

ECONOMIC RESEARCH REPORTS

ARBITRATION PROCEDURES

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RR # 91-38

July, 1991

**C. V. STARR CENTER
FOR APPLIED ECONOMICS**



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To appear in Peyton Young (ed.), Negotiation Analysis
(Ann Arbor, MI: University of Michigan Press, 1991)

ARBITRATION PROCEDURES*

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*The support of the C. V. Starr Center for Applied Economics is gratefully
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ABSTRACT

Conventional Arbitration, in which an arbitrator is free to choose any settlement in a two-party dispute, is compared with several alternative arbitration procedures:

1. Final-Offer Arbitration (FOA) permits each party to submit a so-called final offer; the arbitrator is restricted to choosing one or the other final offer and cannot split the difference.

2. Combined Arbitration uses FOA if the arbitrator's preferred position is between the two final offers; if the arbitrator's position is outside these offers, Conventional Arbitration is used.

3. Two-Stage and Multistage FOA. Two-Stage FOA allows the initial loser under FOA to respond with a counteroffer; if the arbitrator prefers the counteroffer, the settlement is the average of this counteroffer and the initial winner's offer; otherwise, the initial winner's offer is chosen. Multistage FOA is not limited to two stages but allows for a sequence of offers and counteroffers until one side wins twice in a row, in which case its last offer becomes the settlement.

A game-theoretic analysis of optimal strategies shows that Combined Arbitration, Two-Stage FOA, and Multistage FOA lead to the greatest convergence but not the same settlement. FOA (and a variation called Bonus FOA) do not encourage convergence and, as a consequence, foster more serious bargaining before they are used. The use of FOA in major league baseball and public employee disputes is discussed, and recommendations are offered about the use of the other procedures, depending on the criteria that are deemed most important to satisfy.

ARBITRATION PROCEDURES¹

Steven J. Brams, D. Marc Kilgour, and Samuel Merrill, III

1. Introduction

Arbitration is defined to be "the hearing and determination of a case in controversy by a person chosen by the parties or appointed under statutory authority."² By this definition, not only do the parties to a dispute submit their differences to the judgment of an arbitrator, but there is also the "determination" of an outcome: the dispute does not end in impasse; there is a resolution that both parties are obliged to accept. This was true in biblical times, too:

If a case is too baffling for you to decide, be it a controversy over homicide, civil law, or assault--matters of dispute in your courts--you shall promptly repair to the place which the LORD your God will have chosen, and appear before the levitical priests, or the magistrate in charge at the time, and present your problem. . . . You shall carry out the verdict that is announced to you. (Deut. 17: 8-10)

Thus does arbitration have a venerable history.

We restrict the subsequent analysis to "interest" arbitration, or arbitration between parties with different interests, such as labor and management over wages. "Grievance" or "rights" arbitration, by comparison, refers to the interpretation of the privileges or rights allowed the parties under an existing contract (e.g., what an employer is obligated to do to ensure worker safety). Also, we limit consideration to disputes that involve only two parties, in which one party wants more of something and

the other party less. Two-party disputes, in fact, constitute the great bulk of cases settled by interest arbitration.

If the parties to a dispute cannot reach a settlement on their own, arbitration may be mandated by law. The usual rationale for mandating arbitration is that the external costs (i.e., those to parties not involved) of, say, a strike by police officers or firefighters are so great that imposing a settlement is preferable to imposing those costs on the public.

Of course, the fact that a dispute will be arbitrated if two sides are not able to settle will affect the prior negotiations of the parties. If there is no requirement that arbitration be used as a last resort, the disputants must consider the possibility of an impasse, such as a prolonged strike, if they do not settle. On the other hand, if arbitration is mandatory should negotiations break down, the parties must consider the possibility of an imposed settlement, which may or may not be to their liking. In the event that arbitration is used, the issue of what kind of settlement will be selected depends critically on the arbitration procedure.

Although the dictionary definition of arbitration is silent on how a settlement is determined, traditionally the arbitrator is free to render any judgment, which is what we call Conventional Arbitration. In recent years, however, a number of different procedures have been proposed that do not give the arbitrator free rein in selecting a settlement. For example, one procedure now in common use, Final-Offer Arbitration (FOA), restricts the arbitrator's choices to one or the other of the so-called final offers made by each side. Although this procedure does not induce the two sides to converge by making the same offers--as some of its proponents had hoped--it does give them an incentive to settle on their own, lest the arbitrator

choose an "extreme" offer of the other side. Other procedures do give the two sides more of an incentive to converge, but not necessarily to the settlement preferred by the arbitrator.

If we are to design procedures intelligently, we must model these strategic effects. But good design also requires empirical testing and normative evaluation. At this stage, a comparison of the theoretical predictions of the arbitration models with experience is possible only for two procedures (Conventional Arbitration and FOA), because the other procedures to be discussed are untried. On the other hand, controlled experiments with the other procedures are possible and, in fact, have been conducted in the case of a procedure we call Multistage FOA (Neale and Bazerman, 1987).

Our analysis of different procedures indicates that there is no perfect procedure: trade-offs are inevitable. Thus, for example, there is no procedure that simultaneously induces the parties to converge on their own (so an arbitrated settlement need never be imposed), mirrors the settlement preferred by the arbitrator (which presumably helps to ensure its fairness), and forecloses the possibility of an extreme settlement (by encouraging both sides to compromise if not converge). Our task will be to compare and evaluate some of the most promising procedures that have been proposed.

With the exception of Conventional Arbitration, which tends to lead to exaggerated claims, all the arbitration procedures force the disputants to compromise between attempting to match the arbitrator's judgment and pushing for their own best offers, but they do this in varying degrees. Some procedures induce the disputants to home in on the arbitrator's preferred settlement, whereas others either do not promote such convergence or

induce convergence to some other point. It seems that only the threat of an unfavorable settlement can reduce posturing and get the parties to make concessions and offers that converge; yet convergence may not be to the arbitrator's position. Indeed, as we shall suggest, convergence may not always be desirable.

What one considers desirable, from a normative perspective, depends on the kind of behavior that one believes an arbitration procedure should encourage in the settlement of disputes. We offer some prescriptions, based on different criteria, in the concluding section.

2. Conventional Arbitration

Under the most commonly used form of interest arbitration, Conventional Arbitration, an arbitrator acceptable to both sides of a dispute specifies a settlement that is binding on the parties. It would appear to work well when the arbitrator is knowledgeable about issues and impartial, so any judgment he or she renders is considered fair.

In practice, however, Conventional Arbitration suffers from several disadvantages (Bloom, 1986; Neale and Bazerman, 1987). The most important is that the arbitrator's judgment may not be independent of the two sides' positions. For example, if the arbitrator tends to split the difference between these positions, each side will have an incentive to make an extreme demand and not budge from it (Farber, 1981).³

Of course, it may not pay to exaggerate too much, because arbitrators tend to devalue positions that seem outlandish (Bazerman and Farber, 1985). Nevertheless, Conventional Arbitration does not provide much incentive for the parties to reconcile their differences.

There is a related problem with Conventional Arbitration: it may have a chilling effect on the negotiations that precede the arbitration, especially if there is the perception that the arbitrator may be swayed by exaggerated claims. After all, why should parties negotiate seriously if, by taking extreme positions, they can use these positions to bolster their claims in the arbitration later? But more than just "setting up" an arbitrator, a party may decide to derail a negotiated settlement if it believes it can obtain a better outcome in arbitration.

The extent to which an arbitration procedure encourages serious bargaining--and promotes convergence toward a negotiated settlement--is one of the principal criteria we shall use in evaluating different procedures. Conventional Arbitration does not do well on this criterion insofar as there is any kind of averaging by the arbitrator, which favors the party that is more extreme.

3. Final-Offer Arbitration (FOA)

FOA was proposed in Stevens (1966), though it had been discussed informally earlier (Stern *et al.*, 1975, p. 113, fn. 7). In the last twenty-five years, it has gained widespread attention and use.

Under FOA, each party submits its final offer for a settlement to an arbitrator, who must choose one final offer or the other. The offer chosen by the arbitrator determines the settlement. Unlike Conventional Arbitration, the arbitrator is not permitted to split the difference, or compromise the offers of each side in any other way. One side or the other "wins" by having its offer chosen.

Proponents of FOA have argued that it forces the two sides to converge, eliminating the need for a settlement imposed by the arbitrator, as under Conventional Arbitration. Here is how one analyst described the reasoning underlying the convergence argument:

If the arbitrator or panel was permitted to select only one or the other of the parties' final offers, with no power to make a choice anywhere in between, it was expected that the logic of the procedure would force negotiating parties to continue moving closer together in search of a position that would be most likely to receive neutral sympathy. Ultimately, so the argument went, they would come so close together that they would almost inevitably find their own settlement (Rehmus, 1979, p. 218).

Of course, if the two sides do not converge, or come close to converging, the arbitrator will be forced to pick between two possibly extreme offers. Hence, the value of FOA depends on its ability to induce a negotiated settlement, under the threat of a possibly onerous settlement if one loses under FOA.

In effect, the two parties play a guessing game with each other about where the arbitrator stands, trying to offer a settlement that is favorable to themselves and at the same time does not deviate too much from the judgment of the arbitrator. A number of theorists have modeled these trade-offs,⁴ which we shall analyze with a simple game-theoretic model. We will then compare the theoretical predictions of the model with empirical data from major league baseball and public-employee disputes.

4. A Model of FOA

FOA can be modeled as a two-person game, wherein each party tries to make a more competitive offer than the other. The game is constant-sum, because the gains by one side are exactly balanced by the losses of the other, making the sum of the payoffs to both sides a constant.

We assume that the players have only incomplete information about what the arbitrator thinks is a fair settlement. In the model, this means that the players do not know the arbitrator's preferred settlement but view it as a range of possibilities, some possibly more likely than others. This information is common knowledge--both players know it, each knows that the other knows it, and so on.

The players may acquire this knowledge from a variety of sources. If the arbitrator has a prior record, this may be informative, as well as guidelines to which the arbitrator may be required to adhere. Information on previous settlements of disputes in the same area may also narrow the range of likely choices of the arbitrator. In addition, each side will assess the quality of the arguments presented by both sides in order to try to ascertain in which direction the arbitrator might be pulled.

We do not assume that the players, in taking account of these different factors, will be able to second guess the arbitrator exactly. Instead, we assume that they develop a common perception, described by a probability distribution, about a range of possible settlements. This distribution gives the relative likelihood that different settlements will be preferred by the arbitrator. Thus, the model incorporates uncertainty; that it is viewed in the same manner by both players makes it common knowledge.⁵

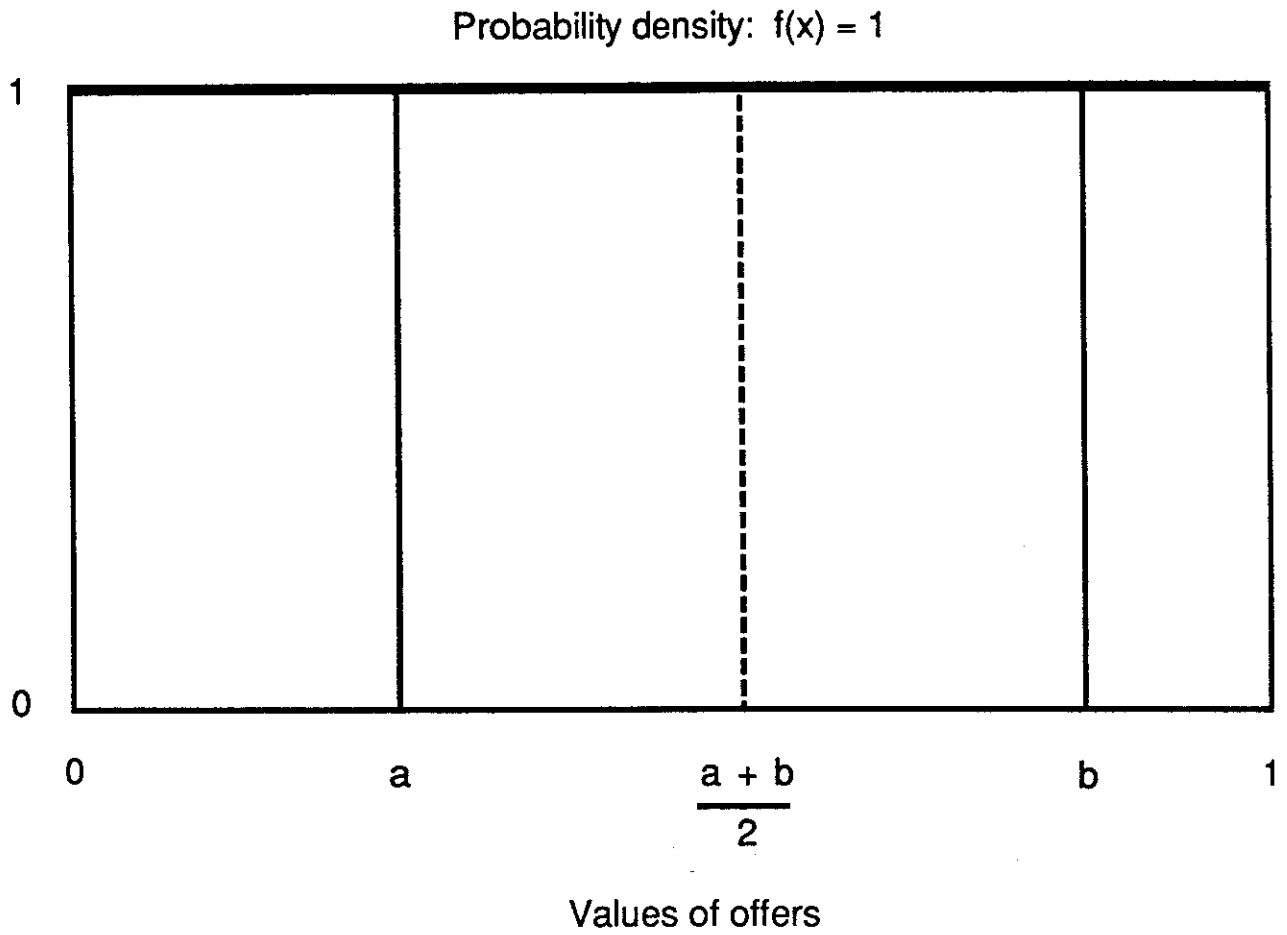
To simplify the analysis, we focus on one simple distribution to illustrate how the optimal strategies of the two parties can be computed under FOA. Additionally, we assume that the dispute is over a single quantifiable issue, such as a wage scale or cost-of-living adjustment, though models of FOA have been developed that allow for more than one issue (Wittman, 1986).

The two disputants begin by making simultaneous final offers; the arbitrator then chooses one or the other.⁶ Let a and b denote the final offers of a "low" bidder A and a "high" bidder B , respectively. A , for example, might be management, which wants to keep the wage scale as low as possible, and B labor, which wants higher wages.

Let x denote the arbitrator's preferred settlement. Under FOA, if x is closer to a , the settlement is a ; if x is closer to b , the settlement is b ; if x is equidistant from a and b , the settlement is a or b with equal probability; and if $a = b$, the settlement is the common value. We do not assume that the players know x but only that the players' beliefs about x are common knowledge and can be represented by some probability distribution. This distribution describes how likely, in the players' eyes, the arbitrator will favor one settlement versus another.

For example, assume that all settlements are equally likely--that is, the players think that x is equally likely to fall anywhere in a specified interval. Management and labor might agree, for example, that the arbitrator is likely to suggest a wage increase x of between \$0 and \$1, and that every value of x in that interval has the same chance of occurring. This assumption about the distribution of x is given by the uniform density

FIGURE 1
FINAL OFFERS OF A (a) and B (b) FOR UNIFORM DISTRIBUTION



function $f(x) = 1$, $0 \leq x \leq 1$, which means that the relative likelihood, $f(x)$, of any x being in the interval from 0 to 1 is the same for all x (see Figure 1).

Figure 1 about here

On the other hand, one might assume that the arbitrator is more likely to be closer to the midpoint of the interval, $1/2$, than the endpoints, 0 or 1. Because the uniform density function is very easy to work with, however, we use it here to illustrate the calculation of the optimal strategies of the players. Later we shall note the effects of other densities on players' optimal strategies.

We begin by defining the expected settlement, $F(a,b)$, which may be interpreted as the payoff that A wants to minimize and B wants to maximize. If $a \geq b$, the final offers converge or crisscross (i.e., A's offer equals or exceeds B's offer). In this case, the settlement is simply equal to the common offer if $a = b$, or the offer closer to the arbitrator if $a > b$. Henceforth we assume for FOA that this is not the case and concentrate on the expected settlement in the case of nonconvergence.

In the latter case,

$$F(a,b) = a(\text{Pr}\{x \text{ is closer to } a\}) + b(\text{Pr}\{x \text{ is closer to } b\}),$$

where Pr indicates the probability of the event inside the brackets. As illustrated in Figure 1, a will be closer to x if x is between 0 and $(a+b)/2$, which will occur with probability $(a+b)/2$. (This probability is simply the area of the rectangle, extending from 0 to the midpoint of the offers of A and B, with height equal to the value of the density function, 1, between

these points.) Likewise, B will be closer to x with probability $1 - (a+b)/2$. Hence,

$$\begin{aligned} F(a,b) &= a[(a+b)/2 - 0] + b[1 - (a+b)/2] \\ &= (a^2 + 2b - b^2)/2. \end{aligned}$$

It is easy to show using calculus that A minimizes $F(a,b)$ by choosing $a = 0$; similarly, B maximizes $F(a,b)$ by choosing $b = 1$.⁷ These strategy choices simultaneously minimize (for A) and maximize (for B) the expected settlement and constitute the solution of this two-person constant-sum game. These strategy choices imply that $F(0,1) = 1/2$, which is the value of the game, or the settlement that the players can ensure for themselves whatever the other player does.⁸

In fact, no matter what strategy B chooses, A's best response is $a = 0$. Similarly, no matter what strategy A chooses, B's best response is $b = 1$. That is, $a = 0$ is a dominant strategy in that it is A's best response to any choice of B in the interval from 0 to 1; similarly, $b = 1$ is a dominant strategy for B. If either player deviates from its dominant strategy, he or she cannot do better and may do worse (see note 8), which make the outcome an equilibrium. For example, if A chooses $a = 0$, but B chooses $b \neq 1$, $F(a,b) < 1/2$, so B, who wants to maximize $F(a,b)$, is hurt by this choice.

It may seem strange that it is the endpoints, 0 and 1, of the interval that are the optimal strategies of A and B, respectively. After all, these strategies are divergent, contrary to the view expressed earlier that FOA will induce each side to approach its adversary in order to maximize the chances of having its offer selected.

The flaw in the earlier reasoning is that, although each player increases the probability that its offer will be chosen by moving toward the midpoint of the distribution, this gain in probability is more than offset by the loss in potential payoff it suffers by compromising its final offer. The net effect is to push the players to the extremities of the distribution, not to pull them toward the center.

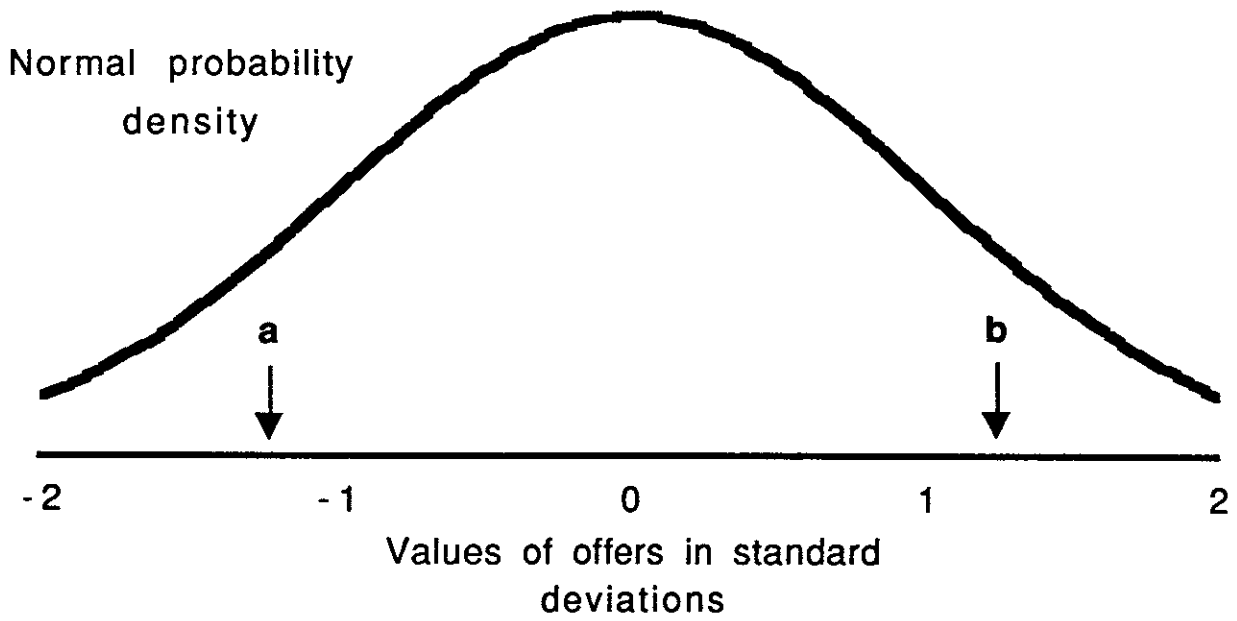
But what if there were "more probability" in the center--say, the density function were unimodal (i.e., had one peak or mode) and symmetric (i.e., had the same shape on each side of the mode)? Under certain conditions, the concentration of area around the center helps, but rarely by very much. For example, the optimal strategies of A and B for the well-known normal distribution are more than two standard deviations apart (2.51 to be exact), which means that 80 percent of the area under this density lies between the optimal positions of A on the left and B on the right (Brams and Merrill, 1983), as shown in Figure 2. The fact that there is an 80-percent

Figure 2 about here

probability that the arbitrator will prefer a less extreme settlement than would be chosen under FOA illustrates, as in the uniform case, how FOA induces one-sided settlements.

For other distributions, a player's optimal strategy may not even lie inside the interval of possible values of x , resulting in an even greater divergence of offers than was illustrated for the uniform distribution. Optimal strategies for still other distributions--including discrete distributions, in which the number of possible offers is finite--may be

FIGURE 2
OPTIMAL FOA STRATEGIES OF A (a) and B (b) FOR NORMAL DISTRIBUTION



"mixed" (involving randomized choices between two "pure," or specific, strategies) or may not exist.

Necessary and sufficient conditions have been found for the existence of different kinds of optimal strategies, which tend to be quite sensitive to the specific distribution assumed over the arbitrator's preferences (Brams and Merrill, 1983). But for essentially all continuous distribution there is never convergence of the optimal final offers (e.g., to the median). Quite the contrary: optimal final offers tend more to be divergent than convergent, often separated by two or more standard deviations.

But is this necessarily bad? According to Stern *et al.* (1975, p. 3), the divergence in final offers "increases the pressure on the parties to take realistic bargaining positions and to settle their dispute through direct negotiations without use of arbitration." Presumably, a reasonable settlement on which the players could agree would be the value of the game under FOA (1/2 in our earlier example), which would obviate the risk of an unfavorable extreme outcome.

5. FOA in Major League Baseball

Negotiated settlements are, in fact, the norm in major league baseball, in which FOA has been used since 1975 to settle salary disputes between the teams and players. Of the 111 major league players who filed for arbitration in 1988, 93 (84 percent) negotiated contracts before FOA was actually used (Chass, 1988). As one baseball arbitrator put it, "I'm starting to feel like the atomic bomb. The deterrent effect of me as an arbitrator is enough" (Cronin, 1989, quoting Stephen B. Goldberg).

Evidently, it is the likelihood of divergent final offers under FOA that puts pressure on the disputants to settle on their own, discouraging the actual use of FOA.⁹ Brams and Merrill (1983, p. 940) called this the paradox of arbitration, arguing that "it takes a procedure like FOA, which implements a biased outcome, to get the two sides to abandon it, bargain seriously, and settle their differences on their own."¹⁰

Despite the fact that the vast majority of settlements in baseball are negotiated, between 1975 and 1989 303 cases went to arbitration. The scorecard reads 165 FOA victories for the teams and 138 for the players (Chass, 1990, p. B14), suggesting that the players are somewhat more aggressive in their demands and, consequently, less likely to win. By contrast, labor union leaders, who have constituents as well as themselves to satisfy, tend to be more conservative, as we will show in the next section.

Another factor may be at work in the case of baseball--the enormous overall increase in recent baseball salaries (thanks to a major television contract), which alleviates the cost of losing. Thus, even the players who went to arbitration and lost made remarkable gains in 1989, averaging incredible 110 percent average salary increases over 1988. By contrast, the FOA winners averaged 135 percent increases, whereas those who negotiated their salaries (84 percent of the total, the same as in 1988) had average increases of 98 percent (Chass, 1990, p. B14). Manifestly, the players who used FOA had stronger cases for big increases than those who negotiated settlements, but perhaps the most striking fact is that average salaries approximately doubled in one year. With that kind of increase, how much risk is there in "losing" under FOA?

6. FOA in Public-Employee Disputes: The Importance of Winning

As of 1981, FOA was used to settle public-employee disputes in ten states (Freeman, 1986).¹¹ Although FOA leads to more negotiated settlements than Conventional Arbitration in such disputes (Freeman, 1986), the risk of losing under FOA has not led to its demise. Instead, players (usually labor) have adopted certain strategies to minimize this risk, depending on how they view the consequences of winning and losing under FOA.

To understand these strategies, suppose that one or both players under FOA derives value from winning per se (e.g., because of the psychic reward from having its offer chosen), above and beyond the gain from the settlement that the arbitrator selects. We model such a situation, in which winning adds independent value to the settlement under FOA, by assuming that the "perceived" settlement is adjusted downward if A wins (so A benefits) and upward if B wins (so B benefits).

Call this adjustment a bonus. A labor negotiator in a wage dispute, for example, may be more satisfied with, say, a 5 percent raise in the pay rate if that settlement is his or her own final offer than if it were management's. By the same token, to management the mere fact that labor's offer is chosen may make it less attractive.

There are various reasons why players may put added value on winning. One reason may be cultural--it is said, for example, that Americans prize winning more than other nationalities. Another may derive from the psychic needs of certain individuals, who, because of insecurities, seek affirmation of their positions.

We suspect, however, that bonuses are at least as much role related as tied to subjective feelings or cultural values. Consider the different roles of labor and management in work disputes. There are several reasons--some admittedly speculative--why labor's bonus might exceed management's, although our subsequent conclusions in no way depend on such a relationship. The rank and file, on whose votes labor leaders depend, tend to be caught up in the euphoria of winning or the frustration of losing a settlement, whereas the people to whom management is responsible (e.g., shareholders or taxpayers) are usually more remote. A string of losses may be fatal to a labor negotiator's position as a union leader. Management negotiators are likely to have less personal stake in the appearance of victory and focus more on the possible long-run consequences of appearing weak. Labor negotiation is only one, albeit an important one, of the concerns of management.

Assume that bonuses for winning--in addition to the value of the settlement--may accrue to one or both parties in a dispute and need not be equal. When only one player derives a bonus from winning, and both players are aware of this (i.e., the bonus is common knowledge), then the player that derives the bonus will be forced toward the position of the one that does not.¹² Say this is labor (B); then B will choose a lower b than is optimal according to our previous calculation.

By contrast, the player (A) who derives no bonus will tend to move away from B by lowering its offer, a , from what was previously optimal. In other words, concessions by one player (B) do not elicit concessions by the other (A). Quite the opposite: both players, instead of moving toward each

other, move leftward or rightward together--in this case leftward by making lower offers, hurting the player who receives the bonus (B).¹³

It is the players' common knowledge of the bonus that allows the player who cares more about winning to be exploited by the player who does not, shifting the equilibrium settlement in the latter's favor. Clearly, it would be in the interest of the party deriving the bonus to hide its bonus--if that were possible--to induce movement by the adversary toward its position rather than away from it.

Such attempts at cover-up are surely made ("we will never surrender"), but they, like bonuses, are often difficult to detect. Nevertheless, it may still be possible to infer which party derives the bonus from the positions that two parties take and some estimate of where the arbitrator stands.

To illustrate this calculation, we turn to a study by Ashenfelter and Bloom (1984) of 423 arbitration cases involving salary disputes between police unions and local governments in New Jersey over the period 1978-80. Of these cases, 324 were conducted under FOA and 99 under Conventional Arbitration. Of the 324 FOA settlements, more than two-thirds (69 percent) were awarded to labor.

Ashenfelter and Bloom (1984) argue that not only were the FOA decisions impartial but also that the arbitrators used the same standards as under Conventional Arbitration, which is a finding independently supported by Farber and Bazerman (1986). Ashenfelter and Bloom (1984, p. 123) indicate, however, that under FOA

the parties may not typically position themselves equally distant

from, and on opposite sides of, the arbitrator's preferred award. This might happen either because unions have a more conservative view of what arbitrators will allow, or because unions may be more fearful of taking a risk of loss than are employers.

Although the first explanation cannot be ruled out (we know of no attitudinal data to test it), the data on offers and settlements allow a test of the second explanation.

To begin with, assume that risk-averse players, because they fear losing, place a higher value on winning. Thus in the New Jersey FOA cases, Brams and Merrill (1991) postulated that labor, but not management, perceived itself to receive a bonus from winning. In fact, the data strongly indicate that labor final offers under FOA, which averaged a 7.9 percent increase in total compensation, more closely approximated arbitrator choices (7.5 percent under Conventional Arbitration) than management final offers, which averaged 5.7 percent.

Using Ashenfelter and Bloom's (1984) estimates for the mean and standard deviation of this distribution, Brams and Merrill (1991) computed labor and management's optimal final offers, both with and without a labor bonus. The hypothesis that labor received no bonus was shown to be untenable. On the other hand, a hypothesized bonus equivalent to about a 4 percent increase in compensation explained well the actual final offers.

But labor, by increasing its probability of winning, may have paid dearly by decreasing the expected value of the settlement. If there were no bonus for labor, our model shows that the average settlement would have

been an 8.0 percent increase, whereas the actual average settlement was a 7.4 percent increase, which, in relative terms, is an 8 percent loss to labor.

7. Variants of FOA That Induce Convergence

Recently, several variations on FOA have been proposed that tend to bring two parties together, sometimes immediately and sometimes in stages:¹⁴

I. Combined Arbitration (Brams and Merrill, 1986; Brams, 1986) mixes Conventional Arbitration and FOA in such a way that both sides are motivated to make the same final offer, provided that they believe that the arbitrator is more likely to favor a middle rather than an extreme position.¹⁵ This hybrid procedure works as follows:

(i) The two parties submit their final offers (a and b) at the same time that the arbitrator records his or her choice of a fair settlement (x).

(ii) If the arbitrator's choice falls between the two final offers (and the offers do not crisscross), then the offer closer to the arbitrator's choice becomes the settlement. Thus, FOA is used in the case of ascending offers a-x-b, with a or b the settlement, depending on which is closer to x.

(iii) If the arbitrator's choice falls outside the two final offers (and the offers are not identical, nor do they crisscross), then the arbitrator's choice is the settlement. Thus, Conventional Arbitration is used in the case of ascending offers a-b-x or x-a-b, with x the settlement in each case.

(iv) If the offers are identical, then the common offer is the settlement. If the offers crisscross (i.e., the minimizer's offer is greater

than the maximizer's offer), then the settlement closer to the arbitrator's choice is the settlement, as under FOA.

Note that rule (iii) allows for the imposition of the arbitrator's judgment-- and, consequently, a settlement more extreme than the final offers of either side. It is especially this rule that induces the parties to converge absolutely, because each party is "protected" on its side by a more extreme arbitrator who favors it. This protection motivates both parties not just to move toward each other--as under Bonus FOA (see note 14)--but to make identical final offers.

II. Two-Stage FOA (Brams, Kilgour, and Weber, 1991) allows the initial loser under FOA to respond with a counteroffer. If closer to the arbitrator's judgment, the loser's counteroffer is averaged with the winner's original offer and becomes the settlement; if the winner's original offer remains closer than the counteroffer, then the original offer becomes the settlement.

To illustrate this procedure, consider how it might work in major league baseball, where T = team (assumed to have a female owner), P = player (assumed to be male), and A = arbitrator (for balance, we leave open the question of gender):

1. T proposes a salary of \$1M and P proposes \$1.3M; both offers are made public. A thinks \$1.1M is fair, but this choice is not announced. (It may be recorded for later reference to permit subsequent verification that A's actions were consistent with his or her judgment.)

2. A selects T as the initial winner because she is closer to A's ideal of \$1.1M than P is.

3. P gets a second chance, after being told that T is the initial winner. Knowing that A's ideal must be between \$1M and \$1.15M (because T's \$1M is closer to A's ideal than P's \$1.3M), P makes a counteroffer of \$1.15M, which is made public.

4. P becomes the new winner because his counteroffer of \$1.15M is now closer to A's ideal of \$1.1M than is T's winning original offer of \$1M. The settlement under Two-Stage FOA is the average of the initial and new winning offers: $(\$1M + \$1.15M)/2 = \$1.075M$.

III. Multistage FOA is similar to Two-Stage FOA, except that the sequence of offers and counteroffers is not limited to two stages but continues until one side wins twice in a row. We can illustrate Multistage FOA by continuing our earlier example. After P becomes the new winner under Two-Stage FOA, instead of there being a settlement, T under Multistage FOA would now have an opportunity to make his own counteroffer--knowing that P won (temporarily) with his counteroffer of \$1.15M--and the process might unfold as follows:

4'. P becomes the new winner because his counteroffer of \$1.15M is now closer to A's ideal of \$1.1M than is T's winning original offer of \$1M.

5. T makes a counteroffer of \$1.06M, which is closer to A's \$1.1M than P's \$1.15M, so T becomes the new winner.

6. P responds with a new counteroffer of \$1.12M, which is closer to A's \$1.1M than T's \$1.06M.

7. T responds with a new counteroffer of \$1.07M, which is not closer to A's \$1.1M than P's \$1.12M. Hence, P's \$1.12M becomes the settlement because he won twice in a row.

By comparison with the settlement under Two-Stage FOA (\$1.075M), the settlement of \$1.12M under Multistage FOA is slightly closer to A's ideal of \$1.1M in this hypothetical example. We emphasize that this example is illustrative of the use to Two-Stage and Multistage FOA, not optimal offers under these procedures, which are given in Brams, Kilgour, and Weber (1991) and Brams (1990, ch. 3).

Both Two-Stage FOA and Multistage FOA lead to convergence of a very different kind from Combined Arbitration: the two sides approach the arbitrator, wherever he or she is located, rather than the perceived median (from which the arbitrator may be quite distant). We shall compare the rationales of each in the concluding section.

Although both the sequential procedures tend to produce less extreme settlements than FOA, Two-Stage FOA is simpler and seems to perform as well as Multistage FOA in many situations. However, it lacks the give-and-take aspect of bargaining that occurs in many real-life situations.

The continuing opportunity that players have to learn from the feedback they receive, and revise their offers accordingly, may be a virtue in arbitration as well as bargaining. On the other hand, Two-Stage FOA is simpler than Multistage FOA and has similar convergence properties.

If near-convergence to the arbitrator's position under Two-Stage or Multistage FOA seems desirable, why, one might ask, not use Conventional

Arbitration? After all, it would absolutely eliminate any discrepancy between the settlement and the arbitrator's position.

The apparent reason for using one of the sequential procedures is that it induces the players to converge on their own. Consequently, the settlement is not imposed, although the players' convergence is very much driven by the perceived position of the arbitrator after the first stage.

If convergence means forcing two parties to accept a settlement contrary to their interests, it would not seem to be a laudable goal. But when the lack of a settlement in, say, a public-employee strike jeopardizes public health or safety, one might reasonably argue that public consequences should take precedence over private interests: arbitration should be able to override any impasse in the negotiations. Even in private disputes, an arbitrated settlement may be appealing because it saves parties from the costs of a prolonged conflict (e.g., a strike) that could bankrupt both of them.

It would seem preferable that the parties reach an agreement on their own--even if driven to do so by an arbitration procedure--than have an arbitrator impose it on them. Judging from the high number of agreements reached in major league baseball without resorting to FOA, the threat of implementing FOA seems to foster negotiated settlements.

Compared with FOA, which tends not to induce convergence, the optimal offers under the procedures described in this section reflect greater sacrifices by the players. But which procedure is best? We address this question in the concluding section by showing how an answer depends on the criteria by which the different procedures are evaluated and the trade-offs they entail.

8. Summary and Conclusions

FOA and its variants force the parties to make some compromises, lest they be hurt by demanding too much. By contrast, under Conventional Arbitration, the disputants are often motivated to posture and make preposterous demands, leading to divergence rather than convergence, especially if the arbitrator is likely to split the difference between the claims of the two sides.

Next to Conventional Arbitration, FOA is the least satisfactory in inducing convergence, unless the parties derive internal bonuses from winning independent of the value of the settlement itself. But if only one party derives an internal bonus, and both parties are aware of it, the party receiving the bonus is hurt in the settlement because its greater receptivity to compromise induces its adversary to toughen its stance and concede less.

The upshot is that the more compromising party, while enhancing its chances of having its offer selected under FOA, does so at the expense of lowering its expected payoff when the parties choose their equilibrium strategies. As seen in the police arbitration disputes in New Jersey, the unions were the exploited party, receiving an average 8 percent less in pay increases than they might have achieved with less conservative final offers, even though they won more than two-thirds of the settlements under FOA.

By comparison, in major league baseball the teams have won more FOA cases than the players, but we suggested that this is because the players represent only themselves and do not have to worry, like labor leaders, about appeasing constituents. Also, even losing under FOA in baseball has reaped the players huge salary increases recently, affording them the

opportunity, by being less timid, to risk failure and still come out substantially ahead.

In selecting an arbitration procedure, the choice depends on what kind of convergence, if any, one deems most desirable. If it is convergence to the median of the arbitrator's probability distribution, then Combined Arbitration seems best equipped to move players there. If it is convergence to what the arbitrator considers fair, then Two-Stage or Multistage FOA seems best, even if it is a position different from the median of the arbitrator's distribution (as the players perceive it).

One's faith in the perceived median as a compromise, versus one's faith in the arbitrator's judgment, will be the determinant of whether one regards Combined Arbitration, or either Two-Stage or Multistage FOA, as the better of the convergence-inducing arbitration procedures for settling disputes. The choice between these alternatives may be summarized in the following fashion:

- Combined Arbitration, more than any other procedure, compels the parties themselves to bargain because it carries the greatest risk for the players of an extreme settlement; the arbitrator's distribution provides them with an orientation, and its median becomes a focal point for agreement.

- Two-stage and Multistage FOA, more than any other procedure, tend to draw the parties toward the arbitrator by introducing the possibility of learning in successive stages, but never at the cost of imposing the arbitrator's judgment upon them (as can occur under Combined Arbitration if the parties fail to converge).

These are the two sets of procedures we find most attractive in fostering convergence. But we leave unresolved which is more equitable, because this determination rests on a normative judgment about what kind of convergence--to the median or the arbitrator's position--one seeks to promote.

A case can be made, we believe, for each kind. One would want to approach the arbitrator if he or she were viewed as being completely impartial, more capable than anyone else of finding an equitable settlement. The median would be more attractive if the players had less faith in the arbitrator's fairness and more in their common perception of what he or she would be most likely to choose--namely, a compromise in the middle (if the distribution is symmetric and unimodal). The former view (arbitrator the best judge) would favor one of the sequential procedures, whereas the latter view (players the best judges) would support Combined Arbitration.

At the same time, we believe, a case can be made for FOA. The fact that it may lead to extreme settlements tends to encourage serious bargaining and negotiated settlements before FOA is used, as has been the case in major league baseball. But when negotiated settlements are harder to reach, as has been true in public-employee disputes, the procedures with more convergence-inducing properties deserve to be considered.

They are, to be sure, untried, but their attractive theoretical properties commend them for experimentation, especially in situations in which the use of Conventional Arbitration or FOA has become routine instead of a last resort. When even FOA fails to stimulate serious bargaining, arbitration procedures like Combined Arbitration, and Two-

Stage and Multistage FDA, seem called for to induce the parties to make greater concessions and strike their own compromises.

NOTES

¹We thank Colin Day, Barry O'Neill, Peyton Young, and anonymous referees for their valuable comments on earlier drafts of this chapter. This chapter is a substantially modified and abbreviated version of Brams (1990, ch. 3), which is adapted with the permission of Routledge.

²Webster's Ninth New Collegiate Dictionary (1983).

³This problem does not afflict FOA: the players' optimal offers are not affected if the arbitrator bases his or her choice in part on these offers. While an arbitrator's split-the-difference philosophy will shift his or her position toward the midpoint of the two offers, this position--as long as it also reflects the arbitrator's independent views--will remain nearer the offer that the arbitrator actually prefers. Hence, the arbitrator will still choose this offer, robbing the players of an incentive to alter their strategies--by making exaggerated claims--even if these have some influence on the arbitrator's position.

⁴See, for example, Farber (1980); Chatterjee (1981); Crawford (1982); Brams and Merrill (1983, 1986); and Wittman (1986). For a model of both conventional and final-offer arbitration, wherein the arbitrator seeks to maximize his or her expected utility based on the offers of the two sides and inferences about their private information (e.g., reservation prices), see Gibbons (1988). In modeling FOA, Samuelson (1989) also assumes the players possess private information in a game of incomplete information; McCall (1990) assumes that the union negotiator has information superior to that of the rank and file in a principal-agent model of FOA.

⁵In a model of Combined Arbitration (to be discussed later), Brams and Merrill (1986) relax the common-knowledge assumption: the players may have different distributions over the arbitrator's preferences.

⁶If the arbitrator is influenced by the final offers, the results we shall describe later still hold, as shown in the exchange between Rabow (1985) and Brams and Merrill (1985) and explained in note 3.

⁷Differentiating $F(a,b)$ with respect to a and b ,

$$\frac{\partial F}{\partial a} = a \quad \frac{\partial F}{\partial b} = 1 - b,$$

and setting the derivatives equal to zero, yields $a = 0$ and $b = 1$, which are a minimum and a maximum, respectively, because

$$\frac{\partial^2 F}{\partial a^2} = 1 > 0 \quad \frac{\partial^2 F}{\partial b^2} = -1 < 0.$$

⁸This value is the best possible for each player in the sense that, if $a = 0$, $F(0,b) \leq 1/2$, so the minimizer guarantees the settlement is never more than $1/2$; and if $b = 1$, $F(a,1) \geq 1/2$, so the maximizer guarantees the settlement is never less than $1/2$.

⁹Because there has been no use of Conventional Arbitration in major league baseball, however, we cannot compare the proportion of negotiated settlements under the two different procedures.

¹⁰On the other hand, an arbitration procedure that induces convergence may also be good, because it facilitates the closing of the final gap that might separate two sides. We discuss such procedures later.

¹¹FOA has also been used in bidding competitions on U.S. Defense Department contracts (Carrington, 1988; Halloran, 1988).

¹²Brams and Merrill (1991). Similarly, Wittman (1986) demonstrated that a risk-averse player, who prefers moderate settlements to risky lotteries, will move toward its adversary. To be risk-averse, in fact, is another way of saying that winning less with greater certainty provides a player with a bonus.

¹³In analyzing "optimum retorts," Raiffa (1982, pp. 114-115) also showed that the best response of one player to another's shift toward the center was to move farther away.

¹⁴The list in the text is not exhaustive. For example, Bonus FOA, proposed by (Brams and Merrill, 1991), gives the winner under FOA a bonus, equal to the gap between the two final offers, for having its offer accepted by the arbitrator. This bonus is paid by the loser to the winner; it is an external reward that is part of the procedure--unlike the internal bonus discussed in section 6, which we interpreted to accrue from the pride or satisfaction of winning.

As an illustration of Bonus FOA, assume management's optimal offer is 4 percent and labor's is 6 percent. Then if labor wins, the settlement is 8 (6 + 2) percent.

Because the stakes of winning and losing are higher under Bonus FOA than under FOA, Bonus FOA provides a greater incentive than does FOA for the parties to approach each other, decreasing the gap separating their optimal offers under FOA by a factor of two-thirds. But once the bonus is added to or subtracted from the offers, depending on who wins, the settlement is exactly the same as under FOA. Thus, if the optimal offers of the two players under FOA are 2 and 8 percent, then under Bonus FOA they would be 4 and 6 percent, making 2 percent and 8 percent the only possible settlements. By comparison, the variants of FOA discussed in the text lead to less lopsided settlements.

¹⁵More precisely, they will converge to the median of the arbitrator's probability distribution if it is unimodal and symmetric.

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