# A BEHAVIORAL SIMULATION MODEL OF SINGLE AND ITERATIVE NEGOTIATIONS

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**Abstract**

*A simple simulation model demonstrates that the outcome of a negotiation may critically be affected by (i) the structure of the negotiating problem -- the joint distribution of negotiators' evaluations of potential settlements; and, (ii) the negotiators' tactical approach to the problem -- the decision rules that guide the choice of concessionary offers made during the bargaining process. Hampered by cognitive limits and faced with imperfect information about the other party's interests, negotiators may rely on simple heuristics in choosing among possible concessions during the negotiating process. The model of single negotiations is extended to examine how the outcome of one negotiation may impact future negotiations. Focusing on two negotiator interests -- concern for self and concern for fairness -- the model shows how adjustments in tactical decision rules from one negotiation to the next sometimes leads to an unwarranted deterioration in the parties' relationship.*

## INTRODUCTION

Ongoing research at Rockefeller College approaches negotiations as a problem in multi-party decision making. In the mid-1980's, the Decision Techtronics Group and a state labor relations agency jointly undertook a study of how analytically-based group decision support techniques could be used as an aid during the mediation of collective bargaining disputes. The project involved both an exploratory study of analytical mediation under simulated conditions (Mumpower, et. al. 1985) and use of the procedure during an actual impasse (Mumpower, et. al. 1988).

The study's results indicated a need for additional theoretical development and empirical investigation of negotiation support systems. To this end, Mumpower (1988) sets forth a theoretical framework that treats negotiations as a hierarchical, n-party judgment task. Using linear and plausible nonlinear utility functions, Mumpower (1990) examines closely the structure of negotiations problems and uncovers surprisingly complex joint *payoff spaces* and unexpected efficient frontiers in simple two-party, two issue problems. Darling and Mumpower (1990) develop a simulation model of the incremental dynamics of the negotiations process and explore simple decision heuristics negotiators might use to guide their choice of concessions during the negotiations dance. Darling (1990) investigates the impact of negotiator concern for both self and other payoffs on the two-party, two-issue feasible payoff space and efficient frontier. The present paper extends this line of research by tracing simulated negotiators through a *series* of negotiations, in which each successive outcome feeds back to influence the parties' negotiating tactics in subsequent negotiations.

This paper consists of four sections. In the first, a model of single negotiations is described that emphasizes how both the negotiations problem confronting the parties and the boundedly-rational and potentially biased decisions they make during the negotiation

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process critically affect the outcome. The second section develops a model of iterative negotiations. This model "closes" the loop between the outcome of one negotiation and the rules negotiators use to choose among possible concessions in subsequent negotiations. As the parties move sequentially from one negotiation to the next, the outcomes of their prior negotiations affect the choices they make in the current dispute.

The final two sections present simulation results from the iterative model. In the fourth section, the negotiators are repeatedly confronted by a fixed negotiation problem. This approach allows careful analysis of the dynamics created as the parties adjust their tactical decision rules from one negotiation to the next. The final section of the paper examines how these endogenously generated dynamics respond to a stochastic environment of sequential, randomly-generated negotiation problems.

## MODELING SINGLE NEGOTIATIONS

Lax and Sebenius (1986:11) describe negotiations as a *"process of potentially opportunistic interaction by which two or more parties, with some apparent conflict, seek to do better through jointly decided action than they could otherwise"* -- **people** engaged in a joint decision-making **process** that leads to an **outcome.** A schematic of a negotiations model emphasizing these three key elements appears in Figure 1.

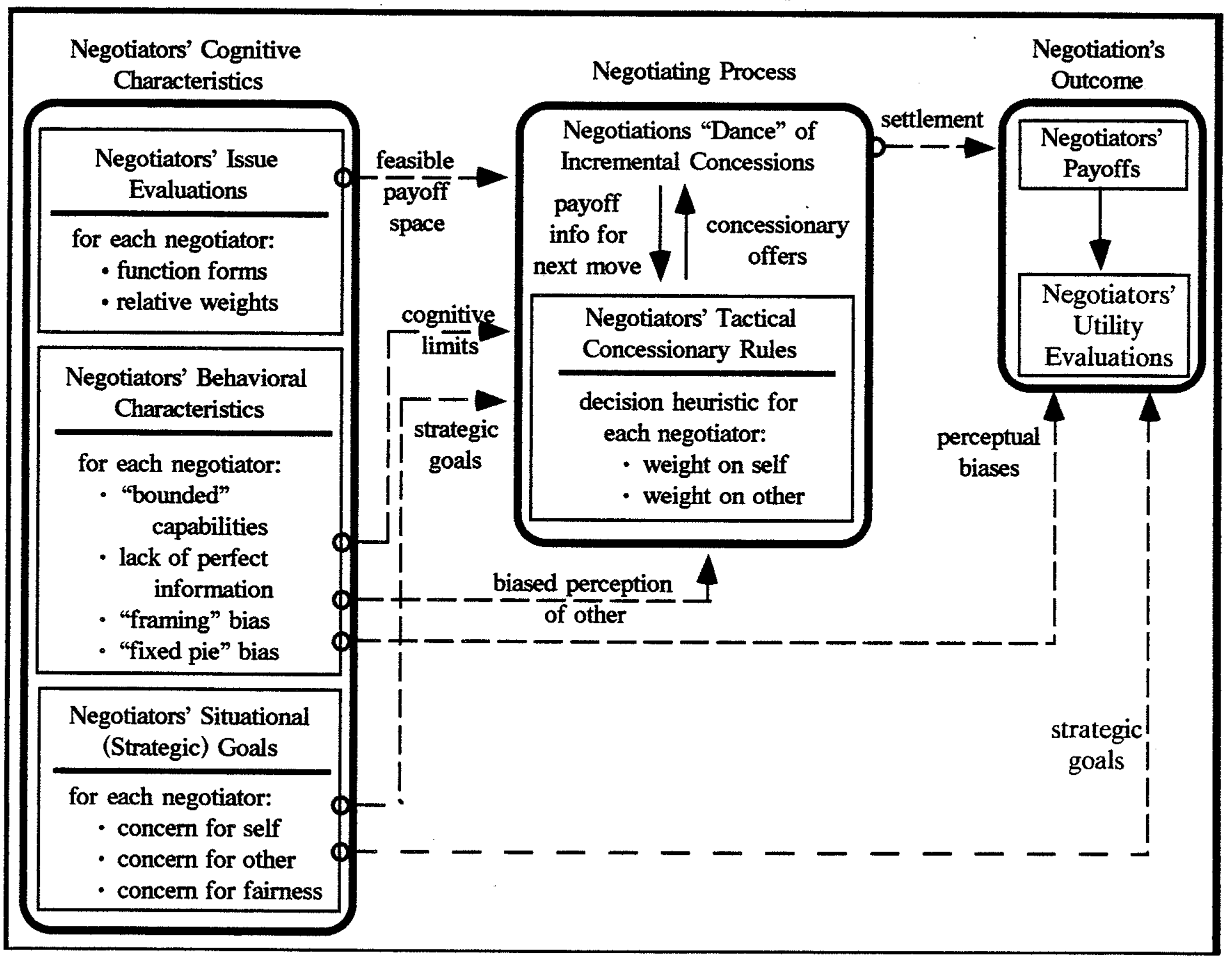



**Figure 1. A model of single negotiations focusing on people, process, and outcome.**

The parties are assumed to be single individuals negotiating for themselves. An *issue* is an item of dispute the negotiators recognize as explicitly "on the table." The parties are assumed to be in fundamental conflict over each issue, *i.e.* for one party more is better and for the other more is worse. Despite the fundamental conflict over each issue, the negotiations problem does not necessarily constitute a zero-sum game.

## The Negotiators' Cognitive Characteristics

As shown in Figure 1, the model distinguishes three categories of negotiators' cognitive characteristics: their narrowly self-interested evaluations of the issues; their situational goals for the negotiation; and, their general behavioral characteristics.

*Negotiators' Issue Evaluations.* At the start of most negotiations, both parties have an initial position on each issue. These initial positions serve as end-points for a range of potential settlements on the issue. Between the two end points, most issues contain one or more salient compromise points. If the issues in the negotiation are assumed to be independent and the compromise points discrete, the number of feasible settlements is determined by the product of the possible compromise points (including the two end points) for each issue.

Using *relative weights* to reflect differences in the comparative importance between the issues and *function forms* (both linear and non-linear) to measure trade-offs between levels within each issue, Mumpower (1990) shows how negotiators' evaluations of potential settlements can profoundly impact the structure of the negotiation problem. Mumpower first calculates hypothetical negotiators' "payoffs" for all feasible settlements and then constructs a *feasible payoff space* by plotting the joint distribution of payoffs. Figure 2 shows several feasible payoff spaces constructed from different, but plausible, relative weights and function forms.

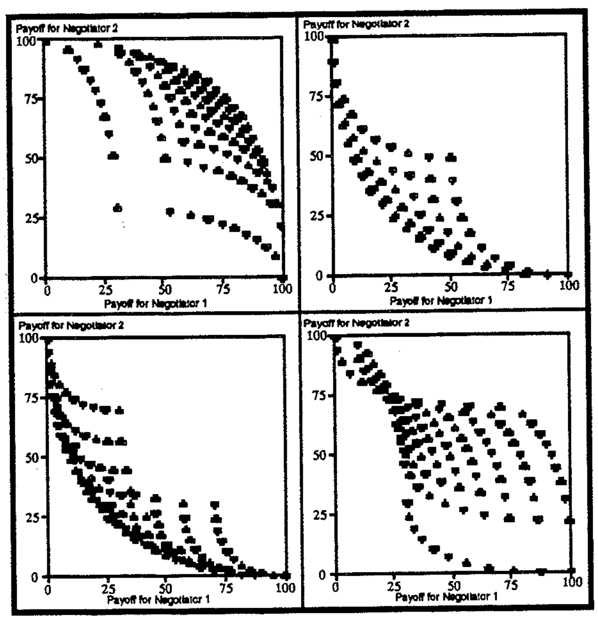



**Figure 2. Feasible payoff spaces under four conditions.**

The structure of the negotiation problem determines the joint payoffs parties can hope to achieve. Some problem structures provide feasible settlements that allow both negotiators to receive most of what they desire; others force trade-offs such that one negotiator loses more than the other gains. Depending on the shape of the efficient frontier, settlements that simultaneously allow both negotiators equal payoffs and maximize the joint payoff of the parties, may or may not be possible.

*Distinguishing Negotiators' Issue Evaluations and Situational Goals.* A negotiator's situational goals may be defined in an egocentric, narrowly self-interested manner. However, this is not always the case. Other factors often may enter into a negotiator's decision calculus. Darling and Mumpower (1990, see also Mumpower 1988) distinguish two stages in the cognitive process negotiators use to evaluate potential settlements. In the first stage, the evaluation is based on a narrowly circumscribed view of the negotiator's self-interest. At this stage the negotiator is concerned with the amount of value he or she receives from the settlement, without regard to the outcome received by the other, the fairness of the settlement, or social pressures. The term *payoff* is used to refer to this first stage settlement evaluation, which the model captures as the negotiators' issue evaluations.

In the second stage, the negotiator may broaden his or her perspective, taking account of situational and social factors, such as reputational concerns, the parties' ongoing relationship, and the other's welfare. The term *utility* is used to refer to this second stage evaluation. The model captures the factors which a negotiator uses to compute utility as situational goals. The distinction between a negotiator's payoff and utility, while critical conceptually, is likely to be confounded in practice, as the negotiator evaluates the prospective outcomes from multiple vantage points.

*Situational Goals.* Negotiators are likely to use at least two cues to evaluate potential settlements -- the value of the outcome for the negotiator ($Pay_{SELF}$) and the value of the outcome for the other ($Pay_{OTHER}$). Darling and Mumpower (1990) suggest that both the tactical decision rules used by the parties during the negotiating process and their evaluations of the final outcome (utility) can be represented using a weighted, additive model of these two cues --

$$w_{SELF}\,(Pay_{SELF}) + w_{OTHER}(Pay_{OTHER})$$

where $w_{SELF}$ represents concern for self and $w_{OTHER}$ represents concern for the other. We assume these two concerns are independent and that negotiators may seek to minimize as well as maximize either their own or the other's payoffs. Figure 3 identifies eight primary *negotiating orientations* based on this additive model. Clearly an infinite number of evaluation rules are possible, depending on the specific values of $w_{SELF}$ and $w_{OTHER}$.

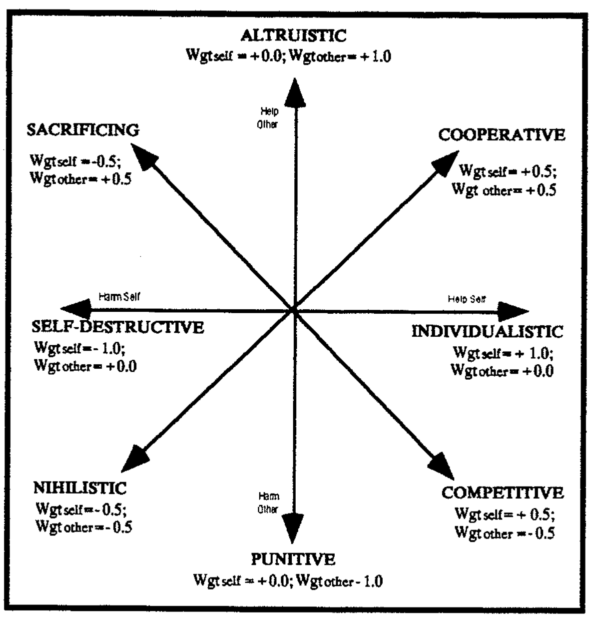



**Figure 3. Eight orientations to negotiations.**

A third negotiator concern -- concern for fairness -- can be represented as $Pay_{SELF}$ - $Pay_{OTHER}$. (Mumpower 1980; see also Lowenstein, et. al. in press). This hybrid of the two basic cues is particularly important in instances where the negotiator is not altruistically concerned with the value received by the other, rather he or she is either (i) instrumentally concerned that the other be sufficiently satisfied with the outcome to continue the relationship (beneficial to the focal negotiator); or, (ii) feels constrained to behave in socially acceptable ways.

*Behavioral Characteristics.* The model explicitly recognizes two general human behavioral characteristics -- the "bounded" nature of human information processing capabilities and the lack of perfect information on which to base judgments (Morecroft 1985; Simon 1981 and 1976). The section describing the negotiations process shows how these two cognitive limits critically impact negotiations.

Framing Effects. In its simplest form, a negotiator's concern for self is reflected in his or her payoff. However, experimental results suggest that a negotiator's evaluation of his or her outcome is critically affected by whether the payoff is perceived as a gain or a loss relative to some salient frame of reference. The impact of framing on negotiators' performance has been studied extensively. (Neale & Bazerman 1985; Neale & Northcraft 1986). This work generally has focused on externally generated goals (for example, negotiators are given an outcome they should try to achieve). When externally generated references are absent, negotiators are likely to derive their own frame of reference based on prior experiences or from cues found in the situation. The cues used by a negotiator to construct his or her internal reference sometimes may cause a negotiator to misperceive how well or poorly he or she did in a negotiation.

Fixed Pie Bias. Our previous simulations (Darling and Mumpower 1990) assumed that negotiators had perfect knowledge of both their own and the other's payoffs. This is not ordinarily the case. Bazerman and Neale (1983) suggest a negotiator's perception of the other's payoff is not randomly imperfect, rather, it is biased by a belief in the "mythical fixed pie of negotiations." A negotiator afflicted by this bias assumes the parties' interests are diametrically opposed -- more for one requires an equal loss by the other. If "100" points are involved in the negotiations, the other's payoff is perceived as the difference between "100" and the negotiator's own payoff. The following weighted formula can be used to model a partially or completely biased negotiator --

$$PercPay_{OTHER} = w(Pay_{OTHER}) + (1\text{-}w)\,(100 - Pay_{SELF})$$

where $1 \geq w \geq 0$. When $w = 1$, the negotiator is using perfect information, when $w = 0$, the negotiator is completely biased. A more realistic approach uses a $w$ between these two extremes, suggesting only a partially-biased negotiator.

**The Negotiating Process**

The "potentially opportunistic" aspect of negotiations (one side may try to manipulate or misrepresent its position in order to gain advantage) makes perfect information on the other's payoffs unavailable. Even if the other's payoffs were known, the enormous number of conceivable settlements for relatively small negotiation problems exceeds the negotiators' cognitive capabilities. Thus, "real" negotiators are unable to construct and analyze feasible payoff spaces. Negotiations begins with both parties "demanding" their most favorable settlement, and proceeds with a negotiating "dance" consisting of incremental concessions. Darling and Mumpower (1990:25) describe the process as follows:

*The uncertainty and cognitive complexity entailed in most negotiations prevent the parties from leaping to a joint agreement on their first move.*

> *Instead, negotiators tend to proceed incrementally and cautiously, attempting to 'feel their way along' to a settlement, unsure of when the level of concessions they offer meets the other's minimum reservation level, and hoping not to be taken advantage of.*
>
> *In choosing among the many possible offers or counter-offers to make, negotiators are likely to rely upon a tactical rule they hope will lead to a satisfactory outcome. Encumbered by limited, imperfect information about the other party's (and perhaps their own) payoff function and...hampered by the limits of their cognitive capacity, negotiator's tactical rules are likely to look ahead only a move or two. Because they are short-sighted, they sometimes (but not always) lead to suboptimal outcomes, falling into traps posed by local maxima and failing to find Pareto superior packages of tradeoffs.*

The negotiations dance is simulated in the following way. Negotiations begin with both negotiators making an initial offer that maximizes their own payoff on the issues. Thereafter, negotiators alternately make new offers, changing their previous offer by making a small concession on either Issue A or Issue B until an agreement is reached. (In the model, concessions always consist of 10 units, where issues are represented on a 0-to-100 scale.) In the two-issue cases used here, a total of 20 concessions, ten by each party, are required in order to reach agreement. The simulation does not allow the negotiators to pass. They must always make a concession, and once a concession is made it may not be retracted.

In order to choose whether to concede on Issue A or Issue B, the model assumes that negotiators apply a simple heuristic -- they concede on whichever of the two issues leaves them better off in terms of their tactical decision rule. The tactical decision rules are based on the negotiating orientations shown in Figure 3. For example, an individualistic negotiator concedes such that the proposed settlement maximizes $Pay_{SELF}$, the cooperative negotiator proposes the settlement which maximizes $(Pay_{SELF}+Pay_{OTHER})$, and the competitive negotiator chooses to maximize $(Pay_{SELF} - Pay_{OTHER})$.

## MODELING ITERATIVE NEGOTIATIONS

This section of the paper describes a model of iterative negotiations in which the parties are sequentially confronted by negotiation problems. The parties change their tactical decision rules for the current negotiation based on their previous result. The algorithm used to adjust the negotiators' tactical decision rules relies conceptually on the same three factors negotiators use to evaluate the final outcome in the single negotiation model -- concern for self, concern for other, and concern for fairness. In the present implementation of the model, only the first and last of these concerns are considered. A causal diagram of the modeled decision rule adjustment process is shown in Figure 4.

### Adjustment for Concern for Self

The premise of this factor in the adjustment process is straight-forward -- if a negotiator is satisfied with his or her own payoff then there is no reason to change his or her tactical rule; if a negotiator is unsatisfied with his or her payoff, then the negotiator adopts a more competitive rule, attempting to increase his or her share of the pie. Unless the payoff received is inordinately large or small, a negotiator's satisfaction with his or her outcome results from comparison with an individually-relevant reference point. The present model uses three, equally-weighted cues to construct each negotiator's reference point: payoffs received during previous negotiations with the other ("past outcomes"); the negotiator's appraisal of the structure of the present negotiation problem; and, the perceived payoff of the other.

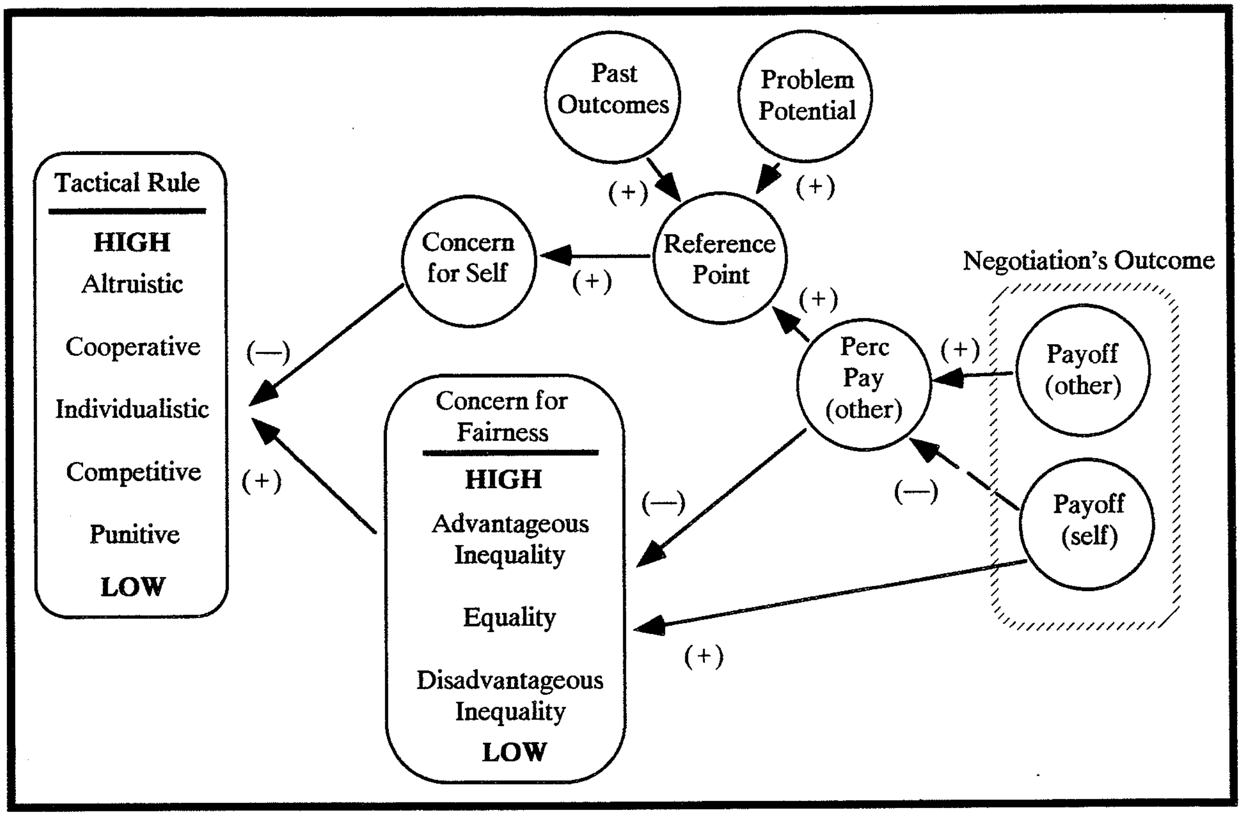



**Figure 4. The tactical decision rule adjustment process.**

*Past Outcomes.* Past achievements impact present expectations. If the negotiator has done well in past negotiations with the other, he or she expects to do well again. The model uses a moving average of a negotiator's past payoffs for this factor.

*The Current Negotiation Problem.* Negotiators, while cognitively limited, are not completely inept. Although unable to perfectly construct the payoff space, many negotiators have some idea of whether the current negotiation problem is generous, benign, or particularly malevolent. (Thompson and Hastie 1988). The model uses the payoff the negotiator would receive from an issue-by-issue compromise based on the parties' opening positions to approximate negotiators' perceptions of the structure of the current negotiation problem.

*The Other's Payoff.* The other's payoff, as perceived by the negotiator, is the final factor used in construction of the reference point. Use of the other's outcome reflects neither a concern (positive or negative) for the other, nor a concern for fairness. Rather the value received by the other represents a comparative standard which a negotiator can use to assess how well he or she did in the current encounter.

## Adjustment for Concern for Fairness

This factor adjusts the tactical rule based on the negotiator's perception of whether he or she did better or worse than the other. If the negotiator did better than the other -- *advantageous inequality* -- he or she attempts to equalize the parties' payoffs by adopting a more cooperative rule. In the opposite case -- *disadvantageous inequality* -- the negotiator becomes increasingly competitive.

## ITERATIVE NEGOTIATIONS USING FIXED NEGOTIATION PROBLEMS

Previous analysis using the single negotiation model (Darling & Mumpower 1990) shows that the negotiated outcome often depends on both the tactical decision rules the parties use and the structure of the negotiation problem they confront. In order to distinguish simulation results which are due to the parties' adjustments to their tactical decision rules from results generated by the structure of the negotiation problem, the first iterative simulations hold the negotiation problem constant during the sequential negotiations. In all the results reported here, both parties begin the first negotiation using the individualistic tactical rule. Except when otherwise specified, the parties enter the first negotiation without preconceived expectations of the outcome they will receive (the "past outcomes" factor in the parties' reference points is initialized as the first round payoff).

### Using Perfect Information

Simulations were first run using negotiation problems with structures previously analyzed by Mumpower (1990), and assuming the parties had perfect information about the other's payoff. In almost all of these simulations the parties never left their initial equilibrium -- no change occurred in either the tactical decision rules used by the parties or the settlement they reached.

Investigation of this initially troubling result provided increased confidence in our model. Because the weights and function forms used in these problems were generally symmetric and both parties begin the simulation using individualistic tactical rules, the parties negotiated equal payoffs. Thus, adjustments in the tactical rules for concern for fairness are not necessary; the parties receive equal payoffs that they accurately perceive. Changes in the tactical rules due to concern for self also are unnecessary. Two of the factors used to construct the reference point used by concern for self -- past outcomes and the other's payoff -- could not have an effect on these negotiation problems. The final factor in the reference point, the negotiators' perception of the structure of the negotiation problem, is modeled as the payoff which results from an issue-by-issue compromise. The individualistic tactical rule often finds good settlements. (Darling and Mumpower 1990). In these initial simulations, the individualistic tactical rule used by both parties results in settlements that were equal or superior to an issue-by-issue compromise. Therefore, the simulated negotiators had no reason to change their tactical rules.

The problems confronted by "real" negotiators are not ordinarily this symmetric. Figure 5 shows changes in payoffs and tactical decision rules over time for a simulation that departs from equilibrium. In this case, the first negotiation results in unequal payoffs even though the parties both use individualistic tactical rules and make an equal number of concessions. Negotiator 2 receives the higher payoff and becomes increasingly cooperative, while Negotiator 1 adopts increasingly competitive tactics. After a few negotiations, the changes in their tactical rules lead the parties to negotiate a different settlement. The new settlement reduces the payoff received by both negotiators, but continues to favor Negotiator 2. Despite the increasingly cooperative tactics of Negotiator 2 and the increasingly competitive tactics of Negotiator 1, the parties are unable to close the gap in their respective payoffs.

This pattern occurs regularly, but not always, when the negotiation problem is not symmetric and the parties have perfect knowledge of the other's payoff. In some cases the tactical changes result in the parties reaching a different settlement. When new settlements are found they usually result in lower payoffs for both parties. If one negotiator is more easily satisfied than the other (based on his or her weights and function forms) and equal numbers of concessions are required, the parties often have difficulty finding more equitable solutions.

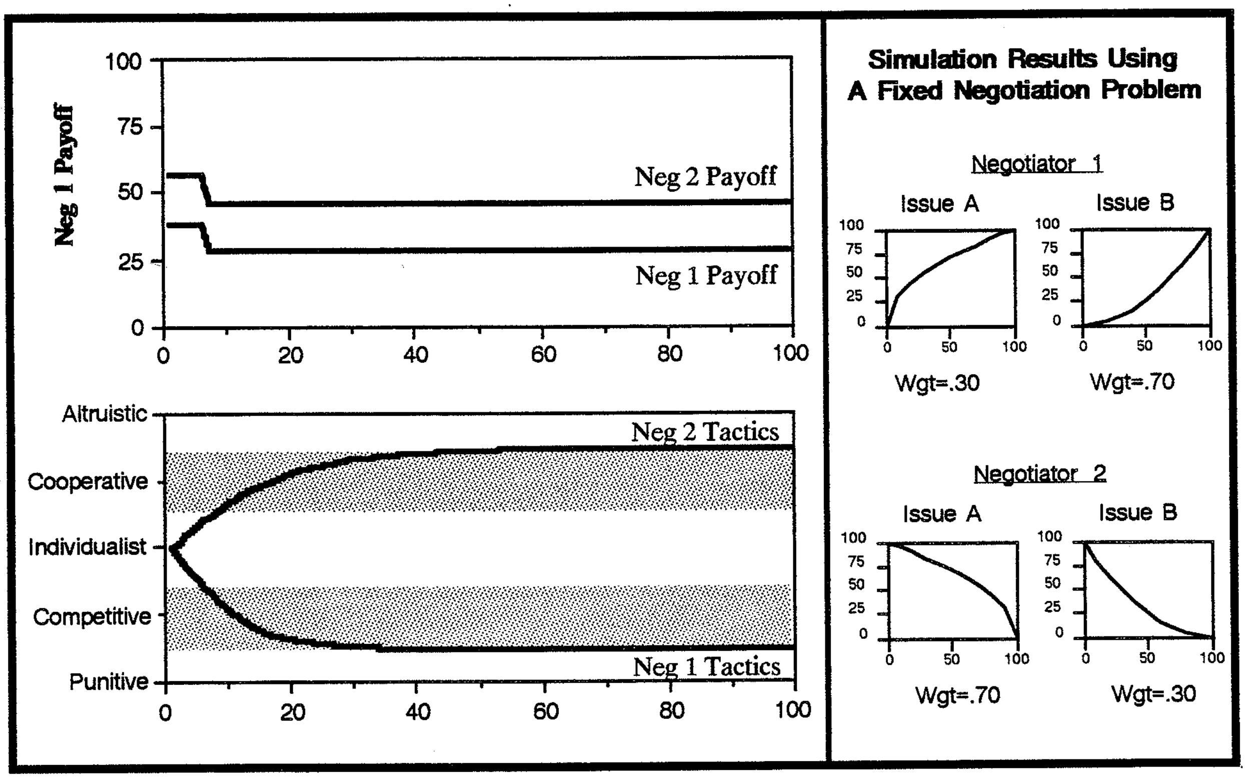



**Figure 5. Fixed Negotiation Problem, Perfect Information .**

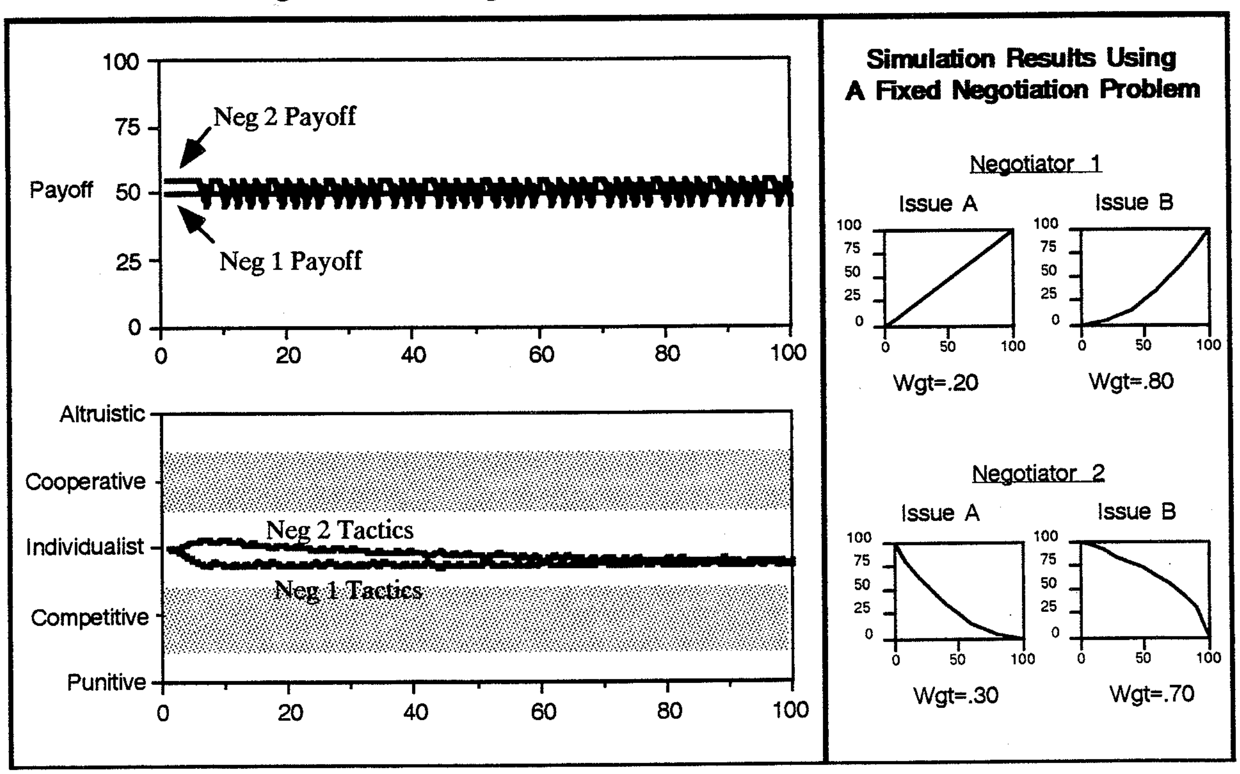



**Figure 6. Fixed Negotiation Problem, Perfect Information .**

In the remainder of the simulations using non-symmetric, fixed negotiation problems, the parties also begin with unequal initial payoffs. However, in these cases the adjustments in the parties' tactical rules "overshoot" their intended effect -- the settlement changes such that the negotiator who previously received less than the other now receives the higher payoff. This change in relative payoff incites further adjustments to the tactical rules that often return the parties to their initial settlement. An example is shown in Figure 6. In most negotiation problems which exhibit this behavior, the oscillations in the parties payoffs keep their tactical rules close together, but this is not always the case.

## Imperfect Information -- The Fixed Pie Bias

In order to more accurately model negotiator characteristics, the next phase of the analysis partially, but not completely, biases the parties' perception of the other's payoffs. The formula for perceived payoff, discussed earlier, is used with a weight of 0.5. The imperfect information affected both their view of the outcome and their evaluation of potential concessions during the negotiation dance.

Analysis again begins with the symmetric cases and their tendency toward equal outcomes. When the parties' equal payoffs are over "50" points (more than half of the "100" point pie), the negotiators' misperception of the other's payoff leads them both to believe the other received *less* than half the pie. Out of concern for fairness, both negotiators become increasingly cooperative. Similarly, when their equal outcomes are less than "50" points, both negotiators become increasingly competitive believing the other got *more.* In some cases the changes in tactical rules result in new settlements and oscillatory behavior, however, this is relatively uncommon.

When the negotiators lack perfect information about the other's payoff, the results of simulations using non-symmetric cases are consist with the findings using the symmetric cases. In many of the simulations, negotiators initially reach a settlement in which both receive more than "50" points, although their payoffs are generally not equal. Despite the unequal payoffs, the biased view of the other's payoff prevents the negotiator who receives the lower outcome from perceiving he or she did worse. In fact, perceiving that he or she got *more* than the other, the negotiator who receives the lower payoff adopts increasingly cooperative tactical rules out of concern for fairness.

In the remainder of the non-symmetric cases one negotiator received more than "50" points and the other less. This results in the same divergence in tactical rules as shown in Figure 5.

## The Curse of "Great Expectations"

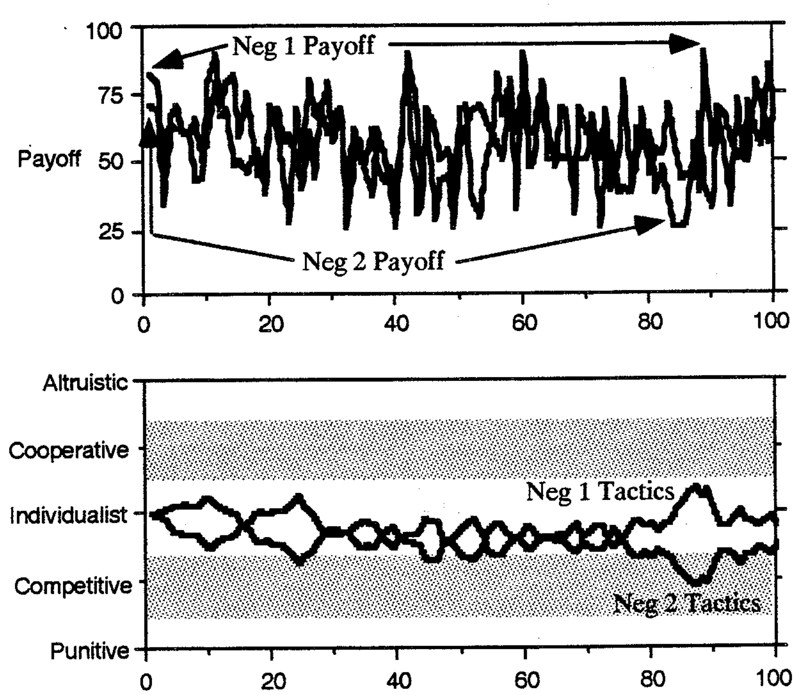
The reference point the simulated negotiators use to assess their personal satisfaction (concern for self) includes a factor for past outcomes. In the previous simulations, the effect of the past on current expectations was neutralized in the first negotiation by initializing it to the first negotiated outcome. Thus, unless changes in the tactical rules caused by other pressures result in a different settlement, this factor did not have an impact in the tactical rule adjustment process. However, when this factor is initialized at values higher than the parties' first-round payoffs, it sometimes raises the negotiators' reference points above their payoffs. When this occurs, negotiators are unsatisfied with their result and become increasingly competitive. In these cases, when changes in tactics do result in a new agreement, it usually reduces the outcome received by both parties, aggravating their already deteriorating relationship.

## ITERATIVE NEGOTIATIONS USING CHANGING NEGOTIATION PROBLEMS

No claim is made here that the negotiations problems used in the simulations are representative of the problems "real life" negotiators face. However, it is doubtful that negotiators consistently face exactly the same problem. The following simulations examine how negotiators respond when serially confronted with randomly-generated negotiation problems.

### Using Perfect Information

Figure 7 shows simulation results of negotiators facing changing negotiation problems. These negotiators possess perfect information about the other's payoff. As is apparent in the payoff graph, the parties almost always reach an agreement with a joint payoff in excess of "100" points. Often they simultaneously receive payoffs in excess of "50" points.




**Simulation Results Using Changing, Sequential Randomly-Generated Negotiation Problems**

**Figure 7. Changing Negotiation Problem, Perfect Information.**

The randomly-generated problems are generally non-symmetric, therefore the parties usually receive unequal payoffs. Much of the fluctuation in tactical decision rules shown in Figure 7 is based on adjustments for fairness caused by the unequal payoffs. Because both negotiators accurately perceive the other's payoff, their adjustments for fairness are in opposite directions -- when one moves toward cooperative, the other moves toward competitive. This accounts for the apparent "mirror-image" of the parties tactics. These adjustments do not, however, account for the slight, but noticeable, competitive drift in the tactical decision rules.

The source of this drift is concern for self. Although a negotiator usually receives a payoff in excess of half the pie, some payoffs inevitably are larger than others. When a series of high payoffs are followed by a low one, a negotiator is likely to be unsatisfied with his or her result. Expecting to have received *more*, he or she becomes more competitive.

When a series of low payoffs are followed by a high one, a negotiator may be pleasantly surprised, but does not adjust his or her tactical rule. The drift to competitive tactics would be more severe but for the mitigating influence of the two other factors which also impact the reference point, the negotiator's partial understanding of the decision problem and the other's payoff. Although the oscillations which result from concern for fairness seem to predominate, in a sense they are just random noise against the drift toward competitive tactics caused by concern for self.

## Imperfect Information -- The Fixed Pie Bias

As in the previous simulation, the negotiators in Figure 8 face changing negotiation problems. These negotiators, however, only possess limited, biased information about the other's payoff. Like the parties in Figure 7, they generally receive good, but unequal, payoffs from their randomly-generated, non-symmetric negotiation problems.

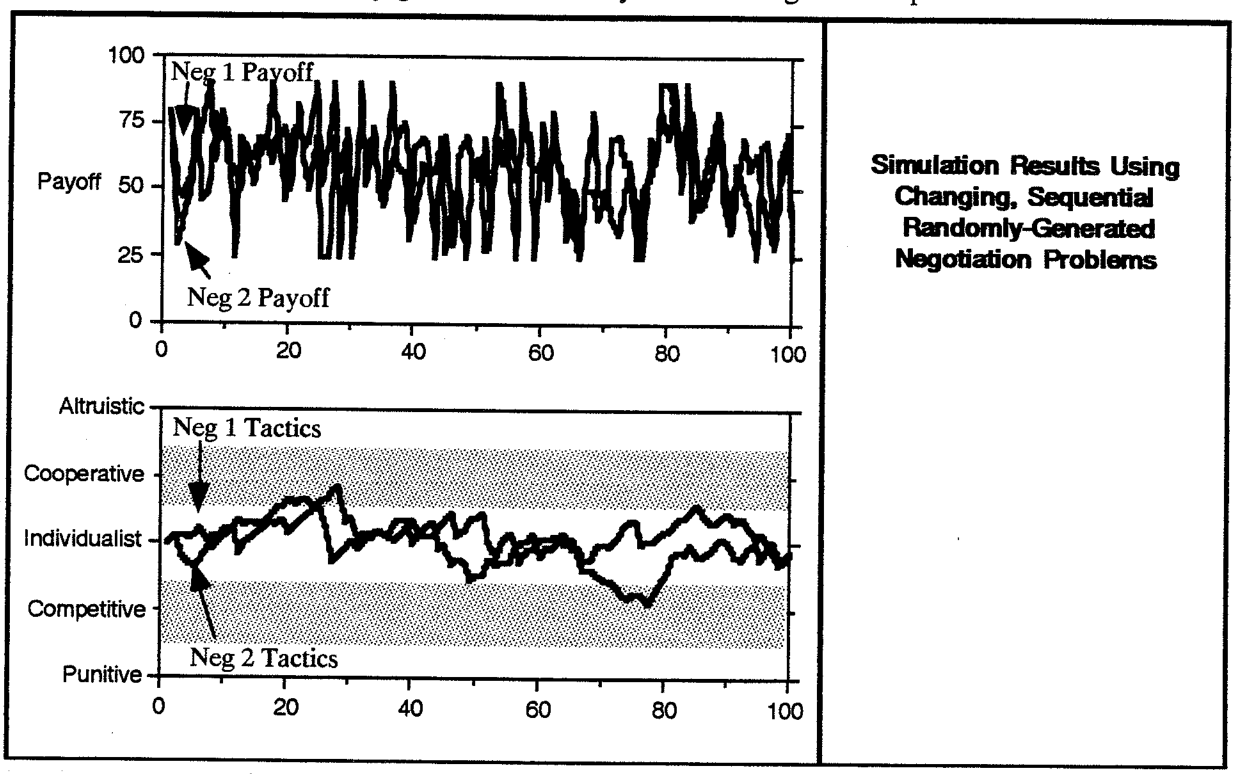



**Figure 8. Changing Negotiation Problem, The "Fixed Pie" Bias.**

The Figure 8 tactics graph shows that the negotiators in this simulation exhibit neither the competitive drift nor the "mirror-image" qualities of the Figure 7 simulation. Both of these differences in behavior are attributable to the negotiators' misperception of the other party's payoff. Like the biased negotiators in the fixed problem simulations, these negotiators believe if they got *more* then the other got *less*. Given that negotiators receive payoffs in excess of "50" points more often than not, concern for fairness moves the parties toward cooperative tactics more than half the time.

The competitive drift arising from concern for self found in Figure 7 has not gone away. When the parties' have a partially biased view of the other's payoff, the competitive drift is offset by a cooperative tendency in the tactical rule adjustment process based on concern for fairness.

## CONCLUSIONS

Two criticisms can be made of the algorithm used to adjust negotiators' tactical rules. The first is that it is too pessimistic -- it discounts the possibility of altruistic behavior and does not postulate increasingly cooperative behavior on the part of negotiators whose concern for self is satisfied. The second criticism is that the model is too optimistic -- it postulates equally strong (but opposite) responses when a negotiator does better than the other and when a negotiator does worse than the other.

No claim is made that the algorithm constitutes an accurate representation of how "real life" negotiators react. However, if a negotiator believes competitive tactics can increase his or her immediate payoff, and altruism or social constraints do not discourage this approach, cooperative behavior still may emerge either from an instrumental desire to influence the other's tactical orientation in future encounters or to induce the other to continue a relationship that is advantageous to the focal negotiator. This possibility may not be as far-fetched as it initially sounds. Walton and McKersie (1965: vii) identify attitudinal structuring as an important subprocess in negotiations intended to "influence the attitudes of the parties toward each other and affect the basic relationship bonds between the social units involved." Axelrod (1985:12) notes,

> *What makes it possible for cooperation to emerge is the fact that the players might meet again. This possibility means that the choices made today not only determine the outcome of this move, but can also influence the later choices of the players. The future can therefore cast a shadow back upon the present and thereby affect the current strategic situation.*

The simulation results reported here represent only a preliminary investigation of the iterative model. Definitive comments on the model's dynamic characteristics must await further simulation and empirical investigation. However, the changes in the tactical rules shown in Figures 7 and 8 correspond well with our casual observations of the attitudes individuals exhibit in long-term, interdependent relationships. Some relationships appear to oscillate around a fixed level of negotiator orientation, while others drift into increasingly competitive, acrimonious behavior. During some periods in the relationship both parties are cooperative, they get along very well. Sometimes, both parties are competitive, they seem at odds with each other. At other times, one party is cooperative and the other is not. This simulation model suggests that the source of these dynamics may be found in the negotiators' cognitive characteristics -- the structure of problem they confront, their situational goals, and their behavioral limits and biases; the tactical rules that guide the negotiating process; and, in the way those rules are adjusted from one negotiation to the next.

These results suggest that negotiation support must do more than guide the parties to higher payoffs in the current problem, it also needs to pay attention to both short and long-term consequences for the parties' ongoing relationship. If the negotiators are provided better information about the others' payoff, then the negotiation support system also must take steps to ameliorate the potential adverse consequences of invidious comparison. If negotiation support is able to increase the parties' payoffs in one negotiation problem, it must be careful not to inappropriately raise the parties' expectations for the future. In short, negotiation support needs to pay greater heed to both the short-term and long-term dynamics of negotiations and the cognitive factors that influence them.

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