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The Chilling Effect of Optimism: The Case of Final-Offer Arbitration

David L. Dickinson

ABSTRACT

This article examines the incentive effects of final-offer arbitration (FOA) when disputants have optimistic (i.e., biased) beliefs about the arbitrator's settlement preferences. Optimism is shown to increase the divergence in Nash equilibrium final offers, and the divergence is largest under naïve, rather than sophisticated, optimism. Therefore, though FOA rules were instituted to lessen the "chilling" effect of arbitration, FOA interacts with optimism to worsen the chilling effect. Data from controlled laboratory experiments confirm that optimism leads to more divergent final bargaining positions and higher dispute rates. These results highlight the role that de-biasing expectations can play in improving bargaining outcomes.

ARTICLE

1. Introduction

The "chilling" effect of arbitration has concerned both researchers and practitioners of alternative dispute resolution procedures. The chilling effect occurs if binding arbitration lowers dispute costs relative to alternative outcome options (e.g., strike, termination of relationship, etc.). As a result, the disputants may rely more on arbitration and less on good-faith negotiations to settle disputes. This implies a decrease in negotiated settlements, which are usually considered desirable because the disputants themselves determine their outcomes (Crawford, 1979). Stevens (1966) argues that arbitration must create outcome uncertainty in order to promote good-faith negotiations. Outcome uncertainty may, however, have the unintended side-effect of sustaining and breeding optimism. In the context of this paper, optimism refers to a belief or expectation that the average settlement preference of the arbitrator will be more favorable to your own position than actually is the case. So, when the outcome that would occur under arbitration is uncertain, a priori, this opens the door for the development of unrealistic or biased expectations of how favorable the arbitrated settlement will be. A large body of existing psychology and economics research documents negotiator optimism—also referred to as divergent expectations, self-serving bias, and overconfidence. This seems to imply that any arbitration procedure that successfully creates outcome uncertainty is also fertile ground for optimism to further chill negotiations by affecting *expected* dispute costs.

This article examines the effects of disputant optimism or overconfidence in the case of final-offer arbitration (FOA)—a particular set of arbitration rules where the arbitrator is constrained to choose one of the disputant's final offers as the binding settlement. The rules of FOA are of interest given that Stevens (1966) considers this set of arbitration rules as most likely to reduce the chilling effect of arbitration.[1] As a result of Stevens' argument, several U.S. state jurisdictions commenced using final-offer arbitration rules to settle public sector labor disputes (currently used in some form by 12 state jurisdictions to settle contract disputes for public sector workers; see Hebdon, 1996). FOA is also well-known in its current use for settling Major League Baseball salary disputes, and it used in Canada to resolve disputes in the transportation and fisheries industries. It has been shown in the theoretical literature that, contrary to Stevens' argument, disputants' final offers do not converge to generate agreement under FOA (Farber, 1980 and Brams and Merrill, 1983), and this lack of convergence is considered a manifestation of the chilling effect of FOA. In this article, I use a simple extension of the existing theory to show the effects of disputant optimism on the pure strategy Nash equilibrium final offers under FOA rules. The sufficient, though not necessary, condition of symmetric optimism shows that the equilibrium final offer spread is an increasing function of the disputants' optimism—both naïve and more sophisticated beliefs are considered.

Data from laboratory data on negotiations under FOA are presented to examine how final offer positions vary with disputant expectations. Data on expectations, final offers, and dispute rates with FOA as the impasse resolution procedure are generated. These data are unique in their detail and critical for examining the optimism/chilling-effect hypothesis. In naturally occurring settings, it is difficult to disentangle the potentially confounding effects of optimism, private information, or institutional differences of the actual FOA implementation, all of which may play an important role in the disputants' final positions and bargaining outcomes. The result is that it is difficult, if not impossible, to attribute a specific component of divergent final offers to optimism.[2] Some laboratory research has been directed at optimism and its effects on negotiations, but the existing research examines the effect of optimism on dispute rates in a general sense. Further, existing research does not match point estimates of arbitrator preferences with disputes or disputant final offers. Econometrics can sometimes be creatively used to study optimism, as is shown in Farmer et al. (2004), but optimism is typically quite difficult to directly examine with naturally occurring field data.

There has been a limited number of other controlled laboratory studies with a specific focus on arbitration (see, Ashenfelter et al., 1992, Neale and Bazerman, 1985, Bolton and Katok, 1998, Dickinson, 2004 and Pecorino and Boening, 2001) and these experiments do not, in general, examine the issue of optimism. One exception is Neale and Bazerman (1985), which involves a laboratory examination of optimism and framing of disputes. While their study offers general support for the notion that optimism (or "overconfidence" in their terminology) increases dispute rates when using FOA, there are several difficulties in using their results to support the hypotheses of this current article. Specifically, subjects engage in a less-controlled role-playing experiment, which may introduce social norms of behavior into the data generation process and these can confound interpretation of the data. Also, the specific form of FOA they examine is distinct in that their subjects negotiated a package of several issues, and the arbitrator chose the final offer representing the greatest compromise. This differs from an arbitrator decision process where final offers are chosen based on their proximity to the arbitrator's notion of a fair settlement—this latter decision framework finds support in the results in Farber and Bazerman (1989). Finally, the Neale and Bazerman study does not elicit point estimates of disputant expectations that can be used to directly test their effect on the disputants' final offers, which is a key objective of this present article.[3]

The laboratory-generated data presented in this article show that optimistic beliefs are prevalent and that average distance between final offers – as well as dispute rates – is significantly positively related to optimism.[4] This implication is that efforts spent on correcting disputants' biased perceptions are an important component of limiting the chilling effect of FOA.

2. Equilibrium final offer spreads

Consider the Farber (1980) framework first used to derive equilibrium final offers under FOA. Disputants each have a desired level a quantifiable variable, x. Disputant b, the buyer, desires a low level of x such that utility is $U_b(x) = -x$ (or some parametric shift of this), while disputant s, the seller desires a high level of x such that $U_s(x) = x$. 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 density function $f(x)$ (see also Ashenfelter, 1987, for empirical support of this assumption).

If $\bar{x}$ is the mid-point of the disputants final offers, then it has been shown that the Nash equilibrium pair of final offers for risk neutral bargainers is $(x_s^* - x_b^*) = 1/f(\bar{x})$, where $f(\bar{x})$ is the arbitrator density function evaluated at $\bar{x}$ (e.g., see Farber, 1980, Brams and Merrill, 1983 and Ashenfelter et al., 1992). I consider optimism (i.e., divergent expectations in general) by simply indexing each disputant's belief about the arbitrator preferred settlement distribution. As such, $f_b(x)$ and $f_s(x)$ are the pdf's and $F_b(x)$ and $F_s(x)$ the cdf's of the buyer and seller, respectively. In previous analysis, the arbitrator is hypothesized to choose the final offer that is closest to his notion of a fair settlement. This implies that the probability of choosing the buyer's final offer is $F(x_b+x_s/2)$, which is the probability that the arbitrator's notion of a fair settlement is less than the midpoint of the disputants' final offers. Optimism implies that the buyer and seller may not assess this probability similarly, and so we have $F_b(x_b+x_s/2) \neq F_s(x_b+x_s/2)$. It is shown in the Appendix A that the Nash equilibrium spread between final offers for risk neutral bargainers with divergent expectations is then

(1) $(x_s - x_b)_b{}^* = \dfrac{2F_b(\bar{x})}{f_b(\bar{x})}$

for the buyer, and

(2) $(x_s - x_b)_s{}^* = \dfrac{2 - 2F_s(\bar{x})}{f_s(\bar{x})}$ for the seller. Of course, when one assumes common unbiased expectations—$f_b = f_s = f$, $F_b = F_s = F$, and $F(\bar{x}) = 1/2$, then this reduces to a common $(x_s - x_b)^* = 1/f(\bar{x})$, the typical result. A pure strategy Nash equilibrium pair of final offers only exists if $2F_b(\bar{x})/f_b(\bar{x}) = 2 - 2F_s(\bar{x})/f_s(\bar{x})$.

When expectations are biased, assume that they can be represented as a parametric shift of the true $f(x)$ distribution. Consider first what we will call naïve optimism, where each disputant feels that his own belief about $f(x)$ is the correct one and bases his expected utility calculation accordingly. Though not a necessary condition, a sufficient condition for existence of a pure strategy Nash solution is that $F_b(\bar{x}) = 1 - F_s(\bar{x})$, and $f_b(\bar{x}) = f_s(\bar{x})$. Note that this implies a symmetric bias to expectations. By this, I mean that the degree of optimism (or pessimism) is identical for both disputants. This yields our first result.

Result 1

Symmetric optimism is a sufficient condition for existence of a pure strategy Nash equilibrium final offer pair in FOA.

Optimism implies that $F_b(\bar{x}) > F(\bar{x}),\ f_b(\bar{x}) < f(\bar{x})$ for the buyer and $1 - F_s(\bar{x}) > 1 - F(\bar{x}),\ f_s(\bar{x}) < f(\bar{x})$ for the seller, where the un-indexed functions represent the unbiased pdf and cdf. Fig. 1a shows a case of identical degrees of optimism for both buyer and seller that would generate a more divergent pair of Nash final offers than those resulting from the unbiased expectations case. Viewing optimism as a parametric shift in $f(x)$ implies that height of the density function at $\bar{x}$ is now lower than with unbiased expectations, and the area underneath the cumulative distribution function evaluated at $\bar{x}$ is larger than before (see Fig. 1a). As such, the equilibrium final offer spread is larger for both disputants. This assumption of symmetric optimism leads to result 2.

Result 2

With naïve (symmetric) optimism, final offers diverge more than with unbiased expectations.

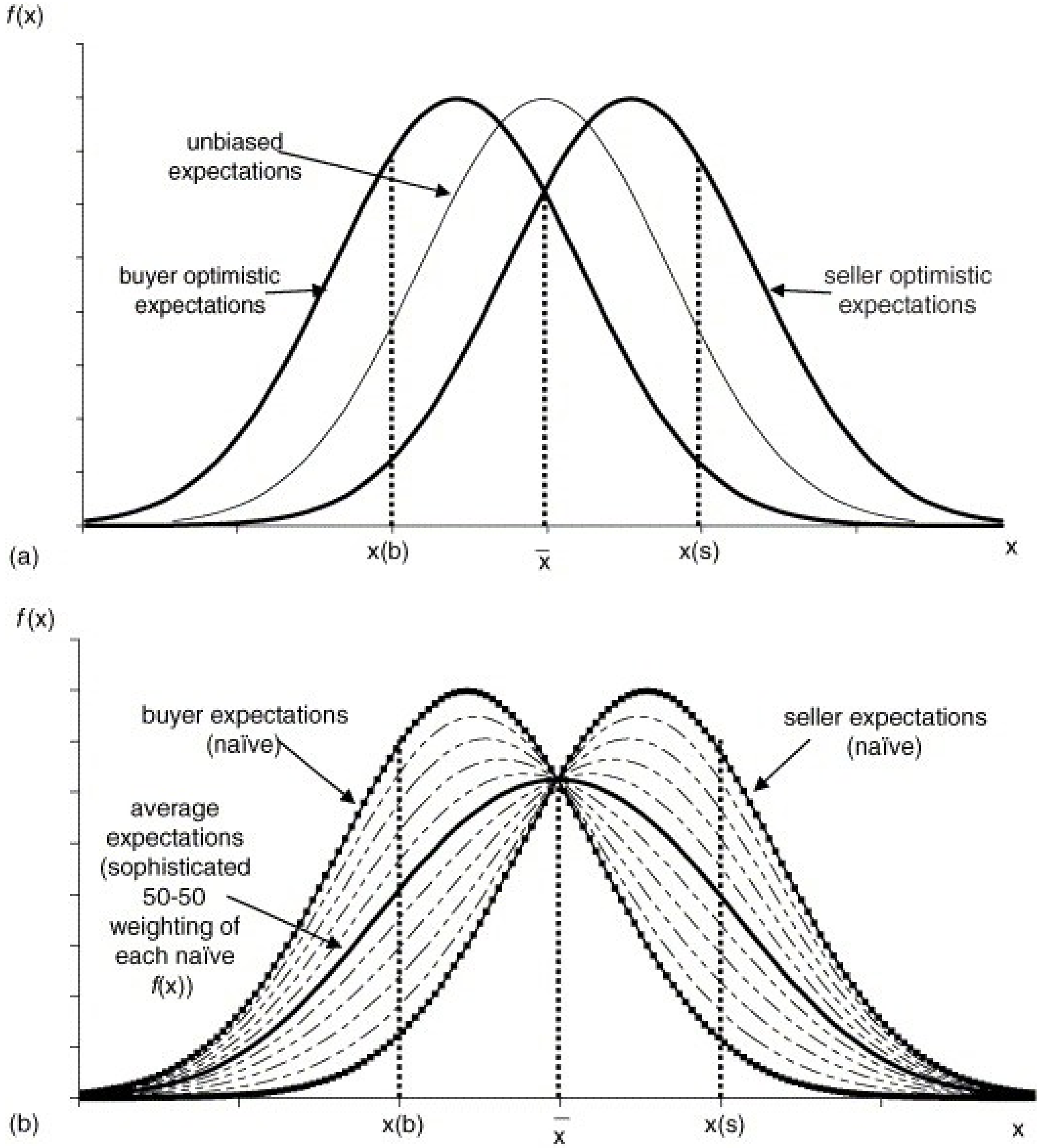

Fig. 1. (a) Naïve optimism (b) Naïve optimism and sophisticated belief possibilities.

Brams and Merrill (1986) consider this case of what I refer to as naïve optimism. They also consider a case where expectations diverge, but each disputant considers that the true distribution of arbitrator preferences is really a combination of the two distinct disputant perceptions of $f(x)$. In fact, one can imagine in general that disputants might consider any possible weighting of his own perception of $f(x)$ and his counterpart's. Fig. 1b shows several of the distinct combinations that are possible. It is still sufficient, though not necessary, that the resultant distribution upon which the disputants base their strategy be symmetrically biased (e.g., each considers that the true $f(x)$ is an 80% weighting of his own biased $f_i(x)$ and a 20% weighting of his counterpart's). Let us call this type of belief *updated optimism*.[5] Fig. 1b shows this form of updated optimism, which implies that $f_i(\bar{x})$is unchanged for both disputants, relative to naïve optimism, but $F_i(\bar{x})$is not. Specifically, under updated optimism, $F_b(\bar{x})$is smaller (as is $1 - F_s(\bar{x})$) than under naïve optimism. This leads to result 3:

Result 3

With updated optimism final offers diverge less than with naïve optimism but more than with no optimism.

From a theoretical standpoint, one may consider that "sophisticated" disputants are able to reason beyond the first-level updating described above. Consider, for example, a disputant who can update several stages. In stage 2, the buyer weights his own stage-one belief and his counterpart's, but the buyer reasons that stage-one beliefs are a weighted average of initial (stage-zero) beliefs for both disputants, $f_b^0(x)$and $f_s^0(x)$. The updating functions for the buyer and seller are then as follows:

(3b) $f_b^t = \alpha f_b^{t-1} + (1 - \alpha) f_s^{t-1}$, for t total stages

(3s) $f_s^t = \beta f_s^{t-1} + (1 - \beta) f_b^{t-1}$, fot t total stages

This is somewhat similar in spirit to assuming rationality that takes into account a finite depth of reasoning (e.g., see results in Nagel, 1995). Stage two beliefs for the buyer would then be

(4) $f_b^2 = \alpha f_b^1 + (1 - \alpha) f_s^1 = \alpha[\alpha f_b^0 + (1 - \alpha) f_s^0] + (1 - \alpha)[\beta f_s^0 + (1 - \beta) f_b^0]$

and so on for t stages into the future. Eq. (3b) could then be written more simply as

(3b′) $f_b^t = \alpha_t f_b^0 + (1 - \alpha_t) f_s^0$where α_t is the effective weight placed on own-beliefs of $f(x)$ for t stages of reasoning. While such sophistication may seem intriguing, the predictions from this version of updating will be empirically indistinguishable in our data from the simpler version of updated optimism presented initially. To be specific, assume symmetric optimism (i.e., $\alpha = \beta$), and consider a disputant who reasons in this way for four stages—this is beyond the depth of reasoning of two to three steps shown by subjects in Nagel (1995). In this case, individuals who weigh their own beliefs by 80% at each stage will behave in equilibrium as if they were *one*-stage updating with a weight on own-beliefs of about 57% (see Fig. 2). Additional stages of updating with optimism are equivalent to placing an "effective" weight on initial own-beliefs that converges to 50% from above.[6] Fig. 2 shows this for up to five stages of reasoning for various initial levels of optimism regarding own-beliefs of $f(x)$. As can be seen, optimistic updating that is consistent with several stages of updating is also consistent with *only one* stage of updating where the disputant starts with a less optimistic weighting on own-beliefs of $f(x)$. For this reason the exposition of sophisticated updating in this article has focused on the more simple one-stage form of updating.

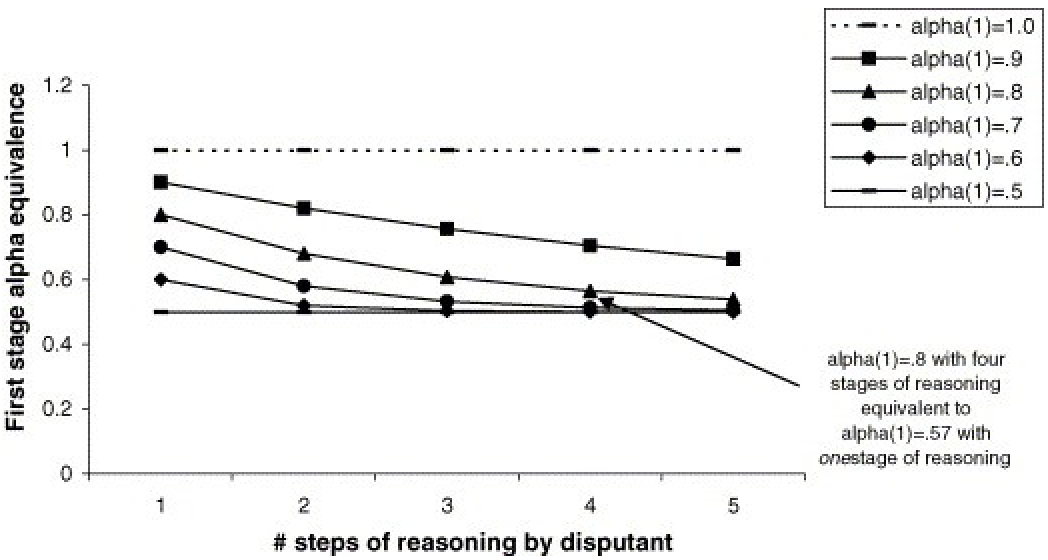

Fig. 2. Optimistic bargainers convergence to α = .50 occurs from above.

With regards to updated optimism, the degree of divergence of final offers is a decreasing function of the degree to which the counterpart's $f(x)$ is weighted, which implies that greater consideration of the merits of your counterpart's beliefs will help reduce the chilling effect.[7] Practical attempts to de-bias disputants (i.e., reduce their optimism) can be found in the psychology literature (see Fishhoff, 1977), and Babcock et al. (1997) implement a successful de-biasing treatment in a case study experiment in which subjects' consideration of the weakness of their own case helped lower dispute rates. Bazerman and Neale (1985) show that less concessionary (i.e., more divergent) final offers will result from overconfidence, and Neale and Bazerman (1985) correct for overconfidence to some extent by simply informing subjects that overconfidence existed in an earlier study. The intuitive theoretical result is therefore consistent with practical attempts to somehow get disputants to consider their counterparts' expectations, because it is recognized that this will bring disputants' final bargaining positions closer.

It should also be noted that final offer divergence is not merely an interesting academic exercise. A main criticism of FOA is that outcomes may be considered unacceptable given that one party receives his final offer and the other does not. Increased divergence of final offers will then imply that arbitrated outcomes under FOA will increase in *unacceptability*. Alternatively, the perceptions of the procedural justice of FOA and/or the quality of the arbitrated awards will decline (this tradeoff is noted in Farber, 1980). This then highlights that efforts towards eliminating biased expectations would then be successful on two fronts: first, they would help increase voluntary settlement rates and; second, those who do dispute will find FOA-arbitrated outcomes to be more acceptable given that the arbitrator would chose from less extreme final offers.

3. Some empirical evidence

Field data on FOA bargaining outcomes do not typically include the disputants' expectations of arbitrator settlement preferences along with the disputants' final offers. As such, it is somewhat of an empirical challenge to identify the relationship between optimism and final offers. For example, it would be unclear from field data whether more divergent final offers were the result of disputant optimism or simply the result of an unbiased but large expected variance of arbitrator preferences Nonetheless, there is some support in field data that self-serving biases are a determinant of bargaining impasse (Babcock et al., 1996). One way around the field-data challenge is a case study or mock negotiations approach, as in Babcock et al. (1997). Their results support the notion that optimism harms bargaining outcomes, but the context-rich face-to-face nature of such negotiations experiments, though more "real world" in some sense, also allow for the potentially confounding effects of social norms of behavior in the data generation process (see Roth, 1995). Such mock negotiations studies are informative and necessary at some level, but a strict theory-testing experiment requires as much control over the test-environment as possible.

Data in Dickinson (2003) is generated in a controlled laboratory environment. Subjects bargain in a context-free zero-sum environment over the level of the variable x, where one disputant's payoffs are linearly increasing (and the other's linearly decreasing) in the level of x. This section presents some more detailed results from the FOA treatment of his larger experimental design. In that study, expectations of arbitrator behavior are elicited prior to each FOA round (i.e., where FOA is the set of arbitration rules used in the event of bargaining impasse) and a random expectation is drawn at the conclusion of the experiment and compensated for accuracy. The experimental arbitrator is modeled as a Normal ($\mu = 500$, $\sigma = 60$) distribution (following the general procedure in Ashenfelter et al., 1992). The level of detail on expectations and matched data on final offers and disputes allows for direct tests of the effects of expectations on both final offers and dispute rates.[8] There may be some concern that subjects can diversify their earnings risk by submitting a high expectations value offset by a low final-offer value. However, the design and data mitigate this concern. First, the design is such that only *one* randomly chosen expectations round is selected for monetary compensation. Secondly, the data show a relationship inconsistent with such subject behavior, as will be seen in Table 1.

Table 1.

Empirical models of disputants' final-offer difference (dependent variable = final offer difference; data from disputed rounds. $N = 383$, random effects modeling)

Variable	Linear coefficient (*p*-value)	Quadratic coefficient (*p*-value)	Cubic coefficient (*p*-value)	Fourth-degree polynomial coefficient (*p*-value)
Constant	102.8 (.00)***	103.0 (.00)***	99.0 (.00)***	100.7 (.00)***
ExpDif	.365 (.00)***	.263 (.00)***	.284 (.00)***	.10 (.43)
ExpDif∧2	–	.0004 (.14)	.001 (.03)**	.002 (.00)***
ExpDif∧3	–	–	−.000002 (.10)*	.0000025 (.32)
ExpDif∧4	–	–	–	−.00000001 (.03)**
R^2	.123	.135	.14	.16

* Significance for the two-tailed test at the .10 level.
** Significance for the two-tailed test at the .05 level.
*** Significance for the two-tailed test at the .01 level.

Fig. 3 shows the prevalence of optimism in the data. The line shows aggregate expectations for those rounds ending in voluntary settlement, and the bars show the same for the disputed rounds. Fig. 3 defines pairwise optimism (pessimism) as seller expectation minus buyer expectation greater (less) than zero, where expectations are the point estimates elicited independently for each disputant prior to the round. Strictly speaking, it is possible for a buyer to be optimistic and a seller pessimistic and this be labeled as pairwise optimism (e.g., buyer expectations of 400 and seller expectations of 450 based on a distribution of $f(x)$ with average at $x = 500$), but average expectations across all bargaining pairs are roughly symmetric about the true $f(x)$ arbitrator distribution mean of $x = 500$, and so any bias given this particular coding of the data is expected to be minimal. It is apparent from Fig. 3 that pairwise optimism is far more common than pessimism in this data set, and one can also see that expectations appear less optimistic in rounds ending in voluntary settlement.

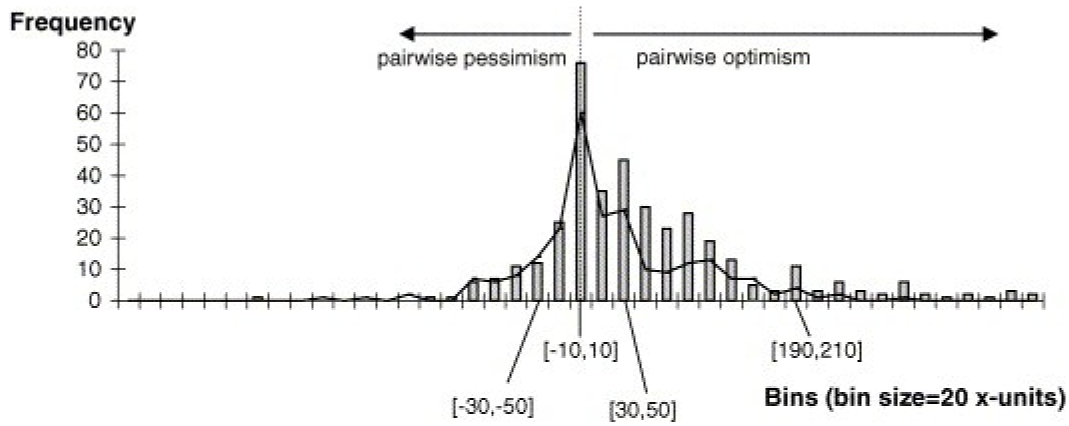

Fig. 3. Histogram of pairwise differences in expectations—Seller minus Buyer expectation. Bars = data from dispute rounds: *N* = 383; Line = data from voluntary settlement rounds: *N* = 246.

A key testable implication of the theoretical extension described earlier is that optimism will cause final offers to diverge in FOA—the greater the optimism the greater the divergence. Table 1 shows results from linear and nonlinear specifications that model the final-offer difference of the pair (seller's final offer minus buyer's final offer) as a function of pairwise expectations difference (*ExpDif*). This analysis is limited to the subset of rounds in which the disputants bargained to impasse and made final offers, which was 61% of the time or 383 out of 630 individual bargaining pair rounds. All estimations in Table 1 are random effects GLS results.[9]

The linear model in Table 1 confirms the hypothesized positive relationship between optimism and final-offer divergence.[10] The evidence from Table 1 also suggests that a non-linear model fits the data better. Fig. 4 shows the predicted values from the models in Table 1 along with the naïve (risk-neutral) prediction based on the Normal (500,60) distribution utilized for the experiments, shown for the *ExpDif* range of the experimental data. The general pattern of the predicted final-offer difference data shows two items of interest. First, increases in optimism are predicted to increase the final-offer difference by less than the naïve prediction (see Fig. 4). The naïve prediction is based on risk neutrality, which must be taken into account in comparing forecasts with the theoretical benchmark.[11] The risk-neutral naïve prediction is a final-offer difference of about 150 for unbiased bargaining pairs (i.e., *ExpDif* = 0) for the distribution used in the experiments and, since the predicted final-offer difference for an unbiased pair is closer to 100, average subject risk aversion may be present in the data (see Holt and Laury, 2002, for documentation of risk averse behavior in experimental subject pools). However, risk aversion itself should only imply a parametric shift of the naïve risk-neutral curve, and so risk aversion cannot explain the unique shape of the estimated relationship.

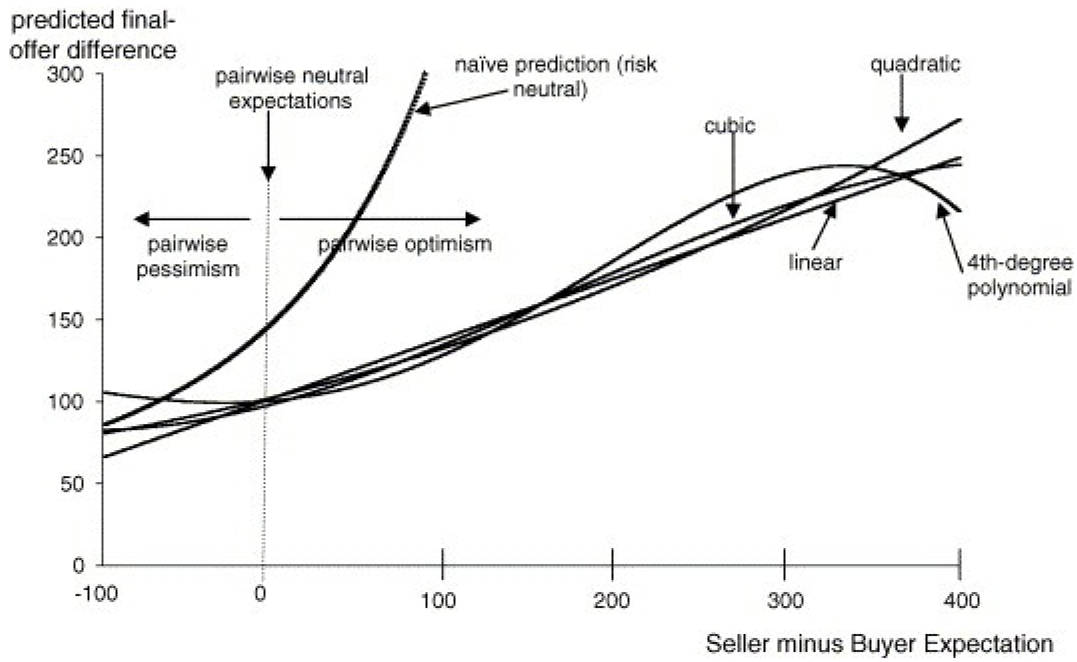

Fig. 4. Predictions of final-offer bid difference (predictions based on estimations shown in Table 1).

The second item of interest is that the nonlinear predictions show some evidence that final-offers increase at a decreasing rate as pairwise optimism increases, and there may be a point at extreme optimism where final-offers stop diverging. It is somewhat difficult to characterize the form of this sophistication, but it seems to be distinct from the simple form of sophisticated optimism (i.e., "updated" optimism) described earlier in this paper. Updated optimism correctly predicts smaller marginal increases in divergence (as optimism increases) than with naïve optimism, but updated optimism would imply a distinctly shaped relationship between expectations and final offer divergence. The shape of the cubic and 4th-degree polynomial fits of the data imply that bargaining pairs experience a diminishing marginal effect of optimism. Though behavior more sophisticated than naïve optimism is evident, updated optimism as described in this paper can describe only the flatter slope of the forecast line.

The basic final-offer divergence results are in line with those in Neale and Bazerman (1985) and Farmer et al. (2004). Neale and Bazerman (1985) use a role-playing negotiations simulation to show that decreased optimism increases concessionary behavior of disputants. In Farmer et al. (2004) the authors econometrically distinguish optimistic offers from those resulting from private information in Major League Baseball FOA salary disputes. They find strong evidence that baseball player optimism chills negotiations by generating overly aggressive (extreme) player offers.

In addition to its effects on final offer divergence, the chilling effect of optimism is also considered to imply increased *dispute rates* for greater degrees of bargaining pair optimism, as has been shown in previous research (Loewenstein et al., 1993 and Babcock et al., 1995). This follows directly from a simple expected utility model of dispute rates. Let utility $U_i(x) = f_i(x)g_i(x)$

for disputant i, where $f_i(x)$ is still the disputant's expectation of arbitrator preferences, and $g_i(x)$ is the disputant's payoff function. Optimism simply increases the expected payoff of utilizing arbitration through $f_i(x)$, ceteris paribus. If arbitration is one of several way to achieve an outcome payoff – others would be voluntary settlement, strike, termination of the relationship, etc. – then optimism effectively lowers the "price" of arbitration relative to voluntary settlement, for example. It follows that disputants are predicted to demand more arbitrated settlements under optimism.

To examine this, a random effects probit model is estimated to examine the effects of optimism on the binary variable dispute = 0, 1 for settlement and dispute, respectively. The estimated marginal effects based on $N = 630$ observations yield the equation
Dispute = .07(1.69) + .0007(1.90)*ExpDif (t-stats in parenthesis). The estimated constant term and coefficient on *ExpDif* are significant at the 9 and 6% level, respectively, implying that pairwise optimism significantly increases the likelihood of dispute in the FOA data. The coefficient on *ExpDif* implies that each increase in expectations difference of one standard deviation of the arbitrator settlement distribution increases the likelihood of dispute by 4.2%. The average divergence of expectations in the experiment sample was 61.4, and so this level of optimism in the subject pool is estimated to have increased dispute likelihood by just over 4%.

4. Conclusions

Arbitration is an important impasse resolution procedure for certain types of disputes. In the specific rules of final-offer arbitration the final offers of the disputants play a very strategic role in the arbitral settlement. Disputant optimism is often considered a primary cause of disagreement in bargaining, and optimism is not only predicted to increase disputes but also shown to cause final offers to diverge in FOA even more than in the unbiased expectations case. This divergence decreases to the extent that a disputant weighs his counterpart's expectations as having merit, but even when optimistic expectations are updated by considering counterpart beliefs, final offers diverge more than with unbiased expectations. In other words, consideration of counterpart beliefs may be effective at bringing disputants' final bargaining positions closer, but it would be even most effective (and direct) to align disputant beliefs with actual arbitrator settlement preferences.

The laboratory results presented are significant in that they are a *direct* test of the optimism/chilling effect hypothesis in FOA. More divergent expectations are shown to increase dispute rates and cause more divergent final bargainer positions. Updated optimism describes bargainer behavior better than naïve optimism, but this form of sophistication does not describe diminishing marginal effects of optimism. Models of bargainer behavior that capture this feature of the data are a clear area for future study.

The importance of final-offer divergence is that it can be viewed as a measure of how close a bargaining pair is to agreement. Therefore, optimism does not just push a few marginal disputants from settlement to dispute, but it significantly chills bargaining for *all* disputants. On the other hand, final offers that are closer to one another, though they still result in invoking

FOA, will generate more acceptable arbitrated outcomes under FOA rules. This implies that efforts aimed at improving bargaining expectations of disagreement outcomes would improve negotiations for all disputants, even those who ultimately invoke arbitration.

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Appendix A.

Let buyer and seller be risk neutral bargainers with $U_b(x) = -x$ and $U_s(x) = x$. The distribution of arbitration settlement preferences (or, equivalently, the distribution of likely settlements from a given pool of arbitrators, from which one will be chosen) is represented by the density function $f(x)$, with cumulative distribution function $F(x)$. Under final-offer arbitration rules, the arbitrator chooses the buyer's final offer if the arbitrator's notion of a fair settlement is closer to the buyer's final offer, which is just $F(\bar{x})$. Similarly, the probability that the sellers final offer is chosen is $1 - F(\bar{x})$.

The expected payoff under final-offer arbitration to the buyer is

(A1) $EU_b(x) = F_b(\bar{x})x_b + [1 - F_b(\bar{x})]x_s$

which is indexed to reflect the buyer's expectations of arbitrator preferences. For the seller, expected payoffs are

(A2) $EU_s(x) = F_s(\bar{x})x_b + [1 - F_s(\bar{x})]x_s$

which is similarly indexed to reflect the seller's expectations. The buyer minimizes (A1) and the seller maximizes (A2) in the zero-sum bargaining problem, and the resultant first-order conditions are:

$$\text{Buyer}: \quad 0 = F_b\left(\frac{x_b + x_s}{2}\right) + \frac{1}{2}x_b f_b\left(\frac{x_b + x_s}{2}\right) - \frac{1}{2}x_s f_b\left(\frac{x_b + x_s}{2}\right)$$

$$\left(\text{noting that } f_b(\bar{x}) = f_b\left(\frac{x_b + x_s}{2}\right) \text{ and } F_b(\bar{x}) = F_b\left(\frac{x_b + x_s}{2}\right)\right)$$

(A3) $$\rightarrow \quad 0 = F_b(\bar{x}) - \frac{1}{2}f_b(\bar{x})(x_s - x_b)$$

(A3′) $$\rightarrow \quad (x_s - x_b)_b{}^* = \frac{2F_b(\bar{x})}{f_b(\bar{x})}$$

Similarly, for the seller the first-order conditions are

$$\text{Seller}: \quad 0 = 1 - F_s\left(\frac{x_b + x_s}{2}\right) - \frac{1}{2}x_s f_s\left(\frac{x_b + x_s}{2}\right) + \frac{1}{2}x_b f_s\left(\frac{x_b + x_s}{2}\right)$$

(A4) $$\rightarrow \quad 0 = [1 - F_b(\bar{x})] - \frac{1}{2}f_s(\bar{x})(x_s - x_b)$$

(A4′) $$\rightarrow \quad (x_s - x_b)_s{}^* = \frac{2 - 2F_s(\bar{x})}{f_s(\bar{x})}$$

In the identical and unbiased expectations case, both (A3′) and (A4′) reduce to the typical result shown in Farber (1980), Brams and Merrill (1983), and Ashenfelter et al. (1992).

(A5) $(x_s - x_b)^* = \dfrac{1}{f(\bar{x})}$(because (A3) and (A4) can be combined to show that $F(\bar{x}) = 1 - F(\bar{x})$, or $F(\bar{x}) = 1/2$ in equilibrium with identical expectations). Brams and Merrill (1983) show that these solutions (for the identical expectations case) are global equilibrium solutions for many commonly considered distributions (including the normal, uniform, triangular, and logistic distributions).

NOTES

[1] The empirical evidence on FOA is somewhat mixed. Farber and Bazerman (1989) argue that both laboratory and field evidence are convincing in that FOA reduces the chilling effect compared to conventional arbitration rules, which allow the arbitrator to make an unconstrained choice of settlement. However, more recent laboratory studies have shown higher dispute rates for FOA (Ashenfelter et al., 1992 and Dickinson, 2004). Field evidence is also not so clear when one considers that arbitration rules all labeled as FOA may in fact differ significantly across jurisdictions that utilize the procedure (see Feigenbaum, 1975).

[2] It should be noted that many have considered FOA reasonably successful, in practice, at reducing the chilling effect of arbitration over conventional arbitration rules (e.g., Feuille, 1975 and Hebdon, 1996), but more controlled laboratory studies that untangle some of the confounding effects in field data have more recently shown the opposite (see footnote 3).

Dickinson (2003) indicates that the chilling effect on disputants' final offers across different arbitration institutions is a function of the degree to which final offers play a strategic role in the arbitration institution, and the strategic role of final offers in FOA is quite obvious.

[3] Farber and Bazerman (1989) argue that divergent expectations does not itself explain existing data, but their study mainly examines contract zone comparisons in FOA and conventional arbitration—where the arbitrator can make an unconstrained settlement choice. Subsequent laboratory studies have cast doubt on whether one arbitration rule yields consistently higher dispute rates than the other (e.g., Ashenfelter et al., 1992 and Dickinson, 2004, show *higher* dispute rates under FOA).

[4] An additional virtue of a controlled laboratory bargaining environment is that an identical set of FOA rules across bargaining pairs can be guaranteed. In practice, state jurisdictions that have utilized FOA often do **not** all use the same rules (see Feigenbaum, 1975). Nonetheless, they are still all considered to use FOA rules, and so field research comparing such states may have difficulty disentangling the effects of the distinct FOA rules from the actual incentive effects of pure FOA.

[5] The idea of considering both naïve and more sophisticated optimism was suggested to me by a referee for a related paper.

[6] Convergence still occurs for pessimistic bargainers, although convergence occurs by cycling around 50% rather than through one-sided convergence. In the extreme case of symmetric pessimism where $\alpha = \beta = 0$, the effective weight on own-beliefs of $f(x)$ alternates from 0 to 100% in each stage of updating. Under the extreme case of optimistic disputants ($\alpha = \beta = 100\%$ the results are the same as with naïve optimism (see Fig. 2).

[7] More specifically, assume that the buyer's final belief of $f_{b*}(x)$ is $(1-\beta)f_b(x) + \beta f_s(x)$ (and $(1-\beta)F_b(x) + \beta F_s(x)$). One can the show that $\partial(x_s - x_b)_b^*/\partial\beta < 0$ if $F_b(\bar{x})/f_b(\bar{x}) > F_s(\bar{x})/f_s(\bar{x})$in general, which implies that the equilibrium final offer spread is decreasing in the weight placed on the counterpart's beliefs. In the special case where $f_b(\bar{x}) = f_s(\bar{x})$, then this reduces to $F_b(\bar{x}) > F_s(\bar{x})$, which is always true for optimistically biased expectations considered in this article. The symmetric argument can be made for the seller.

[8] Terms such as "arbitrator settlement distribution" were not present in the experimental protocol or instructions. Rather, terms were selected to be as neutral as possible (e.g., arbitrator was the "computer decision-maker").

[9] The random effects estimation is appropriate for this particular empirical model, and it controls both for the fact that there is pairwise heterogeneity in the bargaining pairs and for the potential correlation of the error term for a given subject pair (i.e., the cross-sectional unit of this particular panel data) across FOA rounds. Given that five rounds of negotiations occur for each bargaining pair under FOA, the need to correct for the possibility of such interdependence in the error structure is explicitly taken into account with this random effects modeling.

[10] One may argue that *ExpDif* is not exogenous, but rather a function of the experiment and outcomes within the experiment (and perhaps other items). A two-stage least squares approach that creates instruments for expectations still shows a significant chilling effect of optimism on final offers, though an insignificant effect on dispute rates (discussed later in this section). The instruments for expectations are likely not ideal, however, as the R^2 on the first-stage regression is just .17. In sum, the main results are qualitatively unaffected by an instrumental variables versus one-stage approach for expectations in the empirical model.

[11] This naïve benchmark prediction is created using the Normal ($\mu = 500$, $\sigma = 60$) distribution used in the experiment for the computerized arbitrator. Optimism (pessimism) is considered to be symmetric in this case. For example, the prediction for identical expectations is just the standard risk-neutral prediction (e.g., a final-offer difference of about 150 for $f(x) \sim N(500,60)$). The prediction at Seller-minus-Buyer expectations = 50 is based on Eqs. (1) and (2) with buyer (seller) perception of $f(x)$ having mean $x = 475$ ($x = 525$). For example, in Eq. (1) buyer optimism both increases the numerator and decreases the denominator of the equilibrium final offer bid spread.