04**
Type of payoff (B)	1.1187	1	1.1187	6.056	.02**
A x B	.0670	1	.0670	.363	.55
Error	14.7772	80	.1847		
Total	16.8620	83			

**very unlikely F value

Table 15. Multiple comparison t values for all pairs of means of amount of money won by player with greatest votes in initial coalition

Means / Means	SS/PM	SS/RM	MS/PM	critical ratio
SS/RM	2.1754			
MS/PM	2.0746	.2578		2.8566
MS/RM	3.2376*	.9922	1.3200	p =.05

*Significant beyond .05 level

MS/RM condition. Two 3-2 coalitions in the MS/RM condition made an agreement in which the 2-vote player received the larger proportion of the payoff. These payoff reversals give support to Hypothesis 3 for the payoff data.

Stability. Two independent measures of stability were used: 1) amount of money in the final agreement and 2) the average number of offers to form a new coalition rejected per agreement.

The means and standard deviations for the amount of money in the final agreement are given in Table 16. The differences in the means of the various experimental conditions were in the predicted direction. Table 17 reveals that there was a significant difference between the real and play money groups for this dependent variable. This result confirmed Hypothesis 2 for the amount of money in the final agreement. Hypothesis 1 was not confirmed. In order to test Hypothesis 3 multiple comparison t tests were made between all pairs of means. Table 18 reveals that the MS/RM mean was significantly different from the means of only the SS/PM and the MS/PM conditions. This result did not confirm Hypothesis 3 for the level of final agreement. An analysis of this dependent variable by type of initial coalition revealed no significant differences in the level of final agreement between types of initial coalitions.

An examination of the average number of rejections per agreement (Table 19) reveals differences between the experimental conditions in the hypothesized direction. Table 20 shows a significant difference in the average number of rejections per agreement between the real and play money groups. This result confirmed Hypothesis 2 for the average number of rejections per agreement. Hypothesis 1 was not confirmed. As predicted,

Table 16. Means, standard deviations, and Ns of the amount of money in final agreement

Bargaining sequence	Single stage		Multi-stage	
Statistics \ Type of payoff	Play money	Real money	Play money	Real money
Mean	5.9583	8.2222	6.7917	8.7222
Std. dev.	2.6289	1.3528	2.2259	.5745
N	24	18	24	18

Table 17. Analysis of variance of the amount of money in final agreement

Source of variance	SS	df	Mean square	F	Significance value
Bargaining sequence (A)	9.1428	1	9.1428	2.362	.13
Type of payoff (B)	90.4802	1	90.4802	23.377	<.0005***
A x B	.5714	1	.5714	.148	
Error	309.6389	80	3.8705		
Total	410.7024	83			

***extremely unlikely F value

Table 18. Multiple comparison t values for all pairs of means of amount of money in final agreement

Means \ Means	SS/PM	SS/RM	MS/PM	critical ratio
SS/RM	3.6871*			2.8566
MS/PM	1.4672	2.3298		p =.05
MS/RM	4.5014*	.7625	3.1441*	

*Significant beyond .05 level

Table 19. Means, standard deviations, and Ns of the average number of rejections per agreement

Bargaining sequence	Single stage		Multi-stage	
Statistics \ Type of payoff	Play money	Real money	Play money	Real money
Mean	2.0625	3.4000	2.4667	3.6667
Std. dev.	1.1162	1.0748	1.2075	.6642
N	24	18	24	18

Table 20. Analysis of variance of the average number of rejections per agreement

Source of variance	SS	df	Mean square	F	Significance value
Bargaining sequence (A)	2.3144	1	2.3144	2.073	.15
Type of payoff (B)	33.1144	1	33.1144	29.656	<.0005***
A x B	.0972	1	.0972	.087	.77
Error	89.3296	80	1.1166		
Total	125.0442	83			

***extremely unlikely F value

Table 21. Multiple comparison t values for all pairs of means of average number of rejections per agreement

Means \ Means	SS/PM	SS/RM	MS/PM	critical ratio
SS/RM	4.0604*			2.8566
MS/PM	1.3252	2.8333		p =.05
MS/RM	4.8703*	.7572	3.6429*	

*Significant beyond .05 level

the largest average rejections occurred in the MS/RM condition. A comparison of means of the four experimental conditions showed a significant difference between the MS/RM mean and the SS/PM and MS/PM means (Table 21). This result did not confirm Hypothesis 3 for the average number of rejections per agreement. An investigation of the effect of initial coalition type upon the average number of rejections revealed no significant differences in rejections between type of initial coalition.

Time for first agreement. Tables 22 and 23 reveal that it took the real money groups significantly less time to reach an agreement than the play money group. This result confirmed Hypothesis 5. Hypothesis 4 was not confirmed. An inspection of Table 22 shows that it took the least time to reach an agreement in the MS/RM condition. A comparison of the MS/RM mean with the means in the other conditions revealed it was significantly different from the SS/PM mean, but not from either of the other two means (Table 24). Therefore, Hypothesis 6 was not supported.

Hypothesis 7 received no support from either the amount of money in the final agreement or the average number of rejections per agreement (Table 25). An examination of Table 25 reveals the same general type of correlations in all conditions except the SS/RM condition. Z transformation tests for differences between the correlations in the MS/RM and SS/RM conditions yielded significance values of .41 for the amount of money in the final agreement, and .23 for the average number of rejections. Therefore, there were no significant differences between experimental conditions in the correlation of time with stability.

Alternate hypotheses

Alternate hypothesis 1: simplifying coalition-bargaining game. As previously reported, the SS/PM condition yielded SIW contact and coalition

Table 22. Means, standard deviations, and Ns of time taken to make first agreement

Bargaining sequence	Single stage		Multi-stage	
Statistics \ Type of payoff	Play money	Real money	Play money	Real money
Mean	1.9904	1.6444	1.7717	1.2161
Std. dev.	.7179	1.0121	.8208	.7346
N	24	18	24	18

Table 23. Analysis of variance of time taken to make first agreement

Source of variance	SS	df	Mean square	F	Significance value
Bargaining sequence (A)	2.1534	1	2.1534	3.195	.08*
Type of payoff (B)	4.1799	1	4.1799	6.202	.02**
A x B	.2259	1	.2259	.335	.56
Error	53.9163	80	.6740		
Total	60.3216	83			

*unlikely F value

**very unlikely F value

Table 24. Multiple comparison t values for all pairs of means of time taken to make first agreement

Means \ Means	SS/PM	SS/RM	MS/PM	critical ratio
SS/RM	1.3531			2.8566
MS/PM	.9243	.4978		p =.05
MS/RM	3.0281*	1.5659	2.1728	

*Significant beyond .05 level

Table 25. Correlation of time taken to make first agreement with amount of money in final agreement and average number of rejections per agreement[a]

Bargaining sequence	Single stage		Multi-stage	
Stability \ Type of payoff	Play money	Real money	Play money	Real money
Money in final agreement	-.144	.092	-.155	-.205
Average rejections	-.069	.068	-.143	-.369
N	24	18	24	18

[a]None of the correlations were significantly different from a zero correlation at the .05 significance level.

results almost identical to the previously reported research. In addition, the coalitions were very unstable. For these reasons alternate hypothesis 1 was not confirmed.

Alternate hypothesis 2: experience and learning effect. A comparison between the SS/RM groups and the repeat/SS/RM groups revealed a significiant difference between the two conditions on only one dependent variable. The subjects divided the payoff more equally the second time they played the game than they did the first time (Table 26). Alternate hypothesis 2 was, therefore, partially confirmed. Additional data supporting the conclusions about the repeat/SS/RM group is presented in Appendix A (p. 86).

Alternate hypothesis 3: amount of time for experiment. An analysis of the amount of money in the final agreement in the 2-hour condition and the 1-hour condition revealed no significant difference between the two conditions (Table 27). Therefore, alternate hypothesis 3 was not confirmed.

Additional factors that could influence dependent variables. An examination of the initial contacts and coalitions by subject's position at the game table revealed a tendency for subjects at the ends of the game table in the SS/RM condition to choose each other. In order to determine if this fact could have altered the pattern of contacts and coalitions in the SS/PM condition a control group was run. In the control group, subjects could not see each other until after two players had selected each other as their preferred partner. In addition, the players did not know which of the other two persons in the experiment had which number of votes until after a reciprocal partner selection. Otherwise, the game was identical to the SS/PM condition. Tables 28 and 29 reveal that the tendency to choose the player facing one did not significantly alter the coalition

Table 26. t test of difference in the amount of money won by player with the greatest number of votes between single stage/real money groups and repeat/single stage/real money groups

Statistics \ Condition	Repeat/ single stage/ real money	Single stage/ real money	t value
Mean	4.6111	4.9306	2.4117**
Std. dev.	.1816	.4778	df = 26
N	9	18	$.02 < p < .05$

** very unlikely t value

Table 27. t test of difference in the amount of money in final agreement between 1-hour/multi-stage/play money condition and 2-hour multi-stage/play money condition

Statistics \ Condition	1-hour/ multi-stage/ play money	2-hour/ multi-stage/ play money	t value
Mean	7.0000	6.5000	.4897
Std. dev.	2.0400	2.5500	df = 18
N	14	10	$p > .50$

Table 28. Exact probability test for independence between the initial contact distribution in the single stage/real money condition and the initial contact distribution in the single stage/real money/divider condition

Condition / Contacts	Single stage/ real money	Single stage/ real money/ divider	Totals	Exact probability
Greater	18	13	31	.2486
Fewer votes	36	14	50	
Totals	54	27	81	
Exact probability test for uniformity of column distribution	.0198**	1.0000		

** very unlikely distribution

Table 29. Exact probability test for independence between the initial coalition distribution in the single stage/real money condition and the initial coalition distribution in the single stage/real money/divider condition

Condition / Coalitions	Single stage/ real money	Single stage/ real money/ divider	Totals	Exact probability
4-3	1	3	4	
4-2	10	4	14	.2084
3-2	7	2	9	
Totals	18	9	27	
Exact probability test for uniformity of column distribution	.0193**	.9146		

** very unlikely distribution

process. Additional data to support this conclusion are reported in Appendix A (p. 91).

An analysis of all the dependent variables failed to reveal any significant differences as a result of the three symbol names assigned to the subjects.

The order in which the subjects bargained in the preliminary negotiation round of the multi-stage condition could have affected the coalition process. If there was a primacy or recency effect from the bargaining order, it would not be too surprising to have obtained a somewhat equally distributed set of coalitions. An analysis of the effect of preliminary bargaining order upon all of the dependent variables revealed no significant effects. Data to support this conclusion are presented in Appendix A (p. 110).

An analysis of information about subjects' prior knowledge of the experiment revealed that three subjects had heard it was a bargaining game and two subjects had heard money could be won. None of these five subjects was discarded from the experiment.

Information collected about subjects' participation in other psychological experiments revealed that no subjects had participated in any experiments that one would expect to bias a person's behavior in this experiment.

If subjects had suspected that they would be allowed to break the initial coalition at the time they were negotiating to form the coalition, it would very likely have influenced their coalition behavior. The subjects were asked on the post-game questionnaire whether or not they had suspected, prior to being informed by the experimenter, that they would

be allowed to break the first agreement. Forty-eight subjects responded that they were not sure they would be allowed to break the first agreement but that they did feel there would be more to the game than had been described to them. In explaining this response to the experimenter after the game was over, subjects said the game, as described, seemed too simple and too short for there not to be more to it. An analysis of the responses to this question by experimental condition is presented in Appendix A (p. 85).

A critical factor when offering real money as a payoff in a psychological experiment is convincing the subjects that they will actually receive the money. Prior to being given the money, the subjects in the real money condition were asked if they believed they would receive the payoff in real money. Ninety-five of the 108 subjects responded affirmatively. An analysis of the responses to this question by experimental condition is presented in Appendix A (p. 86).

An analysis of data collected on the post-game questionnaire revealed that there were no differences between experimental conditions in 1) the subjects' experience in playing competitive games, or 2) the value of $9 to the real money subjects. Data to support these conclusions are presented in Appendix A (p. 100).

DISCUSSION

This experiment's fundamental tenet was that previous results supporting resource theory predictions in the Type 5 coalition situation were the product of three artifacts in the experimental design. These artifacts were: 1) unequal status among the game participants; 2) time pressure to make a quick coalition; and 3) demand characteristics of the experimental situation. According to the general hypothesis, if these artifacts were removed, the resource theory outcomes would be eliminated and the coalition process would be that predicted by the rational-objective theorem.

Effect of equalizing status and making minor changes in game

A comparison of the forced coalition game used in this experiment with the non-forced coalition game of Vinacke and Arkoff (1957) revealed no difference in the distribution of initial coalitions. A comparison of this experiment's results with Chertkoff's (1966) forced coalition experiment revealed no differences in either initial contacts or coalitions. However, there was a significant difference between the experiment reported in this paper and Vinacke and Arkoff's experiment in the division of the payoff. In order to make this comparison, the payoff splits in this experiment had to be retabulated to fit Vinacke and Arkoff's arbitrary classification scheme. It is doubtful that Vinacke and Arkoff's scheme is as appropriate a test of the payoff division hypothesis as would be a mean difference test. In spite of this criticism, it is evident that Vinacke and Arkoff's subjects split the payoff exactly 50/50

considerably more often than the players in this experiment. This difference causes one to suspect that the coalition process in the two experiments was different. An examination of the Vinacke and Arkoff experimental procedure suggests a possible explanation for this apparent difference in coalition processes. In the parchesi game the winner was defined as the player, or players, first crossing the finish line. When two players formed a coalition in this game their separate game markers were replaced by one single marker representing the two-person coalition. Since both players in the coalition would cross the finish line at the same time (i.e., would be equal winners), this procedure implied an equality between the two coalition partners. In addition, coalition partners may have tended to perceive each other equally because Vinacke and Arkoff did not give their subjects a strong orientation to maximize their individual payoff within the coalition. These two equalizing tendencies could very well account for the coalition partners splitting the payoff 50/50 almost one-half of the time in Vinacke and Arkoff's experiment. It should be pointed out that this same explanation could account for the failure of the payoff data in the parchesi paradigm experiments to support the predictions of resource theory.

In comparison with the parchesi game, the coalition game used in the experiment reported here emphasized the inequality of the coalition partners. Each coalition member was encouraged to maximize his individual winnings in order to 1) be the first place winner in the game, and 2) surpass all previous players of the game who began with the same number of votes. Under these circumstances, a subject would be inclined to want more money than his partner, even if it was only one dollar more. The difference

in orientation and rules between the two experiments could easily account for the discrepancy in the payoff splits. In any case, payoff splits in the experiment reported here are more in line with RT expectations than are the Vinacke and Arkoff data.

It was concluded, therefore, that the coalition-bargaining game used in the SS/PM condition of this experiment produced results strongly supporting the predictions of RT. Consequently, any observance of outcomes not supporting RT, obtained using this game, can not be accredited to differences in structure between conventional paradigm games and the SS/PM game.

Effect of alleviating time pressure

Hypothesis 1 predicted that by allowing all pairs of players to have preliminary negotiations the coalition process outcomes would give greater support to the predictions of the rational-objective theorem than obtained without preliminary negotiations. Table 30 reveals that this hypothesis was confirmed only for the division of the payoff. One possible explanation for the failure of preliminary negotiations to eliminate the SIW effect for contacts and coalitions is as follows. The factor about which the subjects are negotiating in the preliminary round is the share of the payoff each coalition partner will receive. The bargaining strategy used in the preliminary negotiations by the player with the most votes (relative to the opponent bargaining with) is usually that the payoff should be split in proportion to the number of votes each player would contribute to the coalition. The player with less votes usually wants to ignore the votes and bargain on the basis of equal power and, therefore, an equal split of the payoff. Since each player wants to ensure that he will be chosen by both of the other players, there is a

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tendency for each player to offer his opponents better terms in the preliminary negotiations than he would actually agree to in a final negotiation. This means that the player with more votes makes preliminary agreements in which he receives less than his proportionate share of the payoff, and the player with less votes makes preliminary agreements in which he receives less than one-half of the payoff. Even though preliminary negotiations are not binding there is a tendency for these preliminary agreements to become the terms of final agreements. Choosing a coalition partner on the basis of the most profitable preliminary agreement results in three and two choosing each other. However, the preliminary agreement results in a final agreement that divides the payoff more equally than dividing it in proportion to initial resource values.

It was concluded, therefore, that even though the preliminary negotiations did not eliminate the SIW effect for contacts and coalitions, they alleviated the tendency for the time pressure to cause the payoffs to be split according to the initial resource values.

Effect of obviating demand characteristics

It was hypothesized that subjects playing the game for real money would form coalitions more in accord with the rational-objective theorem predictions than subjects playing the game for play money (Hypothesis 2). Table 30 shows that the data confirmed this hypothesis for every dependent variable. It was concluded, therefore, that the most significant factor in producing outcomes more in agreement with the R-O-T than with RT is providing the players with a payoff for the game that is of significant value. The assumption made in the experiment was that a payoff of signi-

Table 30. Confirmation of experimental hypotheses one through three

Dependent variables \ Hypotheses	1	2	3
1. Coalition process			
a) contacts	not confirmed	confirmed	not confirmed
b) coalitions	not confirmed	confirmed	not confirmed
2. Payoff division	confirmed	confirmed	not confirmed
3. Stability process			
a) amount of money in final coalition	not confirmed	confirmed	not confirmed
b) average rejections	not confirmed	confirmed	not confirmed

ficant value obviates the subjects tendency to play the game 1) for the experimenter's approval or 2) the easiest and fastest way. Instead, the subject plays the game for its own reward.

Even though the contact, coalition, and payoff data were more equally distributed in the real money condition, the distributions for all three dependent variables were different from a chance distribution. Therefore, the effect of the initial resource values was not completely eliminated by real money payoffs.

Combination of preliminary negotiations and real money payoff

Hypothesis 3 stated that the greatest incidence of equal coalitions and payoff splits, and the greatest coalition stability, would occur in the preliminary negotiation--real money condition. This hypothesis was not statistically confirmed for any of the dependent variables. However, there are three other types of information that give support to the validity of this hypothesis. First, for every dependent variable, the condition producing behavior most in agreement with the R-O-T was the MS/RM condition. The consistency of this result suggests that there is more going on in this condition than can be accounted for by the real money main effect. Second, the only condition that reported payoff reversals was the MS/RM condition. This is a significant event since it has never before been reported that the person with the most votes in a coalition received less money. The implication of a payoff reversal is that the votes are of little significance in determining the division of the payoff. This result offered further support for Hypothesis 3. Third, further evidence of the validity of this hypothesis was revealed in the fact that the only condition in which the contact and coalition distributions were not significantly different from chance was the MS/RM condition. In other words, the MS/RM condition

is the only condition in which the SIW effect was completely eliminated. However, the payoff division in the MS/RM condition was significantly different from a chance division.

It was concluded, therefore, that neither a forced coalition paradigm, preliminary negotiations, nor real money payoff could by itself eliminate the RT outcomes and produce R-O-T outcomes. However, if all three of these factors were present in a coalition situation, the outcome would be more in agreement with the predictions of the R-O-T than resource theory.

Time for first agreement

Another variable of interest in analyzing the coalition formation process was the amount of time taken to reach the first agreement. The data revealed that, as predicted, it took less time to reach an agreement in the real money than the play money condition. This implies that when persons are playing a game of real value to themselves, their negotiations are concise and direct and they do not waste time bickering over unimportant details. There was no difference in time taken for the first agreement between the groups with preliminary negotiations and those without preliminary negotiations. The prediction that when preliminary negotiations are combined with a real money payoff the negotiations take the least time was not confirmed.

In addition, the amount of time required for the first agreement was not significantly related to the stability of the coalitions. It was concluded, therefore, that the amount of time taken to reach an agreement was significantly related to only the main effect variables of bargaining sequence and type of payoff.

Alternate hypotheses[10]

A number of alternative explanations were offered for the results obtained in this experiment, such as 1) greater understanding of the coalition situation as a result of simplifying the coalition-bargaining game; 2) the one-hour time limit of the experiment inducing false stability; 3) differential preference for players as a result of their position around the table; 4) differential preference for players symbol names; and 5) differential preference for players as a result of preliminary negotiation bargaining order. An examination of all of these factors revealed no significant effects upon the coalition formation process.

The alternate explanation, that more experience in playing the game would result in R-O-T outcomes, received some support from the payoff data in the repeat/SS/RM group. The subjects in the SS/RM condition who played the game a second time split the payoff more equally than the subjects in the original SS/RM condition. The post-game interview with the subjects repeating the experiment revealed the reason for the difference in payoff distributions between the two times they played the game. Since the subjects in the repeat condition had already played the game, they were aware that the initial coalition would be allowed to break.

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[10] If the behavior observed in an experiment can be accounted for by an alternate explanation as well as by the theoretical explanation being studied then one cannot be sure which explanation is correct. In order to substantiate the theoretical explanation being tested, one must show that the only set of existing circumstances that could have produced the observed effect was that set controlled by the experiment. At the same time, one does not reject a theoretical explanation that has been offered merely because some alternate set of circumstances could have produced the observed effect. In order to reject the theoretical explanation being tested, one must demonstrate that the alternate set of circumstances did affect the dependent variable in the manner predicted by the experimental hypotheses.

In anticipation of this the subjects made initial agreements that split the payoff more equally in hopes that their partner would not be too susceptible to offers to break the initial coalition. Of course, if the initial coalition did not break there would be more money in the game. Since, there was no difference between the SS/RM groups and the repeat/SS/RM groups in initial contacts or coalitions, it was concluded that experience, per se, could not account for the R-O-T results obtained in this experiment.

The fact that three subjects had some prior knowledge of the experimental game was not taken as a serious influence since the information given these subjects was no more revealing than the information provided on the experiment sign-up sheets. The two subjects who knew before arriving for the experiment that the game was to be played for real money said they had signed up for the experiment before learning about the money. Therefore, no subjects were omitted from the analysis for possessing prior knowledge of the experiment.

The 48 subjects who indicated that they prematurely thought the first coalition would be allowed to break were not discarded from the experiment. In post-experimental discussion, many of these subjects confessed that this was only one of many possibilities that occurred to them. In the case of others, it was apparent to the experimenter that some subjects responded affirmatively to this question just because they did not want to admit that they had not been able to foresee this possibility. It appears that a post-game questionnaire is not a valid means for obtaining data about this factor.

Conclusions and further research

The main conclusions of this experiment about the coalition process in the Type 5 coalition situation are:

1) The strength-is-weakness results that have been obtained in the Type 5 coalition situation using the conventional research paradigm are, at least partially, the product of artifacts in the experimental situation.

2) The main factor contributing to the production of rational-objective theorem outcomes is the use of real money to create a payoff for the coalition-bargaining game that is of significant value to the participants.

3) Real money payoffs are not sufficient to completely eliminate the strength-is-weakness effect and produce rational-objective theorem coalition outcomes; however, the combination of real money payoffs with a forced coalition paradigm and preliminary negotiations will tend to produce an equal distribution of initial contacts and coalitions.

4) If the coalition process is examined in a realistic situation for testing coalition formation theory, the results are more in agreement with the rational-objective theorem than resource theory.

5) Both preliminary negotiations and real money payoffs contribute to participants taking less time to reach an agreement to form a coalition.

These conclusions assume that the coalition process is not altered if the initial resource values are randomly assigned. However, Anderson (1967) suggests that the random assignment of initial resources is a prime factor in producing equal outcome effects in coalition formation studies. In order to test this hypothesis a follow-up study is being conducted in which the subjects will earn their resources prior to playing the coalition-bargaining game.

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APPENDIX A

ANCILLARY RESULTS

Two types of results are presented in this section. First, results that support some of the conclusions stated in the Discussion section. These results usually contain no significant effects, or if the effects are significant, they are of no consequence to the problem being examined. These results will be examined under two different headings: 1) the subject's perception of the experimental situation; and 2) alternate explanations for the results obtained to verify the experimental hypotheses. The second type of results presented are those that were obtained from data not directly related to the hypotheses being tested.

Subject's perception of the experimental situation

How interesting and involving was the game? In order to determine if the subjects played the game in earnest, the subjects were asked the following question on the post game questionnaire--How interesting and involving was the game? The possible responses were listed on a four-point scale and ranged from not very interesting or involving (scale value of one) to very interesting and involving (scale value of four). The mean response for all subjects was 3.113 and the standard deviation in responses was .738. Only two subjects responded that the game was not very interesting and involving. The average response was that the game was quite interesting and involving. A least squares analysis of variance revealed no significant differences between the experimental conditions in the responses to this question. The means and standard deviations and the AOV summary table are presented in Tables 1 and 2.

Table 1. Means, standard deviations, and Ns of interest and involvement in the game

Bargaining sequence	Single stage		Multi-stage		
Statistics \ Type of payoff	Play money	Real money	Play money	Real money	Overall
Mean	3.139	3.056	3.072	3.204	3.113
Std. dev.	.683	.763	.773	.711	.738
N	36	54	69	54	213

Table 2. Analysis of variance of interest and involvement in the game

Source of variance	SS	df	Mean square	F	Significance level
Bargaining sequence (A)	.0842	1	.0842	.154	.70
Type of payoff (B)	.0289	1	.0289	.053	.82
A x B	.5805	1	.5805	1.059	.30
Error	114.5358	209	.5480		
Total	115.2958	212[a]			

[a]The discrepancy between the total N of 213 for this analysis and the overall N of 252 for the experiment is due to the fact that the first few groups that were run either did not receive a post-game questionnaire or received one with some questions omitted. This explanation accounts for the discrepancy in N in all analyses on individual subjects that did not have 252 subjects.

How much trust in coalition partner? It was suggested in the problem section that the conventional coalition paradigm engendered a feeling of distrust or dissatisfaction in the coalition partners. It was predicted that this distrust would result in a tendency to break coalitions. Table 3 reveals that the SS/PM subjects (condition most like conventional research paradigm) indicated they had the least trust in their coalition partners. The AOV presented in Table 4, however, shows that the SS/PM condition does not have significantly less trust than the MS/PM condition; even though the difference between the two conditions is in the hypothesized direction and is almost significant at the .05 level. The main effect for type of payoff is significant, with the real money groups reporting greater trust than the play money groups. However, the interaction between bargaining sequence and type of payoff is also significant. An examination of the means reveals that the interaction is produced by real money causing an asymptotic level of trust. When play money is used, multi-stage bargaining increases trust, but trust is increased by real money to an asymptotic level at which multi-stage bargaining results in no additional trust between coalition partners. This interpretation is supported by the multiple comparison t values in Table 5.

How hard try to win game's payoff? In the real money condition, the assumption underlying offering the winning players $9 in real money was that such a payoff would increase the player's motivation to win the game's payoff. In order to obtain some measure of the effect of type of payoff on the participant's motivation, the subjects were asked how hard they tried to win the game's payoff. Tables 6 and 7 reveal that the results do not support the expectation. The

Table 3. Means, standard deviations, and Ns for amount of trust in initial coalition

Bargaining sequence	Single stage		Multi-stage		
Statistics \ Type of payoff	Play money	Real money	Play money	Real money	Overall
Mean	2.167	3.722	2.980	3.622	3.190
Std. dev.	1.167	1.085	1.286	1.114	1.289
N	24	36	50	36	146

Table 4 . Analysis of variance of amount of trust in initial coalition

Source of variance	SS	df	Mean square	F	Significance level
Bargaining sequence (A)	4.3615	1	4.3615	3.146	.08*
Type of payoff (B)	41.4487	1	41.4487	29.899	< .0005***
A x B	7.1715	1	7.1715	5.173	.02**
Error	198.2382	143	1.3863		
Total	242.6667	146			

*unlikely F value
**very unlikely F value
***extremely unlikely F value

Table 5. Multiple comparison t values for all pairs of means of amount of trust in initial coalition

Means \ Means	SS/PM	SS/RM	MS/PM	critical ratio
SS/RM	5.0128*			2.8304
MS/PM	2.7823	2.8837*		p =.05
MS/RM	4.6905*	.3603	2.4951	

*Significant beyond .05 level

Table 6. Means, standard deviations, and Ns of how hard subjects tried to win game's payoff

Bargaining sequence	Single stage		Multi-stage		
Statistics \ Type of payoff	Play money	Real money	Play money	Real money	Overall
Means	3.028	2.630	2.652	2.481	2.667
Std. dev.	.878	.958	.937	.926	.940
N	36	54	69	54	213

Table 7. Analysis of variance of how hard subjects tried to win game's payoff

Source of variance	SS	df	Mean square	F	Significance level[2]
Bargaining sequence (A)	3.4589	1	3.4589	4.001	.05**
Type of payoff (B)	4.0800	1	4.0800	4.719	.03**
A x B	.6523	1	.6523	.754	.39
Error	180.6985	209	.8646		
Total	187.3333	212			

**very unlikely F value

The play money subjects indicated they tried harder to win the game's payoff than the real money subjects. The responses to this question, therefore, do not support the assumption that real money increases the player's motivation to win the game's payoff. A closer analysis of the data reveals a possible explanation for this anomalous result. An investigation of the individual responses to this question revealed that the players who won the least money in the coalition, or who won no money at all, indicated they did not try very hard to win the game's payoff. It appears that in order to reduce any dissonance arising from not winning as much money as desired, the players indicated they did not try very hard. Evidently, reliable responses to this question can not be obtained on a post-game questionnaire.

Suspect break first agreement. As explained in the method section, subjects were not informed that they would be allowed to break the initial coalition and form subsequent coalitions until after the initial coalition had been formed. If subjects suspected they would be allowed to break the initial coalition it would very likely influence the type of coalition and type of agreement they would make. The subjects were asked on the post-game questionnaire if they had suspected initial agreements could be broken prior to being informed. Forty-eight of the 213 subjects responding answered the question yes. In talking with the subjects after the experiment it became very evident that a post-game questionnaire was not a good place to ask this question. Subjects do not like to be duped or misinformed in an experiment and are very reluctant to publicly admit they were unaware of the full purpose of the experiment. Some subjects were, therefore, very reluctant to answer this question "no". In addition, post-game

interrogation of the players revealed a strong tendency for the question to be misinterpreted among the first subjects to participate in the experiment. The subjects interpreted the question to be asking them if they understood, at the time they were informed by the experimenter, that they could break the first coalition. The question was, therefore, reworded, however, subjects continued to respond quite often in the affirmative, though the frequency of yes responses did decrease. The frequencies of yes and no responses by experimental conditions are given in Table 8 and the exact probabilities for each effect in the factorial design are given in Table 9. The statistical tests reveal no differences between experimental conditions in the responses to this question. The difference between the overall number of yes and no responses was significant.

Believe receive real money. A critical factor when offering real money as a payoff in an experiment is convincing the subjects that they will actually receive the money. Prior to being given the money, subjects in the real money condition were asked if they believed they would receive the money. Ninety-five of the 108 subjects in the real money condition responded affirmatively. The difference in yes and no responses is significant beyond the .001 level. Tables 10 and 11 reveal no differences between experimental conditions in the type of response to this question.

Alternate explanations for results supporting experimental hypotheses

Amount of experience in playing coalition-bargaining game. The subjects playing the game a second time produced a distribution of initial contacts and coalitions not significantly different from the first game they played (Tables 12 and 13).

Table 8. Frequency of premature suspicion that initial coalition could be broken

Bargaining sequence	Single stage						Multi-stage						
Type of payoff	Play money			Real money			Play money			Real money			
DV \ Subjects votes	4	3	2	4	3	2	4	3	2	4	3	2	Totals
Yes	1	5	3	5	6	5	3	4	3	2	5	6	48
No	11	7	9	13	12	13	20	19	20	16	13	12	165
Totals	12	12	12	18	18	18	23	23	23	18	18	18	213

Table 9. Factorial design exact probabilities for subject's premature suspicion that initial coalition could be broken

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Subject's votes (C)	fixed effect
DV - Suspect break (D)	< .0001***
A x B	fixed effect
A x C	fixed effect
A x D	.1379
B x C	fixed effect
B x D	.1421
C x D	.1820
A x B x C	fixed effect
A x B x D	.7340
A x C x D	.9118
B x C x D	.8355
A x B x C x D	.4625

***extremely unlikely distribution

Table 10. Frequency of subjects in real money condition who believed they would receive payoff in real money

Bargaining sequence	Single stage			Multi-stage			
DV \ Subjects votes	4	3	2	4	3	2	Totals
Yes	16	15	16	15	16	17	95
No	2	3	2	3	2	1	13
Totals	18	18	18	18	18	18	108

Table 11. Factorial design exact probabilities for subjects in real money condition who believed they would receive payoff in real money

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Subjects' votes (B)	fixed effect
DV - believe receive real money (C)	< .0001***
A x B	fixed effect
A x C	1.0000
B x C	1.0000
A x B x C	1.0000

***extremely unlikely distribution

Table 12. Exact probability test for independence between the initial contact distribution in the single stage/real money groups and the initial contact distribution in the repeat/single stage/real money groups

Condition / Contactee	Repeat/ single stage/ real money	Single stage/ real money	Totals	Exact probability
Greatest votes	7	18	25	.6128
Least votes	20	36	56	
Totals	27	54	81	

Table 13. Exact probability test for independence between the initial coalition distribution in the single stage/real money groups and the initial coalition distribution in the repeat/single stage/real money groups

Condition / Coalitions	Repeat/ single stage/ real money	Single stage/ real money	Totals	Exact probability
4-3	1	1	2	.2378
4-2	2	10	12	
3-2	6	7	13	
Totals	9	18	27	

Differential preference for position around the game table. In order to examine the effect of position upon initial contacts, an analysis was done of the frequency with which each player contacted the person on his left or the person on his right. In terms of Figure 1 (p. 25) S_3 is on the left of S_1, S_1 is on the left of S_2, and S_2 is on the left of S_3. Tables 14 and 15 reveal a significant interaction between bargaining sequence, type of payoff, and subject's position at the table in the frequency with which each player contacted the player on his left or right. The interaction effect is localized in the single-stage/real money condition where the players on the left and right chose each other a disproportionate number of times. The difference in the number of times the player on the left chose the other two players was significant at the .03 level.

Initial coalitions were analyzed for a position effect by comparing the frequency of left-right, left-center, and center-right coalitions. In terms of Figure 1 (p. 25) S_1 is in the left position, S_2 is in the center position, and S_3 is in the right position. Tables 16 and 17 reveal no significant position effects for initial coalitions. However, the test for the uniformity of the coalition distribution in the single stage/real money condition is almost significant at the .05 level.

Position effects for division of the payoff and coalition stability are not reported since they would be difficult to interpret due to confounding with other variables. In any case, there is no evidence of a position effect for these dependent variables. An analysis of a position effect on time taken to reach the first agreement yielded no significant effects.

Table 14. Frequency with which each player contacted the player on his left or the player on his right

Bargaining sequence	Single stage						Multi-stage						
Type of payoff	Play money			Real money			Play money			Real money			
Contactee \ Position[a]	L	C	R	L	C	R	L	C	R	L	C	R	Totals
Player on left	15	10	11	4	11	12	14	11	12	13	10	8	131
Player on right	9	14	13	14	7	6	10	13	12	5	8	10	121
Totals	24	24	24	18	18	18	24	24	24	18	18	18	252
Exact probability test for uniformity of column distribution	.3074	.5413	.8388	.0309**	.4807	.2379	.5413	.8388	1.0000	.0962*	.8145	.8145	

[a]L = Player sitting in left position; C = Player sitting in center position; R = Player sitting in right position.
*unlikely distribution
**very unlikely distribution

Table 15. Factorial design exact probabilities of each player's contacts of the player on his left or the player on his right

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Subject's position (C)	fixed effect
DV--Position of contactee (D)	.5618
A x B	fixed effect
A x C	fixed effect
A x D	.5116
B x C	fixed effect
B x D	.6761
C x D	.7928
A x B x C	fixed effect
A x B x D	.7980
A x C x D	.2119
B x C x D	.1839
A x B x C x D	.0335**

**very unlikely distribution

Table 16. Frequency of initial coalitions by position

Bargaining sequence	Single stage		Multi-stage		
Type of payoff / Position	Play money	Real money	Play money	Real money	Totals
Left-center	12	4	8	6	30
Center-right	5	3	8	8	24
Left-right	7	11	8	4	30
Totals	24	18	24	18	84
Exact probability test for uniformity of column distribution	.2524	.0566*	1.0000	.5613	

*unlikely distribution

Table 17. Factorial design exact probabilities of initial coalitions by position

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
DV--Initial coalition by position (C)	.6762
A x B	fixed effect
A x C	.1365
B x C	.4031
A x B x C	.2263

In order to obtain more information about the effect of the players' position on the coalition process further analyses were performed. An investigation of the significant position effect for contacts in Table 14 suggested that the two players sitting across from each other at the game table were choosing each other more often than by chance. Therefore, an analysis was performed of the frequency with which the players seated across from each other initially contacted each other. Tables 18 and 19 reveal a significant difference between the four experimental conditions in the frequency with which the subjects sitting at the end of the table choose the player seated across from them. The main difference lies in the single-stage/real money condition as it did with the contacts analyzed in Table 14. In the single-stage/real money condition the players chose the opponent sitting across from them 72% of the time. There were no significant differences in the frequency with which players chose the opponent across from them or not across from them in any of the other three experimental conditions.

It is not sufficient to merely demonstrate a significant effect in order to accept an alternate hypothesis. It must be shown that the effect influenced the dependent variable being measured in the direction hypothesized. If the subjects at the ends of the table contacted a player solely because of eye contact of personal features then the results in the single-stage/real money condition are not valid. On the other hand, if the players at the end of the table are first choosing on the basis of experimentally provided variables (votes, random, equal power, etc.) and then using eye contact and personal features to try and prematurely confirm their decision, the coalition process is probably not significantly altered. The reason

Table 18. Frequency with which players facing each other contacted each other

Bargaining sequence	Single stage				Multi-stage				
Type of payoff	Play money		Real money		Play money		Real money		
Direction of contact \ Position	Left	Right	Left	Right	Left	Right	Left	Right	Totals
Across	9	11	14	12	10	12	5	8	81
Not across	15	13	4	6	14	12	13	10	87
Totals	24	24	18	18	24	24	18	18	168
Exact probability test for uniformity of row sums of column distribution	.1934		.0113**		.6655		.1325		

**very unlikely distribution

Table 19. Factorial design exact probabilities for choosing player facing you

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Subject's position (C)	fixed effect
DV - Position of opponent (D)	.6998
A x B	fixed effect
A x C	fixed effect
A x D	.1223
B x C	fixed effect
B x D	.2129
C x D	.4456
A x B x C	fixed effect
A x B x D	.0129***
A x C x D	.5347
B x C x D	.7604
A x B x C x D	.5177

*** extremely unlikely distribution

it is possible for there to be no significant position effect and yet not observe an equal distribution of contacts and coalitions is that the votes were not assigned to each table position an equal number of times in the single-stage/real money condition. Table 20 reveals that the player with four votes was in the center position 61% of the time, three votes was in the center position 28% of the time, and two votes was in the center position 11% of the time. Thus, three votes and two votes were in the end positions for most of the games. The exact probability of obtaining this distribution of votes across positions was .0289. Table 21 shows that the end positions at the table (left-right) were occupied by the 3-2 vote pair 61% of the time, and by the 4-2 vote pair 28% of the time. The exact probability of obtaining this distribution is .0289. Thus, if the players are choosing on the basis of votes, the most likely vote combination is facing each other 61% of the time.

In order to determine if facing each other significantly affected the results obtained in the single-stage/real money condition a control group was run. In this control group the subjects could not see each other nor know which player had how many votes until after they had indicated their coalition partner preference. A comparison of the initial contacts and initial coalitions obtained in the control group with the SS/RM group revealed no statistically significant differences. (This data is presented in the Results section.)

Differential preference for player's symbol names. An analysis of all of the dependent variables failed to reveal any significant differences, or any differences that approached significance, as a result of the label assigned to the subjects.

Table 20. Distribution of votes by position around the game table and the probability of observing the distribution obtained in the single stage/real money condition

Position \ Votes	4	3	2	Totals	Exact probability
Left	4	7	7	18	
Center	11	5	2	18	.0289
Right	3	6	9	18	
Totals	18	18	18	54	

Table 21. Distribution of pairs of votes by position around the game table and the probability of observing the distribution obtained in the single stage/real money condition

Position \ Votes	4-3	4-2	3-2	Totals	Exact probability
Left - center	9	6	3	18	
Center - right	7	7	4	18	.0289
Left - right	2	5	11	18	
Totals	18	18	18	54	

Differential preference as a result of preliminary bargaining order. The three players in the coalition-bargaining game participated in a preliminary contact round in the multi-stage condition. The six possible orders in which the pairs of three players could bargain were counterbalanced. If there was a primary or recency effect due to this preliminary bargaining order then it would not be too surprising to obtain a somewhat equally distributed set of coalitions. The initial contacts made by the multi-stage subjects were analyzed according to a subject's preference for the first or second opponent he bargained with. Tables 22 and 23 reveal no significant differences in initial contacts due to preliminary bargaining order.

An analysis of initial coalitions formed according to position in the bargaining order yielded no significant differences between the three bargaining orders. (Tables 24 and 25).

The analyses of the effect of preliminary bargaining order upon payoff division, stability, and time to reach first agreement yielded no significant differences.

Difference in player's previous experience in playing competitive games. If there were differences between the four experimental conditions in the experience the subjects had in playing competitive games, it might confound the interpretation of the results. Tables 26 and 27 reveal no difference between the experimental conditions in the experience subjects had in playing competitive games.

Alternate hypothesis 9: value of 9. Two different measures were used of the value of $9 to the real money subjects. One measure was the economic value of $9 as indicated on a six point scale ranging from very

Table 22. Frequency with which Ss in multi-stage condition contacted the first or second opponent bargained with in the preliminary round

Type of payoff	Play money									Real money									
Subjects bargaining position	1, 2			1, 3			2, 3			1, 2			1, 3			2, 3			
Contactee \ Subject's votes	4	3	2	4	3	2	4	3	2	4	3	2	4	3	2	4	3	2	Totals
First player bargained with	1	4	4	3	4	1	4	5	3	5	2	3	1	3	4	3	2	3	55
Second player bargained with	7	4	4	5	4	7	4	3	5	1	4	3	5	3	2	3	4	3	71
Totals	8	8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	126
Exact probability test for uniformity of row sums of column distribution	.1249									1.0000									

Table 23. Factorial design exact probabilities of contacting first or second opponent bargained with in preliminary round of multi-stage condition

Effect	Exact probability
Type of payoff (A)	fixed effect
Subjects bargaining position (B)	fixed effect
Subject's votes (C)	fixed effect
DV--Contactee by bargaining (D)	.1812
A x B	fixed effect
A x C	fixed effect
A x D	.4682
B x C	fixed effect
B x D	.7105
C x D	.8543
A x B x C	fixed effect
A x B x D	.5918
A x C x D	.2240
B x C x D	.8094
A x B x C x D	.0970*

*unlikely distribution

Table 24. Frequency of initial coalitions in multi-stage condition according to preliminary bargaining order

Type of payoff	Play money			Real money			
Bargaining order / Coalitions	1	2	3	1	2	3	Totals
4-3	0	1	0	1	1	2	5
4-2	0	1	6	3	2	2	14
3-2	5	5	6	2	4	1	23
Totals	5	7	12	6	7	5	42
Exact probability test for uniformity of distribution of column sums	.2524			.9557			

Table 25. Factorial design exact probabilities of forming initial coalition according to preliminary bargaining order in multi-stage condition

Effect	Exact probability
Type of payoff (A)	fixed effect
Bargaining order (B)	.5462
DV - Initial coalition (C)	not relevant
A x B	.3582
A x C	.1094
B x C	.6289
A x B x C	.2090

Table 26. Means, standard deviations, and Ns of how often subjects played competitive games

Bargaining sequence	Single stage		Multi-stage	
Statistics \ Type of payoff	Play money	Real money	Play money	Real money
Mean	4.028	3.704	3.652	3.741
Std. dev.	1.920	1.598	1.705	1.417
N	36	54	69	54

Table 27. Analysis of variance of how often subjects played competitive games

Source of variance	SS	df	Mean square	F	Significance value
Bargaining sequence (A)	1.4454	1	1.4454	.532	.47
Type of payoff (B)	.6993	1	.6993	.257	.61
A x B	2.1470	1	2.1470	.790	
Error	568.2540	209	2.7189		
Total	571.8122	212			

little money (scale value of one) to a very lot of money (scale value of six). The second scale was a measure of how much the subject needed all, or part, of the $9 as of the day of the experiment. The subject's response to this question recorded on a six point scale ranging from very little need (scale value of one) to a very lot of need (scale value of six). Table 28 and 29 indicate that there were no significant differences between the multi-stage/play money and multi-stage/real money conditions for either of these measures of the value of $9 to the subjects. There is a slight tendency for the multi-stage/real money subjects to indicate a greater need for the money than the single-stage/real money subjects, however, since there were no observed differences in the dependent variable between these two conditions it is of little consequence.

Conjunctive results of interest.

Distribution of final coalitions. There were no significant differences between the experimental conditions in the distribution of final coalitions or in the division of the payoff in the final coalition.

Average number of messages sent between coalition partners. In the second phase of the coalition game the Ss communicated by means of written messages. The player excluded from the coalition made written offers to the coalition partners who either accepted or rejected the offers. In addition, the coalition partners could send messages to each other encouraging their partner to either maintain or break their agreement. An analysis of the average frequency with which these messages were sent per agreement reveals a significant difference between the two bargaining sequence levels as well as between the two payoff levels (Tables 30 and 31). A greater number of messages were sent in the multi-stage condition than

Table 28. t test of mean difference between single stage/real money condition and multi-stage/real money condition in value of $9.00

Statistics \ Conditions	Single stage/ real money	Multi-stage/ real money	t value
Mean	3.2593	3.3148	.3248
Std. dev.	.9749	.7727	df = 106
N	54	54	p >.50

Table 29. t test of mean difference between single stage/real money condition and multi-stage/real money condition in need for $9.00

Statistics \ Conditions	Single stage/ real money	Multi-stage/ real money	t value
Mean	2.5926	3.0185	1.9214*
Std. dev.	.9421	1.3102	df = 106
N	54	54	.05 < p <.10

*unlikely t value

Table 30. Means, standard deviations, and Ns for the average number of messages sent between coalition partners per agreement

Bargaining sequence	Single stage		Multi-stage	
Statistics \ Type of payoff	Play money	Real money	Play money	Real money
Means	2.2779	3.4178	2.9925	4.8706
Std. dev.	2.6917	1.9861	2.8557	2.1117
N	24	18	24	18

Table 31. Analysis of variance of average number of messages sent between coalition partners per agreement

Source of variance	SS	df	Mean square	F	Significance value
Bargaining sequence (A)	24.1583	1	24.1583	3.888	.05**
Type of payoff (B)	46.8402	1	46.8402	7.539	.007***
A x B	2.8025	1	2.8025	.451	.50
Error	497.0718	80	6.2134		
Total	569.0347	83			

**very unlikely F value
***extremely unlikely F value

in single stage condition, and a greater number of messages were sent in the real money condition than in the play money condition. Table 32 reveals that the number of messages sent between coalition partners was significantly correlated with the amount of stability in the coalition process.

Player who speaks first in the initial coalition round. Previous research has suggested that the initiator of the negotiations has some added advantage in the situation (Vinacke and Arkoff, 1957; and Chertkoff, 1966). One measure of this fact would be if the player who spoke first in the initial coalition round received a larger share of the payoff more often than the player who spoke second. Tables 33 and 34 reveal that even though there is a slight tendency for the player speaking first to receive the largest share of the payoff in the play money condition, it is not a statistically significant difference ($p = .1333$).

Player who breaks initial coalition. An investigation was made of the relationship between the player who breaks the initial coalition and 1) the number of votes he possessed; and 2) the proportion of the payoff he received. Tables 35 and 36 show that there was a significant difference in the proportion of initial coalitions broken by the player with 4 votes, 3 votes, and 2 votes. The player with 2 votes broke his initial coalition 72% of the time, and 3-vote player broke his 31% of the time, and the 4-vote player broke his initial coalition 27% of the time.

It was also the case that the player with the lesser amount of money in the initial coalition broke the coalition significantly more often than the player with either an equal or greater amount of money than his partner (Tables 37 and 38).

Table 32. Correlation of average number of messages sent between coalition partners with stability

Bargaining sequence	Single stage		Multi-stage		
Stability \ Type of payoff	Play money	Real money	Play money	Real money	Overall r
Money in final agreement	.589**	.030	.546**	-.096	.525**
Average rejections	.560**	-.079	.621**	-.207	.474
N	24	18	24	18	84

** very unlikely r value

Table 33. Frequency with which player who spoke first in initial coalition negotiations received the largest share of the payoff

Bargaining sequence	Single stage						Multi-stage						
Type of payoff	Play money			Real money			Play money			Real money			
Speaking order \ Payoff proportion	<	=	>	<	=	>	<	=	>	<	=	>	Totals
First	7	2	13	6	7	5	6	5	12	2	6	1	72
Second	11	2	8	5	7	6	12	5	6	1	6	2	71
Totals	18	4	21	11	14	11	18	10	18	3	12	3	143

Table 34. Factorial design exact probabilities of whether player who spoke first in initial coalition negotiations received the largest share of the payoff

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Subject's proportion of payoff (C)	not relevant
DV - speaking order (D)	1.0000
A x B	fixed effect
A x C	not relevant
A x D	not relevant
B x C	not relevant
B x D	not relevant
C x D	.2739
A x B x C	not relevant
A x B x D	not relevant
A x C x D	.9077
B x C x D	.1333
A x B x C x D	1.0000

Table 35. Frequency with which individual players broke initial coalition

Bargaining sequence	Single stage				Multi-stage				
Type of payoff	Play money			Real money			Play money			Real money			
Initial coalition \ Subject's votes	4	3	2	4	3	2	4	3	2	4	3	2	Totals
Broken	1	4	15	1	1	3	2	3	11	0	2	2	45
Not broken	5	12	3	2	1	2	3	8	5	1	1	2	45
Total	5	16	18	3	2	5	5	11	16	1	3	4	90

Table 36. Factorial design exact probabilities for players who broke initial coalition

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Subject's votes (C)	fixed effect
DV - Initial coalition breakage (D)	not relevant
A x B	fixed effect
A x C	fixed effect
A x D	fixed effect
B x C	fixed effect
B x D	fixed effect
C x D	.0003***
A x B x C	fixed effect
A x B x D	not relevant
A x C x D	.5534
B x C x D	.1616
A x B x C x D	1.0000

*** extremely unlikely distribution

Table 37. Frequency with which individual players broke the initial coalition according to the proportion of the payoff they received (data only for initial coalitions that were broken)

Bargaining sequence	Single stage		Multi-stage		
Type of payoff / Payoff proportion	Play money	Real money	Play money	Real money	Totals
Less than partner	14	3	9	3	29
Equal to partner	2	2	2	1	7
More than partner	4	0	5	0	9
Totals	20	5	16	4	45

Table 38. Factorial design exact probabilities for individual players who broke the initial coalition according to the proportion of the payoff they received (data only for initial coalitions that were broken)

Effect	Exact probability
Bargaining sequence (A)	fixed effect
Type of payoff (B)	fixed effect
Proportion of initial payoff received (C)	.0001***
A x B	fixed effect
A x C	.9047
B x C	.1052
A x B x C	1.0000

***extremely unlikely distribution

Players in final coalition. An analysis of the players in the final coalition revealed no significant relationship between being a member of the initial coalition and being a member of the final coalition.

APPENDIX B

COALITION-BARGAINING GAME INSTRUCTIONS

[time]

You are here [today / tonight] to participate in a competitive game. If this game does not take the full hour, I have a second non-competitive game, in which you each play by yourself and not against each other, to fill out the hour. The first game is a test of your bargaining and game playing skills. During this game each of you should endeavor to win as much of the game's payoff as possible and let the other players take care of themselves. In other words, it is <u>every man for himself</u>.

In order to prevent personal characteristics from affecting the game, I am going to give each of you a nonsense symbol. I would like for you to refer to each other throughout the game in terms of these nonsense symbols instead of by name, position around the table, hair color, etc. That is:

The player on my left will be - - -/_____[1].

The player in the center will be - - -/_____.

The player on my right will be - - -/_____.

In this game you will each begin with a certain number of votes. The number of votes you begin with is determined by which of these envelopes you draw. [Show them (3) envelopes.] There are various numbers of votes in each envelope. Each of you draw an envelope (any S order). Take out the card inside, and as I call on you announce out loud how many votes you have in the game. At the same time, each of you record your own label

---

[1]Blank spaces were filled in with the symbol name of the appropriate player.

and number of votes; and your opponent's labels and numbers of votes on this sheet. [Record sheet--E write on Summary Sheet--Repeat numbers out loud.] Now put the cards back in the envelopes and give the envelopes to me. [Put envelopes back on hook] As you can see, there is a total of 9 votes in this game--your job is to find a means for obtaining control over a majority of these votes (i.e., 5 votes or more), and thereby win the payoff which is $\begin{bmatrix}\$9 & \text{in real money}\\ \$900 & \text{in play money}\end{bmatrix}$. (Put up clip board with card that has $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$ on it). Presently, you are all in the same predicament--all players have less than 1/2 the total votes in the game (i.e., no player has a majority of the votes); therefore, no single player can win the $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$ by himself. However, if any two of you would form an alliance and pool your voting power, that pair would control a majority of the votes in the game and would receive the $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$. Therefore, the basic rule of this game is that in order to win any money, some two of you must form an alliance. The $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$ may be split by the alliance partners in any way or proportion they like. However the goal for each of you in this game is to obtain as much of the $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$ as possible. In order to achieve this goal you must try to be a member of that alliance in which you can maximize your share of the $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$.

The only condition for declaring that an alliance has been formed and that it will receive the $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$ is that some two players mutually agree on how to split $\begin{bmatrix}\$9\\ \$900\end{bmatrix}$. If no alliance forms you all lose.

Any Questions?

Examples:

(1) three political candidates--no majority--pool votes and control nomination, thereby dividing rewards.

(2) three board members of a company voting their shares on the issue of bonuses for board members. No majority--two pool their votes and control distribution of bonuses--splitting as they like.

In other words, I am referring to a situation in which no single individual has the power to control the outcome but two people by pooling their resources can jointly determine the outcome.

Remember, your goal in this game is to be a member of that two party alliance which will maximize your share of the $900.

You should strive to achieve this goal because the amount of money each of you wins in this game will be compared with the amount of money won by each previous player in this experiment who started out with the same number of votes as you in order to see if you are the current CHAMPION in your group. That is, (ZEJ, VAF, YOV) - - - - -.

In other words, you are competing with previous players who started the game under the same condition as you, as well as competing against each other in this game to see who will be the winner in this game.

Any Questions?

You will use the following procedure in order to decide which two players will form an alliance.

Multi-stage[2]

You will begin by each pair (_ _ _) of you participating in preliminary negotiations for periods of two minutes each. These negotiations are only for the purpose of discussing possible terms for splitting the $900 and no final agreement can be made during this time. During these negotiations you may make preliminary offers and probe the other player about his possible terms for agreement, but offers and statements made during this period are not binding and do not have to be honored. This round of preliminary bargaining is designed strictly for the purpose of allowing each of you to assess the bargaining strategy, offers, and expectations of your opponents, before deciding which player you would like to form an alliance with.

After all pairs have finished preliminary negotiations you will each indicate on a secret ballot the symbol name of the player you prefer to form an alliance with an the two players who first select each other will be allowed to negotiate the final terms for splitting $900. You can record information about your preliminary negotiations on the bottom half of your record sheet. This record sheet is just for your convenience, and you are not obligated by anything you record on it. Take your record sheet with you when you leave the room. You may now proceed--remember you are to discuss how you will divide $\begin{bmatrix}\$9\\\$900\end{bmatrix}$. [Third player leaves] Do not begin until I get back.

You have two minutes to verbally discuss possible terms for forming an alliance and splitting the $\begin{bmatrix}\$9\\\$900\end{bmatrix}$. Remember you can not make a final agreement. I will inform you when you have thirty seconds remaining.

---

[2]This section is used for multi-stage bargaining conditions only.

[time]

[Pair 1]

Now if _____ will change places with _____, the next pair will have preliminary negotiations.

[Pair 2]

Repeat above statement.

[Pair 3]

Single stage[3]

Each of you will write on this slip of paper [choice form] the symbol of that player with whom you would like to form an alliance, without letting the other players see your choice, and pass it through the slot in the divider to me. This selection procedure will be continued until two of you select each other, or in the event none of you ever select each other--until the hour is up. The first two of you to select each other will then attempt to negotiate a final agreement on how to split the $\begin{bmatrix}\$9\\\$900\end{bmatrix}$. If no agreement is reached by the two players who first select each other, the process of choosing and negotiating will be repeated until an agreement is reached or the time is up. In the event an explicit agreement is reached by some two players, I will declare an alliance formed by those two players and distribute the money according to the terms of their agreement.

Any Questions?

O.K. Write the symbol of that player whom you would like to form an alliance with on the second line of this sheet of paper and pass it to me through the slot in the divider in front of you. I will inform you when two of you have selected each other.

---

[3]This section is used for single-stage bargaining conditions and multi-stage bargaining conditions.

[Negotiations]

_____ & _____ have selected each other and will have up to three minutes to verbally negotiate the final terms of an agreement. If they cannot come to an agreement in three minutes, the process of selecting and negotiating will be repeated. If they reach a mutually acceptable agreement within three minutes, the two of them will win the total [$9 / $900] ; and it will be split according to their agreement. If _____ will go [out into the hall / into the other room] negotiations will begin. However, _____ & _____, please wait for me to return before you start negotiations.

[third player leaves]

[time]

In the event the two of you come to an agreement, I would like for you to let me know by filling out this form [agreement contract] and passing it to me through the slot in the divider. [Explain how to fill it out] It makes no difference who fills it out, but both of you must sign it with your symbols if you reach an agreement in order for the agreement to be valid. You will have up to three minutes to negotiate verbally with each other and get the signed contract to me if you reach an agreement. If I have not received a signed contract when three minutes is up, I will declare that no agreement was reached and the other player will return and we will repeat the process of selecting and negotiating. I will tell you if and when you have one minute left.

Any Questions?

Begin! [Negotiate]

_____ & _____ reached an agreement. _____ gets $_____ and _____ gets $_____.

Now I would like for each of you to write the terms of this agreement in the first section of this form. [Agreement form]

[Put up divider]

Stability

_____ did not win any money in this game, but we are going to give him a chance to win some money. _____ will be allowed to make two written counter-offers proposing a new alliance with himself to each of the alliance partners--(_____ & _____). If _____ can induce either _____ or _____ to break their existing agreement, then a new alliance between _____ and his new partner would replace the present alliance. In this event the existing agreement between _____ & _____ would be VOID, and the money would be redistributed according to the new alliance agreement. However, if either _____ or _____ breaks their existing alliance, whey will cause a penaltv of $\begin{bmatrix}\$1\\\$100\end{bmatrix}$ on the game, leaving only $\begin{bmatrix}\$8\\\$800\end{bmatrix}$. This means that any offers _____ makes to one of the alliance partners must be based on how much of $\begin{bmatrix}\$8\\\$800\end{bmatrix}$ he will give his new partner if he breaks his present agreement and forms a new alliance with _____ _____. If a new alliance is formed, then the player from the previous alliance who is not a member of the new alliance loses all of his money from the previous agreement; but he is then allowed to make counter-offers to the new alliance partner. However, his offers must be based on how much of $\begin{bmatrix}\$7\\\$700\end{bmatrix}$ he will give to a player to ally with him, since I will assess a penalty of $\begin{bmatrix}\$1\\\$100\end{bmatrix}$ each time an alliance agreement is broken. Remember, if an alliance breaks the alliance partners receive no money--there is no accumulation of money from

one alliance to the next.

The game is over when either:

(1) all of the money is gone, or

(2) two alliance partner both reject two offers made to them by the excluded player

Any Questions?

Here are some rule cards for you to refer to during this part of the game.

Rules of the Game

1. NO TALKING--all messages or offers to each other or to the experimenter are to be made in writing and passed through the slots in the divider.
2. The excluded player may make two, and only two, offers to each of the alliance partners, but he may not send another offer until he had received a reply to his present offer. [This means one offer at a time, but the offers can be made in any order (1111, 121, 112, 211, etc.)]
3. The alliance partners may either accept or reject an offer from the excluded player, and they may include counter-offers or other comments in their reply. The alliance partners may not initiate offers or messages to the excluded player.
4. The alliance partners may initiate messages to each other but these messages may refer only to maintaining or breaking their present agreement. The messages may not be offers to change the terms of the present agreement.

5. All messages are to be sent on the appropriate forms. A reply must be made on the same form it was received on.

6. You have a maximum of two minutes to send or reply to an offer.

This means you need to--

1. Keep your messages short--Money speaks louder than words anyway. If you are taking too much time to send or reply to an offer, I will send you a notice saying you have thirty seconds to act. If you do not send or respond to an offer within those thirty seconds, the offer is void and is considered to be rejected.

In addition--

2. Save all messages and offers

3. Illegal offers or messages will be marked illegal and returned to you with an explanation.

Any Questions?

4. The excluded players should realize that the number of votes is no longer the basis for making an offer to a player, instead, his offers should be related to the amount of money a player has in his present agreement.

5. During this part of the game, you should all take into account the fact that the noise of writing and passing messages gives your opponents some information about the number of messages sent.

Remember, the object of the game is to win as much money as possible. The game is over when either:

(1) all the money is gone;

or (2) each of the alliance partners reject two messages from the excluded player.

As I said previously, _____ has no money in the game so he will be allowed to make offers to _____ and _____ based on how much of $800 he will give one of them to form a new alliance with him. If _____ and _____ maintain their agreement, _____ will have $_____ and _____ will have $_____. You may all begin to send messages according to the rules of the game.

All messages will be sent on this form [offer form] and passed to me through the slots in the bottom of the divider. I will check the messages to see that they are legal, and if they are O.K. I will deliver them to the intended player.

[time]

Statement to be read if an agreement breaks

All right, we have a new agreement. Will you write the terms of this agreement on your agreement form. In this agreement _____ gets $_____, and _____ get $_____.

Now _____ has no money in the game, so he will be allowed to make offers to _____ and _____ based on how much of $_____ he will give one of them to form a new alliance with him. If _____ and _____ maintain their agreement then the game is over and _____ will have $_____ and _____ will have $_____.

You may now send offers and messages again.

[Repeat above, if necessary, after each agreement breaks.]

APPENDIX C

COALITION-BARGAINING GAME FORMS

1. Player's Record Sheet

Record Sheet

My label is _____ I have $_____ votes.

Other players

Label	No. of votes
1. _____	$_____
2. _____	$_____

Preliminary Negotiations

Negotiations with	Comments
1. _____	
2. _____	

Note: Preliminary negotiation section omitted for single stage condition.

2. Initial contact form

From: _____

I would like to form an alliance

with: _____

3. Agreement contract

Agreement contract

The $_____ will be

divided as follows:

$_____ for _____

$_____ for _____

Signed: _____

and

_____

4. Record of agreements

My label is _____

Total Amount of Money Divided	Alliance Partners	Amount of Money for each player	Agreement Status Maintained	Broken
$_____	_____	$_____		
	and	and		
	_____	$_____	_____	_____
$_____	_____	$_____		
	and	and		
	_____	$_____	_____	_____
$_____	_____	$_____		
	and	and		
	_____	$_____	_____	_____
$_____	_____	$_____		
	and	and		
	_____	$_____	_____	_____
$_____	_____	$_____		
	and	and		
	_____	$_____	_____	_____
$_____	_____	$_____		
	and	and		
	_____	$_____	_____	_____

5. Communication form

From: _____

To: _____

I will give you $ _____

and keep $ _____ for myself.

Comments:

Reject _____

Accept _____

APPENDIX D

PLAYER'S RULE CARDS

Rules of the Game

1. NO TALKING--all messages or offers to each other or to the experimenter are to be made in writing and passed through the slots in the divider.
2. The excluded player may make two, and only two, offers to each of the alliance partners, but he may not send another offer until he had received a reply to his present offer. [This means one offer at a time, but the offers can be made in any order (1111, 121, 112, 211, etc.)]
3. The alliance partners may either accept or reject an offer from the excluded player, and they may include counter-offers or other comments in their reply. The alliance partners may not initiate offers or messages to the excluded player.
4. The alliance partners may initiate messages to each other but these messages may refer only to maintaining or breaking their present agreement. The messages may not be offers to change the terms of the present agreement.
5. All messages are to be sent on the appropriate forms. A reply must be made on the same form it was received on.
6. You have a maximum of two minutes to send or reply to an offer.

APPENDIX E

POST-GAME QUESTIONNAIRE

1. Play money form

POST GAME QUESTIONNAIRE

1. Did you know any of the other players in this experiment before coming to the experiment? Yes _____ No _____

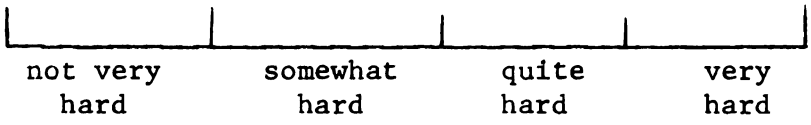
2. Did you know anything about this experiment before you came here today? Yes _____ No _____

   If yes, what?

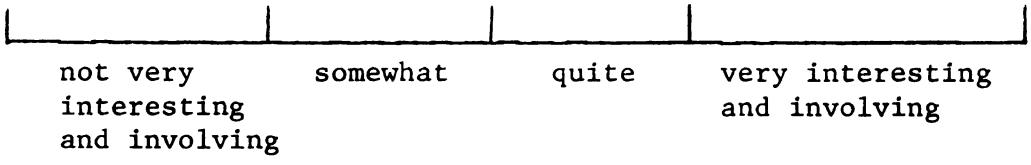
3. Have you participated in any other experiments similar to this experiment? Yes _____ No _____

   If yes, briefly describe the other experiment.

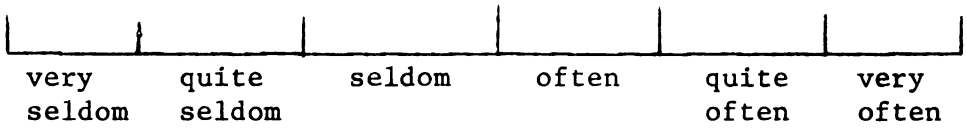
4. How hard did you try to win as much money as possible?



5. How interesting and involving was the game?



6. How often have you played a card game, parlor game, game of chance, etc., in the last six months?

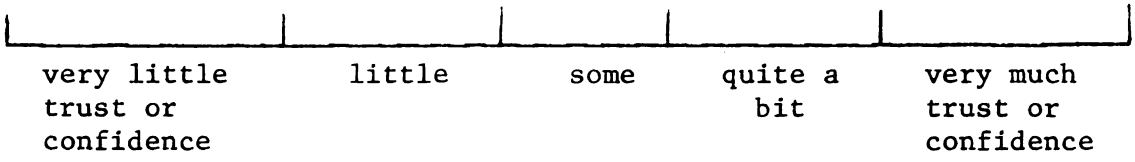


7. During the first part of the game, before the first agreement was made did you expect that the first agreement would be allowed to break and new alliances be allowed to form? Yes _____ No _____

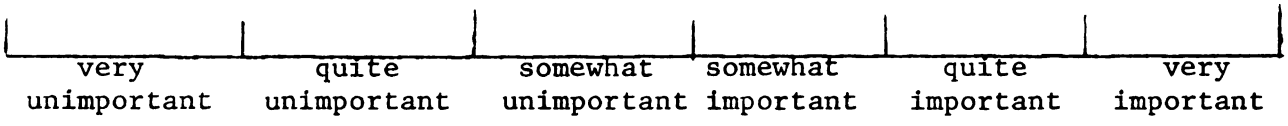
   If yes, why did you think this?

8. When each of you indicated by "secret ballot" whom you would like to form an alliance with, why did you choose the player you selected?

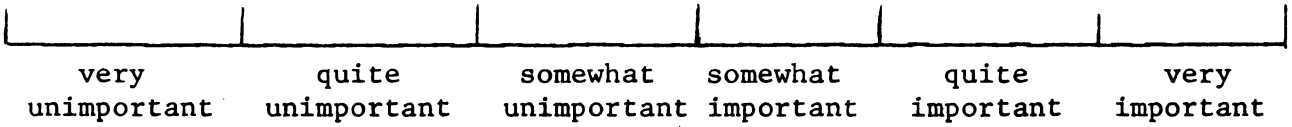
9. If you were one of the partners in the first alliance, how much trust or confidence did you have in your partner that he would not break the first agreement?



10. As a goal, how important was it to you that you have the highest winnings in your category, when compared with previous players who began the game under the same conditions as you?



11. As a goal, how important was it to you that you be the winner of this game irregardless of how you compared with previous players?



12. If you were playing for real money, would you have played the game differently? Yes _____ No _____

If yes, in what way?

13. If you could play the game again, what strategy would you use in order to win the most money?

14. If you have any further criticisms or evaluations of this experiment, please write them below.

2. Real money form

POST GAME QUESTIONNAIRE

1. Did you know any of the other players in this experiment before coming to the experiment? Yes _____ No _____

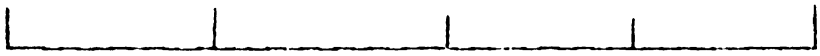
2. Did you know anything about this experiment before you came here today? Yes _____ No _____

   If yes, what?

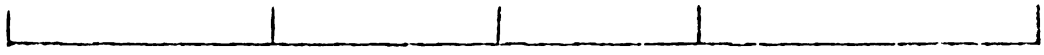
3. Have you participated in any other experiments similar to this experiment? Yes _____ No _____

   If yes, briefly describe the other experiment.

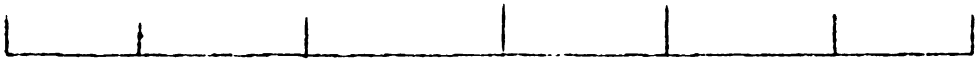
4. How hard did you try to win as much money as possible?



5. How interesting and involving was the game?



6. How often have you played a card game, parlor game, game of chance, etc., in the last six months?

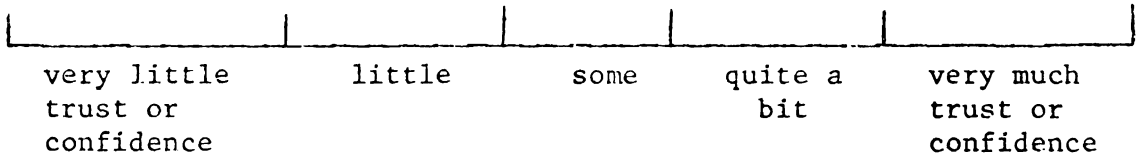


7. During the first part of the game, before the first agreement was made did you expect that the first agreement would be allowed to break and new alliances be allowed to form? Yes _____ No _____

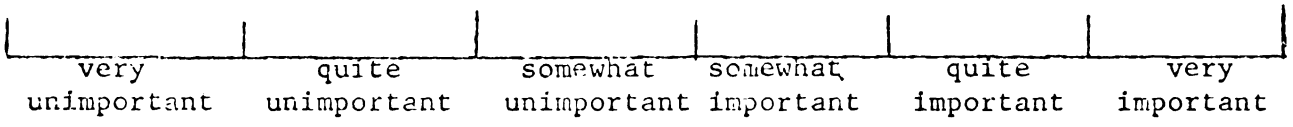
   If yes, why did you think this?

8. When each of you indicated by "secret ballot" whom you would like to form an alliance with, why did you choose the player you selected?

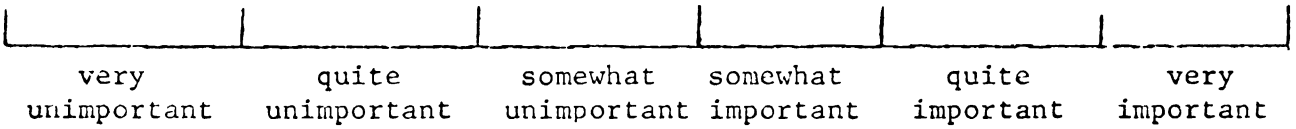
9. If you were one of the partners in the first alliance, how much trust or confidence did you have in your partner that he would not break the first agreement?



10. As a goal, how important was it to you that you have the highest winnings in your category, when compared with previous players who began the game under the same conditions as you?



11. As a goal, how important was it to you that you be the winner of this game irregardless of how you compared with previous players?



12. During the game did you believe that you would be given the amount you won in real money? Yes _____ No _____

If no, why not?

13. If you could play the game again, what strategy would you use in order to win the most money?

14. If you have any further criticisms or evaluations of this experiment, please write them below.

15. What is the value to you of the total amount of money in this game?

very little money	little money	some money	quite a bit of money	a lot of money	a very lot of money

16. As of today, how much did you need to win as much money as possible in this game:

very little need	little need	some need	quite a bit of	a lot of need	a very lot of need

17. What is the approximate annual income of your parents?

18. What is your approximate annual income?

APPENDIX F

EXPERIMENTER'S RECORD SHEET

Time: _____

Group _____

Date _____

Condition _____

Table Position:

Preliminary Round (Time: _____)

	Pair	Preliminary agreement	Initiator	Explicitness
1.				
2.				
3.				

Agreement Round (Time: _____)

	Choices	Pair	Agreement	Time	Initiator
1.					
2.					
3.					
4.					
5.					
6.					

Stability (Time: _____)

	Isolate	Amount Kept	Amount Pot	Offer To	Amount of Offer	Accept (A) Reject (R)
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
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22.						
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24.						