Conventional versus Final-Offer Arbitration

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Abstract

We compare conventional and final-offer arbitration in terms of the trade-off between influence costs and adjudication error. Informed parties with conflicting interests attempt to influence a sophisticated arbitrator. The arbitrator rationally corrects for the parties' incentives to boost their claims. In the Perfect Bayesian equilibria, misrepresentation expenditures are smaller under final-offer arbitration but adjudication error is larger. Conventional arbitration is the best procedure if adjudication accuracy is highly valuable or if the parties do not differ too much in their capacity to boost their claims.

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1 Introduction

Arbitration is a widely applied method of resolving disputes that fail to be settled by negotiation, both in public and private sectors. While arbitration mechanisms can vary substantially in design, their central feature is that they involve a third party, empowered by the ex-ante agreement of the disputants, to impose a binding decision in resolution of the dispute. Currently, conventional arbitration (CA) and final-offer arbitration (FOA) are the most commonly used methods, and thus have attracted considerable theoretical and empirical interest in recent years (both to analyze the decision-making process used by arbitrators and to study the behavior of bargainers subject to arbitration). Under CA, the arbitrator is free to impose any award of his choice, that is based on his best judgement of an appropriate settlement. This award may, but does not have to be, a compromise between the parties' final offers. Though widely used in commercial disputes or as an alternative to trials in civil litigation in number of juridictions, a long-standing critique of CA mechanisms in literature argues that they tend to "chill" pre-arbitration negotiations and increase the likelihood of arbitrator-determined settlements: to the extent that arbitrators are inclined or perceived to compromise between the parties' final positions, disputants may be encouraged to exaggerate claims and avoid concessions (Farber, 1981). FOA has been designed to remedy this deficiency by constraining the arbitrator to select one or other of the disputants' final offers as the arbitration award (Stevens, 1966). Since no compromise is possible, FOA should incite the disputants to stake out more reasonable bargaining positions: each party should prefer to make concessions rather than face the possibility that the arbitrator chooses the other's side proposal. Since the effectiveness of arbitration is judged by the frequency with which it leads to negotiated settlement, FOA is generally considered as superior to CA by inducing disputants to reach their own agreements and respecting their preferences (see, for example, Armstrong and Hurley, 2002)[1].

However, empirical analysis comparing outcomes under CA and FOA challenge these theoretical predictions. For example, experimental analysis by Ashenfelter *et al.* (1992) and Dickinson (2004) find higher dispute rates in FOA. Furthermore, while

[1] Several alternative procedures, such as combined arbitration (Brams and Merrill, 1986), double-offer arbitration (Zeng *et al.*, 1996), and amended final-offer arbitration (Zeng, 2003), have been proposed to improve the convergence properties of arbitration, but they are not used in practice.

research to date on CA and FOA has produced important results, it is also based on a questionable assumption. Theses approaches presume that the arbitrator knows more about the case as the disputants themselves: the arbitrator is considered to construct an "appropriate award" as a function of the – perfectly known – merits of the case, while disputants' offers are based on their beliefs about this appropriate settlement (which are characterized by a probability density function). This assumption places excessive power in the hands of the arbitrator since the parties' expectations regarding the arbitrator's preferred settlement dictate their equilibrium offers and, thus, the final settlement as well. Furthermore, we argue that such a setting neglects the adversarial nature of arbitration, which is analogous to a civil suit with the arbitrator acting as a judge (Shin, 1998): at the hearing, the opposing parties are invoked to make their cases and present evidence, and the arbitrator must rely on these testimonies to fashion a fair settlement. For instance, this is the case in Major League Baseball which have made use of FOA to resolve salary disputes between owners and players since 1974: each side gets time to present evidence and to rebut the other's case, and the arbitrator must select one side's final offer within 24 hours. Such a design is more consistent with the premise that the parties themselves have substantive information bearing on the dispute, and the – at least partially ignorant – arbitrator hears the case and uses the parties' offers to infer factual issues. In such a context, it seems reasonable to consider that formulating exaggerated claims is by nature costly – and not simply risky – for the parties. Indeed, each party's claim may be interpreted as a story together with supporting evidence and experts, and the further a party moves away from the truth, the more elaborate the argumentation needs to be[2]. Such "influence costs" are not considered in standard approaches, which assume that the arbitral costs are only based on the arbitrator's fees, time, ..., and on uncertainty regarding the arbitration award as perceived by risk-averse bargainers (Farber and Katz, 1979; Farber, 1980).

From this perspective, the present paper considers a situation where the disputants share knowledge of the case merits (knowledge not possessed by the arbitrator), and may choose to boost their claims at a given cost in order to influence the arbitrator's award most favorably. In this setting, self-interested parties make optimal use of private information in their offers, and the arbitrator rationally corrects for the parties' incentives to formulate distorted offers in order to adjudicate as truthfully

[2]Notice that the use of professional advocates by disputants is a common practice in real-world arbitration cases (Harcourt, 2000).

as possible. This asymmetric information framework aims to shed some new light on the welfare properties of CA and FOA, in terms of influence costs and adjudication error, and in an environment where the arbitrator is sophisticated but ignorant. In perfect bayesian equilibria, it is shown notably that CA is the best procedure if adjudication accuracy is highly valuable socially or if the parties do not differ too much in their ability to boost their claims. Our model complements studies of Gibbons (1988) and Samuelson (1991). Gibbons (1988) considers a similar asymmetric information setting but without introducing influence costs, neither comparing welfare properties of CA and FOA on this basis. Samuelson (1991) develops a richer framework by incorporating incomplete information between disputants themselves, but focuses on the FOA's ability to aggregate the parties' private information about the merits of the case.
The remainder of the paper is organized as follows. Section 2 lays down our theoretical framework, while Sections 3 and 4 analyze the equilibrium and welfare implications of CA and FOA. Section 5 discusses the main results and conludes. For ease of exposition, all technical proofs are relegated to the Appendix.

2 The Model

There are two risk-neutral parties denoted A and B and an arbitrator. The contested issue is the value of $x \in \mathbb{R}$. Party A would like the adjudicated value to be large, party B would like it to be small. For instance, x is the amount that B should pay to A. The true value of x is known to both parties but not to the arbitrator, whose prior beliefs are represented by the density $g(x)$ with support over the real line. The parties move first, simultaneously stating their claims about the realization of x. Party A claims that the quantity at issue equals x_A, party B claims that it equals x_B. After hearing the parties' claims, the arbitrator updates his beliefs and adjudicates some quantity $\widehat{x}$.
Stating a claim is costly for the parties to the extent that it differs from the true value. The interpretation is that a claim x_i is a story together with supporting documents, experts and the like rendering $x = x_i$ plausible. The more a claim differs from the true value, the more elaborate and costly the argumentative story needs to be. When the true value is x, the cost of claiming x_i is

$$c_i(x_i, x) = \frac{1}{2}\gamma_i(x_i - x)^2, \quad i = A, B.$$

Parties may differ in their ability to boost claims, a feature captured by the parameter γ_i. For instance, one party has better access to persuasive documents or has greater rhetorical skills. The parties' ability in this respect is common knowledge.
A party' net payoff depends on the arbitrator's decision $\widehat{x}$ and on his submission costs. For party A, the payoff is

$$\pi_A = \widehat{x} - \tfrac{1}{2}\gamma_A(x_A - x)^2.$$

For party B, it is

$$\pi_B = -\widehat{x} - \tfrac{1}{2}\gamma_B(x_B - x)^2.$$

Each party chooses his claim by trading off the cost of exaggeration against the effect exaggeration may have on the arbitrator's decision.
The arbitrator wants to adjudicate as truthfully as possible, i.e., he would like to minimize the discrepancy between adjudicated and true value. His payoff is minus the loss function defined by the quadratic error

$$l = (\widehat{x} - x)^2.$$

After hearing the parties, he therefore chooses $\widehat{x}$ to minimize the expected quadratic error[3], given his updated beliefs about x. The arbitrator's posterior beliefs are denoted by the conditional cumulative distribution $G(x \mid x_A, x_B)$.
However, the arbitrator's decision is constrained by the procedure. When the procedure is *conventional arbitration*, we take it that the adjudicated value must lie within the interval defined by the parties' claims. Specifically, the arbitrator's action space is then

$$A_N = \{\widehat{x} : \widehat{x} = \lambda x_A + (1-\lambda)x_B,\ \lambda \in [0,1]\}, \qquad (1)$$

where the subscript N stands for conventional arbitration. When the procedure is *final-offer arbitration*, the arbitrator is restricted to adjudicate one claim or the other. His action space is then

$$A_F = \{x_A, x_B\},$$

where the subscript F stands for final-offer arbitration. The arbitrator chooses $\widehat{x}$ to minimize expected quadratic error given the restrictions entailed by the procedure.

[3]Indeed, the actual process by which arbitrators are selected provides them incentives to make appropriate awards in light of the case merits, in order to maintain their professional reputation (Bloom and Cavanagh, 1986).

The outcome under the two procedures will differ in the influence costs incurred by the parties and the adjudication error. The social payoff is assumed to be evaluated by

$$L = C + \theta l$$

where $C = c_A + c_B$ represents total influence costs, l is the quadratic error in adjudication and θ is the rate at which society trades off influence costs against error. The two procedures are compared on the basis of the prior expected value of$L$.

3 Equilibria

For each procedure, we exhibit a separating Perfect Bayesian equilibrium. The arbitrator infers from the parties' claims the true value of x, which turns out to lie between the parties' claims. Under conventional arbitration, the arbitrator therefore adjudicates the inferred true value. Under final-offer arbitration, his best response is to pick the claim closest to the inferred true value. Under this procedure, however, both claims will be equidistant from the true value. Hence, the arbitrator is indifferent between adjudicating one claim or the other and simply randomizes between the two.

Conventional arbitration

Under conventional arbitration, given the parties' claims, the arbitrator must adjudicate $\widehat{x} = \lambda x_A + (1-\lambda)x_B$ for some $\lambda \in [0,1]$. In a pure strategy equilibrium, the arbitrator's best response can therefore be described by a function $\lambda(x_A, x_B)$ with values in the unit interval.

A Perfect Bayesian equilibrium is defined by the strategies $x_A(x)$, $x_B(x)$ and $\lambda(x_A, x_B)$ together with beliefs $G(x \mid x_A, x_B)$ such that

$$x_A(x) = \max_{x_A} \lambda(x_A, x_B(x))x_A + [1 - \lambda(x_A, x_B(x))]\, x_B(x) - \tfrac{1}{2}\gamma_A(x_A - x)^2,$$

$$x_B(x) = \max_{x_B} -\lambda(x_A(x), x_B)x_A(x) - [1 - \lambda(x_A(x), x_B)]\, x_B - \tfrac{1}{2}\gamma_B(x_B - x)^2,$$

$$\lambda(x_A, x_B) = \min_{\lambda \in [0,1]} E\left[(\lambda x_A + (1-\lambda)x_B - x)^2 \mid x_A, x_B\right],$$

where the posterior beliefs $G(x \mid x_A, x_B)$ satisfy Bayes' rule along the equilibrium path. We focus on the equilibrium where the arbitrator's best response function $\lambda(x_A, x_B)$ is a constant. We refer to it as a constant weights equilibrium.

Proposition 1 *Under conventional arbitration, the unique constant weights equilibrium satisfies* $x_A(x) = x + \lambda/\gamma_A$, $x_B(x) = x - (1-\lambda)/\gamma_B$ *and* $\lambda = \sqrt{\gamma_A}/(\sqrt{\gamma_A} + \sqrt{\gamma_B})$. *The arbitrator infers that the true value is* $x = x_A(x) - \lambda/\gamma_A = x_B(x) + (1-\lambda)/\gamma_B$; *he adjudicates* $\lambda x_A(x) + (1-\lambda)x_B(x) \equiv x$.

The parties know that they can influence the arbitrator's decision. The influence possessed by party A is captured by λ, that of party B by $1-\lambda$. As a result, parties always boost their claims and chilling effect occurs. However, this is self-defeating at equilibrium. The arbitrator expects boosted claims, he rationally corrects for boosting and adjudicates the inferred true value.

To complete the description of the equilibrium, we need to specify the arbitrator's beliefs off the equilibrium path. The observation of a pair of claims such that $(x_A, x_B) \neq (x_A(x), x_B(x))$ for all x is out of equilibrium. The arbitrator then believes that at most one party deviated from his equilibrium strategy. He thinks that with probability λ party B deviated, in which case A did not so that the true value is $x_A - \lambda/\gamma_A$; alternatively, that with probability $1-\lambda$ party A deviated, in which case the true value is $x_B + (1-\lambda)/\gamma_B$. His mean posterior belief is therefore

$$\lambda\left(x_A - \lambda/\gamma_A\right) + (1-\lambda)\left(x_B + (1-\lambda)/\gamma_B\right) = \lambda x_A + (1-\lambda)x_B,$$

which he adjudicates.

Final-offer arbitration

Under this procedure, the arbitrator can only adjudicate either x_A or x_B. His best response is described by a function $\mu(x_A, x_B)$ defined as the probability that he adjudicates x_A. Given the parties' claims, the adjudicated value $\widehat{x} \in \{x_A, x_B\}$ is therefore a random variable with distribution $\mu(x_A, x_B)$.

A Perfect Bayesian equilibrium is defined by the strategies $x_A(x)$, $x_B(x)$, $\mu(x_A, x_B)$ and posterior beliefs $G(x \mid x_A, x_B)$ satisfying

$$x_A(x) = \max_{x_A} \mu(x_A, x_B(x))x_A + \left[1 - \mu(x_A, x_B(x))\right] x_B(x) - \tfrac{1}{2}\gamma_A(x_A - x)^2,$$

$$x_B(x) = \max_{x_B} -\mu(x_A(x), x_B)x_A(x) - \left[1 - \mu(x_A(x), x_B)\right] x_B - \tfrac{1}{2}\gamma_B(x_B - x)^2,$$

$$\mu(x_A, x_B) = \min_{\mu\in[0,1]} E\left[\mu(x_A - x)^2 + (1-\mu)(x - x_B)^2 \mid x_A, x_B\right],$$

where $G(x \mid x_A, x_B)$ is obtained from Bayes' rule whenever possible. Again, we focus on the equilibrium where the arbitrator's best response function is a constant and refer to it as a constant weights equilibrium.

Proposition 2 *Under final-offer arbitration, the unique constant weights equilibrium satisfies* $x_A(x) = x + \mu/\gamma_A$, $x_B(x) = x - (1-\mu)/\gamma_B$ *and* $\mu = \gamma_A/(\gamma_A + \gamma_B)$. *The arbitrator infers that the true value is* $x = x_A(x) - \mu/\gamma_A = x_B(x) + (1-\mu)/\gamma_B$ *; he is indifferent between adjudicating* x_A *or* x_B *because* $x_A(x) - x = x - x_B(x)$.

As in the previous procedure, both parties boost their claims but the arbitrator nevertheless infers the true value. The difference is that the parties now boost equally. This a necessary feature at equilibrium. A party has no influence on the adjudicated quantity if his claim is believed to be the most unreasonable one. Because exaggeration is costly, exaggerating more than the other party can therefore not be part of an equilibrium when the true quantity is inferred. In turn, the arbitrator is indifferent between either claim because both entail the same adjudication error, which allows him to randomize.
The following out-of-equilibrium beliefs support the above strategies. Suppose a pair of claims is observed such that $(x_A, x_B) \neq (x_A(x), x_B(x))$ for all x. As before, the arbitrator then believes that at most one party deviated from his equilibrium strategy but does not know which one. He thinks that it is equally likely that party A or party B is now closest to the true value. Hence, he is indifferent between adjudicating x_A or x_B, implying that randomizing with probability μ is sequentially rational.

4 Welfare

It is often held that, compared to conventional arbitration, the parties' claims under final-offer arbitration will diverge less from one another. The above shows that this is indeed the case even with a sophisticated arbitrator, at least when parties differ in their capacity to boost claims. For the same reason, influence expenditures will be smaller under final-offer arbitration.
The claims discrepancy is $\Delta = x_A - x_B$. Under conventional arbitration,

$$\Delta_N = \frac{\lambda}{\gamma_A} + \frac{1-\lambda}{\gamma_B} = \frac{1}{\sqrt{\gamma_A \gamma_B}}.$$

Under final-offer arbitration,

$$\Delta_F = \frac{\mu}{\gamma_A} + \frac{1-\mu}{\gamma_B} = \frac{2}{\gamma_A + \gamma_B}.$$

Substituting each party's claim boosting in the party's cost c_A or c_B yields the total influence costs

$$C_N = \frac{1}{\left(\sqrt{\gamma_A} + \sqrt{\gamma_B}\right)^2},$$

$$C_F = \frac{1}{2\left(\gamma_A + \gamma_B\right)}.$$

The next result is then straightforward.

Proposition 3 *$\Delta_N \geq \Delta_F$ and $C_N \geq C_F$ with strict inequalities if $\gamma_A \neq \gamma_B$.*

The intuition for the result is that, under final-offer arbitration, adjudication is on average biased in favor of the party with the least capacity to boost his claim, i.e., the party with the largest γ_i. Specifically, $\mu > \lambda$ when $\gamma_A > \gamma_B$, the reverse inequalities hold otherwise. This induces the less capable party to exaggerate "slightly more" under final offer than under conventional arbitration; the benefit is that the more capable party exaggerates "much less". Under final-offer arbitration, the average bias in adjudication is

$$E\left[\mu x_A(x) + (1-\mu)x_B(x) - x\right] = \frac{\gamma_A - \gamma_B}{(\gamma_A + \gamma_B)^2}.$$

A full comparison of the two procedures depends on the weight accorded to adjudication accuracy versus influence costs. Under conventional arbitration, there is no adjudication error. Under final-offer arbitration, the mean quadratic error is

$$l_F = \mu\left(\frac{\mu}{\gamma_A}\right)^2 + (1-\mu)\left(\frac{1-\mu}{\gamma_B}\right)^2 = \frac{1}{\left(\gamma_A + \gamma_B\right)^2}.$$

The total social loss for each procedure is therefore

$$L_N = C_N = \frac{1}{\left(\sqrt{\gamma_A} + \sqrt{\gamma_B}\right)^2},$$

$$L_F = C_F + \theta l_F = \frac{1}{2\left(\gamma_A + \gamma_B\right)} + \frac{\theta}{\left(\gamma_A + \gamma_B\right)^2}.$$

Proposition 4 *Conventional arbitration has lower total costs than arbitration if (i) parties do not differ too much in their capacity to present boosted claims or (ii) if accuracy in adjudication has high value relative to influence costs.*

5 Conclusion

Previous theoretical literature has largely focused on the convergence properties of arbitration mechanisms, considering that FOA is better than CA since it promotes pre-arbitration concessions, good faith negotiations and less reliance on third-party settlements. While these analyzes have provided interesting predictions about individual behavior, they are less satisfactory concerning the welfare properties of arbitration. In a framework where the parties know the true merits of the case and the arbitrator is ignorant, our model highlights that CA may be better than FOA in terms of the trade-off between influence costs and adjudication error. Furthermore, the chilling effect is self-defeating at equilibrium: parties always formulate distorted offers, however the arbitrator – expecting exaggerated claims – rationally corrects for boosting and infers true value.

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