THE SPATIAL MODEL OF CRISIS BARGAINING: AN EXPERIMENTAL TEST

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international crises have received an increasing amount of attention in recent years from students examining the causes of war. In large part this is due to the belief that, since some crises end peacefully while others result in war, an understanding of the dynamics of crisis behavior can lead to an understanding of why wars occur (Lebow, 1981). A crisis is often characterized as "a sequence of interactions between the governments of two or more sovereign states in severe conflict, short of actual war, but involving the perception of a dangerously high probability of war" (Snyder and Diesing, 1977: 6)[1] Such a concern has led to a number of approaches to the study of crises, with many of the more recent studies aiming to develop formal theories of various aspects of crisis behavior (Snyder and Diesing, 1977; Morgan, 1984; 1986; forthcoming; Powell, 1987; Brams and Kilgour, **1987; O'Neill,** 1987;Leng, 1988). In general, the purpose of this growing body of literature is to use deductive models in the determination of the conditions under which crises escalate to war.

Although this research has produced a number of elegant theoretical explanations for crisis behavior there have been relatively few attempts to test these theories against empirical evidence. Snyder and Diesing (1977) evaluate a number of case studies to test their theoretical derivations, but such tests fall short of satisfying any general explanatory claims for their theoretical arguments. More recently, Leng (1983,1988) has utilized the behavioral Correlates of War data set to test a number of propositions regarding crisis bargaining and James (1988a,b) has utilized International Crisis Behavior project data to test hypotheses regarding crises derived from expected utility theory and a model proposed by Brams and Kilgour (1987). These studies clearly contribute to our ability to evaluate certain theoretical explanations for crisis behavior; but, because the conceptual basis of some models is not entirely commensurate with the operationalizations that guide the coding rules for the data sets, the models that can be tested are clearly limited.

Researchers wishing to subject formal theories of crisis behavior to systematic tests have *three* basic options when existing data bases do not provide variables that completely correspond to the theoretical concepts. First, they can use existing data while recognizing the limitations and remaining circumspect about their results. The major drawback of this approach is that one can never be certain whether the results tell us more about the theory or *the* inadequacies of *the* data (e.g. see Morgan and Ray, 1989). Second, new data sets can be developed in which variables corresponding to theoretical concepts are identified and measured. This can involve an enormous commitment of time and resources and, if the data ere not useful for testing other models and theories, the payoff may be minimal. Finally, laboratory experiments, using human subjects, can be designed linking theory and measurement.

Classical experimental design allows for the careful manipulation of treatment conditions, while current advances in laboratory experimental methods in the social sciences allow the careful development of operational measures of theoretical concepts. Of **course,** the principal drawback of this approach is the problem of external validity—generalizing from subject behavior in a highly constrained setting to a more complex natural setting. However, careful

[1] This definition is not the only one to be found in the literature (e.g., Hermann, 1969; Brecher and James, 1986) and it is certainly open to question in that it omits a number of factors often considered to be important (e.g., time pressure). It does capture, in some sense, the "lowest common denominator" of most definitions of international crisis, however, and it does delimit the set of cases for which the model outlined here is applicable.

experimental controls ensure that strong statements can be made concerning the congruence between theory and experiment. Such an approach can address important questions when seeking to test abstract, theoretical concepts. If subjects in a carefully controlled laboratory setting do not behave in accordance with the predictions of a model it is highly unlikely that actors in complex natural settings will do so. At a very basic level experimental evidence can provide some indication as to whether a theory "makes sense" and points to where additional theoretical and empirical work will be most fruitful.

In spite of the potential benefits of this latter strategy it has not been widely applied in the field of international relations (for one recent exception see Niou and Ordeshook, 1988). Simulations have been used in international relations research to some extent (see, e.g., Guetzkow and Valdez, 1981) but these are not as tightly controlled as experiments and do not correspond closely to the idealized deductive structure of formal theories. There is a growing body of research to provide some guidance, however. A number of studies have been conducted in which game theoretic solution concepts are tested on the basis of experimental evidence (see, e.g., Ordeshook, 1986, Chapters 6-9 or Herzberg and Wilson, 1988) and these can serve as a guide to the development of experiments to test formal models of crisis behavior. The purpose of this paper is to present preliminary results from an experiment designed to test propositions derived from a spatial model of crisis bargaining proposed by Morgan (1984, 1986, forthcoming; see also Morrow, 1986). In the next section, a simplified version of the model is outlined. The subsequent section details an experimental design aimed at testing features of this spatial model of bargaining. The penultimate section analyzes data from two experimental series. The final section concludes with the implications of these results for this theory and for additional experimental work.

A Spatial Model of Crisis Bargaining

The model sketched here represents a synthesis of traditional utility-based bargaining theory (Nash, 1950; Pen, 1952; and especially Zeuthen, 1968) and the spatial theory of voting (Hinich and Pollard, 1981; Enelow and Hinich, 1984). Since the model is presented in detail elsewhere (Morgan, 1984; 1986; forthcoming), this description is brief, emphasizing the most important elements of the model for the purposes at hand. It is important to note that the model is intended to portray the analyst's, as opposed to the actor's, perspective. Although the basis of the model is grounded in elements of game theory, the aim is not to determine a "solution" in a game theoretic sense. The game theoretic approach has always posed a problem for the study of bargaining in that it cannot explain why bargaining occurs--if the players know the situation and the theory, they can predict with certainty the outcome and should not waste their time "bargaining". Thus, the model should not be interpreted as representing a set of conditions that determine a solution, but as a set of assumptions regarding how bargainers react to certain situations. We do not assume that the actors have full information regarding the situations they face; for example, one can incorrectly estimate the opponent's preferences or the power relationship. For this reason, the "solutions", or predicted outcomes, are expressed as probability distributions over all possible bargained solutions as well as the no agreement, or war, outcome. As analysts, we are interested in using the model to determine what factors affect these probability distributions across outcomes.

Components of a Bargaining Model.

The model consists of two main components, an issue space and a utility space. Crisis situations are represented in an m-dimensional space where each axis is associated with one of the issues under dispute and each point on a dimension represents a possible outcome on the relevant issue. Each participant is located in the issue space by an ideal point, the coordinates of which represent the participant's initial bargaining position on the issues at stake. An actor's preferences over the outcomes in the issue space are associated with the distances between each possible outcome and the actor's ideal point[2] By assuming the actors' preferences can be represented by von Neumann-Morgenstern utility functions, the utility space can be derived from the issue space. The issue space provides the basis for much of the analysis that can be done with this model (see Morgan, 1988a; 1988b) and serves as the linkage between the concrete issues over which disputes occur and the rather abstract utility space. Within the context of the model, bargaining is viewed as attempts by each side to induce the other to accept an outcome closer to its own ideal point and concessions occur when a party "moves toward" its opponent by proposing an outcome closer to the opponent's ideal point. Although actual bargaining occurs over the issues at stake, the decisions of whether to accept a proposal, begin a war, increase the costs imposed on the opponent, and so on, are made on the basis of the expected benefit from each option.

To simplify the presentation of the model, the discussion focuses on a specific example, depicted in Figure 1. It should be kept in mind this represents a greatly oversimplified version of the model and the conclusions derived from the model are in no way dependent on the specifics of the example. Figure 1 depicts a single issue dispute between two actors, i and j, represented on the single continuous dimension, Π.[3] The points, π, on Π represent possible outcomes on the issue and the actors' initial positions are denoted by O_i and O_j. We assume that outcomes closer to j's initial position provide j greater utility than outcomes further away (and the same is true for i). At any point in time, an actor can choose from a number of options: it can initiate a war; it can end the crisis by accepting the last proposal, π, offered by the opponent (perhaps the opponent's O); it can make concessions by offering a π closer to the opponent's O; or, it can do nothing and wait for some movement by the opponent.

<Figure 1 About Here>

It is assumed that, for any π, the probability that both i and j would choose π over war can be determined and that a joint probability distribution over Π can be derived that can be used to determine the probability that war would occur. A participant's willingness to accept a given proposal is assumed to be a function of the loss of utility associated with such a move, which is characterized by the participant's loss function defined over the issue space and incorporates the actor's risk orientation, as well as the participants' relative power and resolve. For simplicity, the utility loss functions are linear and symmetrical across actors in this example. We also impose the restriction that there is a one-to-one mapping from the issue space to utility for both actors. This allows us to represent both the issue space and the utility space on a single dimension and will facilitate an intuitive explanation of the model.[4]

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[2] In general, the farther from an outcome is from an actor's ideal point, the less preferred it is. Since all issues are not equally salient for every actor, however, the issues are weighted and preferrences are represented by weighted Euclidean distance. See Morgan, 1986; Enelow and Hinich, 1984.

[3] For now we leave open the question whether these actors are individuals or simply the preferences of the median decision maker.

[4] This greatly oversimplifies the model and, as will be seen below, imposes even greater restrictions than does the experimental version. By creating what is essentially a zero-sum conflict (at least with respect to the issues at stake--if war is the result, that presumably imposes costs on both parties) the presentation of the main concepts is much easier.

The utility loss function establishes limits of the upper and lower bounds for the probability distribution regarding whether a π will be accepted. First, there exists some point up to which the utility loss is so minimal that π would be accepted with certainty. These points are labelled Δi and Δj for i and j, respectively. Since we can assume that a player's 0 would definitely be accepted, $0i$ and $0j$ can be taken as the limits of Δi and Δj. It is also assumed that there exists some point at which the utility loss is so great that the participant would definitely choose war over π. This point (labelled μi or μj) establishes the lower bound of the probability that π will be accepted, any π on or to the right of μi, for example, would be accepted by i with a probability of 0.0. We will assume that a player's lower bound is limited at the proposal which has utility equal to the expected utility of war.

Notice the interval $[\mu j, \mu i]$ in Figure 1. Any proposal to the left of μj would be rejected with certainty by j and any proposal to the right of μi would be rejected with certainty by i; thus, when μj is to the right of μi (i.e., the bargaining set is empty) we know that war is certain. We do not assume that a non-empty bargaining set, as in the figure, guarantees a negotiated settlement, however. While it is assumed in many bargaining theories that a non-empty bargaining set is necessary and sufficient to insure a negotiated settlement, we follow Zeuthen (1968) and assume that a non-empty bargaining set is necessary for a settlement but that it is not sufficient. Since we do not assume that the parties are fully informed as to the location of each others' reservation points, war can result even with a non-empty set. An actor might reject a proposal that is preferred to war in the hopes of achieving an even better outcome which can lead the opponent to conclude that the bargaining set is empty and to initiate a war.

For crises in which war is not certain, the model is designed to produce a probability distribution that specifies the likelihood of each possible outcome, including war. The precise nature of this distribution is determined by a number of variables in addition to the participant's utility loss functions. Specifically, three factors (for each actor) are incorporated into the model: the costs for each associated with the bargaining process; the power of the actors in terms of their relative war fighting capabilities; and, the parties' resolve. The detailed conceptualization of these variables can be found in Morgan (1984, 1986, forthcoming).

In international crises the notion of 'costs' generally refers to the parties' abilities to inflict damage on one another through military means (such as bombardments, blockades, etc.), economic sanctions, and so on. Costs can also be incurred directly from the act of bargaining (through the expenditure of resources, including attention) as well as from discounting future benefits. The ultimate outcome is less valuable to a bargainer the longer these costs are absorbed; thus, an actor should be willing to make immediate bargaining concessions in an attempt to avoid paying these costs. In the terms of the model, this suggests that to avoid paying the costs of bargaining an actor should be willing to accept immediately any proposal that provides less utility than does that actor's 0. Thus, the degree to which j (for example) must suffer bargaining costs can be reflected by the location of Δj. The greater the bargaining costs to j, the farther from $0j$ will be Δj. Note, however, that representing an increase in bargaining costs to an actor by shifting Δ does affect the entire probability of acceptance function. Shifting the point of lowest utility that would be accepted with certainty away from an actor's ideal point serves to increase the probability of acceptance for all proposals up to μ.

The second factor is the relative power of the actors in terms of their capabilities for fighting a war. The justification for this is straightforward. Within a bargaining situation the party which is more likely to achieve its objectives through war should be less willing to make concessions, all else being equal. One interpretation of this situation is suggested by Zeuthen's analysis of labor-management bargaining (1968). We may suppose that the outcome of a war is uncertain and that it can take on any value in a range of possible outcomes. There is, however, a probability distribution over the range of outcomes and we can determine the expected value of this distribution. Saying that one player is more powerful than the other means that this distribution is constructed in such a way that the expected value favors the more powerful player. This player should then be less willing to make bargaining concessions since it would expect to lose less (or gain more) from a war.

This aspect of power is represented in the model by the shape of the probability of acceptance functions. In our example the linear probability of acceptance functions represent a case in which i and j are equally likely to win a war. These functions can take any shape that is monotonically decreasing (from Δ to μ) and other shapes can be used to represent cases in which one party is more likely to win a war. If, for example, j is more powerful than i, j's probability of acceptance function is convex with respect to $0j$ and i's probability of acceptance function is concave with respect to $0i$. This suggests that an actor is more likely to accept a proposal providing a given amount of utility when that actor is disadvantaged than when equal or superior to its opponent in war fighting capabilities. The degree of war fighting disparity between the parties can be reflected in the amount of curvature of these functions. The curvature will increase as does the disparity.

The third and final factor, resolve, is conceptualized as an unwillingness (that could be the product of "nonrational" factors such as domestic politics or pure stubbornness) to allow the opponent a sizeable negotiated "victory" even though the agreement provides a higher value than that expected from war. This aspect of resolve is incorporated into the model through the actors' μs. As an actor's resolve increases, its μ will shift toward its 0. This reflects an increased unwillingness to capitulate. This indicates that the party prefers war to *some* proposals that provide greater expected utility (when resolve is ignored) than does war; and, we can see that the greater the resolve, the greater the shift in μ. Note that while this does affect the probability of acceptance for all proposals in $[\mu,\Delta)$ it does not affect Δ, indicating that even a highly resolved party may still be willing to make some concessions, provided that the outcome is still reasonably close to its 0.

The bargaining model proposed here is constructed to provide a probability distribution over all possible outcomes. We have, for each actor a probability of acceptance function over all possible crisis outcomes and can thus determine the joint probability that any given proposal would be accepted by both parties and, more importantly, we can determine the probability that war will result. The most reasonable point to treat as the 'solution' to the bargaining problem is that point within the range of possible negotiated outcomes that maximizes the joint probability of being accepted.[5] This is determined as follows: We have for each actor a function, $p_i(\pi)$, that provides the probability that each π would be accepted. The 'solution' will be the π^* that maximizes the derivitive of the product of these functions, evaluated within the interval $[\mu_j,\mu_i]$. Mathematically, π^* is the proposal that satisfies

$$\left(pi(\pi) \times \frac{\partial pj(\pi)}{\partial \pi}\right) + \left(pj(\pi) \times \frac{\partial pi(\pi)}{\partial \pi}\right) = 0 \qquad \{1\}$$

5 Remember that this should not be interpreted as a 'solution' in the standard game theoretic sense; rather, it is the negotiated settlement most likely to be reached, keeping in mind that war might be more likely than *any* negotiated settlement.

The second task of the model is to determine the probability that some negotiated settlement will be reached (i.e. that war will be avoided). For a given π, the value of $p_i(\pi)$ and $p_j(\pi)$ is interpreted as the probability that the lowest π i or j would accept is π or some π that provides less utility. Thus, the probability functions can be seen as determining the cumulative probability distributions which can be used to calculate the corresponding probability density functions (p.d.f.s). The probability that war will be avoided is determined by the product of the proportions of the p.d.f.s that are within the interval $[\mu_j, \mu_i]$. Mathematically,

$$p(\text{war}) = \quad 1 - \left(\frac{\int_{\mu_j}^{\mu_i} p_i'(\pi)}{\int_{\Delta_i}^{\mu_i} p_i'(\pi)} * \frac{\int_{\mu_j}^{\mu_i} p_j'(\pi)}{\int_{\mu_j}^{\Delta_j} p_j'(\pi)} \right) \qquad \{2\}.$$

Equations {1} and (2) constitute the heart of the model. They specify the "predictions" to which the model leads in terms of the probability that a crisis will end in war as well as the likely negotiated outcome should one occur. These equations can be utilized to provide insight into the relationship between the key variables incorporated into the model and crisis outcomes. For example, we can derive hypotheses associating the relative power of crisis participants with probable crisis outcomes by demonstrating how changes in power, as reflected in the probability of acceptance functions, lead to changes in predicted outcomes. The purpose of the experiment presented below is to provide a means to represent these variables in a laboratory setting and to *enable* us to test the derivations.

Before presenting the experimental design and results it is necessary to mention briefly some of *the* hypotheses to which the model leads. The formal derivations have been presented elsewhere (Morgan, 1986; forthcoming) and will not be restated. Also, we will mention only those hypotheses derived from the model that the current experiment is designed to examine. If we consider simple, situations as depicted in Figure 1 *the* model leads to a number of hypotheses regarding t*he* impact of changes in the variables individually. When the costs of bar-gaining are increased (while holding the other variables constant) we expect to find no change in the mode of *the* distribution of negotiated outcomes but the model suggests that the likelihood of war decreases very slightly. Increases in the ability of one party to prevail in war or increases *in* the resolve of 8n actor are expected to shift the probability distribution of negotiated outcomes In that actor's favor and to bring about an increase in the probability of war. When the variables are allowed to vary simultaneously, the relationships become somewhat more complex. By and large, the general tendencies remain the same, but a given increase in an actor's resolve or in *the* costs of bargaining provides more benefit, in terms of *the* probability distribution of negotiated outcomes, to the weaker party than to the more powerful—but this benefit is relatively slight and is not likely to overcome the -advantage of greater war fighting capabilities.

Experimental Design

<u>Basic Design.</u>

The experiment reported here involved groups of two individuals who participated on computer terminals which were physically separated from one another. A total of 100 participants were recruited for the experiment. Participants were recruited from various undergraduate classes and the "commons" in student housing. Participants were free to select the time in which they desired to participate. All students were promised that they would be paid in cash at the conclusion of the experiment. No information was provided about the expected earnings from the experiment. If pressed, recruits were given a range of payoff for the experiment, representing the theoretical minimum and maximum earnings. Of these participants, 80 participated in 40 replications for our first experimental wave and the remaining 20 individuals were in the second wave of 10 replications. Participants were told that they would be in two distinct experiments, one in which they would participate with the computer, and the second in which they would participate with one another.

The experiments were run with 4 or 6 individuals at a time. Participants, upon arriving for the experiment were allowed to select their own computer terminal and were kept physically separated. Each participant was randomly assigned to a group and each group was made up of two individuals. In addition, each group was randomly assigned to the experimental conditions detailed below. Before beginning the experiment, participants worked through a short series of instructions at their individual terminal. These instructions incorporated several tests, both on how to use the computer equipment and emphasizing key elements of the experiment.

The first experiment was in fact a "pre-experiment" designed to allow participants to earn an endowment for subsequent play. In the "second" experiment, individual payoffs could become negative, so the initial earnings were a means of ensuring that participants had an endowment for the experiment. Rather than "staking" each individual to a fixed amount prior to beginning the experiment, we chose to have member's "earn" their endowment. As Hoffman and Spitzer (1985) show in a different experimental context, participants respond quite differently to endowments they earn than to endowments that are assigned. This pre-experiment was quite simple. The computer displayed a line with integers ranging from 1 to 100. Participants were to select a point on that line and when their choice was made, the computer randomly chose a point from a normal distribution. Participants were then paid on the basis of how far their own guess was from the choice made by the computer. The closer their choice, the more they earned. Once participants earned more than five dollars, this pre-experiment was ended. Participants had full information about the distributional properties of the computer's choice. Using a mouse, participants could "point" anywhere on the line and they were given information concerning the likelihood that the machine would select that particular point.

Once the pre-experiment was completed, participants were given instructions on their individual terminals concerning the bargaining experiment. These instructions included several tasks in which they were required to give a proper response before moving on. The instructions informed members that they would be randomly assigned with another partner, that they would interact with that individual via their computer terminal, and that at the conclusion of the experiment they would be paid, in private, their earnings from both experiments. Before beginning the experiment, individuals were quizzed as to their randomly assigned identity and other components of the experiment.[6]

The task for participants in the experiment was to either reach agreement on a single point taken from a line or to allow the computer to randomly choose, from a normal distribution, a point on that line. As with the pre-experiment, a line, with integers ranging from 1 to 100, was displayed on the computer terminal. Each participant was assigned a specific point on that line, which constituted her "ideal point" for the proposal space. At that point an individual received her maximum payoff. Points further from a member's ideal point decreased linearly in value. Table 1 gives the ideal points, valuation, and utility functions for the participants in both experimental waves. The only notable point is that, although participants' utility functions were linear, the utility functions for the players were asymmetric. Since individuals participated in two distinct periods, in the first individuals were randomly assigned an ideal point. At the second period, the ideal points and utility functions of the players were swapped, though players were not

[6] These instructions are available upon request from the second author.

informed in advance that this was to be the case. Using a mouse to point to an alternative on the line, an individual was always provided information concerning the location and value of that point to her.

<Table I About Here>

Participants were given two distinct menus from which to choose. The first menu allowed individuals to propose an alternative on the proposal space to another player. Such a proposal was an indication that the member was willing to end the period, earning the value of that proposal. A choice was simply made by clicking a point on the proposal space, then affirming that this proposal was what the individual wished to send to her partner. Once a proposal was sent, the partner was notified as to which proposal was made, its location on the proposal space, and its value. That individual then chose to accept or reject the proposal. The initial proposer was then notified of her partner's choice, if the proposal was rejected, both participants continued the experiment. If the partner accepted the proposal, the initial proposer was then given the choice to affirm or reject the proposal. If rejected, play resumed. If accepted, the period was finished and both players were credited with the amount earned from accepting this proposal. Thus, the experiment required unanimity for accepting a proposal.

A participant could also choose to unilaterally end the period. The second option on the menu enabled a participant to stop the experiment, if a player confirmed that this was what she wished to do, the computer randomly selected a point from a normal distribution. That point became the final proposal and players were paid their value for it. Players were fully informed as to the shape of the normal distribution, since the likelihood that a particular point would be selected by the computer was displayed and individuals could freely examine it by moving the cursor across the proposal space.[7] In addition, ending the period was not costless. The individual choosing to end *the* period was assessed a fee of $ 1.00, an amount which was subtracted from his/her earnings, in accordance with the model developed above, war is not a costless activity, and this point was Incorporated into the model through this fee.[8]

This experiment included two periods of bargaining. While member identities were randomized prior to beginning the experiment, the same partner was retained across periods.[9] Payments

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7 The values displayed were not the true probabilities. Instead, these values were displayed as the probability multipled by 1000- In pre-tests, participants indicated that the extremely small values reported as probabilities made little sense to them, and they were not able to adequately discriminate across changes in those values, in looking at the larger magnitudes, however, they could see how fast the distribution dropped off.

8 it could be argued that the "target" of the attack should also be charged a war fee and, in fact, it might seem reasonable that the fee for the victim would be higher than that for the war initiator (if there is an advantage to striking first). The experimental problem is to create some disincintive for resorting to war. If the victim of attack is charged more than the attacker, the war fee becomes an incentive to end negotiations, and even fewer of the pairs would reach agreement. A war cost to only the initiator is not precluded by the model.

9 Multiple periods were inducted in order to determine whether learning effects were important for these reasonably complex experiments. By retaining *the* same pair of players across periods, we have also introduced the possibility "reputational" effects may occur as one partner or the other may develop a noticeable style in *the* strategies that are played. However, given that only two periods are played, we doubt that there is sufficient time for such strategies to be noticed and

were credited to a member and withheld until completion of the experiment. These experiments were not costless. During the bargaining period participants were assessed costs that were a function of the amount of time spent in the experiment. Two different cost conditions were run in these experiments and they were kept symmetric for players within an experiment. The low cost experiments subtracted SO, *10* per minute spent in the experiment while high cost experiments subtracted $0.50 per minute. During the course of the experiment, a timer was displayed in the upper right corner of each member's screen. Also displayed was the amount of money that would be subtracted from the member's earnings at the end of the period. This amount was updated each second. At the outset of each period the costs for the experiment were posted and members were quizzed as to how much they would be charged. When a proposal was made and sent to another player, the timer was halted and did not resume until one of the players rejected the proposal, if the proposal was accepted by both parties, the current time costs were subtracted from the members' earning and the period ended.

Experimental Conditions.

The primary concern in this study is with the circumstances under which bilateral bargaining will break down and the parties will go to war. The model outlined above indicates that a non-empty bargaining set is necessary (though not sufficient) for actors to reach a negotiated settlement. A bargaining range for players in a bilateral bargaining game (with war) is affected by the relative power of the players, the cost for initiating war, and the costs imposed on bargaining. In our experiments, we have fixed the costs for going to war (the player ending an experiment is charged $1.00) and have varied the costs of bargaining (with high and low costs assessed players in the experiment). Our main effects condition for the experiment is with differential power among the players. Power in these experiments is defined by a mean and standard deviation for the normal distribution from which the computer makes a random draw if a player chooses to end the period. Two distinct distributions were used in these experiments. The first condition was a symmetric power case, in which the distribution was normal, with a mean of 50 and a standard deviation of 17. In this case both players had roughly equal chances that the computer would choose an outcome closer to their ideal point. In the second condition, power was asymmetric, with the mean of the normal distribution located at 65 and a standard deviation of 10. In this instance the player whose ideal point is at 92 is advantaged by the computer's choices.

These two power distributions yield very different, non-empty bargaining ranges. Each player has a reservation point at the outcome providing a payoff equal to the expected payoff of war minus the war initiating fee (i.e., a player would prefer initiating war to accepting a negotiated settlement with a payoff lower than the reservation point) and the outcomes between the players' reservation points constitutes the bargaining set. It is important to note that this method of calculating the bargaining range assumes the players are risk neutral, expected value maximizers and that this is exogenous to the model. As we shall show below, this was a questionable assumption. Given the expected value for going to "war" (ending the bargaining period), the positions of the various players, and their utility functions, the symmetric power condition yields a bargaining range over the interval [46, 58]. Note that this range encompasses much of the central part of the proposal space and includes such commonsensical divisions as "split-the-middle" (the point 48) and a "focal point" (the center of the proposal space -- 50). Meanwhile, the asymmetric power condition yields a bargaining range separated from such divisions. It includes the interval: [61,73].

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for "reputations" to grow. We take note of these points and subsequently analyze our data to see if there are any period effects.

Our experimental design, then, includes some very simple elements. Individuals first earn an endowment in a pre-experiment That experiment introduces them to the properties of a normal distribution by displaying the likelihood that a proposal on a single dimension will be selected by the computer. The closer their own guess, the more they earn. Participants are not told how many choices they can make, nor how much they can earn in this pre-experiment instead, they are stopped once they earn in excess of $5.00. in the experiment, participants are randomly assigned to a partner with whom they bargain in two different periods. Following detailed instructions as to how to participate in the experiment, participants then have options to make a proposal and agree to end the period, or to let the machine pick a proposal which ends the period. Any proposal selected by a player must be ratified by both parties before it is finalized. Upon completing a period member payoffs are tallied and all associated costs for the period are subtracted. At the conclusion of the experiment individuals are paid in private their total earnings.

Our first prediction, then, is that the choice of a negotiated outcome depends on the distribution of power (given by the mean and standard deviation of a normally distributed probability density function). We focus on two distinct power distributions and expect that in the symmetric case, negotiated outcomes will settle in the interval [46,58]. For the asymmetric power distribution, negotiated outcomes will fall In the interval [61,73]. *The* second prediction focuses on the bargaining costs assessed the players. Two distinct conditions are used in this experiment, either assessing individuals $, 10 or $.50 per minute during the bargaining process. The model suggests that there should be little, if any, difference across these conditions. The third prediction is purely behavioral. This experiment is reasonably complex and we are concerned with whether there are any learning effects. Here participants engage in two bargaining periods and we test for period effects. For this first wave of experiments we have a 2x2x2 factorial design with 10 replications per cell.

Analysis

Negotiated Outcomes.

First we examine the independent effect of switching power conditions on the choices of negotiated settlements. Under the symmetric power condition, 27 of 40 outcomes were negotiated (67.5%). Since there are no statistically significant effects due to differences in bargaining costs or across periods for these negotiated settlements, we pool these outcomes under the symmetric power condition. [10] These outcomes are plotted on Figure 2a From this Figure, it is clear that the

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[10] Examining only negotiated outcomes which were achieved through agreement by both parties, we calculated a regression equation predicting the distance of *the* final outcome from the bargaining range from dummy variables for the period and type of bargaining costs. Our analysis yielded *the* following parameters (standard *errors* in parentheses):

OUTCOME =	CONSTANT +	PERIOD +	COSTS
	3.58	5.41	4.27
	(3.24)	(3.80)	(3.82)

where: period 1=0,2=1 costs low=0, high= 1

This analysis shows there is no statistically significant period or cost effects for this experimental condition.

bargaining range does not predict very well. Of the negotiated outcomes, only 5 fall in the predicted bargaining range (18.5%). Equally interesting, however, is that neither a "split- the-distance" solution nor 8 focal point made up of the midpoint of the proposal space does very well in capturing the choices on which participants agreed. Although there is considerable variance in choices, there is a substantial clustering of outcomes shifted toward player 2, whose ideal point is at the point 92. We return to this observation below.

<Figure 2 About Here>

Under the asymmetric power condition, 23 of 40 outcomes are reached through negotiation (57.5%). Again, since there are no statistically significant effects due to differences in bargaining costs or across periods for these negotiated settlements, we pool these outcomes for purposes of discussing outcomes under this asymmetric power condition.[11] These outcomes are plotted on Figure 2b. Here the predicted bargaining range does a much better job in predicting outcomes, as 14 of the 23 negotiated agreements fall in this range (60.9%). As with the symmetric power condition, there is substantial variation among these outcomes about the predicted bargaining range, although the asymmetric bargaining range is more successful in predicting outcomes.

These results are striking in that the bargaining range appears to have very little predictive power. However, the data do raise several important questions. First, why does the bargaining range for the asymmetric power condition predict outcomes so much *better* than the bargaining range for the symmetric power condition? Second, why do conimonsensical outcomes for the symmetric power condition perform so poorly? Finally, why do *the* outcomes for the symmetric power condition look so much like those outcomes for the asymmetric power condition? This last question is key end we *return* to it with a second series of experiments.

War

We now turn to the question of whether the level of bargaining costs imposed on the actors in this experimental crisis situation affects the likelihood of breaking off negotiation and choosing war. Choosing war in this context was not costless -- the player choosing to unilaterally end the period was charged $ 1.00 for doing so. Yet remaining in the experiment, bargaining over outcomes was also costly — since both actors were assess a per-minute cost for staying in the experiment. The costs were symmetric for players. Our expectation is that these costs should have very little effect on the probability of war, though higher costs should lead to a (marginally) lower probability of war. Table 2 breaks down, by power condition and cost condition, the

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[11]Examining only those outcomes which were achieved through agreement by both parties, we calculated a regression equation predicting the distance of the final outcome from the bargaining range from dummy variables for the period and type of bargaining costs. Our analysis yielded the following parameters (standard errors in parentheses);

OUTCOME = CONSTANT + PERIOD + COSTS

1.44	0.74	4.34
(3.36)	(4.18)	(4.18)

where: period 1=0,2=1 costs low=0, high=1

As with the symmetric experimental condition there is no statistically significant independent effect for either periods or costs.

percentage of experiments in which war was chosen. [12] The data displayed in Table 2 show that there is no effect of these costs on the choice to end the experiment. While there is some variation across cost conditions, the Chi-Square tests of significance do not enable us to reject a null hypothesis that the variation is random.

<Table 2 About Here>

The Behavioral Bargaining Range.

Our experimental results provide little support for the model's theoretical expectations. In particular, participants in these experiments do not regularly choose outcomes in the bargaining range when reaching a negotiated settlement. Yet there are distinct patterns to this data. The model outlined above predicts that negotiated outcomes will appear in a bargaining range, however, the calculation of this range is exogenous to the model. As a starting point we began with the notion that individuals set with foresight and ere capable of complex calculations. Our approach used an expected value formulation based on the costs and expected outcome of going to war to establish a bargaining range for each of the treatments. However, an alternative behavioral rule, relying on a far simpler choice process, involves settling on outcomes where both parties derive positive value.

In these experiments, payoffs are private to each player end there are no opportunities for players to communicate their earnings to one another. All communication is controlled by a computer connected to the local area network. Moreover, the only communication allowed in the experiment is *the* location of a proposal, who proposed it, and whether or not the proposal is agreed to by the other party. Nonetheless, given the payoff functions used in this experiment, there is a narrow range across which both players gain positive (non-zero) payoffs. This range extends across the interval [60,70], end is the same for both symmetric and asymmetric power conditions. For the sake of clarity, we call this the "behavioral bargaining range."

if we replot the outcomes for both power conditions and now include the behavioral bargaining range, we find a substantial improvement in fit among the negotiated outcomes (see Figure 3). Now we find that 29 of 50 outcomes (58.0%) fall in this range. On the plot we differentiate between *the* symmetric and asymmetric power conditions. With the former, just under half the outcomes appear in this behavioral bargaining range. As we noted above, even though power is approximately symmetrically distributed for the two players, still the outcomes favor player 2, For the asymmetric power condition, here too there is an improvement in fit Although there is substantial overlap between both the expected value bargaining range and *the* behavioral bargaining range, almost 70 percent of the outcomes fall in the latter.

<Figure 3 About Here>

Certainly, if we abandon perfect foresight models, other, equally plausible solutions for predicted outcomes are in order. However, our theoretical model points out that given some decision rule, negotiated outcomes will appear in a bargaining range. What we propose here, is a different behavioral rule for participants, which still yields a bargaining range. The question, remains, however, whether this behavioral bargaining range is spurious — after all the fit for the negotiated outcomes is not perfect. To test this conjecture, we ran a second, limited series, of experiments in which the behavioral bargaining range was eliminated. In this second

12 Period effects were tested here, but once again they have no effect, so all results are pooled across periods.

experimental series a 2 x 2 factorial design was used with 5 replications in each cell. Again our main effects were with symmetric and asymmetric power conditions. Controls were implemented for period effects. All conditions were run using low bargaining costs.

To eliminate the behavioral bargaining range, the same parameters in the previous experiment were retained. However, the valuation of individual ideal points (and thus every other point) were Decreased by $ 1.50. While this was more than sufficient to eliminate any segment on the proposal space where both players gained a positive payoff it is interesting to note that the expected value bargaining range does not change. Our experimental results make it clear that eliminating the behavioral bargaining range has a profound effect on individual choices. Quite simply, players in this second experimental series negotiated significantly fewer outcomes than did players in the first series. These results are given in Table 3. Within the symmetric power condition only two of ten outcomes were negotiated. Of these two, one was in the bargaining range predicted using an expected value calculation. Under the asymmetric power condition, three of ten outcomes were negotiated. None of these outcomes appeared in the predicted bargaining range. In neither case did a behavioral bargaining range exist. What is striking about these results is that as the behavioral bargaining range was eliminated, the likelihood that players resort to war increases dramatically. Consequently, it appears that the existence of a bargaining range (even a non-foresighted one) is important for the negotiating process.

<Table 3 About *Here*>

Predicting War.

Although the model elaborated above does not directly address the question of when parties will abandon negotiation, the model does yield several implications concerning negotiation and moving to war. The model clearly indicates that when the bargaining range is empty, parties will move to war. This appears to be the case when the behavioral bargaining range is eliminated. Even so, this fit is not perfect, since a quarter of the outcomes in the second experimental series were negotiated. A weaker version of this strong prediction holds that wars occur when proposals are outside the bargaining range. This is tantamount to an empty bargaining range, since, if participants do not have proposals in that range to consider, there is no reason to expect a negotiated settlement will be reached. In these experiments individuals face real-valued costs for bargaining. To some extent this limits the number of proposals which are made during the course of negotiation. The fewer proposals, the greater the likelihood that points in the bargaining range are not considered. If proposals are made which are not in the bargaining range (or are far from it), such strategies are also indicative of a player's resolve. Consequently, players have an incentive to go to war.

Whether participants in these experiments broke off negotiations because proposals appeared far from the bargaining range is something which can be directly estimated using multivariate PROBIT. Whether or not individuals went to war is measured using a dummy variable in which negotiating a settlement takes on a value of zero and going to war takes on a value of one. The principle independent variable is the average distance of all proposals made by a pair of players from the bargaining range. As the model implies, the further proposals are from the bargaining range, the more likely players are to go to war. Rather than using a dummy variable indicating whether or not *any* proposal was in the bargaining range, the average distance of all proposals was used because participants did not always adopt strategies in which their proposals converged on the bargaining range nor did all participants spend the same amount of time in the experiment. Often participants would start with centrally located proposals and quickly indicate their resolve by moving proposals closer to their own ideal point. Early proposals, some of which were in the bargaining range were seldom returned to by proposers. Individuals commonly began by being quite conciliatory and then hardened when their initial proposals were not accepted by their partner. [13]

in addition two control variables are included in these estimates. First, controls are introduced for the total number of proposals made in the experiment (PROPNUM). This is to account for substantial variation in the number of proposals made in these experiments, which in turn has an effect on the average distances of proposals from the bargaining range. Secondly a control is introduced measuring the risk aversion of pairs of players in these experiments. In the pre-experiment participants played a "matching game" with the computer. They chose a point from 100 points on a line. The computer then randomly chose a point from a normal distribution. For each point on the line players were given full information about the likelihood it would be chosen by the computer. Our conjecture is that risk averse individuals choose points at *the* mean of the distribution, while risk acceptant individuals deviate from the mean, choosing points around space, playing "guesses" and "hunches" rather than the expected value of the game.[14] The measure of risk aversion (RISK) is calculated as the average of the partners' standard deviation of their choices from the mean. Rather than the average distance of an individual's guesses from the mean of the normal distribution, the standard deviation is used. This measure is more sensitive to the variation in an individual's choices. Since either player in these experiments could unilaterally end negotiations, the average of the standard deviations of the players is used. The more risk acceptant a pair of players, *the* more likely that pair will go to war.

The results from the PROBIT analysis are given in Table 4. The analysis is run separately for each of the power conditions and uses data only from the first experimental series. This is done in order to illustrate *the* predictive capacity for the nearness of proposals to both predicted negotiation sets -- the expected value bargaining range and the behavioral bargaining range. [15] Taking the symmetric power condition first, estimates show that the number of proposals made in the experiment has no effect on whether participants choose to reach a negotiated settlement The measure of risk aversion, however, does have an effect, but in the opposite direction from the one we expect. The larger the average standard deviation for the pair of players, the more likely those individuals are to seek a negotiated settlement. This finding is strong and consistent across both of the main effects conditions.[16] It may be that, in these experiments, seeking a settlement with an unknown partner is in fact a riskier situation.

<Table 4 About Here>

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[13] Indeed, models were estimated using the proportion of proposals in the bargaining range, utilizing the other control variables introduced into the model. These models provide very weak estimates, telling us little about the overall process in these experiments.

[14] Of course, this might only *be* measuring the level of understanding of basic elements of probability. Of this, we cannot be certain. Our only evidence that this is not so comes from the fact that few individuals during the course of the experiment indicated they did not understand what they were doing.

[15] The considerable overlap of both ranges for the asymmetric power condition leads us to omit the estimates for the expected value bargaining range. Analysis shows that these estimates differ only in the third decimal place.

[16] Further analysis shows that there is only a weak, negative relationship between which player chooses to break off negotiations and the player with the larger individual measure of RISK. Tau-b = -.11.

The principal concern in this analysis is with the effect of proposals close or far from the bargaining range. With the symmetric power condition, where we note that there are two separated bargaining ranges, average distance from the behavioral bargaining range predicts somewhat better than average distance from the expected value bargaining range. The estimated coefficient EVDIS is far from significant, while BEHAVDIS approaches significance (p = .075)). Moreover, equation 2 does slightly better in terms of the percentage of cases correctly predicted. For the asymmetric power case, BEHAYDIS is also positive and statistically significant beyond the .01 level. The estimates for both equation 2 and 3 point to a positive relationship between the average distance of proposals from the behavioral bargaining range and the likelihood of oping to war. This direction is consistent with expectation, supporting the prediction that the further proposals were from the behavioral bargaining range, the more likely players were to end the period by oping to war.

Summary and Conclusion

In one respect the results of these analyses are somewhat disappointing. We are not able to draw firm conclusions about the hypotheses we set out to test, though some results are consistent with the predictions derived from the model and others are apparently contradictory. A A major difficulty is that the subjects do not behave as expected value maximizers. This is not necessarily inconsistent with the model (the exact utility functions are exogenous to the model); but, since the experiment was designed on this assumption, its violation makes it difficult to base conclusions regarding the model on these results. *For* example, the hypothesis relating power asymmetry to negotiated settlements is based on the effect the asymmetry has on the bargaining range and *the* experiment was designed so that the expected value bargaining range shifted in the asymmetrical treatment. The behavioral bargaining range did not vary across the main treatments, however, so conclusions regarding power symmetry cannot be drawn. It is our belief that some relatively minor changes in *the* experimental design will correct this problem end will, in future tests, enable us to test directly the conclusions of the motel.

In spite of this, some interesting results were produced. Basically, under a revised model we have a reasonably good way to predict when individuals go to war. When proposals are made that converge on the behavioral bargaining range a negotiated settlement is likely. It may be that Ft may be that the bargaining costs imposed on the players induce them to consider only a limited, finite set of proposals. If both players bargain "tough", perhaps because of high resolve, and concede toward the bargaining range slowly then war may be the likely result. This does support one assumption of the model--that a non-empty bargaining set is not sufficient for a negotiated settlement Not only must feasible outcomes exist, they must also be *found.*

The "unexpected" bargaining range that seemed to operate for most pairs is based on a quite simple behavioral rule: participants seek agreements in which their payoff is positive. One interpretation of this is consistent with the work by Kahneman and Tversky on prospect theory (!979; Quattrone and Tversky, 1988). Participants facing the choice of a settlement that involves a negative payoff seem to prefer the lottery of the war outcome, even if the expected value of the lottery is less than the proposed solution (i.e., they are risk acceptant) while those offered a settlement providing a gain prefer to accept rather than risk the lottery of war, even when the expected value of the lottery is significantly higher than the offer (i.e., the are risk averse). This suggests that the participants were behaving in accordance with some previously observed patterns and that future experiments and theoretical models should turn to more complex assumptions regarding participants' utility functions.

The results are encouraging in at least one respect. Even though we have yet to achieve a perfect correspondence between the model and the experimental design, it does appear that further experiments will be worthwhile. These results have produced sufficiently interesting and suggestive conclusions to demonstrate the value of the experimental approach. The apparently simple game led to some surprising conclusions and to some useful insight. While these particular results indicate that some refinement is necessary for the experiment to permit an adequate test of the model, they also are cause for optimism that future tests will lead to revisions and improvements in the structure of the model.

References

Brams, Steven J. and D. Marc Kilgour "Threat Escalation and Crisis Stability: A Game-Theoretic Analysis," American Political Science Review 81 (September): 833-850, 1987.

Brecher, Michael and Patrick James Crisis and Change in World Politics. Boulder: Westview, 1986.

Enelow, James M., and Melvin J. Hinich The Spatial Theory of Voting. Cambridge: Cambridge University Press, 1984.

Guetzkow, Harold and Joseph J. Valadez eds. Simulated international Processes. Beverly Hills: Sage, 1981.

Hermann, Charles F. "international Crisis as a Situational Variable" in James Rosenau ed. International Politics and Foreign Policy. New York: The Free Press. 1969: 409-421.

Herzberg, Roberta and Rick K. Wilson "Sophisticated Voting and Limited Foresight: Results from an Experimental Setting." Journal of Politics Vol 50, 1988, pp. 471-486.

Hinich, Melvin J. and Walker Pollard "A New Approach to the Spatial Theory of Electoral Competition," American Journal of Political Science Vol. 25 (1981), pp. 323-341.

Hoffman, Elizabeth and Matthew Sptizer, "Entitlements, Rights and Fairness: An Experimental Examination of Subjects' Concepts of Distributive Justice" Journal of Legal Studies 14 (June): 259-297, 1985.

James, Patrick Crisis and War. Kingston, Ontario: McGill -Queen's University Press, 1988a.

James, Patrick "Threat Escalation and Crisis Stability: Superpower Cases, 1948-1979," paper presented to the annual meeting of the American Political Science Association, 1988b.

Kahneman, Daniel and Amos Tversky, "Prospect Theory: An Analysis of Decision under Risk," Econometrica vol. 47 (1982): pp. 263-291.

Lebow, Richard N. Between Peace and War. Baltimore: Johns Hopkins University Press, 1981.

Leng, Russell J. "When Will They Ever Learn?: Coercive Bargaining in Recurrent Crises," Journal of Conflict Resolution Vol. 27 (1983), pp. 379-419.

Leng, Russell J. "Crisis Learn in Games" American Political Science Review 82 (March 1988): pp. 179-194.

Morgan, T. Clifton "A Spatial Model of Crisis Bargaining." international Studies Quarterly Vol. 28 (1984), pp. 407-426."

Morgan, T. Clifton Bargaining in International Crises: A Spatial Model PhD dissertation, University of Texas at Austin, 1986.

Morgan, T. Clifton "issue Linkages in international Crisis Bargaining," Rice University School of Social Sciences Working Paper, no. 9, 1988a.

Morgan, T. Clifton "Mediators, Allies and Opportunists: Third Parties in International Crises," Rice University School of Social Sciences Working Paper, no. 13, 1988b.

Morgan, T. Clifton "Power, Resolve and Bargaining in international Crises: A Spatial Theory," international interaction, Forthcoming.

Morgan, T. Clifton and James Lee Ray "The Impact of Nuclear Weapons on Crisis Bargaining: implications of a Spatial Model," in Richard Stoll and Michael Ward, eds. Power and World Politics, Boulder: Lynne Rienner, 1989, pp. 193-208.

Morrow, James D. "A Spatial Theory of international Conflict," American Political Science Review Vol. 80(1986),pp. 1131-1150.

Nash, John F. "The Bargaining Problem." Econometrics Vol. 18 (1950), pp. 155-162.

Niou, Emerson M.S. and Peter C. Ordeshook, "A Theory of the Balance of Power: An Experimental Test," Simulation end Games vol. 19 (December, 1988), pp. 415-439.

O'Neill, Berry "Crisis Instability with Space-Based Antimissile Systems,'Journal of Conflict Resolution. 31 (1987), pp.631-672.

Ordeshook, Peter Game Theory and Political Theory. Cambridge: Cambridge Univ. Press, 1986.

Pen, Jan "A General Theory of Bargaining," The American Economic Review Vol. 27 (1952), pp. 24-42.

Powell, Robert "Crisis Bargaining, Escalation, and MAD," American Political Science Review, Vol.81 (1987), pp.717-736.

Quattrone, 6eorge A. and Amos Tversky, "Contrasting Rational and Psychological Analyses of Political Choice" American Political Science Review Vol. 82 (1988) pp.719-736.

Snyder, Glenn H. and Paul Diesing Conflict Among Nations. Princeton: Princeton University Press, 1977.

Zeuthen, Frederik Problems of Monopoly and Economic Warfare. New York: Augustus M. Kelley Publishers, 1968.

Table 1

Participant's Ideal Points and Utility Functions for the Experiment

Series 1

Player Function	Player Ideal Point	Player Maximum Value	Player Utility
1	4	$8.00	$8.00 - ($.1212 * |4 - X|)
2	92	$8.00	$8.00 - ($.25 * |92 - X|)

Series 2

Player Function	Player Ideal Point	Player Maximum Value	Player Utility
1	4	$6.50	$6.50 - ($.1212 * |4 - X|)
2	92	$6.50	$6.50 - ($.25 * |92 - X|)

where: X is an integer from the line (1,100).

Table 2

Percentage of Experiments Ending in War by Power and Cost Conditions
(Numbers in parentheses)

Symmetric Power

	No War	War
Low Cost	60% (12)	40% (8)
High Cost	75% (15)	25% (5)

Chi-square = 1.03, df=1, p=.31

Asymmetric Power

	No War	War
Low Cost	60% (12)	40% (8)
High Cost	55% (11)	45% (9)

Chi-square = 0.10, df=1, p=.75

Table 3

Percentage of Negotiated Outcomes by Power Condition and Series

	Symmetric Power		Asymmetric Power	
	1st Series*	2nd Series	1st Series*	2nd Series
% Negotiated	60%	20%	60%	30%
% War	40%	80%	40%	70%

*Low cost conditions only.

Table 4

PROBIT Estimates by Symmetric and Asymmetric Power Conditions
(Standard Errors in Parentheses)

	Equation 1 (Symmetric Power)	Equation 2 (Symmetric Power)	Equation 3 (Asymmetric Power)
PROPNUM	.025	.020	.016
	(.031)	(.031)	(.053)
RISK	-.039	-.046	-.059
	(.021)	(.018)	(.025)
BEHAVDIS	----	.029	.058
		(.017)	(.022)
EVDIS	.020	----	----
	(.022)		

Figure 1: A Utility Space Representation of Crisis Bargaining

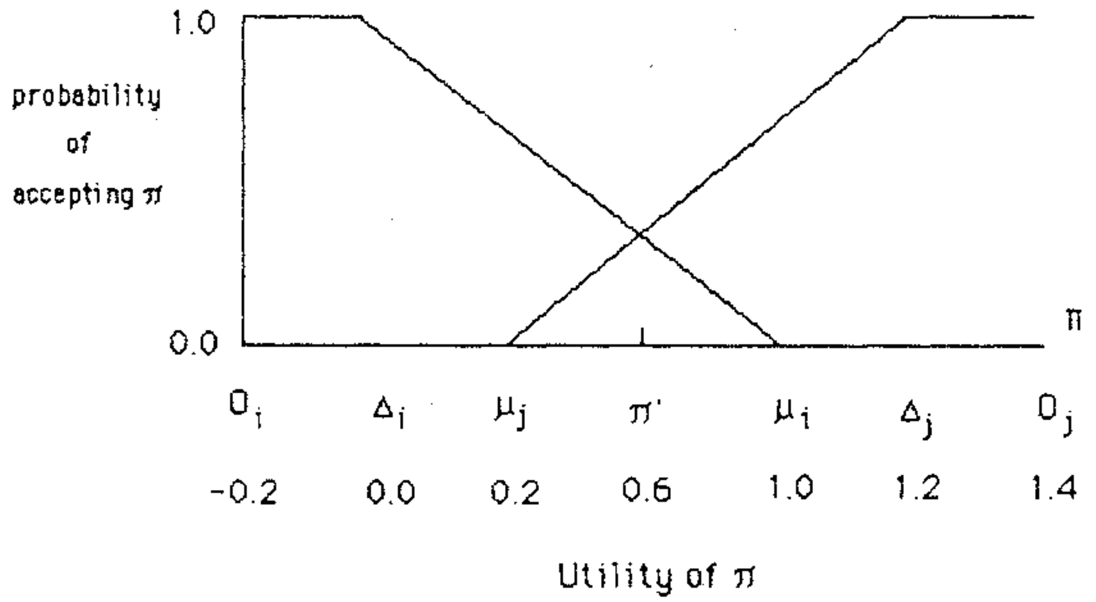

Figure 2a

Negotiated Outcomes for Symmetric Power Condition

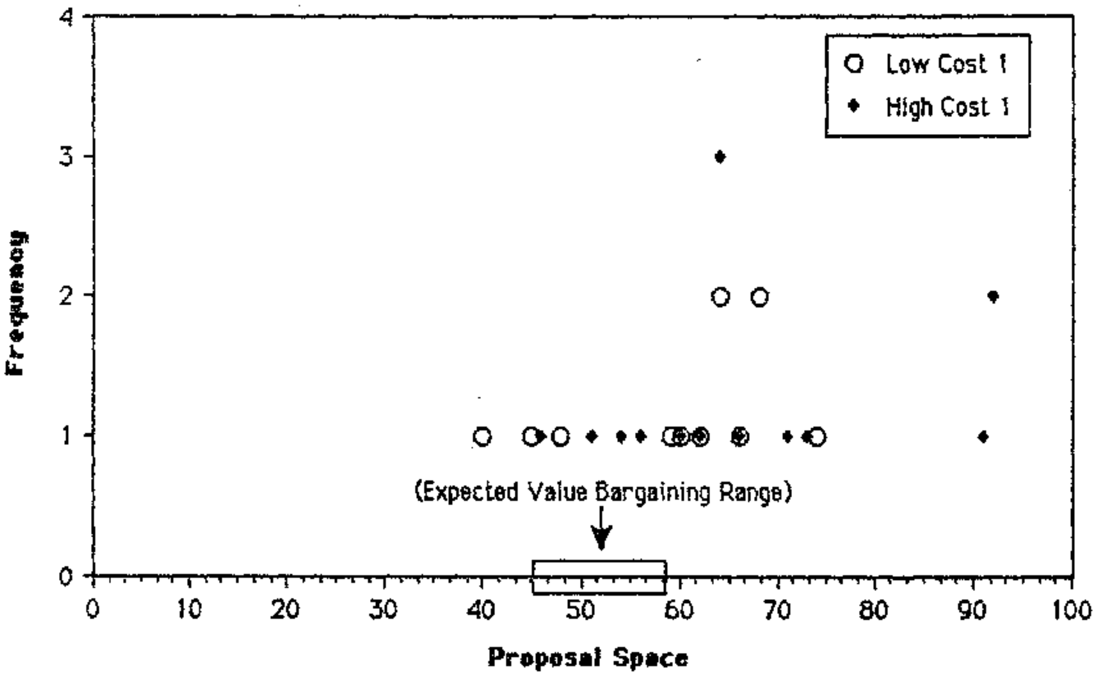

Figure 3

Final Negotiated Outcomes by Power Conditions