

The Effect of Multiple Anchors on Anchoring in Individual and Group Judgment

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This article examines whether the availability of multiple anchors reduces anchoring induced bias in individual and group judgment. Based on earlier research, it was unclear whether multiple anchors would mitigate anchoring effects. This issue was investigated in the context of a two-party, single issue negotiation. ANOVA revealed that an unreliable anchor introduced just before the negotiation was to occur was sufficient to induce substantial anchoring effects that were as large for groups as they were for individuals. This pattern was equally apparent in the judgments of MBA students ($n = 105$) and experienced managers ($n = 135$). Initial offers, aspiration levels, and bottom lines were all affected even though relevant anchors such as information about the certain financial consequences associated with a failure to reach a negotiated agreement were provided. An analysis based on social decision scheme theory suggests that groups did not debias individual judgment because groups did not use anchoring and adjustment to make estimates. Rather, group decisions reflected the majority point of view as it existed at the outset of group discussion. If no majority existed, groups tended to reach consensus by averaging the pre-group estimates of individuals. Implications of these findings for anchoring theory are discussed. © 1997 Academic Press

Some of the most difficult and important decisions that negotiators must make involve determinations that are appropriately made before the bargaining begins. Included in this category of judgments are choices about what one will initially request, one would like to receive, and one would, at a minimum, accept. These

decisions are all in turn linked to a negotiator's perception of the value of the issues in dispute. The evidence is consistent with the view that when people attempt to estimate a magnitude that is uncertain or unknown, they rely on a process called anchoring (Slovic & Lichtenstein, 1971; Tversky & Kahneman, 1974).

According to this process, people estimate unknown values by starting from an initial value, called an anchor, that is then adjusted to arrive at a final estimate. Depending on the extent of uncertainty present, such adjustments to the anchor are usually insufficient, with the result that final estimates are biased towards the anchor. The most significant risks posed by anchoring and adjustment, however, "... lie mainly in the way the original anchor is generated" (Hogarth, 1988, p. 54). Inaccuracies in judgment are particularly likely when anchors are selected at random rather than on the basis of relevance (Bazerman, 1990). Relevance in turn is determined by the nature of the substantive relationship between the anchor and the issues under consideration.

Anchoring is a robust phenomenon that has been observed in many domains and tasks, including assessing probabilities (Edwards, Lindman, & Philips, 1965; Lopes, 1985, 1987; Peterson & DuCharme, 1967; Wright & Anderson, 1989), predicting based on historical data (Sniezek, 1988), making utility assessments (Johnson & Schkade, 1988; Shanteau & Phelps, 1979), exercising clinical judgment (Friedlander & Stockman, 1983), inferring causal attributions (Quattrone, 1982), estimating confidence ranges (Block & Harper, 1991), making accounting-related judgments (Butler, 1986; Joyce & Biddle, 1981), goal setting (Mano, 1990), making motivation-related judgments (Cervone & Peake, 1986; Switzer & Sniezek, 1991), belief updating and change (Einhorn & Hogarth, 1985; Hogarth & Einhorn,

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1989), predicting spousal preferences for new products (Davis, Hoch, & Ragsdale, 1986), evaluating product bundles (Yadov, 1994), and determining listing prices for houses (Northcraft & Neale, 1987).

Most of this research demonstrates anchoring and adjustment across a variety of people and settings but leaves the basic theory of anchoring as described by Tversky and Kahneman (1974) unchanged. In most anchoring studies, individuals have been asked to provide a numerical estimate regarding the frequency of a class or the value of an object when that frequency or value is either not known or subjective in nature. For example, Northcraft and Neale (1987) randomly assigned real estate agents to one of four anchor conditions by providing them with different listing prices for the same house. After viewing the house and reviewing considerable information about it, the agents were then asked to estimate various amounts, including the price for which they would list the house. The agents' responses indicated that they were significantly influenced by the listing price anchor. The evidence from these and other studies suggest that when people are provided with an anchor, even one that has no apparent logical connection to the estimate being made, they tend to use it. As a result, estimates under uncertainty are influenced regardless whether a sound basis for that influence exists.

Less is known about more typical situations, however, such as when many anchors of varying degrees of relevance to the estimate required are available. Multiple anchors characterize many task environments and may affect the ability of anchoring to influence judgment under uncertainty. Studying the consequences of multiple anchors for judgment could therefore shed light on how anchors operate in real-life settings.

As an example, consider how anchoring might affect the vendor of a house who is faced with the task of determining a listing price. There are many possible anchors in this situation, including a real estate broker's suggested listing price, the results of a professional home appraisal, the price of the home that the vendor intends to purchase with the proceeds of the sale, or the price that the vendor originally paid for the house. The abundance of potential anchors here is illustrative of the extent to which multiple anchors of varying quality characterize many situations. The presence of multiple potential anchors complicates the task of predicting the effect of anchoring on judgment.

This example also illustrates that reliance on a given anchor may depend on factors other than normative appropriateness. The final potential anchor referred to above was the price paid by the vendor for the house. These are sunk costs, which according to the dictates of economic rationality should not influence the seller's

decision making. Yet evidence suggests that original purchase price significantly influences a seller's lowest acceptable offer (Dickmann, Tenbrusel, Shah, Schroth, & Bazerman, 1996). These results are consistent with the view that irrelevant anchors may exert powerful effects on judgment, even when relevant potential anchors are available.

Another factor that may influence the capacity of anchoring to bias judgment under uncertainty is the social context in which most important estimates are made. Anchoring at the group level of analysis has received little research attention although groups are an important influence on judgment in real-life settings. Do groups make more accurate estimates under uncertainty than individuals? More specifically, does group judgment manifest less distortion caused by anchoring than individual judgment? Groups may rely on mechanisms other than anchoring and adjustment to make estimates under uncertainty. If the negative effects of anchoring are dissipated by group judgment, then anchoring should be cause for little concern because most important decisions in organizations are made by groups (Donaldson & Lorsch, 1983).

ANCHORING IN NEGOTIATION

One activity that both individuals and groups commonly engage in, and for which multiple potential anchors are normally available, is negotiation. A negotiation would therefore seem to be a particularly conducive context in which to examine how anchoring affects individual and group judgment when multiple potential anchors are available.

Anchoring could manifest itself in negotiation in a variety of ways. For example, anchoring could affect the initial positions, aspirations, or bottom lines of negotiators. Initial position in this study refers to a negotiator's opening offer or asking price. Aspiration level was defined for the purposes of this research as the target or least positive outcome with which a negotiator would be satisfied. A bottom line refers here to the least positive outcome or lowest price that a negotiator would ultimately accept rather than face an impasse. The distinction between an aspiration level and a bottom line implies that negotiators may accept agreements with which they are not satisfied. Such behavior is justified when the value of an agreement exceeds the value of an impasse (Fisher, Ury, & Patton, 1991).

To the extent that anchoring influences the initial positions taken by negotiators, it is likely to impact both the processes and outcomes of negotiation. The initial offer itself may serve as an anchor in subsequent discussions. Research consistently indicates a positive

correlation between initial positions and final agreements (e.g., Chertkoff & Conley, 1967; Benton, Kelley, & Liebling, 1972). Negotiated outcomes are strongly influenced by initial offers, particularly when uncertainty or ambiguity characterizes the issues under consideration (Neale & Northcraft, 1991; Bazerman & Neale, 1992).

Anchoring might also affect the aspiration levels of negotiators. If so, then anchoring may indirectly affect negotiation through the amount of effort negotiators exert in pursuit of their objectives. Aspiration levels represent negotiators' goals. Research suggests that negotiators who set difficult and specific goals tend to outperform those who do not (Huber & Neale, 1986).

Anchoring could also affect negotiation by influencing where negotiators set their bottom lines. For example, in a two-party, single issue negotiation over price, a zone of possible agreement is formed by the overlap in acceptable price ranges. This zone therefore represents the range of possible settlements which both parties should prefer to no agreement. If anchoring influences negotiators' bottom lines, it has the potential to determine the location and size of the zone of possible agreement and whether such a zone exists at all.

From a normative perspective, however, a negotiator's bottom line should reflect the value of no agreement to the negotiator. When a negotiator's bottom line reflects the value of his or her best alternative to a negotiated agreement, it is called a reservation price (Raiffa, 1982; Bazerman & Neale, 1992).

ANCHORING WITH MULTIPLE ANCHORS

There are at least two ways that many potential anchors might reduce the susceptibility of individuals to the influence of an anchor. Previous anchoring studies have usually presented subjects with a single anchor from which to make an estimate. The availability of more than one anchor, however, reduces the probability that subjects will rely on any given anchor. Presumably, as the number of potential anchors rises, the probability that people would rely on any one anchor would fall.

Support for this notion was found by Switzer and Snizek (1991), who examined the influence of anchoring on estimates of the Act-to-Product contingency function in Naylor, Pritchard, and Ilgen's (1980) theory of behavior in organizations. In this study, the anchoring information referred to number of sentences in a single session that were correctly transferred in an editing task. In the multiple anchor condition, subjects were provided with high or low assigned goals as potential anchors and were also told about others' typical performance attainments. This additional information was inconsistent with the assigned goal because the goal

anchors were 9 or 27 whereas the additional information was 18. This additional information diminished the anchoring effect of the assigned goals. Subjects' judgments were influenced by multiple anchors, but that influence was reduced when the anchors contradicted each other (Switzer & Snizek, 1991).

Multiple anchors could also dilute the effects of an irrelevant anchor because anchors may differ in terms of their quality or relevance to the type of estimate required. Presumably, when individuals have multiple anchors of varying quality from which to choose, they will tend to select those anchors that are most relevant to the task at hand. When both relevant and irrelevant information are available, the former should be preferred to the latter because only the former can increase judgment accuracy (Switzer & Snizek, 1991).

Multiple anchors of differing quality could therefore reduce the extent to which anchoring on unreliable sources occurs. Thus, in the presence of such multiple anchors, anchoring on random information may have less of an effect on the processes and outcomes of negotiations than is currently believed (e.g., Bazerman & Neale, 1992). Of course, normative theories of well-calibrated subjective probability assessment urge the incorporation of substantively relevant data without falling prey at all to biases and heuristics such as anchoring (Raiffa, 1968).

ANCHORING IN GROUP JUDGMENT

If multiple anchors might reduce anchoring induced bias at the individual level of analysis, then how might multiple anchors affect judgment at the group level? Davis (1992) argued that group-level outcomes are not always predictable on the basis of the knowledge of individual level performance. An intuitive prediction of group behavior with respect to anchoring suggests that groups may reduce anchoring related bias. Snizek (1992) makes precisely this point in describing the "competing anchors" hypothesis. This hypothesis assumes that the unique judgments of individual group members result in multiple potential anchors for group judgment. Evaluation of the multiple competing starting points serves to debias individual judgments resulting from anchoring and adjustment at the individual level. As a result, bias in group judgment should be less than in individual judgment. This argument thus supports the notion of debiasing via aggregation.

This supposition is supported by evidence that groups make more accurate judgments, on average, than individuals (Hastie, 1986; Snizek & Henry, 1989). The greater human resources available in a group provide groups with more knowledge and skill, a greater number of approaches to a problem, and the ability to eliminate clearly faulty reasoning (Maier, 1967). Groups can

also cancel the errors of individual members (Shaw, 1932). These attributes might enable groups to reduce, if not eliminate, the effects of an inappropriate anchor, particularly if relevant anchors are available.

Although it may be intuitively compelling that groups should be less affected by biases induced by such processes as anchoring, intuitions about aggregate behavior have often fared poorly when investigated empirically. Davis (1992) cites the group problem solving and brainstorming literatures as providing little evidence that social interaction fostered better problem solving and decision making than individuals working alone.

Stasser (1992) also suggests that groups appear to have an advantage over individual decision makers, but that appearances can be deceiving. Groups are actually quite poor at pooling information held by their members, and as a result reach decisions that do not reflect their collective knowledge. If, as Stasser suggests, groups focus on things that their members all knew before discussion, and exchange very little information that is not held in common, it seems unlikely that the various anchors of the individual group members, if different, would produce multiple potential starting points for group judgment. On this basis one would predict that groups would be as susceptible to anchoring induced bias as individuals.

This prediction, however, differs from the results of other studies that document the phenomenon of groups exacerbating individual level biases (e.g., Argote, Seabright, & Dyer, 1986; Nagao, Tindale, Hinsz, & Davis, 1985; Whyte, 1993). One explanation for this effect is rooted in persuasive arguments theory, which was developed to explain the group polarization phenomenon. According to this perspective, no single individual will be aware of all the arguments that exist for each of the decision alternatives. As arguments are made during the course of group discussion, polarization occurs in the direction of the alternative for which the greatest number of arguments have been made (Burnstein & Vinokur, 1977).

Groups have the capacity to elevate or diminish individual performance, but predicting the conditions under which groups will have either effect is complicated by the diversity of tasks, groups, and settings that have been studied to this point. Because of our inability to draw strong conclusions on the basis of the foregoing discussion, we have chosen to ask questions rather than to formulate specific hypotheses. We asked and investigated the following questions:

Q1. Given reservation price and other relevant anchors, will the initial offers, aspiration levels, and bottom lines of individuals in negotiation be affected by an unreliable anchor?

Q2. Given reservation price and other relevant anchors, will the

initial offers, aspiration levels, and bottom lines of groups in negotiation be affected by an unreliable anchor?

Q3. Do groups in negotiation debias individual judgment resulting from anchoring and adjustment?

STUDY 1

Method

Sample. Subjects in Study 1 were MBA students attending a large North American University. A total of 105 MBA students, 57 men and 48 women, participated in the study. The students were, on average, 27 years old ($SD = 3.3$), with an average of 4.1 years ($SD = 3.1$) of full-time work experience.

Study design. The study employed a 3×2 (anchor \times negotiating entity) mixed-factorial design to determine the susceptibility of individuals and groups to anchoring effects in negotiation.

Stimulus materials. Three unique sets of stimulus materials were used in this study. All materials contained instructions for participants, a description of a negotiation scenario, and one of three anchor manipulations. Each subject received only one of the three versions of the stimulus materials. The materials were randomly distributed to participants, with the constraint that each of the three conditions contain approximately the same number of subjects.

The instructions informed subjects that they were participating in a study about decision making. Subjects read a case that was based on an actual negotiation in which one of the authors was involved. The case describes a situation involving two parties and one issue. The issue is price, and the parties were described as having no prospect of a future relationship.

Subjects were told that they represented an auto parts manufacturer. A meeting had been scheduled on short notice for the next day with representatives of a Japanese firm. Sufficient excess capacity that would otherwise go unused was available to meet an unexpected order of the size needed by the Japanese firm. The case further indicated that, unknown to the Japanese firm, the part was currently being sold for \$20 per unit (a confidential figure), and that the marginal cost to the supplier of producing excess capacity was \$10 per unit. Specifically, subjects were informed that "... the actual additional expenditure required ... for this extra production would come to \$10/unit. Thus any amount over this would represent pure profit." The parts manufacturer's reservation price in this negotiation is therefore \$10 per unit. Subjects were not provided with the reservation price of the Japanese firm but were told that the firm had few options and was highly motivated to strike a deal.

Negotiation theory prescribes a basic strategy to claim maximum value in a single issue negotiation like this one. Negotiators are advised to hide their own reservation price, learn about the reservation price of the other side, and press for an agreement that approaches this reservation price in a way that does not generate face loss or spite (Lax & Sebenius, 1986).

Subjects were assigned to one of three anchor conditions; hence anchor is a three-level, between-subjects factor. Anchor was manipulated in the final paragraph of the materials. Anchor was manipulated in such a way as to provide no useful information about the price that the Japanese firm was offering to pay or might have been willing to pay. In the low anchor condition, the final paragraph read as follows:

When you raised the issue of price today, you initially thought that the translator—who was extremely difficult to understand—said that the Japanese firm “was willing to pay in the \$12 per unit range.” When asked to repeat and clarify this remark, the translator said that he had not mentioned a price, but instead had said the Japanese firm wanted you to propose a price per unit for tomorrow’s meeting. Accepting that the \$12 figure was a misunderstanding, you agreed to the request and are now deciding what price to propose.

In the high anchor condition, the \$12 per unit price was changed to \$32 per unit. In the control condition, the interpreter simply stated clearly that “the Japanese firm wanted you to propose a price for tomorrow’s meeting.”

Negotiating entity refers to the performing unit engaged in the negotiation, and includes individuals and groups consisting of three members. The order of presentation of the negotiating entity manipulation was the same for each subject—individual and then group. That is, after responding to the case, participants were placed into groups of three with others who received the same version of the case.

In this study, negotiating entity is therefore a two-level, within-subjects factor, with response format held constant. Negotiating entity was manipulated as a within-subjects factor to capture the essence of much group decision making, in which individual members commence group discussion having already formed a view about the subject of discussion. Laboratory studies comparing individual with group decision making (e.g., Sniezek & Henry, 1989) for reasons of ecological validity typically have individuals make a decision and then assemble them into groups to make the identical decision (Myers & Lamm, 1976; Myers, 1982).

Measures. Three dependent variables were studied: (a) subjects’ opening offer in the negotiation; (b) the lowest price at which subjects would be satisfied to conclude negotiations; and (c) subjects’ bottom line.

After reading the case, individual subjects answered three questions:

1. Without discussing this case with others, please indicate the price per unit that you would propose;
2. Please indicate the lowest price per unit to be paid by the Japanese firm that you would be satisfied with;
3. Please indicate the absolute lowest price per unit that you would be willing to settle for. If you could not get this price, you would prefer not to make a deal.

Procedure. The study was conducted during class time of a course on organizational behavior. The instructions mentioned that the study was about decision making, and asked subjects to assume that the situation described in the case was real. Results of the study were used as the basis for later class discussion.

Subjects initially responded individually to the questions posed in the case. Groups were then asked to freely discuss the scenario and to attempt to reach consensus on responses to the questions. If all group members were unable to agree after the alternatives had been thoroughly discussed, the groups were allowed to decide on a response using any method to make the decision that they wished.

Results

Dependent measures. A one-way analysis of variance (ANOVA) to test for overall anchor effects was conducted for a single factor design with a three-level between-subjects factor (anchor). This analysis was performed separately on individual and group responses to investigate whether anchor had a significant effect on subjects’ initial offers, aspiration levels, and bottom lines at both the individual and group levels of analysis.

Univariate and multivariate ANOVA to test for overall effects were also conducted for a mixed model design with one three-level between-subjects factor (anchor) and one two-level within-subjects factor (negotiating entity). Since the results for both types of analysis were the same, only the results for the univariate ANOVA will be reported. Results of the analyses were used to investigate whether groups were less or more susceptible to anchoring effects in a negotiation than individuals. These analyses were performed on group level data to allow for cross-level comparisons.

The initial price proposals, aspiration levels, and bottom lines of individuals across all three anchor conditions are summarized in Table 1. The initial price proposals, aspiration levels, and bottom lines of groups are summarized in Table 2.

The results of the analyses on individual data indicate that anchor had a significant effect on the initial offer to be made in the negotiation, $F(2,102) = 16.59$,

TABLE 1

Study 1: MBA Students—Individual Responses (Means and Standard Deviations)

	Offer	Aspiration level	Bottom line
Low anchor (\$12)	20.6 (5.0)	16.5 (4.4)	14.0 (4.5)
Control	29.2 (14.8)	22.2 (12.9)	18.5 (9.6)
High anchor (\$32)	33.6 (7.1)	24.7 (7.8)	21.2 (8.4)

$p < .0001$, on the minimum amount that would leave negotiators satisfied, $F(2,102) = 8.02$, $p < .0006$, and on negotiators' bottom lines, $F(2,102) = 7.86$, $p < .0007$.

Planned comparisons were conducted for all three dependent measures. The high versus low anchor contrast was statistically significant for initial offer, $F = 32.19$, $p < .0001$, aspiration level, $F = 15.33$, $p < .0002$, and bottom line, $F = 15.44$, $p < .0002$.

The effect sizes for differences between means in the low and high anchor conditions are found in Table 3.

Regarding Q1, these results provide support for the view that individual judgment in negotiation is affected by an unreliable anchor, notwithstanding the presence of more appropriate anchors.

Results of the ANOVAs on group responses were similar to results for individual responses. A significant effect of anchor was found on initial offer, $F(2,33) = 6.40$, $p < .005$, aspiration level, $F(2,33) = 3.26$, $p < .05$, and bottom line, $F(2,33) = 3.62$, $p < .04$.

Results of the planned comparisons on the group level dependent measures were also similar to results for individual level data. The high versus low contrast was significant for initial offer, $F = 12.76$, $p < .001$, aspiration level, $F = 6.47$, $p < .02$, and bottom line, $F = 7.21$, $p < .01$.

Regarding Q2, these results demonstrate that group judgment is also affected by an unreliable anchor, regardless of the availability of more suitable anchors.

Q3 asks whether individual and group judgment will be affected to a different degree by an unreliable anchor. Regarding the effect of negotiating entity on the dependent measures, a repeated measures ANOVA discerned no main effect of negotiating entity on initial offer, $F(1,33) = 2.3$, $p < .14$, aspiration level, $F(1,33) = .1$, $p < .80$, or bottom line, $F(1,33) = .9$, $p < .36$. There was also no anchor \times negotiating entity interaction

TABLE 2

MBA Students: Group Responses (Means and Standard Deviations)

	Offer	Aspiration level	Bottom line
Low anchor (\$12)	21.3 (3.4)	16.6 (3.0)	13.9 (3.0)
Control	30.1 (15.1)	21.8 (11.7)	16.9 (8.3)
High anchor (\$32)	37.3 (11.5)	25.7 (9.4)	20.7 (6.5)

TABLE 3

MBA Students: Effect Size Index for Differences between Means in Low and High Anchor Conditions

	Offer	Aspiration level	Bottom line
Individuals	1.07	.67	.56
Groups	1.07	.73	.72

effect on either initial offer, $F(2,33) = .7$, $p < .50$, aspiration level, $F(2,33) = .15$, $p < .86$, or bottom line, $F(2,33) = .27$, $p < .76$. No evidence for debiasing by groups was found. These results provide no support for the view that group judgment is superior to individual judgment in the context of multiple anchors of varying quality.

The data and the results of the analyses reveal a clear and consistent pattern. Both individual and group judgment with respect to key issues in negotiation exhibited a marked bias in the direction of an unreliable anchor, even though more appropriate anchors were available. This bias was manifest to a similar degree in individual and group judgment.

STUDY 2

The degree of anchoring induced bias in both individual and group judgment in study 1 was both surprising and large. Although single issue negotiations are common, one possible explanation for the results may be the relative inexperience in negotiation of the subjects who participated in this study. To investigate whether the anchoring effects that were observed could be accounted for on this basis, we repeated the experiment with a sample of experienced managers.

Method

Sample. A total of 135 managers, 41 women and 94 men, participated in this study. The managers were, on average, 40 years old ($SD = 6.8$), with an average of 17 years ($SD = 6.9$) of full-time work experience. All managers had experience in negotiations and were attending an executive program offered by a North American University.

Procedure. The procedure employed in this study was identical in all respects to the procedure employed in Study 1, except that the managers were randomly assigned to either the low (\$12) or high (\$32) anchor condition only. The control condition was removed because the purpose of Study 2 was to determine whether the results of Study 1 could be replicated with experienced managers.

TABLE 4**Study 2: Managers—Individual Responses (Means and Standard Deviations)**

	Offer	Aspiration level	Bottom line
Low anchor (\$12)	19.3 (4.2)	14.7 (3.0)	12.1 (2.2)
High anchor (\$32)	32.1 (10.2)	22.0 (6.9)	17.4 (7.2)

Results

The initial price proposals, aspiration levels, and bottom lines of individual managers in both anchor conditions are summarized in Table 4. Parallel data for groups of managers are summarized in Table 5. ANOVAs on individual level data revealed that anchor had a significant effect on managers' initial offers, $F(1,131) = 83.88$, $p < .0001$, aspiration levels, $F(1,131) = 58.57$, $p < .0001$, and bottom lines, $F(1,131) = 30.80$, $p < .0001$.

ANOVAs on group level data revealed a similar pattern. Anchor had a significant effect on groups' initial offers, $F(1,43) = 89.35$, $p < .0001$, aspiration levels, $F(1,43) = 37.51$, $p < .0001$, and bottom lines, $F(1,43) = 16.43$, $p < .0002$.

A repeated measures ANOVA revealed no effect of negotiating entity on initial offer, $F(1,43) = 1.2$, $p < .28$, on aspiration level, $F(1,43) = 1.03$, $p < .32$, or on bottom line, $F(1,43) = .46$, $p < .50$. No anchor \times negotiating entity interaction effects were found for either initial offer, $F(1,43) = .24$, $p < .63$, aspiration level, $F(1,43) = .12$, $p < .73$, or bottom line, $F(1,43) = .05$, $p < .82$. These results indicate that both the individual and group judgments of experienced managers are affected by unreliable anchors despite the presence of more appropriate anchors.

Effect sizes for differences between means in the low and high anchor conditions in Study 2 are reported in Table 6.

The pattern of these data and results is very similar to that found in Study 1. Even though participants in Study 2 were exclusively experienced managers, individual and group judgment in the presence of multiple potential anchors continued to exhibit susceptibility to the effects of an inappropriate anchor. Teams of experienced managers displayed this bias to the same degree as individual managers.

TABLE 5**Managers: Group Responses (Means and Standard Deviations)**

	Offer	Aspiration level	Bottom line
Low anchor (\$12)	20.5 (3.9)	15.1 (2.4)	12.4 (1.7)
High anchor (\$32)	32.5 (4.5)	22.8 (5.3)	18.0 (6.1)

TABLE 6**Managers: Effect Size Index for Differences between Means in Low and High Anchor Conditions**

	Offer	Aspiration level	Bottom line
Individuals	.89	.74	.56
Groups	1.43	1.00	.72

SDS Theory and Analysis

To shed further light on the comparison of individuals and groups in this study, and to investigate why group performance was not different from that of individuals, an analysis based on social decision scheme (SDS) theory was conducted. This theory has been useful in examining many questions about collective decision making and social interaction (Ono, Tindale, Hulin, & Davis, 1988). SDS theory is explained elsewhere in detail (e.g., Davis, 1973, 1982; Stasser, Kerr, & Davis, 1989). For our purposes, it is sufficient to state that SDS theory in essence maps group members' preferences into a group response. Group discussion typically commences with an array of group members' opinions, and ends with a group decision. The process that leads to this consensus can be represented as a social decision scheme.

For example, equiprobability suggests that each option suggested by each group member is as likely to be chosen by the group as any other option suggested by any other group member. Proportionality in contrast implies that the likelihood of a given option being selected reflects the proportion of group members who prefer that option. A median social decision scheme implies that the group choice will reflect the median individual response. An averaging model assumes that the group chooses an option that reflects the average of the alternatives preferred by group members individually. A majority/averaging rule implies that the majority predicts the group choice, but if no majority exists then the averaging principle applies. Other schemes can be used to describe other types of social process (Davis, 1982).

The SDS analysis was conducted on individual and group responses to the question about where participants would draw their bottom line. The SDS analysis focused on this question because it is representative of the other questions asked in the study and because explicit information was provided in the case with which participants could easily calculate their reservation price. Any amount negotiated over \$10 per unit would result in a profit greater than would be achieved through no agreement.

A rational negotiator would prefer any agreement that is better, even incrementally, than his or her reservation price. Therefore, from an economic perspective,

a negotiator's bottom line is misplaced to the extent that it does not reflect his or her reservation price (Raiffa, 1982; Lax & Sebenius, 1986). From this perspective, information contained in the anchor manipulation is irrelevant because it does not address this issue. Data from both Study 1 and Study 2 were used in this analysis.

Predictions from eight models, judged appropriate at the outset on intuitive grounds, were examined in this analysis. These models were proportionality; equiprobability; median; averaging; majority/proportionality; majority/equiprobability; majority/median, and majority/averaging. The only statistically acceptable fit was provided by the majority/averaging model (χ^2 in the low anchor condition = 15.5, 21 *df*; χ^2 in the high anchor condition = 39.2, 30 *df*).

DISCUSSION

This research advances the theory of anchoring in several different directions. First, this study demonstrated a powerful anchoring effect, even though the anchor was unrelated to the estimation task to be performed and other relevant and appropriate anchors were provided. The present findings are consistent with previous research that demonstrates the capacity of an arbitrary number to act as an anchor and influence individual judgment when people are provided with little or no other useful information, and extends this work to situations in which relevant anchors are also provided. Anchoring on unreliable information therefore appears to pose a significant risk to the quality of individual judgment even when objectively appropriate anchors are available.

Why would individuals use unreliable information to make estimates when more logically useful anchors are provided? One possibility is that some individuals considered this information to be useful. We attempted to minimize this possibility by indicating and acknowledging in the experimental materials the unreliable source of the anchor manipulation (e.g., first noting that the translator "was extremely difficult to understand" and then "... accepting that the \$12[\$32] figure was a misunderstanding, you agreed to the request and are now deciding what price to propose").

In other words, the anchor was manipulated by information that should have been ignored because it conveyed nothing meaningful about the price that the Japanese firm was offering or might have been willing to pay.¹ And even if subjects chose to ignore the instrument's explicit statement to the contrary and treat the

anchor as meaningful, the economic incentive of the Japanese side to misrepresent the truth implies the need for caution in interpreting such statements. Further, the anchor manipulation conveyed no information whatsoever about the value of participants' no agreement alternative, which is the only information according to negotiation theory that should inform the decision about where to draw a bottom line (Raiffa, 1982; Lax & Sebenius, 1986).

The second way that this study contributes to the theory of anchoring is by shedding light on the anchor selection process. As influential as anchoring appears to be in judgments under uncertainty, it is often impossible to predict how anchoring will affect judgment because it is hard to know what anchor people will use in any given situation. Multiple anchors characterize many task environments, yet no theory of anchor selection exists. If, however, the objective is to predict and explain rather than just describe individual and group judgment, then developing a theoretical framework to explain how and why people come to select an anchor is important.

The present research illuminates the anchor selection process by demonstrating that relevance to the estimation task to be performed may not be the dominant criterion in anchor selection. For example, reservation price, although normatively appropriate for determining a negotiator's bottom line, was not a particularly influential anchor in this study. A more important anchor was useless information that was encountered by negotiators just prior to being asked to make strategic judgments. This suggests that the order in which potential anchors are encountered may determine what anchor or anchors are used. Anchor selection in both studies manifested a recency effect, in which information encountered just prior to key judgments being made heavily influenced those judgments. Such order effects are commonly found in studies of impression formation (Asch, 1946). The significance of order effects in the anchor selection process should be explored in future research.

Regarding individual-group comparisons, research on group decision making has for the most part proceeded independently from and with little conceptual connection to work at the individual level (Kameda & Davis, 1990). The present findings help to connect the individual and group levels of analysis by contributing

that the \$12[\$32] figure was *in fact only* a misunderstanding *and genuinely meaningless*, you . . ." [underlining indicates changes in wording from original instrument]. Individual offers from senior managers (*n* = 75) were \$19.8 for the low anchor, and \$30.2 for the high anchor. Thus, the enhanced unreliability of the anchor did not seem to affect the results.

¹ In a later version of the instrument designed to underscore the unreliability of this anchor, the wording was altered to "Accepting

to the growing literature on the impact of individual heuristics and biases at the group level and by demonstrating that distortions in judgment caused by anchoring are as much of a problem for groups as they are for individuals. Groups are as susceptible to the effects of an arbitrary anchor and are as incapable of disregarding such information as individuals.

The results of the SDS analysis provide an explanation for these findings. The SDS analysis indicated that group decisions were consistent with the view of the majority, but where there was no majority, group decisions reflected an averaging of the positions of group members. Opinion tasks such as the ones for which decisions were required in this study seem likely to engage majority norms (e.g., Kerr *et al.*, 1975). The ratio scale, however, as opposed to nominal categories by which participants could express themselves in this study allowed and perhaps even invited compromises which are well described by an averaging process. That is, the response alternatives available to participants were such that it was possible to select a position that was located somewhere between the positions of group members.

These results paint a rather different picture of the way that groups, as opposed to individuals, make estimates under uncertainty. If individuals anchor and then adjust, the groups appeared to commence the estimation process from the positions of group members. The groups did not select an anchor and then adjust, but rather attempted to find an estimate with which people could agree. The process may be described as one of anchoring and adjustment among individual group members, who then proceeded to negotiate on the basis of their individual differences, rather than one of anchoring and adjustment occurring on the group level. If this is a reasonable description of the process at the group level, it is not surprising that group estimates were as biased by an inappropriate anchor as individual estimates. As long as groups use a majority/averaging heuristic, there are no means by which the groups could improve the quality of decision making because the critical judgment of anchor selection occurred at the individual level.

These results do not support Sziezek's (1992) competing anchors hypothesis. These results, however, suggest that group performance would benefit if groups engaged in the type of process that Sniezek described. Groups therefore should be encouraged to explicitly evaluate the starting points from which group members make their own estimates, and attempt to identify the most genuinely appropriate information on which to base their judgments.

This study also explored differences between graduate students and experienced practicing managers in susceptibility to anchoring. In comparing results across Studies 1 and 2, we found the same kind of anchoring effects with experienced managers that had been observed among students. Although subjects in Study 1 were chosen because they possessed demographic and interest profiles similar to those of non-student managers, evidence suggests that the findings of applied behavioral research are affected by the type of experimental subject (Gordon, Slade, & Schmitt, 1986). In this case, however, the results of Study 2 suggest that experience does little to diminish the effects of a salient but unreliable anchor. Anchoring on inappropriate information therefore appears likely to be observed in a wide variety of settings, even when experienced negotiators are working with a team and notwithstanding the presence of relevant anchors.

According to convention, the operational definition of small, medium, and large differences between means corresponds to standardized effect sizes of .2, .5, and .8, respectively (Cohen, 1977). None of the comparisons between means in the high and low anchor conditions in either study had an effect size of less than .56, and in most cases the effect size was considerably larger. A potential limitation of the present findings, however, involves the absence of financial incentives for making accurate judgments. Effect size might have been smaller had incentives been provided for making accurate judgments, as exist in natural settings. Financial incentives can reduce decision errors caused by insufficient attention. Yet incentives do not eliminate decision biases and may exacerbate errors caused by faulty intuition or task misperception (Stone & Ziebart, 1995; Tversky & Kahneman, 1986).

The evidence regarding the impact of incentives on errors induced by anchoring is mixed. Payoffs for accuracy in one study reduced the extent of error in probability assessment due to the use of anchoring (Wright & Anderson, 1989). In another study, incentives did not reduce the effects of a random anchor (Tversky & Kahneman, 1974). Anchoring, however, can be consciously motivated or it may be automatic and unintended (Ritov, 1986). It might therefore be useful to investigate whether high incentives provided to professional negotiators would mitigate anchoring effects.

The present results indicate the utility of training managers, even experienced ones, to improve their judgment under uncertainty. A necessary condition for both accuracy in judgment and effective negotiation is the ability to use available information appropriately. Only the most relevant information should influence decision makers, who should disregard the irrelevant.

Therefore, rather than educating managers to avoid anchoring, they should be taught how to select appropriate from inappropriate anchors, and to use meaningful information from those anchors in making judgments that will determine their performance. In negotiations, such judgments concern opening positions, aspirations, and bottom lines. One such appropriate anchor in making these judgments are data implying one's reservation price. Another may be past contracts governing similar issues. This advice if followed may not reduce the incidence of anchoring, but may reduce the extent to which this heuristic results in the biased judgments of individuals and groups and the attainment of sub-optimal results.

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