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FACULTY WORKING
PAPER NO. 1001

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December 1983

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Acknowledgment: I would like to gratefully acknowledge the comments and contributions of Kenneth Bettenhausen, John Blackmore, Thomas Hamilton, Marcia Kassner, Carol T. Kulik, Michael Malouf, Susan O'Brien, Greg R. Oldham, Alvin E. Roth, Gerrit Wolf and two anonymous reviewers during various stages of this project. Portions of the paper were completed during a visit at the University of Warwick, School of Industrial and Business Studies, Coventry, England; their assistance is also appreciated. Work on this project was supported in part by a grant from the National Science Foundation.

Abstract

The literature on organizations has long focused on the concept of coalition behavior. An experiment on coalition formation was designed as a simulation of organizational decision making groups. Previous research and a variety of game theoretic and social psychological models of coalition behavior provided strong empirical and theoretical bases for the study. Groups of masters students interacted in four sessions that manipulated the power of the five actors in each group. Results were compared to previous findings and were used to evaluate the theories. The findings suggest that (1) revenge was not often used by the players in these groups; (2) social pressure and the weak players' ability to communicate depressed the strongest players' outcomes; and (3) Komorita and Chertkoff's (1973) Bargaining theory and the Roth-Shapley value (Roth, 1977a,b; Shapley, 1953) predicted coalition outcomes better than the other models tested. The implications for organizations and their members are discussed.

Coalitions in Decision Making Groups:
Organizational Analogs

The concept of coalitions is central to much of organizational theory (e.g., Pfeffer and Salancik, 1978; Thompson, 1967). The notion that organizations and small groups are composed of individuals with conflicting motivations and interests is a widely accepted assumption about organizational behavior. And yet, there is almost no mention in the organizational literature of the large, growing body of research and theory on coalition behavior in social psychology, political science, and game theory (Murnighan, 1978a). Two reasons might account for this lack of cross-fertilization: (1) The language of coalition theory, highly formalized mathematics, may be less tractable than most social scientific theory; and (2) the research on coalition behavior has been conducted almost solely in the laboratory and has utilized experimental procedures that do not resemble the coalitional behavior that organization theorists envision as taking place in the real world. The current study deals with the second of these issues by reporting two experiments that investigated coalition behavior in a simulation of organizational decision making. The first problem will also be addressed by reviewing some of the theories of coalition behavior from an organizational perspective, focusing less on the mathematics of the models than on their underlying rationales (cf. Murnighan, 1982a).

The two studies reported here are conceptual replications of previous research by Murnighan (1978b) and Murnighan and Szwajkowski (1979). The current studies were designed to increase the mundane realism (Aronson and Carlsmith, 1969) of the task, making comparisons to organizations more direct. Previous laboratory experiments on coalition behavior have used a wide variety of procedures (e.g., Rapoport and Kahan, 1976; Komorita and Meek, 1978). The current study relaxed many of the controls used in previous research, and stands in marked contrast to most other experimental procedures.

For instance, in this study group members were face-to-face and could communicate with each other almost without restriction. This led to a variety of tactics, types of proposals, expressed reasons for previous behavior, etc. Indeed, sorting all that was happening within the groups as they moved toward agreements is more than can be covered in this paper. However, this "looseness," when it is combined with the findings from the previous studies, offers the opportunity to see whether the underlying coalitional structure that was manipulated within the groups had as much of an impact in the current settings as it did in the "controlled" studies previously conducted (cf., Murnighan, 1982a). As Campbell and Stanley (1966) point out, the more variation existing in experimental procedures, the greater the degree of generalizability that is obtained when results concur. Thus, if the findings of this experiment and those reported earlier are similar, confidence in the findings and in the theories that correctly predict them should be considerably enhanced.

One other study (Komorita and Meek, 1978) looked explicitly at the effects of different procedures on the coalition outcomes of three different games.[1] The changes they made in the procedures were much less severe than those involved here. One procedure, which consisted of secret offers, publicized agreements, and no face-to-face interaction was identical to that used in our previous studies. A second procedure altered the players' interactions by removing the secrecy of the offers: everyone's coalition proposals were displayed so that all of the bargainers could see them. Although Komorita and Meek (1978) found significant differences in the players' outcomes as a result of the changes in the procedures, the extent of these differences was fairly small. In addition, in three studies Murnighan and Szwajkowski (1979) and Murnighan and Roth (1977; 1978) found only small effects for similar changes. The current study instituted considerable changes in the negotiation procedures, thus establishing conditions where correspondingly large effects on the outcomes may be observed.

The Structure of the Games

An underlying assumption in this paper is that the structure of a game depends on the sets of group members (i.e., coalitions) who can make a decision by themselves, regardless of what the other players do. Operationally, this means that we are focusing directly on those sets of individuals who have enough power to make organizational decisions without the support of those who disagree with them. Thus, if three people form the executive committee of an organization and an agreement among any two of them is sufficient to set organizational policy, the structure of this organization's "game" is identified (and corresponds to the five-person All Equal game in this study, described later). In terms of coalition theory, structure is determined by the set of minimal winning coalitions, i.e., coalitions that would no longer be winning if any member left the coalition. This situation can be modeled in several ways, preserving the underlying structure even with differences, say, in resource distribution. For instance, if the members of this group have differential control over blocks of votes (resources) such that the distribution of votes is 4-3-2 or 2-2-1, a majority of the votes still requires that at least two of the group members agree, regardless of which two agree. Thus, given the assumptions used here, the structures of these two games would be considered to be the same. The effect of resources only becomes important as it changes the set of individuals who can make a decision on their own.[2]

The eight games studied in the two experiments here had exactly the same structure as the games studied in Murnighan (1978b) and Murnighan and Szwajkowski (1979). Four of the games included a veto player, who had to be included in every agreement: no decisions could be made without his/her consent. The other four games varied the power positions of the players without including a veto player (see Table 1).

Insert Table 1 about here

The differences among the games are most easily understood by referring to the quota/resource structure, the third column in Table 1. The first number in each sequence refers to the quota of resources necessary to reach an agreement, make a decision, or form a winning coalition. The numbers in parentheses refer to the smallest strategic weights that can be assigned to the players in the game. The weights can be added to determine which coalitions have sufficient strength to win. They are ordinal, however, as far as comparison of individual power positions are concerned.

The games have been arranged in the table so that player A is at least as powerful, and often more powerful, than any of the other individuals in the game. In addition, as one moves across games from the All-Equal game to Veto game #4, several theories predict that the power of player A increases. A strong, sharply delineated difference is apparent as one moves from the non-veto to the veto games: player A can no longer be excluded from any agreements in the veto games. This puts player A in a very strong bargaining position, much like the executive who cannot be overruled. In the non-veto games, player A in the Apex game (the Apex player) also holds a particularly strong position. Table 1 highlights the range of power positions that can be specified in these games, pinpointing one of the distinct advantages of the mathematical approach to coalition behavior.

The current study focuses on coalition behavior within decision making groups. An earlier study (Murnighan, 1974) suggested that coalition behavior helped explain the results of decision making groups whose preferences were markedly different from one another. Indeed, when everyone in a group holds the same preference, there is little reason for conflict among ideas to arise. When preferences differ, however, a subset of the group may form a coalition and make decisions in the coalition's interests, rather than the interests of the entire group. The current study encouraged the formation of coalitions, and the coalitions that did form were easily observed. Unlike the rules in most of the previous research on coalitions, agreements among all five group members were also possible. Thus, the group's inclinations toward collectivism, in the form of agreements including everyone, could be contrasted with their inclinations toward "coalitionalism," forming coalitions that exclude some group members.

The study of coalition behavior in laboratories or in coalition governments has focused directly on the power that the participants hold in a particular situation. Strength, weakness, dependence, resources: All of these are terms common to the coalition literature, as well as the literature on organizations and organizational behavior. A variety of models of coalition behavior approach power from different perspectives, and a brief review of some of the prevalent theories (particularly the theories that were tested in Murnighan, 1978b, and Murnighan and Szwajkowski, 1979, and which can also be tested here) will reveal how they view power and its potential use.

Models of Coalition Behavior

Komorita and Chertkoff's (1973) Bargaining theory is the model that has received the most empirical support in the recent literature (e.g., Komorita and Tumonis, 1980; Murnighan, 1978a). Bargaining theory is based on the notion that individuals will use alternative agreements as threats to try and increase their payoffs within the present agreement or coalition. Thus, if organization A is considering a merger with organization B, Komorita and Chertkoff's model would say that the organization with the greatest number of resources and more alternative organizations as potential partners would have a distinct advantage in the bargaining. If organization A is a dynamic, growing, profit-generating company, and if A in turn has numerous alternative organizations which would be willing to enter a deal similar to the one being negotiated with B, then A should do extremely well. Ironically, this is true, according to Komorita and Chertkoff, even if the prospect of A's alternatives are not particularly good. Their presence alone allows A to tell B, "If you don't go along, I can always get what I need from C." If enough uncertainty about C exists, especially for B, A's threat may be credible enough to be effective (Ellsberg, Note 1). Thus, Komorita and Chertkoff's bargaining model incorporates many of the notions of dependence common to organization theory (e.g., Pfeffer and Salancik, 1978). In dealing with small groups and well-defined resource systems, it makes explicit predictions concerning the likelihood of different parties forming a coalition and how each potential coalition should divide the payoffs it obtains. For a more extended discussion of the model, see Komorita and Chertkoff (1973) or Murnighan (1978a).

A second model, also proposed by Komorita (1974), is called the Weighted Probability model. The rationale behind its predictions are that small coalitions, including few actors (rather than few resources), are more easily formed and more easily maintained than large coalitions. Thus, the model would predict that negotiating with a partnership would be more difficult than negotiating with an individually owned organization. In addition, actors able to form small coalitions are predicted to have an advantage in the potential distribution of payoffs. Not only will small coalitions be more likely to form, but their members will also be included within winning agreements most often and will gain the most from their inclusion.

Komorita's (1979) most recent model, Equal Excess theory, also focuses on the alternative coalitions that a player can form. The theory predicts that all coalitions will initially split the payoff they can obtain equally: two-person coalitions will split 50-50; three-person coalitions will divide the payoff with each receiving 1/3, etc. As bargaining continues, however, players will use their expectations in other coalitions as a threat to increase their payoffs in their current coalition. Thus, an actor who is negotiating a three-person agreement will use the threat of forming a two-person agreement (if that is possible) to increase his or her payoffs with respect to the other coalition members. As play progresses, actors revise their expectations on the basis of their previous interactions, always using their alternatives as potential threats. This process suggests that an organization or an individual with a good reputation will be able to make considerable use of that reputation as one means for increasing benefits. Continued success would then be expected to lead to even more success. The model does indicate that there are decreasing marginal benefits as interactions continue, and that stable outcomes ultimately occur when each player is predicted to receive the same payoff, regardless of which coalition he or she joins.

Other models that pertain to the formation of coalitions in situations such as those studied here are drawn from the field of game theory. The core (Luce and Raiffa, 1957) is a limited model (it does not always exist) based on the presence of intense competition. It basically says that a coalition is stable as long as no other coalition can form that gives every coalition member a greater payoff than they were receiving in the initial coalition. If more profitable agreements are available (if, for instance, an organization locates a less expensive but high quality supply of its required resource inputs), instability and turbulence will result. It makes no prediction in the non-veto games. To illustrate, consider the Apex game. If players A and B are considering a coalition that gives A $80,000 and B $20,000, then B can do better by forming the BCDE coalition with each player getting $25,000. But, in turn, A may be able to tempt one of these four individuals with an offer such as $60,000 for A and $40,000 for the other player. This will exclude three of the other BCDE members, who will then be willing to accept less than $40,000 in partnerships with A. All of the non-veto games have the potential for this "circular" bargaining. In game theoretic terms, no coalition is dominant.[3] Because one actor holds a unique resource, the veto games do yield a prediction for the core, one reflecting its competitive assumptions. The veto player should, possibly after considerable bargaining, be able to play the non-veto players off against one another and ultimately approach receiving the entire payoff. Unrestrained monopolies are simple examples of games where the organization holds a unique resource and acts as a veto player.

von Neumann and Morgenstern's (1944) simple solution presents less stringent requirements for stability: it requires that a solution set include all payoff configurations that do not dominate one another (see footnote 3) and that include at least one member that dominates any payoff configuration outside the solution set. Thus, in the All-Equal game, the solution set contains all those payoff configurations that divide the payoff equally among any three of the five players. If we consider one of these payoffs (1/3, 1/3, 1/3, 0, 0), where players A, B, and C have formed a coalition and each is receiving 1/3, it is easy to find other payoff configurations which dominate it. For instance, players D and E might lure player A away with the following payoff configuration: (½, 0, 0, ¼, ¼). However, this payoff is also dominated by another member of the solution set, where players C, D, and E each receive 1/3: (0, 0, 1/3, 1/3, 1/3). von Neumann and Morgenstern's solution set, then, identifies a set of payoffs that should occur frequently over many interactions. While single interactions may yield payoffs outside of the stable set, rational players should then implement one of the members of the set, because some member of the solution set always dominates non-members. In this sense, von Neumann and Morgenstern's solution set is "stable." This model might be analogous to two organizations that try to better their positions by occasionally trying new partners but continuously return to each other, for reasons of quality, certainty, or similar philosophy.

Other game theoretic models also exist. The competitive bargaining set (McKelvey, Ordeshook, and Winer, 1978) makes identical predictions to those of the solution set in the non-veto games. Aumann and

Maschler's (1974) bargaining set and its subsets (e.g., Davis and Maschler, 1963; Horowitz, 1974; Schmeidler, 1969) make identical predictions as the core in the veto games. Its predictions for the non-veto games are identical to the weighted probability model's. One other model, the Roth-Shapley value (Roth, 1977a,b; Shapley, 1953; Shapley and Shubik, 1954) makes predictions for the players' overall outcomes rather than for any single coalition. Although the mathematics of the model are derived differently, the predictions of the Roth-Shapley value can be determined by considering each possible ordering of the coalitions as equally probable and assuming that they form one person at a time, with each additional person accumulating all of the marginal gain that the new, enlarged coalition can now obtain. Thus, if player B is pivotal when s/he joins the AC coalition, changing it from non-winning to winning, then, given the probability of this order of formation, the entire marginal gain to the coalition from B's joining should be attributed to B. When this is considered for every ordering of the actors, and normalized for the payoffs that are to be awarded, each actor position has a _value_, prior to and independent of the beginning of play. In 5-person games, there are 120 orderings of the players. In the Apex game, player A changes any coalition, except BCDE and coalitions where s/he is ordered first, from winning to losing. Player A is therefore pivotal 72 times; in like manner, the other players are each pivotal 12 times. The Roth-Shapley value for the players, then, predicting their overall outcome from the games, is 60-10-10-10-10.

The Roth-Shapley value, then, can act as a prediction of the overall proportion of the prizes that each actor might realistically expect.

Organizations, subunits, or individuals who are central (Hickson, Hinings, Lee, Schneck, and Pennings, 1971) or critical (Murnighan, 1982b) will be more pivotal, in terms of the value, than actors who are less central or critical, and their payoffs will also be predicted to be larger.

Clearly, many diverse models predict the outcomes of the bargaining games studied here. Without delving into elaborate detail about the derivation of each of the models' predictions (the original sources can be consulted for these), they are shown in Table 2. It is important to note that the predictions are very specific, much more so than theories about organizations.

Insert Table 2 about here

Beyond these predictions, the changes that might be observed in relation to the previous studies are also important. Allowing players to meet face-to-face and no longer assigning quantitative resource allocations makes the current study considerably different from its predecessors and more like group decision making interactions in organizations. The presence of recognizable individuals as one's "opponents" might reasonably lead to a more egalitarian distribution of outcomes than was observed earlier. The appeals of less advantaged players to be considered equal participants in any coalition takes greater credence when strong players cannot ignore the physical presence and individuality of their potential coalition partners: Greater credence is attached to the equality norm (Komorita and Chertkoff, 1973) when a person just like yourself is proposing an agreement. Thus, the strong players in this study are expected to receive lower payoffs than they did when people could not bargain face-to-face. In addition, the weaker players' ability to form a unified coalition that opposes the wishes of the strong player should be facilitated by their ability to interact verbally and nonverbally. Previous experimental procedures, for instance, required the members of a non-Apex coalition to simultaneously and independently coordinate all of their strategies to form a coalition that excluded the Apex player. In the procedures used here, a single non-Apex player can take the floor and vocally dominate, spurring a revolution (cf. Michener and Lawler, 1971) to counteract the strong player's power.

The current methodology also allows people to identify individuals who had played particular roles in past games, particularly the individual who had previously held a powerful position. In subsequent games, which people know will occur, this individual may be subjected to revenge by previously weak players who have assumed powerful positions. The potential for retribution (which does not occur in the last game) may reduce a veto player's audacity/greed/willingness to use so much power. In the previous experiments players knew they would not be identified until all of the bargaining sessions were completed. Thus, powerful players now have another reason to distribute the payoffs more equally. Moderation should not occur, however, in the last session, where there is no possibility for retribution.

This discussion highlights several hypotheses, in addition to the predictions in Table 2. In particular:

(1) Strong players in the current study are predicted to receive lower payoffs than strong players in the earlier studies.

(2) Revenge should lead to reduced payoffs for those who held the strong position in the previous session. In addition, the more an individual took as the strong player, the worse he or she should do subsequently.

(3) Strong players in the last session should do better than comparable players in the other sessions, and should do as well as the strong players in the non-face-to-face studies.

Method

Subjects

The subjects in this study were 165 master's level students enrolled in one of four sections of a behavioral science course at the University of Illinois. For the most part, these students had little or no previous background in behavioral science. To complete the project requirements in the course, students had a choice between writing a library research paper or participating in the bargaining exercises and completing a paper analyzing their own strategies in each of the games. The performance in either option accounted for 15% of the grade in the course. Students who participated in the bargaining exercises (presented as "exercises in strategy selection") were informed that their performance in the games would be compared to the performance of other students in the same power position as their own. Students could obtain an "A" grade for the project in two ways, by either scoring better than the average total points for players in the same position as themselves or by doing an excellent job analyzing their strategies in their paper. All students, regardless of their game performance, were required to complete the paper. Only with a relatively poor paper and below average performance in the games would a student earn a "B" for the project.[4]

Graduate students were used in this study in an attempt to more closely parallel "real world" coalition bargainers. Although none of the theories tested here speak to the expertise of the populations they address, most individuals involved in overt coalition bargaining are both more intelligent and more experienced in bargaining situations than the general population. Graduate students who have some stake in the outcomes of the bargaining, and who are given repeated experience with coalition bargaining, should more closely resemble such a population (cf. Murnighan, Note 2).

A total of 19 groups completed the four veto games; 13 groups completed the four non-veto games. The sexual composition of the groups varied; unlike earlier coalition studies (e.g., Vinacke, 1959) sex had no effect on these results and is not discussed further. During the course of the games, five individuals decided not to complete the exercises; four were playing the veto games and one was playing the non-veto games. All were replaced by students from the same class. Dropping the course was the only reason reported for leaving the groups.

Design and Analysis

For both the veto and non-veto studies, each group played each of four games for twelve trials, where a trial was completed with each agreement. The games were played in different orders, with groups being randomly assigned to one of three Latin square designs to determine the order they played each game. The final assignment of groups to different orders resulted in each game being first, second, third, or fourth among the games played at least three times.

The factors, then, were games (4 levels), players (5 in each game), trials (12), and order (first through fourth). Games, players, and trials were within-group factors; order was the only between group factor. None of the analyses combined veto and non-veto games.

Procedure

The procedure for the veto and non-veto games was identical. The participants were introduced to the "Interdisciplinary Research Game" in the class immediately preceding the beginning of play. Students were told that they would each act as a representative of an engineering department in a five-person group whose task was to determine how to divide the research funds available at each meeting. The players were told that there would be 12 agreements in each session, and each agreement would determine the distribution of $100,000 in grant money. Representatives were told that their departments would be working on the research projects whether or not they obtained any funding, and that their task was to maximize their department's return from each meeting. The subjects were randomly assigned as representatives of the Bioengineering, Chemical Engineering, Metallurgical Engineering, Agricultural Engineering, and Engineering Mechanics departments. They were told that, at each meeting, they would be given a list of the departments which could obtain the available funds at each session. The federal funding agency was described as one that was interested in interdisciplinary research, and that certain programs required the participation of different combinations of departments. Thus, some departments would be more or less likely to be included among the agreements that the agency was willing to fund. In the veto groups, the fact that one of the five departments had to be included in every agreement was noted. The games were described, then, in terms of different departments labelled A, B, C, D, and E; the advantages of the five positions could be easily seen, but identification of which department would hold position A in any session was not revealed until the beginning of that session. Thus, the representatives knew the structure of the game they would be playing ahead of time, but they did not know their power position in that structure.

Students were randomly assigned to groups, with the constraint that members be unacquainted. Each group met for their sessions at the same hour each week for four weeks. They were told which game they would be playing each week but not which position they would hold throughout each game. They were allowed to discuss the games with other members of their class, excluding members of their own group. In addition, the players were encouraged to formulate strategies for each position prior to each game.

Assignment of players to the power positions was pre-determined by randomly assigning members of each group to a particular "slot." The "slot" was unknown to the players and indicated what position each player would play in each of the four games. For instance, the first slot might mean that an individual would be assigned player position A in the Apex game, B in the All-Equal game, etc. The assignments within each slot were determined randomly, with the constraint that no representative would be assigned the A position more than once. The players seemed to adopt the role determined by their position immediately: Strong players took command, weak players directed their communication to the strong player.

The players were seated around a large table behind name plates designating their departments. (This was done to control for seating position, which remained constant for each of the five positions for each game and each group.) Representatives were also given a sheet that identified the agreements that the funding agency was willing to fund; in this way, the power positions of the representatives could easily be seen. The experimenter (who played the role of the funding agency's representative) sat at the head of the table. Immediately in front of the experimenter was a cassette tape recorder, a microphone, and a sheet for recording the agreements and the time the agreement was reached. After outlining the purpose of the study, the experimenter announced that the group could begin. Discussion quickly ensued. An agreement was reached whenever the representatives from departments which could form a valid agreement exchanged proposals and verbally agreed on a payoff division. Most agreements followed a process where one representative presented a proposal that one or more of the other representatives accepted.

The exercises were discussed thoroughly later in the semester. Students received feedback about their performance as bargainers and about their written analyses of the games. All of their questions were answered in full.

Results

The veto games were characterized by protracted negotiations, and sessions often ran for an hour or longer. The non-veto sessions, on the other hand, proceeded very rapidly. Once the players understood the game, negotiations consisted almost strictly of quantitative offers and acceptances. Thus, the non-veto games resembled the previously used procedure more than the veto games. Sessions in these games took, for the most part, about 10 minutes. The players had to be ready with an offer when bargaining began and when it resumed following the previous agreement. Non-verbal communication during the recording of the previous agreement often signaled the upcoming agreement. Thus, both conceptually and empirically, the veto and non-veto games are quite different, warranting separate treatment and analysis.

In the non-veto games, the primary analysis was a games (4) x players (5) x trials (12) x order (4) analysis of variance with each player's outcome in each trial, whether included in or excluded from the winning coalition, as the dependent variable. As with the previous study (Murnighan, 1978b) a significant effect for players ($\underline{F}(4,144) = 104.55$, $\underline{p} < .0001$) and a significant interaction between games and players ($F(12,144) = 19.63$, $p < .0001$) resulted. These effects remain significant after the application of the conservative test (Box, 1954), necessitated by the potential non-independence of the findings. The data for the interaction are displayed in Table 3. The findings are remarkably similar to those from the previous study. Removing the partitions that separated the players in previous studies, allowing verbal interaction and identification of players who had held strong positions previously seems to have had little effect on the mean outcomes in the non-veto games. The only exception occurred in the Apex game, where the Apex players' mean outcomes were considerably smaller than in the more structured procedure of the earlier study.

Insert Table 3 about here

In the veto games, the analysis first included only the veto players' payoffs, in a games (4) x trials (12) x order (4) analysis of variance. The effect for trials was significant, ($F(11,660) = 2.09$, $p < .02$): the veto players' payoffs tended to increase over trials, except for a sharp drop on the last trial. This effect disappeared when the conservative test was applied. The data for the veto players' payoffs in the four games are shown in Table 4. Although the games show some effect on the payoffs, the effect is not statistically significant, as it was in the previous study (Murnighan and Szwajkowski, 1979). More importantly, the data are considerably different in magnitude from the previous study: Thus Hypothesis 1, which predicted reduced payoffs for powerful players, received strong support.

Insert Table 4 about here

Analysis of the non-veto players' outcomes in the veto games was patterned after the analysis of the veto players' outcomes with players (4 levels) included as the fourth factor. The results showed a significant effect for players ($F(3,180) = 4.84$, $p < .003$). Again, unlike the previous study, the interaction of players and games did not reach acceptable levels of significance. The means, however (see Table 5) show much the same pattern as the previous study. Thus, players who could form two-person agreements with A in veto games 2 and 3 obtained greater outcomes than players who were required to form three-person agreements with A in these games. All of the non-veto players received greater outcomes than the previous study, but the benefits for the weakest of the players seem to have increased most. Where before the veto player seemed to obtain identically high payoffs whether s/he bargained with one or two other players, in this study the veto players received less as they included more players in agreements.

Insert Table 5 about here

These findings suggest that the veto players in games 2 and 3 might prefer two-party over three-party agreements. Inspection of the frequencies of different coalition's (see Table 6) substantiates this expectation for game 2 but not game 3. However, while there were considerably more AB agreements in game 2 than any of the three-person coalitions, there were also the greatest number of "all included," five-person agreements.

Indeed, the most striking result among the figures in Table 6 is the large number of all included agreements in the veto games and their almost non-existence in the non-veto games. Where the strong player could be excluded from the winning coalition in any of the non-veto games, s/he could not be excluded in the veto games. Because the veto player retained the power to be a required member of every coalition, the "tough" bargaining alternative available to the weaker players in the non-veto games (i.e., exclusion) was available only in restricted form in the veto games. But even considering this fact, more all included coalitions formed than would be expected from either the theories or previous research. Also, many fewer two-party agreements occurred, in proportion to the total number of agreements, in the veto games than in the non-veto games.

Evaluating the Models' Predictions

For the veto games, the total payoff of the players in the different positions was compared to the predictions of the Weighted Probability model, the core, and the Roth-Shapley value. Total scores for each of the players in each position in each game were divided by 12 (the total number of agreements in each game) and difference scores were calculated for each theoretical prediction for each player in each game. The scores were analyzed in an overall analysis of variance, including games (4), player positions (5), and theories (3) as independent variables. Because increasing the number of theories artifactually increases the degrees of freedom for each test, the conservative test (Box, 1954) was applied to each F-ratio. This correction simply reduces the degrees of freedom for each test. Significant effects were found for player positions [$F(4,330) = 95.29$, $p < .01$], theories [$F(1,330) = 95.64$, $p < .01$], the game by theories interaction [$F(3,330) = 7.37$, $p < .01$], and the player position by theories interaction [$F(4,330) = 20.53$, $p < .01$]. The core's predictions were significantly less accurate than the other models (except for the Weighted Probability model in veto game #1). The Roth-Shapley value outperformed both of the other models, and in a separate analysis including only the value and the Weighted Probability model, the differences between them were significant [$F(12,330) = 10.46$, $p < .01$ for the games x players x theories interaction], but only for the veto player in veto game #1. Because their predictions were so similar in the other games, veto game #1 provided the best test of their relative predictive accuracy, and the Roth-Shapley value made significantly better predictions here than the Weighted Probability model.

A similar analysis compared the Weighted Probability model's predictions for overall outcomes with those of the Roth-Shapley value for the nonveto games. Results were very similar: the games x players x theories interaction was again significant [$F(12,220) = 14.57$, $p < .01$], and for the Apex player in the Apex game, where the predictions diverged most widely, the Roth-Shapley model made significantly better predictions than the Weighted Probability model.

Analysis of the model's predictions for payoff distributions within particular coalitions (the "conditional on inclusion" figures in Table 2) was considerably more complex. The absolute differences between the observed and predicted outcomes for each player in each winning coalition were summed and the sum was divided by the number of members within the coalition. This technique for evaluating theoretical predictions was originally used by Michener, Fleishman, and Vaske (1976). Difference scores for Bargaining theory and the Weighted Probability model were analyzed in a game by trials by theories analysis of variance. The effects for games [$F(3,36) = 23.23$, $p < .01$] and theories [$F(1,12) = 34.91$, $p < .01$] and the game by theories interaction [$F(3,36) = 13.16$, $p < .01$] were all significant. Bargaining theory's predictions were significantly better than the Weighted Probability model's in each game except the All Equal game, where their predictions are identical.

Finally, observation of the frequencies of the different coalitions (see Table 6) clearly shows that the coalitions predicted to be most

Insert Table 6 about here

frequent in the non-veto games by both Bargaining theory and the Weighted Probability model are the most frequent. In the veto games, the high frequency of the all included coalitions (ABCDE) was not predicted by the Weighted Probability model.

Longer Term Effects of Strength

The use of revenge against individuals who held a powerful position (A in the Apex, Pyramid, and veto games, and A or B in the Duopoly game) in a previous game, the subject of Hypothesis 2, was tested by analyses of variance and covariance. In each analysis, the payoffs received by the previously powerful player were compared to the average payoffs of other players in the same theoretical position as the previously powerful player. Thus, if a previous Apex player held position D in the Duopoly game, his/her payoff was compared to the average payoff of players in positions C and E in that game. Due to a revenge motive, player D is predicted to obtain smaller payoffs than C and E. Thus each analysis included two levels of this "revenge" variable (previously A vs. comparable non-A's) as well as the structure of the previous game in a 2 x 4 between subjects design.

Although the average for previous veto players (6.95) was exceeded by the average payoff for non-A's (7.51), overall and in each of the games, the results were not significantly different from one another. The differences in the non-veto games (11.8 vs. 14.5) approached standard significance levels: $F(1,36) = 3.00$, $p < .10$. Analysis of covariance using the previously powerful person's previous payoff as a covariate yielded no significant effects. Thus, although a revenge effect makes intuitive sense, it was not reflected in the players' subsequent outcomes: Hypothesis 2 was not supported.

Analysis of the effects of order on the powerful players' payoffs tested Hypothesis 3. As noted earlier, no significant effects ($F < 1$) resulted in the veto games. In the non-veto games, the analysis used order and trials as repeated measures, and a four-level between factor for the strong players, including players A and B in the Duopoly game, player A in the Pyramid game, and player A in the Apex game. As predicted by Hypothesis 3, and as expected from observations of Table 3, differences among the strong players were significant ($F(3,36) = 10.54$, $p < .001$). The effects for order approached standard significance levels ($F(3,36) = 2.87$, $p < .06$); the interaction was not significant. The average of the strong players' payoffs increased from 40 to 43 in the first three sessions and to 51 in the last. Thus, when the sessions neared completion and there was little possibility for retribution, the strong non-veto players were able to obtain increased benefits. Hypothesis 3 was not supported, however, in the veto games.

Discussion and Conclusions

The first hypothesis stated that strong players in the present study would receive lower payoffs than those in the previous study. This was clearly supported in the veto games: Mean payoffs in the 90% range in the earlier study (Murnighan and Szwajkowski, 1979) were paralleled by mean payoffs in the 60 and 70% range in the current study. In the non-veto games, however, only the Apex player seemed to lose. Duopolists and the A player in the Pyramid game did just as well as their counterparts. While a variety of factors may have contributed to these findings, the two factors which seem to make the most intuitive sense are that the new study allowed the weak players to exert considerably more social pressure on the strong player, and, from the strong player's point of view, retribution was now possible and might inhibit one's desire to make extreme demands. Both of these factors are most salient in the veto games. In the previous study, the veto player could demand an excessive amount of the payoff without having to identify the people who were either excluded from the agreement or included for a very small amount. Also, there was no chance for revenge:

Just as the veto player could not identify victims, they could not identify the veto player. In addition, the norms that seemed to form within the groups, which are addressed elsewhere (Bettenhausen and Murnighan, Note 3), also constrained the veto players' ability to increase their payoffs within a session. Norms for appropriate and inappropriate veto benefits seemed to be established very quickly within the groups, and at different ranges for different groups. Thus, an intransigent veto player was often faced with the potential of a united set of non-veto players. This may also account for the frequency of all-included agreements within the veto games: the weaker players' best option, especially in the long run, was to unite and deal with the veto player as a "single" opponent. From a game theoretic standpoint, such a situation has no determinate solution: any outcome is possible. Within the groups, however, different norms could arise to determine "appropriate" outcomes for the veto player.

In the non-veto games the only appreciable difference from the previous study was the reduced overall outcome obtained by the Apex players. More non-Apex, BCDE coalitions (18% versus 13% in the previous study) explain some of the difference. In addition, the Apex players in the previous study obtained an average payoff of 77.3% when they were included in the winning coalition; in the current study the comparable average was 69.6%. Thus, the difference is not completely attributable to an increase in exclusions of the Apex player. Indeed, the Apex players' mean outcomes when they are included in the winning coalition and the outcomes of the veto players (who had to be included in every agreement) are very similar. The results suggest a potential ceiling effect, imposed not by the conditions of the experiment as much as by the members of the group the Apex or veto player must negotiate with. In the previous study, Apex players who demanded too much were soon excluded by the other players. That was just as true in the current study: Apex players who began to obtain payoffs of 75 or more often found themselves excluded on immediately subsequent trials. Thus, there may be a limit on the payoffs that a player, even one with considerable power, can obtain in a face-to-face group. Further study of this hypothesis is certainly necessary, particularly with respect to the conditions that might lead to exceptions to this rule.

The revenge motive, posited in the second hypothesis, had little effect on the strong players' subsequent outcomes (although it may have led to veto players reducing their own demands). This is particularly surprising when group members clearly identified the players who had previously held strong positions: they were often told that they would receive "special" treatment. The fact that sessions continued for 12 trials, and that people could not ignore the fact that one person, even if it was a previously strong player, was being consistently short-changed, may have dampened a possible effect. Early research on coalitions (e.g., Emerson, 1964) indicates that when the players are aware of others' outcomes, there is a tendency to equalize outcomes. Players who took a short term focus, that is, considering only the current game rather than considering the four games as a whole, may well have been affected by this kind of pressure, making it easier for previously strong players to obtain better payoffs than expected. Added to this is the possibility that previously weak players returned favors provided by previously strong players.

The strong players did increase their benefits in the last of the non-veto games, as expected. In addition, the fact that the non-veto game payoffs were so similar to those from the earlier study supports this portion of the third hypothesis further. However, the lack of an effect in the veto games is curious. Just as few game and player effects were significant in the veto games, they were also less effective in offering an adequate test of the other hypotheses. Further study may reveal the reasons for the absence of these effects.

The similarity between the predicted and observed outcomes was not particularly striking. As we have argued elsewhere (Murnighan, 1982a), the particular conditions of any one study may shift the outcomes. The comparisons of the theories, however, was fairly clear. The difference score analyses in the non-veto games supported Bargaining Theory; the analyses of the overall outcomes in all the games supported the Roth-Shapley value. The continuing inability of the other models to out-predict those two brings them closer and closer to extinction.

Organizational Implications

The intent of this study was to move toward a more realistic setting for the study of coalition behavior in decision making groups. The normal caveats about laboratory research of any kind continue to apply: The subjects were not practicing managers; they did not have any familiarity with each other or with the situation prior to beginning the experiment; their task was unlike any task found in the real world; and the results of their experience had little profound effect on them. Serious attempts were made to overcome these potential limitations. The design provided the opportunity for empirical comparisons with earlier, more controlled studies, and, at the same time, moved toward conditions more analogous to organizational decision making situations. The participants have many of the characteristics of the population they represent. The task was meaningful, involving, and after the first session, not completely unfamiliar. Neither were the other members of the group. And just as most of social science implicitly assumes that people respond to the contingencies of the situations they find themselves in, so, too, did the current sample respond to the contingencies imposed in this experiment.

The results have something to say beyond the numbers and theoretical tests, especially if they are generalizable. In particular, the results were in some ways paradoxical: In the veto games, where one player had considerable power, all-included coalitions occurred frequently. This reiterates a point made by an executive who had observed some of Maschler's (Note 4) rather extreme payoff distributions in his early coalition study: "You would never see anything so severe in the business world." In fact, payoff distributions were not so severe in the games studied here, especially relative to the results of the earlier veto game study. In situations where there is a possibility for retribution and where the individuals involved can identify each other, there may be severe limits to the exercise of power. These limits are relaxed when possibilities for retribution disappear (i.e., when there are no more sessions the strong non-veto players' payoffs increased), but they require very special circumstances to be completely relaxed, conditions more like those of previous studies.

These limits to power may themselves be limited, as appears to have happened in the Duopoly and Pyramid games. Although the Apex players' payoffs dropped, the strong players in these two games did just as well in the face-to-face conditions as they did in the previous study. Part of this may be due to the speed with which agreements were reached: They left little time for the formation of larger coalitions that might have excluded the strong player(s). In both the veto and non-veto games, strong players' payoffs were negatively correlated with agreement time ($r = -.16$, $p < .001$ in both cases). This supports the logic inherent in Komorita's (1974) Weighted Probability model. They may also have held positions that were not considered too powerful.

The fact that the strong players in the Duopoly and Pyramid games did just as well as their counterparts in the non-face-to-face studies suggests a further dichotomy of strength: having obvious strength may increase the limits imposed on the powerful, especially relative to those with moderate strength. Indeed, as most findings in coalition research have shown (Murnighan, 1978a), the strongest players tend to concede the most (at least relative to theoretical predictions). Thus, the executive who wields considerable power may do so not at the expense of a single group, where s/he must make noticeable concessions to retain strength. Instead, as organization theory suggests (e.g., Hickson, et al., 1971), power may result from being one of the strongest players in many groups. Even considerable concessions in each may not affect the executive's overall strength (cf. Murnighan and Vollrath, 1984).

Alternatively, the current findings suggest that the possibility of one's exclusion from the dominant coalition may be an important camouflage for the extent of one's strength. Many issues and decisions arise within organizations; an executive who is excluded from some of those decisions may appear to be less influential than s/he may be. By being included in an organization's dominant, deciding coalition for issues that are most salient, an executive can establish a very strong position, one that may already be stronger and continue longer if s/he is occasionally excluded from decisions on less salient issues. From a strategic standpoint, allowing individuals with less power to partake of a ritualistic inclusion in relatively unimportant deciding coalitions cements one's own position while appeasing those subordinates who have strong aspirations for control.

The two models receiving the most support from this study suggest just this point. Komorita and Chertkoff's (1973) Bargaining theory emphasizes that, in strategic games, players will focus on underlying norms that give them the greatest advantage. Norms for equality will be used by the weak to further their position, while norms for equity will be used by the strong, who have invested more and expect more as a result. While these two normative positions will be debated, those who are pivotal to a coalition, as emphasized by the Roth-Shapley value, will most often be included in deciding coalitions. Thus, when issues are crucial to management, subordinates will not be involved in decision making. Instead a struggle among the individuals who most often form the deciding coalition may ensue. When issues are less critical, being excluded will be in the strong player's interests, and subordinates will be allowed to participate. Indeed, viewing intraorganizational activities as bargaining interactions sheds additional light on them. The presence of threats and counterthreats, and the very real effects of the structure of a situation, as it is defined game theoretically, can influence the outcomes organizational members receive. Pursuing the implications of coalition theories in real organizations requires intense methodologies. Studying intact organizational groups is another way to approach these issues. Modeling the group interactions as games provides a new perspective on the study of groups, and would ground it in a substantial theoretical and empirical base.

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Footnotes

1. The term game is used to denote an interaction that is strategic. It does not necessarily imply playfulness (cf. von Neumann and Morgenstern, 1944).

2. The 4-3-2 distribution cited here has generated more research than any other coalition situation (Chertkoff, 1970; Stryker, 1972). However, the theory (e.g., Komorita and Chertkoff, 1973) and research that has tested it (Kravitz, 1981; Murnighan, 1978a) has argued fairly convincingly that larger group interactions with more varied power distributions, over and above any distribution of resources, offer more for the student of social influence than the earlier findings in the 4-3-2 game.

3. A coalition x dominates a coalition y ($x \neq y$) if every member of x receives more in x than in y, and the coalition x can be formed.

4. The use of an instructor's students in his/her own research raises questions concerning the possibility of unethical coercion. The safeguards taken by the author to preserve the free choice of the participants are available on request.

Table 1

The Games, Their Structures, Quota/Resource Depictions, and Minimum Winning Coalitions.

Game	Structure	Quota/Resource Structure	Another Possible Depiction[b]	Minimum Winning Coalitions
All-Equal	A=B=C=D=E	3(1-1-1-1-1)	20(10-9-8-7-5)	XXX[c]
Duopoly	(A=B)>(C=D=E)	4(2-2-1-1-1)	27(13-12-10-8-7)	AB,AYY[b],BYY
Pyramid	A>(B=C)>(D=E)	5(3-2-2-1-1)	14(10-7-5-3-2)	AB,AC,ADE,BCD,BCE
Apex	A>(B=C=D=E)	4(3-1-1-1-1)	30(24-9-8-7-6)	AZ[e],BCDE
Veto #1[a]	A>(B=C=D=E)	6(4-1-1-1-1)	28(17-8-7-6-5)	AZZ[e]
Veto #2	A>(B=C)>(D=E)	7(5-2-2-1-1)	30(21-10-7-5-4)	AB,AYY[b]
Veto #3	A>B>(C=D=E)	6(4-2-1-1-1)	38(27-13-12-6-5)	AB,AC,ADE
Veto #4	A>(B=C=D=E)	5(4-1-1-1-1)	20(17-6-5-4-3)	AZ[e]

[a] The veto games have not been given names in the literature.

[b] These were the resource distributions used in Murnighan (1978) and Murnighan and Szwajkowski (1979).

[c] X refers to A, B, C, D, or E.

[d] Y refers to C, D, or E.

[e] Z refers to B, C, D, or E.

Predictions of a set of Models for the Eight Games Studied
(Payoffs equal 100 for each winning coalition)

	Mean Overall Payoff			Conditional on Inclusion in Winning Coalition		
Games	Weighted Probability Model	Core	Roth-Shapley Value	Solution Set/ Equal Excess Theory[a]	Bargaining Theory[b]	Weighted Probability Model
All-Equal	20-20-20-20-20	--[c]	20-20-20-20-20	(33-33-33-33-33)	XXX[d](33-33-33)	XXX[d](33-33-33)
Duopoly	27-27-15-15-15	--[c]	30-30-13-13-13	(50-50-25-25-25)	AB(50-50)	AB(50-50)
Pyramid	40-24-24-6-6	--[c]	40-23-23-7-7	(60-40-40-20-20)	AB,AC(60-40)	AB,AC(55.5-44.4)
Apex	69-8-8-8-8	--[c]	60-10-10-10-10	(75-25-25-25-25)	AX[d](67-33)	AX[d](75-25)
Veto #1 (AXX)	50-12-12-12-12	100-0-0-0-0	60-10-10-10-10	(100-0-0-0-0)	--[c]	AXX(50-25-25)
Veto #2 (AB,AXX)	62-11-9-9-9	100-0-0-0-0	65-15-7-7-7	(100-0-0-0-0)	--[c]	AB(72-28)
Veto #3 (AB,AC,ADE)	71-11-11-3-3	100-0-0-0-0	70-12-12-3-3	(100-0-0-0-0)	--[c]	AB,AC(72-28)
Veto #4 (AXX)	80-5-5-5-5	100-0-0-0-0	80-5-5-5-5	(100-0-0-0-0)	--[c]	AX(80-20)

[a] Although the solution set and equal excess theory predict payoffs for those included in winning coalitions, they make no prediction concerning the likelihood of different coalitions, as do bargaining theory and the weighted probability model. Thus, should A, B, C, D, or E be included, they are predicted to obtain the payoff listed.

[b] These are the asymptotic rather than first trial predictions of the theories.

[c] No prediction can be made.

[d] X refers to any player in the All-Equal game, and any player except A in the Apex and veto games.

Table 3

Mean Outcomes of the Players in the Four Non-Veto Games

(Results from Murnighan, 1978b, are shown in parentheses[a])

	Players				
Games	A	B	C	D	E
All-Equal	19.1 (20)	23.6 (20)	21.6 (20)	19.0 (20)	16.7 (20)
Duopoly	37.4 (33.2)	34.6 (33.2)	8.6 (11.1)	11.7 (11.1)	7.7 (11.1)
Pyramid	46.3 (45.0)	19.9 (22.2)	20.1 (22.2)	6.0 (5.3)	7.5 (5.3)
Apex	55.8 (67.0)	11.6 (8.2)	10.4 (8.2)	13.0 (8.2)	9.2 (8.2)

[a]Variations among players with different resources but identical strategic positions have been averaged to make the data comparable to the current study.

Table 5

Mean Outcomes for the Non-Veto Players in the

Four Veto Games

(Results from Murnighan and Szwajkowski, 1979, are shown in parentheses)

Veto Games	Player B		Player C		Player D		Player E	
#1 (AXX)	8.5	(3.8)	6.6	(3.1)	7.8	(3.6)	7.0	(3.4)
#2 (AB,AXX)	11.4	(4.0)	8.0	(1.9)	7.6	(2.0)	7.8	(2.0)
#3 (AB,AC,ADE)	9.4	(2.9)	9.0	(2.9)	7.0	(1.4)	7.1	(1.3)
#4 (AX)	6.8	(1.8)	7.0	(1.0)	5.6	(1.1)	7.4	(1.5)

Table 6

The Frequencies of the Different Coalitions in the Eight Games

Game	AB	AC	AD	AE	ABC	ABD	ABE	ACD	ACE	ADE	BCD	BCE	BDE	CDE	BCDE	AXXX[a]	ABCDE	Totals
All-Equal	--	--	--	--	17	17	12	13	16	12	28	18	14	5	0	1	3	156
Duopoly	65	--	--	--	1	0	1	21	9	20	18	5	15	--	1	0	0	156
Pyramid	47	46	--	--	0	0	2	0	0	27	12	17	--	--	1	2	2	156
Apex	29	35	38	22	0	1	0	0	0	0	--	--	--	--	28	0	3	156
Veto #1 (AXX)	--	--	--	--	31	37	28	24	18	28	--	--	--	--	--	5	57	228
Veto #2 (AB,AXX)	53	--	--	--	8	3	10	28	17	15	--	--	--	--	--	8	85	228
Veto #3 (AB,AC,ADE)	49	41	--	--	10	1	10	6	4	41	--	--	--	--	--	3	63	228
Veto #4 (AX)	27	33	32	50	7	12	4	5	2	4	--	--	--	--	--	13	39	228

[a]AXXX includes ABCD, ABCE, ABDE, and ACDE, all of which were relatively infrequent.