2001

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ERI #2001-02

DISPUTE RESOLUTION WITH "COMBINED" ARBITRATION

by

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February 2001
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Binding arbitration is a common method of alternative dispute resolution used in resolving labor disputes. Two different forms of binding arbitration dominate in practice: conventional arbitration (CA) and final offer arbitration (FOA). In CA, the arbitrator is allowed to choose any settlement as the arbitrated outcome. Criticisms that arbitrators merely “split the difference” of the disputants’ final positions led to the arguments that FOA, in which the arbitrator is constrained to choose one of the disputant’s final offers, might induce more negotiated settlements. A large literature has developed showing that disputants are not, however, theoretically predicted to converge towards agreement under FOA. This paper presents results from a controlled laboratory study of bargaining behavior and dispute rates under an innovative procedure called “combined arbitration” or CombA (Brams and Merrill, 1986). The rules of CombA involve a simple combination of using CA or FOA, depending on whether or not the arbitrator’s notion of a fair settlement lies between the disputants’ final offers. The potential importance of the procedure is that it is theoretically shown to induce convergence of disputants’ final offers. The result is that it theoretically predicts negotiated, as opposed to arbitrated settlements. Disputants generally prefer negotiated settlements, which would also imply substantial cost savings by not actually invoking arbitration. In our experimental environment, subjects anonymously bargain over the size of a disputed variable, X. Subject payoffs are such that bargaining is zero-sum over a $2 pie in each of 20 bargaining rounds. Different dispute resolution procedures are implemented in the event of bargaining impasse at the end of a 2-minute round. We test CombA along with two modified forms of CombA (also
suggested in Brams and Merrill) and find that dispute rates are still significantly higher than when disputes are resolved by destroying the disputed monetary pie (i.e., simulating the high cost of a labor strike perhaps). On the other hand, as the theory predicts, the CombA procedure induces statistically significantly lower dispute rates than the modified CombA procedures that lower the uncertainty costs of basic CombA procedure. To the procedure’s credit, CombA is also shown to not adversely affect negotiated outcomes. The implications of these findings may be significant, and they call for direct comparisons of disputant behavior under CombA, FOA, and CA.

*JEL codes: J5, C9, C7*

Key words: dispute settlement, arbitration, bargaining, experiments
INTRODUCTION

Alternative dispute resolution (ADR) procedures, such as mediation and arbitration, are frequently used to settle labor/management disputes. Binding arbitration is unique among ADR procedures in that it guarantees a settlement, whereas other procedures attempt to facilitate a settlement. As such, binding arbitration has proven particularly attractive as a way of resolving public sector labor disputes where a strike at negotiation impasse is usually not a protected labor action. Two main types of contract (interest) arbitration dominate in these instances.

"Conventional" arbitration (CA) allows the arbitrator to choose any settlement as the binding outcome. "Final-offer" arbitration (FOA), suggested in Stevens (1966), constrains the arbitrator to choose one of the disputant’s final offers as the binding settlement. FOA has been adopted by some jurisdictions in hopes that restricting the arbitrator to choose one of the disputant’s final offers might induce more disputants to arrive at negotiated settlements. Unfortunately, theorists have shown that neither of these commonly used forms of arbitration induces agreement by the disputants. Brams and Merrill (1986) show that a simple combination of CA and FOA—called "Combined" arbitration (CombA)—induces a convergence of the disputants’ final offers under quite plausible conditions. This paper reports results from a controlled laboratory study of disputant behavior under CombA—this is the first evidence to date on the CombA procedure.

Researchers have shown an interest in comparing the effectiveness of different ADR procedures (e.g., Neale and Bazerman (1983), Grigsby and Bigoness (1982), Notz and Starke (1978), and Ashenfelter et al. (1992)). Clearly, a motivating factor in studying CA and FOA is that these procedures are in current use, yet the behavioral incentives of CA and FOA have been shown to predict arbitrated, not negotiated, settlements. Under CA, reasonable offers may not be forthcoming if disputants feel that arbitrators merely l"split the difference” of the disputants’ final positions. Farber and Katz (1979) show that under CA the bargaining “contract zone” is

*The author is an Assistant Professor of Economics and Management and Human Resources at Utah State University. The author is grateful to the Vice-President for Research at Utah State University for funding the experiments for this paper. I also thank Jianlin Cheng, Lujun Zhang, and Pablo F. Rego Barros for valuable computer programming services. I especially thank Stacie Gomm for her efforts on the computerized bargaining environment. Valuable assistance was also provided by Supawan Supanakorn and Bryzan Keith.
increasing in the disputants’ risk aversion and their uncertainty as to the arbitrator’s notion of a fair settlement. Babcock et al (1995), however, show that a contract zone, per se, does not guarantee a settlement or, in the event of a settlement, a quick one. FOA was originally argued to increase uncertainty, and therefore the contract zone, thus making negotiated settlement more likely. However, Farber (1980), Crawford (1979), and Brams and Merrill (1983) show that under FOA, Nash equilibrium final offers do not converge to agreement accept in the case that there is complete certainty as to the arbitrator’s notion of a fair settlement.¹ This is not a realistic case, as this implies by extension that the arbitrator mandates the negotiated settlement in such instances.

Both commonly used forms of arbitration are then predicted to result in arbitrated, as opposed to negotiated, outcomes. Assuming that disputants usually prefer to determine their own settlement versus having an arbitrator impose a binding settlement, CombA is potentially more attractive to the disputants than either CA or FOA, since it theoretically predicts negotiated settlements.² Further, since the arbitration procedure is not invoked when settlements are negotiated, CombA promises potentially significant cost savings as well. An additional virtue of CombA is that it would be relatively easy for disputants to understand the procedure since it combines the rules of two procedures already used in practice. The rules of CombA are as follows (see Brams and Merrill (1986)): If the arbitrator’s notion of a fair settlement lies between the disputants’ final offers, then the rules of FOA are applied. On the other hand, if the arbitrator’s notion of a fair settlement lies outside the final two offers (assuming the

¹ Crawford’s (1979) framework is somewhat different than that of Farber (1980) and Brams and Merrill (1983), but the key point is still made.
² The desire to “save face”, for example, may cause disputants to prefer an arbitrated outcome in some instances.
This simple combination of the two commonly used forms of arbitration is shown to theoretically induce the disputants’ final offers to converge upon the median value of their common estimate of the arbitrator’s notion of a fair settlement.

Researchers have devised a number of innovative arbitration procedures that promise to resolve disputes better than commonly used arbitration. Given that the costs of disagreement are often significant, a systematic study of the effectiveness of innovative procedures has potentially large-scale implications. Consider also the fact that arbitration is used not only in resolving labor contract disputes, but also in resolving commercial disputes, environmental conflicts, and in potentially replacing trials in civil litigation in certain states. The expansion of sales on the Internet has even led to the creation on-line dispute resolution sites, which handle case loads involving tens of millions of dollars already. Still, the successful resolution of labor-management conflict is perhaps most important when significant public sector disruption can result from unsuccessful negotiations. If millions of dollars are already allocated annually using CA or FOA to resolve labor disputes—procedures theoretically predicted to fare worse than the innovative CombA procedure—then it seems apparent that an empirical examination of CombA is needed.

The experimental results reported in this paper involve real subjects making real economic decisions with real cash consequences. While large-scale field studies can cost huge sums of money, smaller-scale laboratory experiments can generate data relatively economically. Furthermore, for dispute resolution procedures such as CombA, where there exists no naturally-

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3 In the event that offers “criss-cross”, such as if management’s final wage offer were greater than or equal to the union’s final wage demand, then either the converged upon offer is chosen, or the offer closest to the arbitrator’s notion of a fair settlement is still chosen.

4 These sites currently use various ad hoc forms of computer-aided bargaining, but on-line arbitration is conceivable as well. The existing sites include www.SquareTrade.com, www.Cybersettle.com, and www.ClickNSettle.com.
occurring data, an experimental environment can be tailored to generate data very specific to the research question at hand. The author’s view is that experiments, in general, can be complementary to field data. And in instances such these, experimental results can provide some initial insights and lower the risk of trial implementation of an arbitration procedure for which there exists no field data. This paper is a first step towards an understanding of how disputants behave under the CombA procedure, and this is a critical step towards a longer-term objective of directly comparing CombA (and other procedures) with commonly used arbitration procedures.

Framework

A framework for bargaining behavior motivated by Farber (1980) incorporates the stochastic nature of arbitrator decisions into the dispute resolution process. The framework we use views negotiations as a zero-sum game. Disputant utility is assumed to be a well-defined function of one quantifiable variable, x. Let utility to Disputant A be $U_a(x) = -x$ (or some parametric shift of this), while utility to disputant B is $U_b(x) = x$. In a union/management context, disputant A would be the manager desiring a low wage offer or wage increase, whereas the union would be disputant B. Assuming that disputants cannot perfectly forecast the arbitrator’s notion of a fair settlement for x in any given case, the disputants’ common estimate of the arbitrator’s notion of a fair settlement is modeled as a probability distribution function $f(x)$. Empirical studies of arbitrator behavior (see Ashenfelter and Bloom (1984), and Ashenfelter (1987)) have revealed that acceptable arbitrator behavior contains a random component that is symmetric around the disputants’ estimation of the median value of $f(x)$, m. In other words, as described in Ashenfelter (1987), arbitrators are statistically exchangeable in the limit, and this allows one to simplify a three-party bargaining environment by drawing arbitrator decisions, z, from a fixed
distribution \( f(x) \). This feature of the arbitration environment is noted and utilized by Ashenfelter et al (1992), and it is an important distinction between their experiments and those in which arbitrator behavior remains uncontrolled (i.e., experiments involving arbitrator role-playing).

Brams and Merrill (1986) show that when modeling bargaining as a zero-sum game, and assuming that the disputants possess identical beliefs about a symmetric and strictly unimodal distribution \( f(x) \), then the global equilibrium pair of final offers under CombA is \((x_a, x_b) = (m, m)\). This result implies that arbitration is not invoked at all, and the disputants negotiate a settlement of \( m \) (see Brams and Merrill (1986) for the theoretical derivation). To the extent that one can create a laboratory environment that closely mimics this theoretical framework of CombA, one can test this prediction of disputant behavior. In terms of the potential acceptability of CombA by actual disputants, Brams and Merrill (1986) note that one characteristic of CombA may prove unattractive to the disputants who contemplate CombA usage. The characteristic is the fact that a more extreme award than either final offer is possible.

In response to potential concerns over extreme offer possibilities in CombA, Brams and Merrill (1986) suggest a modification of CombA—call it CombAMod—which may alleviate these concerns. Since CombA would likely utilize the rules of CA if disputant final offers were close but not convergent (since there would be a relatively high probability that the arbitrator’s notion of a fair settlement, \( z \), would not fall between two very close final offers), the authors suggest that the rules of FOA could still be used even if the arbitrator’s notion of a fair settlement lies outside the disputants’ final offers, as long as the final offers are less than a pre-announced distance, \( \delta \), apart. For example, if management’s final offer was a 9% wage increase and the union’s final offer (demand) was a 9.25% wage increase, then the rules of FOA would be used even if the arbitrator’s notion of a fair settlement was 11%, as long as the pre-announced
CombAMod rule stipulated the use of FOA rules when final offers are within 1% of each other. The result is that when final offers are within the specified δ-limit, an award will never be more extreme than the final offers.

While this modified form of CombA made be more acceptable to the disputants in practice, it comes at a theoretical cost. Specifically, no convergence of final offers is predicted under CombAMod. The Nash equilibrium final offers are predicted as \((x_a, x_b) = \left( m - \frac{\delta}{2}, m + \frac{\delta}{2} \right)\), which is a global equilibrium.\(^5\) Note that under CombAMod, the “safer” the procedure is made for disputants by enlarging δ, the more final offers will diverge. Our experimental environment elicits subject decisions under both CombA and CombAMod (for two different δ values) in order to evaluate both the standard and the modified CombA procedures. If it is empirically shown that there is, as predicted, a larger probability of a dispute (i.e., negotiations impasse) under CombAMod, then the relevant question is whether or not the marginal cost of the higher dispute probability is higher or lower than then marginal benefit of increased procedural acceptability.

More specific details about the experimental procedures are reserved for the next section, but the specific parameterization used in the experimental environment is as follows. Subjects dispute over the size of the variable \(x\). Arbitrator decisions are simulated by drawing random numbers from a normal distribution, \(\mu=500\) and \(\sigma=60\). Information on the arbitrator’s notion of a fair settlement is given by means of a table showing subjects the last 100 draws from the arbitrator’s settlement distribution. For the CombAMod procedure we also test disputant behavior using \(\delta=50, 140\). Each of these forms of arbitration, CombA, CombAMod(50), and

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\(^5\) An additional qualification on these predicted final offers in CombAMod is that \(1/f(m) \geq \delta\), where \(f(m)\) is the value of the arbitrator settlement distribution evaluated at its median. For the normal distribution \((\mu=500, \sigma=60)\) used for the present experiments, this implies that \(\delta\) be less than or equal to \(\sigma \sqrt{2\pi} \approx 150\).
CombAMod(140) is considered an experimental treatment. Given these parameterizations, the predicted final offers are shown in Table 1.

In practice, when binding arbitration is not used to settle contract disputes, a labor strike or management lockout may occur at bargaining impasse. These are often considered the most

<table>
<thead>
<tr>
<th></th>
<th>Predicted disputant final offers ((x_a,x_b))</th>
<th>Convergence?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CombA</td>
<td>(500,500)</td>
<td>Yes</td>
</tr>
<tr>
<td>CombAMod ((\delta=50))</td>
<td>(475,525)</td>
<td>No</td>
</tr>
<tr>
<td>CombAMod ((\delta=140))</td>
<td>(430,570)</td>
<td>No</td>
</tr>
</tbody>
</table>

forceful economic weapons possessed by each side of the bargaining table. In the bargaining experiments, we simulate the relatively higher penalty of a strike or a lockout by including a "no arbitration" treatment in which bargaining impasse results in a zero cash payoff to both disputants. Of course, strikes and lockouts still occur despite their costliness to both union and management. Given this fact, our practically relevant benchmark for comparing negotiated outcomes and dispute rates under CombA and CombAMod will disputant behavior under no arbitration.

**Experiment Details**

Subjects were recruited to participate in the experiments from a variety of different undergraduate classes at Utah State University. Subjects were anonymously and randomly paired with one another and assigned a role of disputant A or B. Subjects remained paired with the same individual throughout all twenty 2-minute bargaining rounds of the experiment, and no
communication (other than through their computer terminals) was allowed in the experiment. While disallowing communication may seem contrary to the spirit of real-world negotiations, to allow communication would introduce "noise" into the experimental data. Face-to-face communications might generate outcomes due, in part, to "...uncontrolled aspects of social interaction" (see Roth (1995)). Indeed, while one can control for demographic variables through supplemental data collection, it would be extremely difficult to quantify and control for factors such as body language. Such factors are, of course, interesting in their own right, but they make more difficult a pure test of the behavioral theories of CombA. As such, we have chosen to remove them from consideration in the controlled experimental environment.

Once all subjects are randomly paired with another subject, each subject reads at his/her own pace the experimental instructions on their computer screens. These instructions give a detailed description of the bargaining environment and procedures for exchanging offers for the value of x. Each subject is also given a hardcopy of a table showing the various cash payoffs for different possible outcomes of the x variable. Subjects are well informed as to how their earnings for a bargaining round are a function of the x outcome in that same bargaining round. Payoffs are such that subjects bargain over the distribution of a $2.00 pie in each bargaining round. Disputant A is instructed to bargain over values of x from 200-700, while disputant B is instructed to bargain over values of x from 300-800. While this detail introduces an informational asymmetry, it does not affect the theoretical predictions that are based on the win-loss bargaining that is created in this experiment—and subjects are aware of the win-loss nature.

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6 Pilot experiments and subject feedback confirmed that a 2-minute round was sufficient time for coming to an agreement on the size of x if the subjects so desired agreement as opposed to impasse.
7 Repeated bargaining with the same counterpart implies that we are using a dynamic experiment to test a static theory. However, experimentalists have noted that individuals often need several rounds of decision-making in order to learn the environment and give the static theory a chance to emerge. Ashenfelter et al (1992) similarly employs repeated bargaining with the same counterpart. Overall, the use of repetition is often considered central to the generation of high quality experiment data.
8 Copies of the experimental instructions can be viewed at http://www.usu.edu/~econmhr/instructions.html.
of the bargaining environment, just not the counterpart’s total payoff amount. The simple fact that the experimental environment places boundaries on the disputants’ bids and offers is also a practical necessity not spoken to in the theory. The purpose of asymmetric bargaining ranges is designed to limit a mechanical fixation on a “split-the-pie” outcome at x=500, and it does mimic the real-world asymmetry that exists in counterpart notions of bargaining ranges in negotiations.¹

Once a general set of instructions have been read and understood, subjects read instructions specific to the method of handling bargaining impasse for the next “several” rounds—subjects completed 5 rounds of each treatment: CombA, CombAMod(50), CombAMod(140), and No Arbitration (NA), although they do not know that there will be 5 rounds of each treatment. At the end of 5 rounds of bargaining, the bargaining screen displays a new set of instructions specific to the dispute resolution procedure for the next “several” rounds. This occurs after every 5 rounds of the experiment (and rounds are randomized in order across the 6 experimental sessions that generated the data). After the 20ᵗʰ round, subjects complete a brief demographic questionnaire and are then paid in cash and in private.

Within the bargaining rounds, disputants are free to submit as many or as few bids and offers for the size of x as they wish. A time clock on the bargaining screen clearly displays the amount of time left in the 2-minute round. There is no restriction that offers alternate or that one disputant submits the first proposal for x. Either disputant can accept the current offer of his/her counterpart at any point up until the end of the round. For the arbitration treatments, disputants are prompted to input their final offers in the event that the round end without agreement. These final offers are the disputants’ last chance to avoid invoking the arbitration procedure. In the

¹ Ashenfelter et al (1992) similarly expressed a concern over mechanical settlements to “split-the-pie”. The dealt with the concern by making the arbitrator’s mean value of the settlement distribution higher than the midpoint of the disputants’ bargaining range. They note that this feature may have made it more difficult for disputants to reach an agreement, and so our procedure may also make dispute more likely compared to having symmetric bargaining ranges. However, treatment comparisons are still just as valid.
event that disputant A’s final offer is higher than disputant B’s final offer, settlement occurs at the average value of the criss-crossed offers. This can be considered analogous to a last-minute out-of-court settlement in a trial.\textsuperscript{10}

Results and Analysis

The data reported are from 48 pairs of subjects.\textsuperscript{11} Subjects received an average experimental payoff of $19.27 (st. dev.=$5.11) for a, roughly, hour and a half experiment. A key statistic in these experiments is the dispute rate, which is the average percentage of rounds in which the disputants fail to reach a settlement. Summary data on the treatment specific dispute rates of 48 bargaining pairs show that dispute rates for NA, CombA, CombAMod(50), and CombAMod(140) are 18\%, 40\%, 55\%, and 56\%, respectively. This is consistent with existing research showing that implementing arbitration procedures, which effectively decrease the cost of disputes, increases dispute rates. Figure 1 shows dispute rates, averaged across all bargaining pairs, for the distinct dispute resolution treatments and the specific within-treatment round. The data in Figure 1 would likely reveal any round-specific effects that could result from, among other things, learning within the treatment.

From Figure 1 it is apparent that dispute rates are lowest in the NA treatment, independent of the bargaining round. Among the arbitration treatments, average dispute rates are lowest under CombA, and roughly similar under the CombAMod treatments. If anything, it

\textsuperscript{10} Technically speaking, the CombA procedure calls for choosing between one of the final offers, even when the final offers criss-cross. Brams and Merrill (1986) show that such criss-crossing of final offers is not an equilibrium. Our experiments can therefore be considered a test of the CombA theory’s robustness with respect to this detail. It should be noted, though, that our experimental results show criss-crossing of final offers in only 1.7\% of the arbitration rounds.

\textsuperscript{11} Date was generated from 50 subject pairs, and two pairs were subsequently dropped from the sample as each pair contained a subject who expressed confusion about the experiment, \textit{ex post} (and such confusion was consistent with these subjects’ earnings as they each earned a payoff of less than $5 given their decisions).
appears that there is a downward trend in dispute rates under CombA that it not present under CombAMod or NA.

The results from regression-based analysis of the basic treatment effects are summarized in Table 2. Column 2 presents probit estimation results of the effects of the various treatments on dispute rates (dispute). While researchers have often focused on dispute rates as the statistic of most interest in evaluating arbitration procedures, our data also allow exploration of the effects that the various arbitration schemes may have on negotiated outcomes. Columns 3 and 4 of Table 2 contain least-squares estimation results of the arbitration treatment effects on the time to reach a negotiated outcome (Agreetime) and on the level of the negotiated X outcome (X-outcome), respectively. All models explicitly account for the interpair heterogeneity in the data.12

Several items stand out from Table 2. Focusing first on the probit model in column 2, one notices that the use of arbitration significantly increases the probability of a dispute. The use of CombA increased the likelihood of a dispute by 26 percent relative to NA. As predicted in theory, the modified form of the CombA procedure increases the probability of disputes relative to CombA. The analysis also shows a marginal increase in dispute rates under CombAMod for the larger δ parameter. The probit model correctly predicts 63% of the disputant outcomes. The CombA procedure does not eliminate disputes (or reduce them to the same level as under NA). Higher dispute rates in the modified procedures (compared to the unmodified CombA) would be expected, however, since convergence of final offers is not theoretically predicted in

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12 The probit model is a random effects probit model, since the estimated value of interperiod (but within pair) correlation is statistically significant (p=.00). In column 3, the estimator is a fixed effects ordinary least squares estimator, whereas the model in column 4 is estimated as a random effects model (generalized least squares estimator). Lagrange Multiplier and Hausman tests support these estimators for the models in columns 3 and 4. The more appropriate fixed effects estimator in column 3 indicates that the pair-specific effects on Agreetime may be correlated with the other regressors. Similar evidence does not exist for correlation between the pair-specific effects on X-outcome and the regressors in the column 4 specification (and hence, a random effects estimator is consistent and more efficient than a fixed-effects estimator).
CombAMod (for any size of $\delta$). This is evidence that subject behavior is still somewhat consistent with the comparative static predictions of dispute rates under CombA and CombAMod.

**TABLE 2**

<table>
<thead>
<tr>
<th></th>
<th>Independent Variable</th>
<th>Independent Variable</th>
<th>Independent Variable</th>
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<tbody>
<tr>
<td></td>
<td>Dispute</td>
<td>Agreetime</td>
<td>X-outcome</td>
</tr>
<tr>
<td></td>
<td>Probit Model (random effects)</td>
<td>Fixed Effects Model</td>
<td>Random Effects Model</td>
</tr>
<tr>
<td></td>
<td>Marginal Effect (p-value)</td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-.35***</td>
<td>Individual specific***</td>
<td>483.91***</td>
</tr>
<tr>
<td><strong>CombA</strong></td>
<td>.26***</td>
<td>-10.91***</td>
<td>10.18</td>
</tr>
<tr>
<td><strong>CombAMod(50)</strong></td>
<td>.39***</td>
<td>-7.23**</td>
<td>8.68</td>
</tr>
<tr>
<td><strong>CombAMod(140)</strong></td>
<td>.41***</td>
<td>-14.06***</td>
<td>1.11</td>
</tr>
<tr>
<td>N=960 (48 pairs times 20 rounds)</td>
<td>(N=505)</td>
<td>(N=505)</td>
<td></td>
</tr>
<tr>
<td>R$^2$</td>
<td>-561.89</td>
<td>.42</td>
<td>.005</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

***, ***, and *** refer to significance at the .10, .05, and .01 level, respectively. For the fixed effects model pair-specific constant terms, we reject the hypothesis of no joint significance of the pair-specific fixed effects based on the F-test ($F_{47,454}=6.20$, $p=.00$)

Columns 3 and 4 of Table 2 examine a different dimension of the effects of the dispute resolution procedures. As noted before, the use of arbitration may also affect negotiated outcomes, not just dispute rates. Farber and Katz (1979) note that the disputants’ uncertainty of the arbitrator’s notion of a fair settlement affects the contract zone and, hence, negotiated outcomes. As such, it is of interest to directly test for potential effects of arbitration on negotiated outcomes, since certain effects may undermine arbitration’s attractiveness to the disputants.

The results from Table 2 show that CombA and CombAMod significantly decrease the time to agreement for negotiated outcomes (column 3). The magnitude of the coefficient on CombA indicates that agreement is likely to occur about 11 seconds faster in CombA than under
NA—this is about 10% faster given the 2 minute bargaining rounds. While this is evidence that CombA significantly affects negotiated outcomes, the fact that it actually expedites the negotiated outcomes is likely an attractive feature of the procedures. If, on the other hand, the CombA procedures were shown to significantly affect the monetary outcome of negotiations, then this would presumably be an undesirable feature of the procedures. Fortunately, as is shown in column 4 of Table 2, neither CombA or the CombAMod procedures significantly affect the level of the negotiated X variable. Notice that such a result is independent of whether buyers or sellers in our experiment are more risk averse, since the balance of the bargaining pair’s risk aversion would also affect negotiated outcomes under the comparison NA treatments.13

In addition to the basic treatment effects model, we also estimate the models of Table 2 with the addition of potentially significant pair-specific attributes. Specifically, we collect data on various demographic characteristics of the subjects and describe each bargaining pair based on the variables listed in Table 3. The inclusion of these variables in our regression analysis is not based on specific theoretical predictions. Rather, their purpose is to serve as indicators of potentially important attributes of disputants, which may serve as a starting point for a more systematic investigation of their effects on negotiations.

The gender variable is meant to explore the potentially significant effect that gender might play in bargaining behavior, as is the variable measuring the subjects’ college major.14 Since most organized religions dissuade followers from conflict, encourage charity, etc., we generate a rough measure of the religious composition of the bargaining pair by asking whether or not the individuals regularly attend religious services. Members of the work force may have

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13 If a procedure were found to significantly increase the level of the X variable, it would be evidence that risk attitudes may be interacting with the procedure itself. The “buyer” in such cases (desiring low levels of X) may have his or her risk aversion magnified by the arbitration procedure and therefore settle for higher X values.

14 Subjects were all college students, and “business” major refers to anyone whose major at this institution is economics, accounting, management & human resources, business information systems, or business administration.
work experience in negotiating over job details, and the “job” variables are designed as a crude proxy of these effects. Finally, experience in actual disputes or negotiations may provide experience that affects subjects’ behavior in subsequent disputes. As such, we measure whether

Table 3

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Variable Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Female</td>
<td>=1 if one of the pair is female</td>
</tr>
<tr>
<td>2Female</td>
<td>=1 if both bargainers are female</td>
</tr>
<tr>
<td>1Business</td>
<td>=1 if one of the pair is a business major</td>
</tr>
<tr>
<td>2Business</td>
<td>=1 if both bargainers are business majors</td>
</tr>
<tr>
<td>1Religious</td>
<td>=1 if one of the pair regularly attends religious services</td>
</tr>
<tr>
<td>2Religious</td>
<td>=1 if both bargainers regularly attend religious services</td>
</tr>
<tr>
<td>1Job</td>
<td>=1 if one of the pair works at least part-time</td>
</tr>
<tr>
<td>2Job</td>
<td>=1 if both bargainers work at least part-time</td>
</tr>
<tr>
<td>1Court*</td>
<td>=1 if one of the pair has been involved in a court case (either plaintiff or defendant)</td>
</tr>
<tr>
<td>1Union*</td>
<td>=1 if one of the pair has been or has a friend or family member who have been union members</td>
</tr>
</tbody>
</table>

*Neither of these measure had enough responses where both individuals responded “yes” to the question, and so we merely measure the effect that having one individual of these types in the bargaining pair.

or not one of the disputants has ever been in litigation or been a union member (or had a family or friend in a union). The results of the reestimations of the models in Table 2 also include a variable to measure the effect of the bargaining round (Round), as well as a variable measuring the total number of previous times during the experimental bargaining that the disputants invoked arbitration (ArbHistory). The results of these estimations are shown in Table 4.15

15 The estimated model for Agreetime is estimated as a random effects model in Table 4, whereas the analogous model including only treatment effects as independent variables was estimated as a fixed effects model. The more appropriate random effects model in Table 4 indicates that, while the pair-specific effects were correlated with other
TABLE 4

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Independent Variable</th>
<th>Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dispute</td>
<td>AgreeTime</td>
</tr>
<tr>
<td></td>
<td>Probit Model</td>
<td>Random Effects Model</td>
</tr>
<tr>
<td></td>
<td>(random effects)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marginal Effect</td>
<td>Coefficient Model</td>
</tr>
<tr>
<td></td>
<td>(p-value)</td>
<td>(p-value)</td>
</tr>
<tr>
<td>Constant</td>
<td>.05</td>
<td>77.96***</td>
</tr>
<tr>
<td>CombA</td>
<td>.29***</td>
<td>-10.93***</td>
</tr>
<tr>
<td>CombAMod(50)</td>
<td>.43***</td>
<td>-7.93**</td>
</tr>
<tr>
<td>CombAMod(140)</td>
<td>.45***</td>
<td>-14.53***</td>
</tr>
<tr>
<td>1Female</td>
<td>-.05</td>
<td>16.70**</td>
</tr>
<tr>
<td>2Female</td>
<td>-.21*</td>
<td>1.26</td>
</tr>
<tr>
<td>1Business</td>
<td>.00</td>
<td>11.08</td>
</tr>
<tr>
<td>2Business</td>
<td>.04</td>
<td>5.46</td>
</tr>
<tr>
<td>1Religious</td>
<td>-.28*</td>
<td>-1.98</td>
</tr>
<tr>
<td>2Religious</td>
<td>-.36**</td>
<td>.511</td>
</tr>
<tr>
<td>1Job</td>
<td>-.08</td>
<td>1.02</td>
</tr>
<tr>
<td>2Job</td>
<td>.08</td>
<td>4.30</td>
</tr>
<tr>
<td>1Court</td>
<td>-.06</td>
<td>1.99</td>
</tr>
<tr>
<td>1Union</td>
<td>-.06</td>
<td>-16.42**</td>
</tr>
<tr>
<td>Round</td>
<td>-.01</td>
<td>-1.01***</td>
</tr>
<tr>
<td>ArbHistory</td>
<td>.02</td>
<td>1.81**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.22**</td>
</tr>
<tr>
<td>N=960 (48 pairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>times 20 rounds)</td>
<td></td>
<td>(N=505)</td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td>.20</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-554.43</td>
<td></td>
</tr>
</tbody>
</table>

*, **, *** refer to significance at the .10, .05, and .01 level, respectively.

The estimations in Table replicate the significant results of the treatment effects shown in Table 2. The estimated effects of the CombA and CombAMod treatments increase by about 3-4 percentage points in each case, but the comparative effects of the different arbitration treatments remain unchanged. Only a small subset of the variables described in Table 3 significantly effect disputes rates or negotiated outcomes. Specifically, when both disputants are female, they are regressors in the model of Table 2, we cannot reject the hypothesis of no correlation in the Table 4 model (and so the random effects estimation is consistent and more efficient than the fixed effects estimation).
21% less likely to dispute, all else equal. This result may imply a specific interaction of two female negotiators that is independent of knowledge of gender (since gender was unknown to the subjects). Similarly, regular attendance of religious services had an important effect on decreasing disputes rates. One “religious” disputant in the pair decreases the probability of dispute by a statistically significant 28%, and when both disputants are “religious”, the probability of disputes is 36% lower than when neither is “religious”.\textsuperscript{16} It appears that attendance of religious services is quite significant at lowering the incidence of conflict, but there is diminishing marginal returns to extra negotiators’ religious association. Overall, the probit model in Table 4 correctly predicts 69% of the disputant outcomes.

While two female disputants significantly lower the probability of dispute, one female disputant significantly increases the \textit{time} to reach a negotiated outcome (although it does not affect the probability of dispute). These gender results are hardly authoritative, but their significant effects on more than one important dimension of bargaining outcomes implies there are likely important gender effects that require more systematic study.

Other statistically significant effects on \textit{Agreetime} include a small (in magnitude) trend towards quicker agreements over the course of the experiment. The magnitude of the coefficient on \textit{Round} suggests that agreement on negotiated outcomes will occur 20 seconds quicker by the 20\textsuperscript{th} round of the experiment. On the other hand, for each round in which the disputants invoke arbitration, the length of time required to reach a negotiated settlement increase by almost 2 seconds—although the lack of significance of the variable \textit{ArbHistory} in the probit model of column 2 reveals no evidence of a “narcotic” effect of arbitration for our sample. Finally, \textit{ArbHistory} also significantly increases the level of the negotiated X variable by approximately \textsuperscript{16} The term “religious” in this paper is meant only to refer to an individual who stated regular attendance at religious services.
1% per instance of invoking arbitration. This last effect suggests that the "sellers" in these experiments may receive more favorable arbitration awards than they obtain through negotiation, and this information is updated into the disputants' subsequent negotiations.

Summary

This paper has presented first evidence of bargaining and dispute rates under the innovative Combined Arbitration procedure devised by Brams and Merrill (1986). In a zero-sum bargaining framework, the CombA procedure is predicted to induce convergence of disputants' final offers, thereby eliminating the need to invoke arbitration. The empirical data generated in a controlled laboratory setting has shown disputants are 26-29% more likely to dispute under CombA than when no arbitration is used and the disputed pie is destroyed. While these results may seem disappointing, several items are worth noting.

While CombA does not eliminate disputes as predicted by theory, dispute rates under CombA are significantly lower (13%-16%) than under the modified CombA procedures, an effect predicted by the theory. Further, it is important that the innovative procedure does not appear to adversely affect negotiated outcomes. To the extent that the various forms of Combined Arbitration affect negotiated outcomes, it is that they expedite negotiated outcomes while not affecting the negotiated level of X. Also, the logical next step to this research is to compare bargaining outcomes under CombA and arbitration procedures commonly used in practice. Herein lies the real interest in examining new methods of binding dispute resolution.17

The author is currently undertaking research to take this next step, and both dispute rates and

17 It seems that the mere existence of an arbitration procedure invites its use by at least some disputants. If our goal as policy makers is to minimize disputes, then perhaps the best form of arbitration would be to let the arbitrator keep the entire disputed amount in the event of bargaining impasse. This may seem ridiculous, but I do not doubt that dispute rates would decrease, as this study has confirmed that the law of demand applies to disputes as well—lower the cost of dispute and bargainers "purchase" more of it.
negotiated outcomes are key variables to analyze in comparing CombA with commonly used CA and FOA (and potentially with other innovative procedures).

We have also found that certain characteristics of the bargaining pair are significant determinants of bargaining outcomes. A pair of female disputants is likely to dispute less frequently, while a mixed male-female pair is likely to delay arrival at negotiated outcomes. Religion may be a significant determinant of disputants' lower propensity to dispute, and some association with labor unions (either personally or vicariously) appears to expedite negotiated outcomes. Previous use of arbitration in the experiment, though it does not increase the probability of current-round disputes, does appear to significantly increase the time to a negotiated settlement. This may be an important cost of any arbitration procedure not typically considered. These are findings with real implications for real world dispute resolution, whether it be the gender choice or bargaining experience level of a chief negotiator, or the dispute resolution procedure itself. As such, we consider this study a first step towards a more systematic use of controlled experiments in generating data on bargaining behavior and alternative dispute resolution.
FIGURE 1
Average Dispute Rates
(averaged across all 48 bargaining pairs)
References


Dispute Resolution with "Combined" Arbitration*

David L. Dickinson

ABSTRACT

Binding arbitration is a common method of alternative dispute resolution used in resolving labor disputes. Two different forms of binding arbitration dominate in practice: conventional arbitration (CA) and final offer arbitration (FOA). In CA, the arbitrator is allowed to choose any settlement as the arbitrated outcome. Criticisms that arbitrators merely "split the difference" of the disputants' final positions led to the arguments that FOA, in which the arbitrator is constrained to choose one of the disputant's final offers, might induce more negotiated settlements. A large literature has developed showing that disputants are not, however, theoretically predicted to converge towards agreement under FOA. This paper presents results from a controlled laboratory study of bargaining behavior and dispute rates under an innovative procedure called "combined arbitration" or CombA (Brams and Merrill, 1986). The rules of CombA involve a simple combination of using CA or FOA, depending on whether or not the arbitrator's notion of a fair settlement lies between the disputants' final offers. The potential importance of the procedure is that it is theoretically shown to induce convergence of disputants' final offers. The result is that it theoretically predicts negotiated, as opposed to arbitrated settlements. Disputants generally prefer negotiated settlements, which would also imply substantial cost savings by not actually invoking arbitration. In our experimental environment, subjects anonymously bargain over the size of a disputed variable, X. Subject payoffs are such that bargaining is zero-sum over a $2 pie in each of 20 bargaining rounds. Different dispute resolution procedures are implemented in the event of bargaining impasse at the end of a 2-minute round. We test CombA along with two modified forms of CombA (also suggested in Brams and Merrill) and find that dispute rates are still significantly higher than when disputes are resolved by destroying the disputed monetary pie (i.e., simulating the high cost of a labor strike perhaps). On the other hand, as the theory predicts, the CombA procedure induces statistically significantly lower dispute rates than the modified CombA procedures that lower the uncertainty costs of basic CombA procedure. To the procedure's credit, CombA is also shown to not adversely affect negotiated outcomes. The implications of these findings may be significant, and they call for direct comparisons of disputant behavior under CombA, FOA, and CA.

Keywords: dispute settlement, arbitration, bargaining, experiments

JEL codes: J5, C9, C7

*The author is an Assistant Professor of Economics and Management & Human Resources at Utah State University. The author is grateful to the Vice President for Research at Utah State University for funding the experiments for this paper. I also thank Jianlin Cheng, Lujun Zhang, and Pablo F. Rego Barros for valuable computer programming services. I especially thank Stacie Gomm for her efforts on the computerized bargaining environment. Valuable assistance was also provided by Supawan Supanakorn and Bryan Keith.
Alternative dispute resolution (ADR) procedures, such as mediation and arbitration, are frequently used to settle labor/management disputes. Binding arbitration is unique among ADR procedures in that it guarantees a settlement, whereas other procedures attempt to facilitate a settlement. As such, binding arbitration has proven particularly attractive as a way of resolving public sector labor disputes where a strike at negotiation impasse is usually not a protected labor action. Two main types of contract (interest) arbitration dominate in these instances.

"Conventional" arbitration (CA) allows the arbitrator to choose any settlement as the binding outcome. "Final-offer" arbitration (FOA), suggested in Stevens (1966), constrains the arbitrator to choose one of the disputant’s final offers as the binding settlement. FOA has been adopted by some jurisdictions in hopes that restricting the arbitrator to choose one of the disputant’s final offers might induce more disputants to arrive at negotiated settlements. Unfortunately, theorists have shown that neither of these commonly used forms of arbitration induces agreement by the disputants. Brams and Merrill (1986) show that a simple combination of CA and FOA—called "Combined" arbitration (CombA)—induces a convergence of the disputants’ final offers under quite plausible conditions. This paper reports results from a controlled laboratory study of disputant behavior under CombA—this is the first evidence to date on the CombA procedure.

Researchers have shown an interest in comparing the effectiveness of different ADR procedures (e.g., Neale and Bazerman (1983), Grigsby and Bigoness (1982), Notz and Starke (1978), and Ashenfelter et al (1992)). Clearly, a motivating factor in studying CA and FOA is that these procedures are in current use, yet the behavioral incentives of CA and FOA have been shown to predict arbitrated, not negotiated, settlements. Under CA, reasonable offers may not be forthcoming if disputants feel that arbitrators merely “split the difference” of the disputants’ final positions. Farber and Katz (1979) show that under CA the bargaining “contract zone” is