Evidence production in adversarial vs. inquisitorial regimes

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Abstract

The advantage of the adversarial regime of judicial decision-making is the superior information of the parties, while the advantage of an idealized inquisitorial regime is its neutrality. We model the tradeoff by characterizing the properties of costly estimators used by each regime. The adversarial regime uses an 'extremal' estimator that is based on the difference between the most favorable pieces of evidence produced by each party. The inquisitorial regime uses the sample mean. We find that neither regime dominates the other. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

The trade-off between an inquisitorial and adversarial system of justice is essentially one of centralized vs. decentralized evidence production. In an adversarial system, the decision-maker must rely on the reports of interested parties, rather than gather evidence for himself. Milgrom and Roberts (1986) find that even a naïve decision-maker can reach a full information decision provided that the interests of the parties are sufficiently opposed, and evidence is costless to produce. The same theoretical result is extended to costly access by Froeb and Kobayashi (1996) (see also McAfee and Reny (1992)), and is consistent with recent experimental findings comparing adversarial with non-adversarial presentation in terms of both revelation of hidden information and accuracy of litigated outcomes (Block et al., 1999; Parker and Lewisch, 1998).

However, these results are qualified by reference to the assumption of symmetrical access to
information and verification of parties’ reports, which highlights the potential importance of the pretrial discovery process (Cooter and Rubinfeld, 1994; Hay, 1994; Jost, 1995; Sobel, 1989) and evidentiary rules (Parker and Kobayashi, 1999; Lewis and Poitevin, 1997; Daughety and Reingenam, 1998).

In this article, we characterize the adversarial and inquisitorial regimes by the estimators they use to resolve legal disputes. This article adds to the growing literature comparing adversarial and inquisitorial procedures (Posner, 1999; Shin, 1998; Dewatripont and Tirole, 1999; Parisi, 2000). Welfare comparisons are made by comparing statistical properties of the estimators. We find that the inquisitorial regime does not strictly dominate the adversarial regime. For some distributions, the adversarial system may produce a lower variance estimator than the inquisitorial system. However, this is not always the case. Further, it may be relatively more costly to obtain a lower variance with the adversarial system.

2. Model

To motivate the model, we consider a stylized model of litigation between two parties. Evidence is produced by drawing out of a probability distribution, \( F(x) \), whose mean, \( \mu \), represents the issue being litigated, e.g. the amount of monetary damages that must be paid by the defendant to the plaintiff. The court’s role is to estimate the mean.

In an adversarial regime, the court is a passive, unsophisticated actor, using a simple split-the-difference scheme to evaluate the evidence put before it:

\[
x^* = \frac{x_p + x_d}{2},
\]

where \( x_p \) is evidence produced by the plaintiff and \( x_d \) is evidence produced by the defendant. We assume that the litigants report only the most favorable information to the court. If the plaintiff and defendant take \( N_p \) and \( N_d \) draws respectively, the litigants reports will equal:

\[
x_p = \text{Max}\{x_1, x_2, x_3, \ldots, x_{N_p}\},
\]

and

\[
x_d = \text{Min}\{x_1, x_2, x_3, \ldots, x_{N_d}\}.
\]

Evidence is costly to produce, so the decision of how much evidence to produce is an optimal stopping problem for each of the litigants. We assume that both parties know the distribution out of which they are drawing.\(^1\) The payoff functions are:

\[
\pi_p = x^* - cN_p
\]

and

\[
\pi_d = -x^* - cN_d,
\]

\(^1\)Note that Rothschild (1974) has shown that even if the litigants do not know the distribution, they learn very quickly, so that they behave almost as if they know the underlying distribution.
where ‘c’ is the cost of a draw.

In a dominant strategy equilibrium, the plaintiff stops producing evidence after a draw greater than \( v_p \); and the defendant stops after a draw lower than \( v_d \). The stopping values are calculated by equating the marginal cost of drawing to the marginal benefit of drawing (e.g. Malliaris and Brock, 1982):

\[
c = \int_{v_p}^{\infty} (x - v_p) dF(x) / 2
\]

and

\[
c = \int_{v_d}^{\infty} (v_d - x) dF(x) / 2.
\]

One can immediately see that if \( F(x) \) is symmetric, then \( v_p - \mu = \mu - v_d \), i.e. stopping values are symmetric around the mean of the distribution. As a consequence, the court’s split-the-difference estimator of the mean is unbiased because the litigants are stopping equidistant from, but on either side of the mean. On average, each party takes the same number of draws, \( N_d = N_p = 1/[1 - F(v_p)] \).

The variance of the court’s estimator equals:

\[
\text{Var}(x| x > v_p) + \text{Var}(x| x < v_d) / 4 = \text{Var}(x| x > v_p) / 2.
\]

An inquisitorial court would gather evidence for itself, without discarding unfavorable evidence. We presume that it would use the sample mean for its well-known optimality properties. Since both the sample mean and the adversarial estimator are unbiased, we can compare the estimators by comparing variances. The variance of the adversarial regime is smaller than the variance of the inquisitorial regime when:

\[
\text{Var}(x| x > v_p) / 2 < \text{Var}(x) / N_c
\]

where \( N_c \) is the number of draws taken by the arbiter. To compare the efficiency of each regime, we compare estimators of equal cost (equal number of draws) by making the substitution \( N_c = 2/[1 - F(v_p)] \). The adversarial estimator has lower variance when:

\[
\text{Var}(x| x > v_p) < \text{Var}(x)[1 - F(v_p)].
\]

This result does not violate the Gauss–Markov theorem, proving the optimality of the sample mean, because the adversarial estimator is not in the class of linear estimators to which the theorem refers. In the adversarial regime, litigants know the distribution out of which they are drawing and use the knowledge to produce optimal stopping rules that sometimes dominate the sample mean, depending on the characteristics of the distribution out of which evidence is produced.

\[\text{If the distribution is asymmetric, then the court’s split-the-difference estimator will not, in general, be unbiased. Although it is difficult to classify asymmetric distributions, it is easy to construct examples in which the party drawing on the longer tail of the distribution stops further out from the mean than the party drawing on the shorter tail of the distribution. In these examples, the court’s estimator } x^* \text{ is biased towards the party drawing on the longer tail of the distribution.} \]
Condition (7) is a necessary, but not sufficient, condition for the adversarial estimator to be preferred to the sample mean. Fig. 1 plots the trade-off between cost and variance offered by the sample mean. On the horizontal axis is the number of draws (a proxy for the cost), and on the vertical axis is the variance of the estimator. The variance of the sample mean is plotted as \( \text{Var}(x)/N \). If society prefers estimators with lower costs and lower variance, then indifference curves are concave toward the origin. With the illustrated societal preferences, the inquisitor will choose the point A. Points B and C illustrate equilibrium outcomes under the adversarial system cases where condition (7) holds because each has lower variance than the sample mean with an equivalent number of draws. At point B, the adversarial system is preferred to the inquisitorial system; at point C, the inquisitorial system is preferred. If condition (7) does not hold, the adversarial estimate will lie in the inferior region labeled D in Fig. 1.

Condition (7) can be illustrated with some examples. For a uniform \([a, b]\) distribution, condition (7) becomes:

\[
(\beta - v_p)^2/12 < [(\beta - \alpha)^2/12][(\beta - v_p)/(\beta - \alpha)],
\]

which reduces to

\[
\alpha < v_p,
\]

which is satisfied for all \( v_p \). Thus, holding the number of draws constant, the adversarial regime has lower variance when the distribution of \( x \) is uniform. The intuition behind this result is that the uniform distribution has a large variance and this imparts a large variance to the sample mean. In the adversarial regime, the litigants choose stopping values that move them quickly to the endpoints of the distribution, resulting in a low-variance estimator, regardless of the value of \( v_p \).

The opposite result can be illustrated using a double exponential distribution centered on \( \mu \), where the distribution functions decay exponentially at the same rate to the left and to the right. In this case, the adversarial regime does much worse. The intuition for this result comes from the ‘memoryless’ characteristic of an exponential distribution, i.e. when the parties move out on the tails of the
distribution, the variance does not decrease. Expenditure in the adversarial system is wasted because 
\[ \text{Var}(x) = \text{Var}(x|x > t_p), \]
and condition (7) is never satisfied.

The intermediate case can be illustrated with a Normal Distribution. If the parties stop near the middle of the distribution due to a small stopping value or equivalently, a large cost of drawing, then the adversarial regime is preferred for the same reason as in the uniform. For a larger stopping value out on the tail of the distribution, the adversarial regime throws away too much information to be efficient.

### 3. Discussion

The adversarial system has been criticized on the basis of its cost, and the tendency for litigants to report only favorable evidence. In contrast to the claims of the critics, we find that the adversarial process is not dominated by even an idealized inquisitorial process.

Our theoretical results suggest caution in concluding that centralized systems of evidence gathering are inherently superior. Further, under circumstances where centralized evidence gathering would dominate, incentives for the litigants to voluntarily choose such rules are created. Thus, a system where such choices are made available, but are not imposed as a mandatory system, would be best able to achieve the benefits identified by the proponents of centralization without incurring the potential costs of imposing these rules when they decrease welfare.

### References


