JEHOSHUA ELIASHBERG, STEPHEN A. LaTOUR, ARVIND RANGASWAMY, and LOUIS W. STERN*

The results of the study show the robustness of two utility-based negotiation theories—group decision theory and Nash's bargaining solution—in accurately predicting outcomes of a marketing channel laboratory simulation in which power and information conditions were varied. Both theories significantly outperformed the predictions of a random model. Nash's theory performed better than group decision theory.

Assessing the Predictive Accuracy of Two Utility-Based Theories in a Marketing Channel Negotiation Context

Negotiations between marketing channel members take place over prices, terms of trade (credit, cash discounts, etc.), delivery, inventory levels, promotional support, and virtually all other elements of the marketing mix. In the marketing channel literature, little attention has been given to testing models capable of predicting the *outcomes* of negotiations under conditions characterizing channel relationships (exceptions are articles by Roering, Slusher, and Schooler 1975 and Dwyer and Walker 1981).[1] Most of the attention to date has been focused on aspects related to the *processes* of channel negotiation, such as those involving the use of power, influence, and conflict management mechanisms (e.g., Brown and Day 1981; Eliashberg and Michie 1984; Frazier 1983; John 1984; Lusch and Brown 1982; Stern, Sternthal, and Craig 1973).

With advances in mathematically based approaches, increased interest has been shown in employing utility-based theories for the prediction of outcomes in a variety of bargaining situations (e.g., Braithwaite 1955; Nash 1950; Raiffa 1953; Shapley 1953). In the field of marketing, the work of Neslin and Greenhalgh (1983) is particularly important. They examined the ability of Nash's bargaining solution (Nash 1950) to predict the points of agreement in a media purchasing simulation using MBA students as subjects. The research we report is an extension of the line of inquiry they initiated. In addition to using Nash's theory, we assess the efficacy of another utility-based theory—group decision theory (Keeney and Kirkwood 1975; Keeney and Raiffa 1976; Raiffa 1968)—to predict the points of agreement in a marketing channel negotiation simulation. In particular, we examine the robustness of both theories for predicting the outcomes of negotiations in settings where there is partial information and/or unequal power among the parties.

Marketing channel interactions provide rich and appropriate contexts for testing utility-based theories relating to negotiation. Channels of distribution conform to the common "image" of the generalized bargaining problem addressed by developers of the theories, that is, bargainers need to reach some mutually acceptable settlement but also wish to settle on terms favorable to themselves (Bacharach and Lawler 1981). This mixed-

[1]Neslin and Greenhalgh's study (1983) predicting outcomes focused on media purchasing, not on channels.

*Jehoshua Eliashberg is Associate Professor and Arvind Rangaswamy is Assistant Professor, Department of Marketing, The Wharton School, The University of Pennsylvania. Stephen A. LaTour is Associate Professor and Louis W. Stern is John D. Gray Distinguished Professor of Marketing, J. L. Kellogg Graduate School of Management, Northwestern University.

The authors thank Renee Florsheim, Patrick J. Kaufman, Vaman Shenoy Kudpi, Lalita Manrai, Marjo-Riitta Lehtisalo, and Donald Yonenaga for help in running the simulation reported in the article. They are also grateful for support from a Xerox Corporation research grant at the J. L. Kellogg Graduate School of Management. Comments and suggestions made by the anonymous *JMR* reviewers are gratefully acknowledged.

Journal of Marketing Research
Vol. XXIII (May 1986), 101–10

motive scenario has been adopted widely throughout the marketing channel literature (e.g., Coughlan 1985; Etgar 1976; Jeuland and Shugan 1983; McGuire and Staelin 1983; Stern and El-Ansary 1982).

In the next section we explain group decision theory and compare its properties with those of Nash's solution to the bargaining problem. We then describe the marketing channel simulation employed in our study and detail our results. Finally, we discuss the implications of our results and suggest directions for future research.

THEORETICAL BACKGROUND

Group Decision Theory

Group decision theory has its origin in individual decision theory. (Its applied version commonly is known as decision analysis; Howard 1968; LaValle 1978). The theory prescribes how an individual should make decisions in situations characterized as risky or riskless (in the sense that the decision maker is either uncertain or certain about the consequences of the decision). *Individual* decision theory first identifies and separates the two major components needed to model this kind of problem, (1) the subjective probabilities that are used to quantify the individual's assessment of the likelihood of the risky outcomes and (2) the von Neumann-Morgenstern (1947) utility functions that represent the individual's risk attitudes and preferences for the various outcomes. The theory then suggests that maximization of individual expected utility be employed as the criterion to choose the best action. Though individual decision theory is primarily normative in orientation, models based on it have been reported to yield promising predictive results in marketing applications (Currim and Sarin 1983; Eliashberg 1980; Hauser and Urban 1979).

In a similar fashion, *group* decision theory prescribes that the group first aggregate the individual subjective probabilities of its members. This step generates a group consensus probability (Winkler 1968), which reflects the group's assessment of the likelihood of the various joint returns the group may obtain. The theory suggests that the group combines the members' often-conflicting utility functions to arrive at an appropriate group utility function, also known as a social welfare function (Edwards 1977; Keeney and Kirkwood 1975). The group utility function and the group consensus probability then can be combined to choose the best action for the group through the criterion of maximization of the group's expected utility (Keeney and Kirkwood 1975). Raiffa (1968, p. 233–7) provides an insightful discussion of the advantages and disadvantages of the group decision-theoretic approach in the case of differing individual probability assessments. If negotiation is viewed as a collective decision-making problem, when the negotiators know all the negotiation outcomes with certainty, only the group utility function needs to be estimated. In that case, the only determinants of the conflict between the group members (negotiators) are their incongruent preferences for various negotiation outcomes.

The two most commonly studied forms for group utility functions are additive and multilinear. Both forms are derived axiomatically from different sets of conditions that can be verified empirically (Harsanyi 1955; Keeney and Raiffa 1976). If we denote the individual von Neumann-Morgenstern utility functions in a dyadic setting as U_1 and U_2 and the group utility function as U_G, the additive group utility function is represented by

$$U_G = K_1U_1 + K_2U_2. \tag{1}$$

The K_i ($i = 1,2$) parameters are to be interpreted as an index of the power of the parties relative to one another in the specific collective decision-making situation (Keeney and Raiffa 1976, p. 540). The relative power of the parties thus has a central role in this theory.

The multilinear group utility function takes the following form.

$$U_G = K_1U_1 + K_2U_2 + K_eU_1U_2 \tag{2}$$

Here, the coefficient K_e moderates the power effect and reflects the group members' concern for achieving equality of utilities at settlement. The larger K_e, the higher the group's collective desire for both parties to choose a settlement yielding individual utilities that are more or less equal to each other. (See Eliashberg and Winkler 1981 for further interpretation of the parameters in a risk-sharing context.)

Some promising empirical applications of group decision analysis in the area of arbitration (as opposed to pure negotiation) have been reported in a variety of contexts, for example, space probes (Dyer and Miles 1976), environmental concerns (Howard 1975; Keeney 1977), and health issues (Torrance, Boyle, and Horwood 1982). To our knowledge, however, there has been no empirical test of the predictive ability of these functions in any negotiation context, in general or in marketing settings—in particular those settings reasonably typical of marketing channel interactions. The research we report is an attempt to advance this field of inquiry through its application to marketing channel negotiations. In a long-term channel relationship characterized by trust and frequent interactions, the negotiators may be considered members of a "group" (as in group decision theory) or as two bargainers with full information trying to reach a just settlement (as in Nash's theory).

Nash Bargaining Solution and its Comparison with the Group Decision-Theoretic Approach

Nash's bargaining solution was the focus of Neslin and Greenhalgh's study (1983) and they provide a useful description of the theory. Therefore, we only paraphrase the basic concepts and parameters of Nash's theory and highlight key differences from group decision theory.[2]

[2]For further comparative discussion see Riddell (1981). Luce and Raiffa (1957) and Roth (1979) provide important discussions of Nash's axioms.

Like the group decision-theoretic solution, Nash's bargaining solution is an axiomatically derived outcome-oriented approach and its prediction focuses on the Pareto-optimal subset.[3] It has been widely employed in several studies to predict outcomes of bargaining experiments (e.g., Roth and Malouf 1979). The Nash solution to the dyadic bargaining problem is the choice of U_1 and U_2 by the two parties to maximize

$$(U_1 - U_{10})(U_2 - U_{20}). \quad (3)$$

Here, U_{10} and U_{20} are the utilities corresponding to the no-agreement point for the two parties.

There are some key differences between Nash's and the group decision-theoretic approach to the bargaining problem. First, the Nash solution does not require interpersonal comparisons of utilities, whereas group decision theory explicitly recognizes such comparisons. This is a controversial issue. It involves questions such as, "Does one dollar to a beggar mean much more than a million dollars to a billionaire?" There have been arguments in the literature, both pro and con, on the interpersonal comparison of utilities (Braithwaite 1955; Isbell 1959; Luce and Raiffa 1957). Luce and Raiffa (1957, p. 137), for example, suggest that bargainers are in fact engaged in comparing individual utilities. Empirically, Nydegger and Owen (1975) report that comparisons of utilities for negotiation outcomes did take place in their experiments. If one assumes that utilities can be compared meaningfully, the utilities corresponding to the no-agreement outcome in the Nash model (U_{10}, U_{20}) can be interpreted as representing the bargainers' relative advantages (Luce and Raiffa 1957, p. 145).

The two bargaining solution approaches also differ in their treatment of the notion of equality or fairness. Group decision theory treats this construct as a parameter that can take different values based on the parties' subjective feelings. Nash's approach, in contrast, requires through its symmetry axiom that the solution depend only on information contained in the model. In particular, it requires that if all players have the same outcome possibilities, they should get equal outcomes. The original Nash model has been extended theoretically to incorporate individual differences and asymmetry (Harsanyi and Selten 1972; Kalai 1977) through additional parameters. One solution concept prescribes that the negotiators maximize

$$(U_1 - U_{10})^{P_1}(U_2 - U_{20})^{P_2}. \quad (4)$$

The parameters P_1 and P_2 represent various confounding effects of factors outside the model (see Roth 1979, p. 17) such as differences in bargaining ability, in the initial distribution of power, and in the parties' assessments of particular "types" of opposers.

In our study, we focus on situational bargaining power and on amount of available information, and we consider only the original Nash model. We compare it with the group decision-theoretic approach in making predictions of simulated channel negotiation outcomes.

METHOD

Fifty-six executives and 140 MBA students participated in the study. Executives were paired with executives and students with students. In each session, one person was assigned randomly to the role of "sales manager" for a manufacturer of ski caps and the other to the role of "buyer" for a retailing firm. Both the retailing and the manufacturing firms were said to be major companies. Both were described as having been in business for a number of years and being roughly equal in size, financial performance, stability, and profitability. This description was necessary to make certain the participants did not attribute unequal situational power to the firms at the outset.

The subjects were told they would negotiate the price to be paid for the ski caps and the quantity to be shipped using a 9 × 5 price-quantity matrix.[4] Perceived interdependence was induced by conducting a warmup negotiation session using an abbreviated (4 × 3) price-quantity matrix. This session served to demonstrate that some cooperation was necessary to achieve a mutually acceptable agreement that was better than outside alternatives. The notion of a long-term relationship was induced by informing each dyad that it would be given the opportunity to negotiate a second time and that the profits generated by each member would be the average of the profits obtained in the two bargaining sessions with the other member. We realize, however, that most channel relationships are much longer in duration and more complex than that simulated in our study.

After the warmup session, experimenters assessed the utility functions of the "sales manager" and the "buyer" for various levels of profit within the range of the profit dollars contained in the price-quantity matrices. The method used was the standard lottery-type procedure (for further details, see Swalm 1966 and Keeney and Raiffa 1976).[5]

Independent Variables

Amount of information. For group utility functions and Nash's theory to predict outcomes accurately, the ne-

[3]Informally, the Pareto-optimal subset is the locus of all settlements such that moving from one to another will make one party better off and at least one other party worse off. For relatively large negative K_e values, the multilinear utility function may not always predict a Pareto-optimal settlement. However, this uncommon situation did not occur in our study.

[4]Each cell of the matrix contained the profit dollars that would be realized by the buyer and seller if they agreed on a price and quantity corresponding to that cell. The matrix used, as well as other simulation materials (e.g., utility-assessment forms, instructions, etc.), are available from the authors upon request.

[5]The utility functions were represented in graphic form. Once a continuous utility function for profits is assessed, a negotiator's utility corresponding to any negotiation outcome can be determined from the graph.

gotiating parties are supposed to have full information about one another's utilities. Actual bargaining situations in marketing channels are unlikely to conform to such a requirement. Therefore, in the simulation, we created two conditions, one conforming to the dictates of the theories (i.e., full information) and another more in line with "real-world" channels (i.e., partial information). In the full information condition, both matrices (the sales manager's and the buyer's) were given to each dyad member. The matrices included information on utility values (on a 0 to 1 scale) for the parties to the negotiation *and* for the "outside" alternatives available to each party. In the partial information condition, the matrices and the utility information they contained were private. However, as in the full information condition, communication between the parties was not restricted during the course of negotiation. Though it would have been possible to restrict such communications, we believed this manipulation of partial information more faithfully represented the conditions of most actual negotiations.

Relative power. Power in a bargaining relationship can be varied as a function of several factors, including (1) the outcomes available from no-settlement alternatives, as in Thibaut and Kelley's (1959) comparison level for alternatives, (2) the motivational investment of the parties in the goals mediated by each of them, and (3) the bargaining skill of the individuals. We elected to focus on situational power, which we manipulated by varying the no-settlement alternatives.

The utility levels corresponding to the no-settlement alternatives can be considered objective power parameters in the Nash bargaining solution. For group utility functions, the party with the better alternative is less dependent on the relationship and therefore should be perceived to have greater situational power, all other things being equal. To operationalize this situation, we informed the subjects that, irrespective of whether they reached agreement, they would be given an opportunity to negotiate with another firm. In the unequal power condition, one of the parties had an alternative that would yield, on average, $65,000 in profit, whereas the other had an alternative that would yield only $25,000. In the equal power condition, each party was informed that their alternative would yield, on average, $40,000 in profit.

Relative power perceptions and utilities were assessed twice during the simulation—before and after the main negotiation. Also, an extensive questionnaire was administered after the negotiation, probing equality considerations (to determine the appropriateness of the multilinear function), perceived power, and several related factors. The responses to some of these questions served as manipulation checks (discussed subsequently).

Three features of the methodology used in our study should be noted. First, the dependent measures are outcomes measured in terms of utilities, not in terms of profit dollars. This approach is consistent with the utility-based nature of the theories examined. Second, the negotiation was constrained by time; the negotiators were given 20 minutes to come to an agreement. Consequently there was undoubtedly an end effect. Third, both perceived power and utilities were assessed before and after the main negotiation session to detect possible changes over time. As Roth and Malouf (1979) note, in much of the bargaining literature, studies assessing correspondence between bargaining models and outcomes have inappropriately used postbargaining utilities when in fact the bargaining may have affected the utilities. In our research only the earlier assessments (hereafter called "prenegotiation" measures) are employed for model estimation. This approach is consistent with our focus on situational power, but leads to a highly stringent test of the theories, in particular the group decision theory.

Procedures for Parameterizing the Group Utility Functions

To assess utilities for the group utility functions, a scaling procedure was used such that the individual and group utilities were restricted to be between zero and one. Perceived power was measured on a constant sum scale whereby the negotiators were asked to divide 100 points between themselves and their opponents to reflect their relative bargaining power (cf. Huber 1974; Johnson and Huber 1977).

Denote

K_{bb} = number of points assigned by buyer to himself/herself,
$K_{bs} = 100 - K_{bb}$,
K_{ss} = number of points assigned by sales manager to himself/herself, and
$K_{sb} = 100 - K_{ss}$.

For the additive group utility functions ($U_A = K_{bA}U_b + K_{sA}U_s$), K_{bA} and K_{sA} were determined by averaging (K_{bb}, K_{sb}) and (K_{ss}, K_{bs}), respectively. K_{bA} and K_{sA} can be interpreted as the dyadic perception of the relative power of the parties. By averaging, each member's perception is being given an identical weight. For the multilinear functions ($U_M = K_{bM}U_b + K_{sM}U_s + K_eU_bU_s$), the following set of simultaneous equations first was solved for the buyer.

$K_{bb} + K_{bs} + K_{be} = 1$,
K_{bb}/K_{bs} = the ratio obtained from the constant sum scale, and
K_{be} = the buyer's response to the equality equation (discussed hereafter).

A similar set of equations was solved for the seller. The solutions for the buyer and sales manager then were averaged to determine the parameters of the group utility function.

To obtain the equality coefficients (K_{be}, K_{se}) for the individual multilinear utility functions, each negotiator was asked (separately) to draw a line on a thermometer scale ranging from -1 ("it was extremely important to me that our utility numbers would be different") to $+1$

("it was extremely important to me that our utility numbers would be the same"). The equality parameter for the group utility function also was computed as an average.

Of the 98 dyads participating in the study, five dyads failed to reach an agreement and four dyads were not included in the analyses because of missing data. The analyses were performed on a total of 89 usable dyads. A minimum of 20 and a maximum of 24 dyads were assigned randomly to the four experimental conditions created by the power and information manipulations.

RESULTS

We first present the results from the power measurements. As mentioned before, perceived relative power is a central construct in the group utility functions. We then describe the predictive performance of the group utility functions in comparison with the Nash bargaining model and to two naïve models.

Reliability and Validity of Power Scales

The reliability of the power scales was assessed by obtaining three postnegotiation measures (using category rating scales) of perceived power and comparing them with a postnegotiation constant sum measure. For the category rating-scale measures, subjects were asked to rate their own and their negotiating partner's power on 9-point scales ranging from powerless to powerful, impotent to potent, and no control to complete control over the profit of the negotiating partner. Cronbach alpha coefficients (Cronbach 1951) of .83 for buyer's perceptions of power and .87 for seller's perceptions of power were obtained. The correlation between the constant sum measure and the 3-item category rating scale averages .82 across buyers and sellers. Therefore, the constant sum measure appears to have sufficient reliability. Further, the fact that the means of the constant sum measure for the equal and unequal power conditions are different in accordance with expectations (see next section) provides evidence for the construct validity of the measure.

Effectiveness of Power Manipulations: Pre- and Postnegotiation Measures

Table 1 contains the perceived average "own" power measured on the constant sum scale. In equal power conditions, we would expect the average perceived own power measure to be close to 50. On the basis of the prenegotiation measures of power, the obtained level is significantly[6] higher at 53.3 ($t(88) = 3.50$), probably reflecting an egocentric bias. Though the mean values of the prenegotiation measures for the equal, high, and low power conditions are in the right direction, none of the differences is significant. When postnegotiation measures are considered, however, all three differences are significant. These results suggest that the subjects crystalized their perceptions more clearly after the negotiation was completed. When power perceptions are analyzed separately for the buyer and seller, there are also some notable differences. On the average, on the basis of premeasures, buyers perceived that they had more power than sellers (58.4 vs. 48.9; related samples $t(88) = 5.1$). Furthermore, these differences in perception hold significantly across all power conditions. There are no significant differences in prenegotiation perceptions across the power conditions in the case of the buyer. However, in the case of the seller, the difference between high and low power conditions as well as between equal and low power conditions is significant. These results suggest that the lack of overall significant differences in prenegotiation measures is mainly the result of an egocentric bias in power perception among buyers (i.e., some "role effect") before they actually experienced the power difference during the course of the main negotiations.

Predictive Performance of the Models

Individual outcomes. Both individual and dyadic measures can be used to test predictions based on the

[6]Throughout the Results section, all results reported as significant are at the level of $p = .05$ or better for two-tailed tests and $p = .025$ or better for one-tailed tests.

Table 1
AVERAGE SELF-PERCEPTION OF POWER FROM CONSTANT SUM SCALE[a]

Self-perception under condition of	*Time of assessment* Pre-bargaining	Post-bargaining	Difference (pre − post)	*Significant t-value*
High power ($n = 44$)	56.7 (14.7)	61.5 (14.3)	−4.9 (15.6)	$t(43) = -2.1$
Low power ($n = 44$)	51.5 (12.3)	40.3 (15.3)	11.1 (15.0)	$t(43) = 4.8$
Equal power ($n = 90$)	53.3 (9.1)	51.9 (9.6)	1.3 (8.5)	n.s.
All conditions ($n = 178$)	53.6 (11.6)	51.4 (14.5)	2.2 (13.5)	$t(177) = 2.2$

[a]Numbers in parenthesis are standard deviations; n.s. denotes a nonsignificant difference ($p < .05$).

theories. However, problems arise with dyadic-level analysis because of a lack of well-defined goodness-of-fit criteria. Consider, for example, the sum of utilities of buyer and seller as a measure of dyadic outcome. The deviation of the predicted sum of individual utilities from the sum at actual agreement can be used as a criterion for the predictive performance of the theory. However, small deviations do not necessarily imply accurate predictions because they may mask large variations in individual utilities. Therefore, even though dyadic analysis may sometimes be preferred in marketing channel studies (see Stern and Reve 1980), our emphasis here is on individual-level outcomes, supplemented with two suggestive dyadic measures. (See Neslin and Greenhalgh 1984 for further analysis of this issue.)

Tables 2 and 3 compare the relative accuracy of the two group utility functions and the Nash bargaining solution in predicting individual negotiation outcomes. Predictions of the theoretical models are based on identifying the settlements above the no-settlement point which maximize dyadic utility score. The theoretical models also are compared with two "naïve" models, (1) an equal-weights additive utility model and (2) a random model in which predicted outcomes are selected at random (with equal probabilities) from any cell of the 9 × 5 price-quantity matrix.

The equal-weights additive model sets the power coefficients equal to .5 in the additive utility model described before and predicts the settlement at the cell that maximizes the group's (dyad's) score. It thus provides some insight into the usefulness of assessing the negotiator's perceived relative power. The random model is independent of any theory because it makes predictions without taking into account relative power or utilities.[7]

Table 2 contains the correlation coefficients between the actual and predicted utilities (separately for buyer and seller) for the five models considered. All four utility-based models predict significantly more accurately than the random model.[8] There are no significant differences in predictive performance between Nash's model and the three group utility models, except that the Nash model performs significantly better than the equal-weights additive model for the case of the seller. However, at the descriptive level, as Table 2 indicates, predictions of the Nash model have higher correlations with the actual outcomes than do those of the group utility models. Also, all utility-based models appear to predict more accurately for the buyer than for the seller. This result replicates a finding reported by Neslin and Greenhalgh (1983) and is probably the consequence of the "role effect" mentioned before.

Table 3 reports the average *absolute* deviations of predicted utilities from the actual obtained utilities, separately for buyers and sellers, under the four experimental conditions for the five different models. Overall (i.e., across all experimental conditions and across both buyers and sellers), the improvement gained by using a utility-based predictive model instead of the random model ranges from 37% for the equal-weights additive model

[7]It must be noted that the 9 × 5 price-quantity matrices do not contain any settlement (measured in profit) which is strictly dominated by either the unequal power ($65,000, $25,000) or equal power ($40,000, $40,000) condition. Hence, all 9 × 5 = 45 possible settlements are considered.

[8]The tests are based on the comparison of correlations from two dependent samples. See, for example, Roscoe (1975, p. 266).

Table 2
CORRELATIONS OF ACTUAL UTILITIES WITH PREDICTED UTILITIES[a]

Model	*Buyer*	*Seller*
Additive (A)	.57	.52
Multilinear (M)	.59	.51
Equal-weight additive (E)	.51	.46
Nash (N)	.66	.61
Random (R)	.25	.35

[a]All correlations are significantly greater than zero ($p < .05$).

Table 3
AVERAGE ABSOLUTE DEVIATIONS OF PREDICTED FROM ACTUAL UTILITIES

	Partial information	*Full information*
Buyer		
Unequal power	.131 (A)	.154
	.135 (M)	.136
	.111 (E)	.149
	.141 (N)	.124
	.228 (R)	.241
Equal power	.150	.161
	.158	.146
	.150	.169
	.109	.081
	.224	.236
Seller		
Unequal power	.122	.183
	.145	.169
	.122	.194
	.140	.144
	.282	.242
Equal power	.152	.202
	.162	.196
	.173	.232
	.133	.132
	.149	.173

A is additive utility model, E is equal-weight additive model, N is Nash bargaining model, M is multilinear utility model, and R is random model.

to 77% for the Nash model. The quality of the predictions also can be ascertained by comparing the deviations with the range of the values over which the predictions could actually fall. The average range is .86 (on a scale of 0 to 1) for buyers' utilities and .82 for sellers' utilities. After averaging over buyers, sellers, and experimental conditions, the deviations computed from the predictions of utility-based models range from 19.5% of the range for the equal-weights additive model to about 15% of the range for the Nash model. In the case of the random model, the average deviations are 26.5% of the range.

To gain further insights, we submitted the deviation scores to an analysis of variance. In no case were there any effects involving the experimental variables. Therefore, the results listed below hold across experimental conditions.

1. The utility-based models predicted significantly more accurately than the random model (additive model, $F(1,85) = 13.25$; multilinear, $F(1,85) = 13.58$; equal-weights additive, $F(1,85) = 13.02$; Nash, $F(1,85) = 21.32$).
2. The Nash model predicted better than both the additive model, $F(1,85) = 4.75$, and the multilinear model, $F(1,85) = 4.57$.
3. There were no differences in performance between the equal-weights additive model and the unequal-weights additive model, a result paralleling that found in the individual decision-making literature (Dawes and Corrigan 1974).
4. The Nash model and the equal-weights additive model predicted significantly better for the buyer than for the seller (Nash, $F(1,85) = 5.10$; equal-weights additive model, $F(1,85) = 7.75$).
5. An analysis of the "signed" deviations between predicted and actual utilities (unlike the absolute deviations in Table 3) indicated that all models significantly overpredicted the utility achieved by the seller at the agreement point (additive, $F(1,85) = 4.90$; multilinear, $F(1,85) = 11.6$; equal-weights additive, $F(1,85) = 28.35$; Nash, $F(1,85) = 22.6$). The Nash model also underpredicted in the case of the buyer ($F(1,85) = 4.20$). The underprediction for buyers and overprediction for sellers by the Nash model parallel Neslin and Greenhalgh's (1983) findings.

Table 4
AVERAGE DEVIATIONS OF ACTUAL FROM PREDICTED UTILITIES USING MODEL FUNCTIONAL FORM

	Partial information	*Full information*
Unequal power	.049 (A)	.050
	.052 (M)	.046
	.055 (E)	.044
	.042 (N)	.041
Equal power	.045	.052
	.047	.052
	.044	.058
	.028	.025

A is additive utility model, M is multilinear utility model, E is equal-weight utility model, and N is Nash bargaining model.

Table 5
PREDICTIONS OF RANK ORDER OF BUYERS' AND SELLERS' UTILITIES

Model	*No. dyads with correct prediction of rank order*	*Percentage (of 89 dyads)*
Additive	56	63
Multilinear	61	69
Equal-weight	55	62
Nash	63	71
Random	48	54

Dyadic outcomes. Table 4 lists deviations between predicted outcomes and actual outcomes obtained by the following procedure. First, the functional form of each model was used to compute the values of the functions at the predicted and actual cells in the price-quantity matrix. Next, the deviations (predicted minus actual) were computed for each dyad and then averaged under each experimental condition. It is important to note that the deviation measures developed are not independent of the model and, hence, no meaningful comparisons can be made between models. However, predictions made by the same model can be compared across the four experimental conditions.

An analysis of variance of these dyadic deviations showed no differences between experimental conditions for the predictions of the group utility functions, suggesting that their predictions are robust across the experimental conditions. In the case of the Nash model, however, the predictions are significantly better under conditions of equal power than unequal power ($F(1,85) = 3.99$).

Another dyadic criterion of predictive performance that may be of interest is the percentage of dyads (of 89) in which the models correctly predict the rank order of buyers' and sellers' utilities at the agreement cell. This percentage gives a measure of a model's performance in correctly predicting whether the buyer or seller would achieve higher utilities at agreement. The results in Table 5 suggest that on this criterion, the multilinear group utility model and the Nash bargaining model perform equally well and outperform the other three models.

DISCUSSION

Our major finding is that, in the marketing channel simulation chosen as the research setting, both group decision theory and Nash's bargaining solution performed well in predicting the outcomes of the negotiations across all conditions. This finding indicates that these utility-based theories are robust even in circumstances which threaten their application, such as partial information and unequal power.

Another important finding is that Nash's theory predicted outcomes more accurately than did the group utility functions, even though the simulation apparently violated the symmetry condition specified by Nash's theory. One reason for the inferior performance of the group utility functions in relation to Nash's theory may be that the prenegotiation power measure failed to show significant differences between the equal and unequal power conditions. The weak induction may have been due to the fact that the availability of alternatives was merely an abstraction before the negotiations actually commenced. As indicated before, we are suspicious of the use of postnegotiation perceived power measures in the group utility functions because postnegotiation perceptions could be a rationalization for the outcome actually achieved. Had we measured power perceptions at some point during the course of the negotiations when the parties were actually experiencing their effects, the predictive accuracy of the group utility functions might have matched that of Nash's theory. (Recall that the power measure for Nash is more objective because it comes directly from the utilities associated with the available alternatives rather than indirectly, via the perceptions of the parties.) Clearly, this area should be subjected to further research, which should include measures of bargaining skill as well as improved measures of situational power.

In terms of ease of operationalization, group utility functions are more difficult to operationalize than Nash's theory. When the former are used, one must work with a number of perceptual measures. The time and effort required to collect such data and to check for reliability and validity may be worthwhile if the models are clearly superior to competing models. Such was not the case in our study. Nash's theory's relative merit is that it is more parsimonious than group decision theory. In addition, the fact that the unequal-weights additive group utility function did not significantly outperform the equal-weights additive model suggests the effort expended in measuring power differences may not have been justified. The critical variables in predicting negotiation outcomes thus appear to be the utilities, not perceptual measures of power. This is also an important subject for future research.

A third major finding is that both theories predicted accurately even when the full-information requirement was violated. This finding seems to indicate that during the course of the negotiations, the parties shared enough relevant information to enable them to achieve settlements close to the normative solutions. Such a phenomenon may be even more prevalent in "real-world" channel relations, especially in those that are highly interdependent, long-term, and characterized by trust (as opposed to opportunistic behavior). This possibility also poses questions for further research.

Finally, the theories predicted better for buyers than for sellers. This finding suggests that buyers are able to achieve outcomes closer to the normative ones recommended by the models. Interestingly, all of the utility-based models tended to overpredict the utilities achieved by sellers at agreement (as well as underpredict in the case of buyers). Supporting the dominance of the buyer is the fact that the average profit achieved by buyers was $69,850 whereas for sellers the average was only $63,990. This finding indicates that there may be significant role bias in perfectly symmetric negotiations. (See Bazerman, Magliozzi, and Neale 1985 for similar findings.) This is another subject worthy of future research.

CONCLUSION

Any technique that facilitates predicting the outcomes of negotiations undoubtedly would be appreciated by management, irrespective of the issue (e.g., labor rates, advertising space charges, allocation of retail shelf space, etc.) involved. Theories developed in economics and the decision sciences can be applied in solving such problems. We have applied two utility-based theories—group decision theory and Nash's bargaining solution—to a marketing channel simulation in an effort to assess the accuracy and robustness of their predictions in such a context.

Our research shows both theories to be superior to a random model that does not consider utilities. This finding indicates that utility-based theories, at least in the setting chosen for our study, can be helpful in generating insights into negotiation outcomes. Of particular importance is the fact that the theories predict well under a variety of information and relative power conditions.

Our research also shows that the more parsimonious model derived from Nash's theory is superior to group utility functions in terms of predictive accuracy. However, the richness of the perceptual data demanded by the group utility functions may provide management with deeper insights about the bargaining *processes*. We focused only on *outcomes*. Given some of the difficulties associated with the measurement of power during a negotiation, further comparisons of the theories with better power measures may be profitable.

We point out several issues for future research. The true test of the theories, however, will be when they are taken into the field and used to predict the outcomes of actual channel negotiations. Despite our efforts to simulate channel interactions in the laboratory, we do not claim to have captured the true levels of intensity, interdependency, and trust of long-term, on-going channel relationships.

The managerial implications of our research obviously must be based on the laboratory study. Extrapolation to the "real world" is probably not appropriate at this juncture. However, if one could extrapolate (i.e., if our findings held up in the field or if we were able to develop a richer channel simulation in the laboratory and achieve the same results), we would argue that the measurement and sharing of information on utilities relating to projected outcomes of the negotiations (via face-to-face communications or through an intermediary) might provide channel members with an input they need to predict the likely negotiation outcome and evaluate its fairness. This input should make the bargaining process more efficient and perhaps more effective as well. Because of the amount of time that might be wasted in an attempt to elicit such information via informal means, more attention to formal utility-based theories seemingly would enhance the productivity of all parties engaged in the process.

REFERENCES

Bacharach, Samuel B. and Edward J. Lawler (1981), *Bargaining: Power, Tactics, and Outcomes*. San Francisco: Jossey-Bass Publishers.

Bazerman, Max H., Thomas Magliozzi, and Margaret A. Neale (1985), "Integrative Bargaining in a Competitive Market," *Organizational Behavior and Human Decision Processes*, 35 (June), 294–313.

Braithwaite, Richard B. (1955), *Theory of Games as a Tool for the Moral Philosopher*. Cambridge: Cambridge University Press.

Brown, James R. and Ralph L. Day (1981), "Measures of Manifest Conflict in Distribution Channels," *Journal of Marketing Research*, 18 (August), 263–74.

Coughlan, Anne T. (1985), "Competition and Cooperation in Marketing Channel Choice: Theory and Application," *Marketing Science*, 4 (Spring), 110–29.

Cronbach, Lee J. (1951), "Coefficient Alpha and the Internal Structure of Tests," *Psychometrika*, 16 (September), 297–334.

Currim, Imran S. and Rakesh K. Sarin (1984), "A Comparative Evaluation of Multiattribute Consumer Preference Models," *Management Science*, 30 (May), 543–61.

Dawes, Robyn M. and Bernard Corrigan (1974), "Linear Models in Decision-Making," *Psychological Bulletin*, 81 (February), 95–106.

Dwyer, Robert F. and Orville C. Walker, Jr. (1981), "Bargaining in an Asymmetrical Power Structure," *Journal of Marketing*, 45 (Winter), 104–15.

Dyer, James S. and Ralph F. Miles, Jr. (1976), "An Actual Application of Collective Choice Theory to the Selection of Trajectories for the Mariner Jupiter/Saturn 1977 Project," *Operations Research*, 24 (March/April), 220–4.

Edwards, W. (1977), "How to Use Multi-Attribute Utility Measurement for Social Decision-Making," *IEEE Transaction on Systems, Man, and Cybernetics*, SMC-7 (May), 326–39.

Eliashberg, Jehoshua (1980), "Consumer Preference Judgments: An Exposition with Empirical Applications," *Management Science*, 26 (January), 60–77.

——— and Donald A. Michie (1984), "Multiple Business Goals Sets as Determinants of Marketing Channel Conflict: An Empirical Study," *Journal of Marketing Research*, 21 (February), 75–88.

——— and Robert L. Winkler (1981), "Risk Sharing and Group Decision-Making," *Management Science*, 27 (November), 1221–35.

Etgar, Michael (1976), "Channel Domination and Countervailing Power in Distribution Channels," *Journal of Marketing Research*, 13 (August), 254–62.

Frazier, Gary L. (1983), "On the Measurement of Interfirm Power in Channels of Distribution," *Journal of Marketing Research*, 20 (May), 158–66.

Harsanyi, John C. (1955), "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility," *Journal of Political Economy*, 63 (August), 309–21.

——— and Reinhard Selten (1972), "A Generalized Nash Solution for Two-Person Bargaining Games with Incomplete Information," *Management Science*, 18 (January), 80–106.

Hauser, John R. and Glen L. Urban (1979), "Assessment of Attribute Importances and Consumer Utility Functions: von Neumann-Morgenstern Theory Applied to Consumer Behavior," *Journal of Consumer Research*, 5 (March), 251–62.

Howard, Ronald (1968), "The Foundations of Decision Analysis," *IEEE Transactions on Systems Science and Cybernetics*, SSC-4 (September), 211–19.

——— (1975), "Social Decision Analysis," *Proceedings of the IEEE*, 63, 359–71.

Huber, George P. (1974), "Multiattribute Utility Models: A Field and Field-Like Studies," *Management Science*, 20 (June), 1393–402.

Isbell, John R. (1959), "Absolute Games," *Annals of Mathematical Studies*, 52, 357–96.

Jeuland, Abel P. and Steven M. Shugan (1983), "Managing Channel Profits," *Marketing Science*, 2 (Summer), 239–72.

John, George (1984), "An Empirical Investigation of Some Antecedents of Opportunism in a Marketing Channel," *Journal of Marketing Research*, 21 (August), 278–89.

Johnson, E. M. and George P. Huber (1977), "The Technology of Utility Assessment," *IEEE Transactions on Systems, Man, and Cybernetics*, SMC-7 (May), 311–25.

Kalai, Ehud (1977), "Nonsymmetric Nash Solutions and Replications of Two-Person Bargaining," *International Journal of Game Theory*, 6, 129–33.

Keeney, Ralph L. (1977), "A Utility Function for Examining Policy Affecting Salmon on the Skeena River," *Journal of Fishery Research Board of Canada*, 34, 49–63.

——— and Craig W. Kirkwood (1975), "Group Decision-Making Using Cardinal Social Welfare Functions," *Management Science*, 22 (December), 430–7.

——— and Howard Raiffa (1976), *Decisions with Multiple Objectives*. New York: John Wiley & Sons, Inc.

LaValle, Irving H. (1978), *Fundamentals of Decision Analysis*. New York: Holt, Rinehart and Winston.

Luce, Duncan R. and Howard Raiffa (1957), *Games and Decisions*. New York: John Wiley & Sons, Inc.

Lusch, Robert F. and James R. Brown (1982), "A Modified Model of Power in the Marketing Channel," *Journal of Marketing Research*, 19 (August), 312–23.

McGuire, Timothy W. and Richard Staelin (1983), "An Industry Equilibrium Analysis of Downstream Vertical Integration," *Marketing Science*, 2 (Spring), 161–92.

Nash, John F. (1950), "The Bargaining Problem," *Econometrica*, 18 (April), 155–62.

Neslin, Scott A. and Leonard Greenhalgh (1983), "Nash's Theory of Cooperative Games as a Predictor of the Outcomes of Buyer-Seller Negotiations: An Experiment in Media Purchasing," *Journal of Marketing Research*, 20 (November), 368–79.

——— and ——— (1984), "The Ability of Nash's Theory of Cooperative Games to Predict the Outcome of Buyer-Seller Negotiations: A Dyad-Level Test," Working Paper #131, Dartmouth College, forthcoming in *Management Science*.

Nydegger, Rudy V. and Guillermo Owen (1975), "Two-Person Bargaining: An Experimental Test of the Nash Axioms," *International Journal of Game Theory*, 3, 239–49.

Raiffa, Howard (1953), "Arbitration Schemes for Generalized Two-Person Games," in *Contributions to the Theory of Games II: Annals of Mathematical Studies*, Harold W. Kuhn and Albert W. Tucker, eds. Princeton, NJ: Princeton University Press.

——— (1968), *Decision Analysis*. Reading, MA: Addison-Wesley Publishing Company, 220–33.

Riddell, W. Craig (1981), "Bargaining Under Uncertainty," *American Economic Review*, 71 (September), 579–90.

Roering, Kenneth J., E. Allen Slusher, and Robert D. Schooler (1975), "Commitment of Further Interaction in Marketing Transactions," *Journal of Applied Psychology*, 60 (June), 386–8.

Roscoe, John T. (1975), *Fundamental Research Statistics for the Behavioral Sciences*. New York: Holt, Rinehart and Winston.

Roth, Alvin E. (1979), *Axiomatic Models of Bargaining*. Berlin and New York: Springer Verlag.

——— and Michael W. K. Malouf (1979), "Game-Theoretic Models and the Role of Information in Bargaining," *Psychological Review*, 86 (November), 574–94.

Shapley, Lloyd S. (1953), "A Value of n-Person Games," in *Contributions to the Theory of Games II: Annals of Mathematical Studies*, Harold W. Kuhn and Albert W. Tucker, eds. Princeton, NJ: Princeton University Press.

Stern, Louis W. and Adel El-Ansary (1982), *Marketing Channels*, 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, Inc.

——— and Torger Reve (1980), "Distribution Channels as Political Economies: A Framework for Comparative Analysis," *Journal of Marketing*, 44 (Summer), 52–64.

———, Brian Sternthal, and C. Samuel Craig (1973), "Managing Conflict in Distribution Channels: A Laboratory Study," *Journal of Marketing Research*, 10 (May), 169–79.

Swalm, Ralph O. (1966), "Utility Theory—Insights into Risk Taking," *Harvard Business Review*, 44 (November/December), 123–36.

Thibaut, John W. and Harold H. Kelley (1959), *The Social Psychology of Groups*. New York: John Wiley & Sons, Inc.

Torrance, George W., Michael H. Boyle, and Sargent P. Horwood (1982), "Application of Multi-Attribute Utility Theory to Measure Social Preferences for Health States," *Operations Research*, 30 (November/December), 1043–69.

von Neumann, John and Oskar Morgenstern (1947), *Theory of Games and Economic Behavior*. Princeton, NJ: Princeton University Press.

Winkler, Robert L. (1968), "The Consensus of Subjective Probability Distributions," *Management Science*, 15 (October), B61–B75.