An Experimental Comparison of Adversarial versus Inquisitorial Procedural Regimes

Michael K. Block, *University of Arizona*, Jeffrey S. Parker, *George Mason University*, Olga Vyborna, *Prague*, Libor Dušek, *Liberal Institute, Prague*

This article reports the results of a multiyear series of economic experiments comparing the two dominant types of legal procedures used in adjudication: (1) the "adversarial" model of party-controlled procedure versus (2) the "inquisitorial" model of judge-controlled procedure. The principal finding is that the relative fact-finding efficiency of the two systems, in terms of both the "revelation" of hidden facts and the "accuracy" of decision, depends significantly upon the information structure. Under a "private" information structure, inquisitorial procedure is relatively more efficient, whereas under a "correlated" information structure, adversarial procedure is relatively more efficient.

1. Introduction

Public policy is implemented through the legal process, in a variety of institutional settings involving courts, administrative agencies, and other

The authors would like to acknowledge research assistance from Steve Dickerson and Raymond Atkins, and helpful comments and suggestion from Bruce H. Kobayashi, John R. Lott, Jr., Vernon Smith, and Gordon Tullock. Professor Parker's work on this paper was supported by grants received through the Law and Economics Center at the George Mason University School of Law. We also thank the Experimental Science Laboratory at University of Arizona for supporting part of the experimental research.

Send correspondence to: Jeffrey S. Parker, George Mason University School of Law, 3401 North Fairfax Drive, Arlington, VA 22201; Fax: (703) 993-8088; E-mail: jparke3@gmu.edu.

bodies. The predominant form of implementation is the process known to lawyers as adjudication, which resolves a dispute between parties by ascertaining and applying a legal decision rule to historical facts determined through a fact-finding apparatus. Most of the institutional details of differing adjudicatory systems are given by their respective approaches to the fact-finding function.

In contemporary legal systems, there are two principal models of adjudication: (1) the "adversarial" model prevailing in Anglo-American law, emphasizing the contesting parties' autonomy and control of legal proceedings; and (2) the "inquisitorial" model influencing the civil law systems of continental Europe and elsewhere—and sometimes used in administrative adjudication in the United States—emphasizing control by a disinterested decision maker or judge. There is much prior literature devoted to a comparison of the relative attributes and performance of the adversarial and inquisitorial systems. Most of this literature consists of purely descriptive comparisons or normative critiques of one system or another, and, despite a growing theoretical literature in recent years, there has been little attention to empirical or experimental analysis of the relative efficiency of the two systems.[1]

In this article, we seek to open the empirical debate by reporting the

1. The legal literature is voluminous. For a relatively recent exchange reviewing the arguments on each side in the specific context of comparing German and American procedure, see the exchange between Langbein (1985) and Gross (1987). Classic critiques of the adversarial system are given by Pound (1917) and Frank (1949), and defenses are given by Fuller (1978) and Landsman (1984). Theoretical analyses include Tullock (1980) and Milgrom and Roberts (1986), both discussed below, as well as Froeb and Kobayashi (1993, 1996) and Shin (1998). The only related experimental work of which we are aware is Thibaut and Walker (1975), which differs markedly in its focus from our investigations. Thibaut and Walker report comparative experimental findings designed to study differences between "party" and "court" control of information transmission and the effect of pretrial bias on outcomes as between the two systems, within a psychology-based experimental design in which subjects were given no payoffs or misled as to the basis for the payoffs. Thibaut and Walker's findings on revelation were consistent with the theoretical economics literature, especially Milgrom and Roberts (1986), in the sense that the potential of ex post verification affected each adversarial party's selection of information to disclose to the tribunal. Similarly, the findings on pretrial bias are consistent with Froeb and Kobayashi (1996), in that adversarial presentation reduced the effect of pretrial bias on the ex post decision. For a critique of Thibaut and Walker's representation of the inquisitorial system, see Damaska (1975).

results of a series of economic experiments comparing adversarial with inquisitorial adjudication primarily in terms of their relative fact-finding efficiency, as given by their respective tendencies to reveal pertinent hidden information to a decision maker, which has been the subject of competing hypotheses in prior literature. On the one hand, Tullock (1980, p. 96) argues that inquisitorial proceedings are likely to be more revealing and therefore more accurate, because "in adversarial proceedings, a great deal of the resources are put in by someone who is attempting to mislead." Tullock's argument is based upon the supposition that litigation typically involves a "Mr. Right" (the party who should win) and a "Mr. Wrong" (the party who should lose), with "Mr. Wrong" engaged primarily in obfuscation. He also appears to assume implicitly that "Mr. Wrong" typically is in possession of private, discrediting information. On the other hand, Milgrom and Roberts (1986) present a game-theoretic model, motivated by institutional arrangements in certain settings of regulation by administrative agencies, in which sufficiently opposed interests between adverse parties ensure the full revelation of information even to a relatively unsophisticated decision maker, at least where both parties have access to the same information and where the parties' reports are verifiable.[2]

Our first set of experiments begins the process of investigating the competing theoretical hypotheses by approximating the conditions envisaged by Tullock, with stylized rules of adversarial versus inquisitorial procedure. Under experimental conditions (1) exaggerating the characteristic features of the two systems into the extremes of party control (adversarial) versus judge control (inquisitorial), (2) embodying the assumption of an unambiguously "right" and "wrong" party under full information, and (3) distributing asymmetric information between two opposing and self-interested parties such that "Mr. Wrong" is given private and discrediting information, we compare the results in terms of both revelation and accu-

2. While Milgrom and Roberts' model assumes costlessly supplied information, Froeb and Kobayashi (1993, 1996) extend the analysis to settings in which parties incur costs to produce statistical evidence that is selectively reported to a "naive" (1993) and even a "biased" (1996) decision maker. Within limiting assumptions of symmetrical party access to information at constant marginal cost, Froeb and Kobayashi's theoretical findings are similar to Milgrom and Roberts. Similar results also are obtained under costly and asymmetrical information by Shin (1998) within a signaling model where the decision maker is able to draw inferences from an adversarial party's failure to produce evidence.

racy across the two rule systems. Our results show that, under these conditions, the judge-controlled "inquisitorial" system is both more revealing and more accurate than is the party-controlled "adversarial" system.

We then conducted a second set of experiments under a differing information structure more closely resembling the assumptions of Milgrom and Roberts, by endowing "Mr. Right" with a clue to the content of the discrediting information possessed by "Mr. Wrong."[3] Under this structure of asymmetric but correlated information between the parties, the relative performance of the adversarial and inquisitorial systems is completely reversed. With this information structure, the party-controlled "adversarial" system now is both more revealing and more accurate than is the judge-controlled "inquisitorial" system.

Under both sets of experiments, our findings are that adversarial and inquisitorial procedures produced significantly different outcomes and that their relative efficiency depends significantly upon the ex ante structure of information available to the parties. Future experimental and theoretical work will be required to investigate whether other variables significantly affect comparative results.

2. The Experiments

2.1. Revelation with Private Information

As indicated above, our initial experiment was designed primarily to test the hypothesis of Tullock (1980). Accordingly, the experiment centered on two case scenarios that were drawn to identify an unambiguous "Mr. Right" and "Mr. Wrong" under full information, and, in both cases, "Mr. Wrong" was provided with private and discrediting information. However, "Mr. Right" was not provided with enough private information to know ex ante whether he or she in fact was "Mr. Right."[4]

3. While Milgrom and Roberts (1986) assume strictly costless access, later work by Froeb and Kobayashi (1993, 1996) predicts the same result under costly and symmetric access (see note 2, above). Our experimental conditions take that hypothesis one step further, by introducing a structure of "correlated" information similar to McAfee and Reny (1992), in which Mr. Right is given costly but asymmetric access. These conditions differ from the theoretical model of Shin (1998), in that we suppress burdens of proof under both adversarial and inquisitorial procedures.

4. If anything, the private information conveyed to "Mr. Right" might have suggested to that subject that he or she in fact would turn out to be "Mr. Wrong," by indicating

Both case scenarios were then subjected to treatment under both of two rule regimes, representing adversarial and inquisitorial procedures, with each observation involving three subjects randomly assigned the roles of complaining party, defending party, and referee.[5] Under both regimes, there was a strong antiperjury rule, with perjury defined to include embellishment as well as falsification and punishable by forfeiture of the offending party's full potential payoff.

For each observation of the experiment, subjects were assigned randomly to rule systems and roles. Each of the six roles—the three roles of referee, complaining party, and defending party, under each of the two rule systems—were given separate instruction sheets. For each case scenario, all three subjects were given sheet of "basic information" that included the simple decision rule to be applied by the referee. Each of the contending parties was given a second sheet of "additional information," which in the case of "Mr. Wrong" included the hidden fact discrediting that subject's position. The parties' payoffs were structured to be completely dependent upon the referee's award dividing a stake between the parties, while the referee's payoff, in the baseline case, was dependent strictly upon the "accuracy" of the award, in relation to the correct application of the given decision rule under full information.

Subjects played both scenarios in two sequential rounds of each experimental session, with learning effects minimized by the randomized reassignment of roles and rule systems between rounds, by isolating subjects between rounds, and by alternating the sequence of the scenarios across successive experimental sessions. At the end of the second round, the subjects were paid and discharged.

Each experimental group was placed in a separate room and observed by a monitor, whose role was to police time limits and enforce the role limitations and the antiperjury rule. The same time limit was provided under both rule systems. In the adversarial regime, the total time was di-

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that, in the absence of further information, that subject would lose the case. In addition, Mr. Right's private information included both useful and false "leads" to the hidden information, whereas Mr. Wrong's private information left no doubt that Mr. Wrong was wrong, that is, would (or, under the decision rule, should) lose the case if the hidden information were revealed.

5. Each subject played two rounds of the experiment, with randomized reassignment of roles between the two rounds, as among the six possible roles of complaining party, defending party, and referee under each of the two rule systems.

vided equally between the parties, and the referee's role was completely passive during the questioning phase. In the inquisitorial regime, the allocation of time among the parties was left to the referee, who was the only questioner permitted.

Aside from the antiperjury rule, neither rule system involved any explicit rules of evidence or burdens of proof. To randomize against the possibility that the given decision rule might be interpreted as implicitly casting the a burden of proof against the complaining party, the full-information "Mr. Right" was the complaining party in scenario 1 and the defending party in scenario 2.[6]

Monitors were instructed to take the observation on "revelation," defined to be disclosure through questioning of the hidden information discrediting "Mr. Wrong" in each case, specified as a 0-1 variable.[7] Monitors also were instructed to report, in the case of "questioning referee," whether the referee asked an open-ended question of one or both parties, essentially inviting that party to volunteer whatever information that party thought should be brought to the referee's attention.

"Accuracy" was observed on the basis of the referee's announced award, as compared with the full-information "correct" answer that "Mr. Right" should be awarded the entire stake and "Mr. Wrong" should be awarded nothing. The parties' payoffs were determined by the referee's award, and the referees' payoffs were determined by the correspondence between the referee's award and the predetermined "correct" outcome. Thus, in an experimental round involving a stake of $20, a precisely accurate decision produced both an "accuracy" score and a referee payoff of $20; whereas an entirely inaccurate decision produced an "accuracy" score and a referee payoff of 0.

A significant aspect of the experimental design was to set referees' maximum payoffs equal to the parties' maximum payoffs, thus presenting strong incentives to referees.

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6. Given this conscious design to eliminate the effects of burdens of proof, particularly the burden producing evidence, our experimental results are not a direct test of the model proposed by Shin (1998).

7. The subjective aspect of these observations is one possible weakness in the experimental results, as the monitors' assignments were not randomized. However, different monitors were employed in different experimental sessions, without any detectable differences in results.

A total of 56 observations were taken on two days in March 1996—March 4 and March 23—at the University of Arizona Economic Sciences Laboratory.[8] Subjects were recruited from the general University community; law students and economics graduate students were used as monitors. Two different payoff levels were used: on March 4, maximum payoffs were $10 per round; on March 23, maximum payoffs were raised to $20 per round for all three roles. In the tables and figures presented below, both sets of observations are normalized to a $20 payoff level in terms of the "accuracy" measure, and we analyze the effect of payoff levels. (In all experiments, each participant received a $5 fee for simply showing up for the experiment.)

In a variant designed to test the effects of the referee's payoff structure on fact-finding efficiency, we took a small number (eight) of additional observations on February 23, 1998, under a modified referee payoff structure that guaranteed a fixed $10 payoff to the referee without regard to the accuracy of the decision, while leaving the parties' payoff structure and level ($20) unchanged. These observations were limited to the inquisitorial system, on the rationale that revelation would be most sensitive to the referee's incentives under that system.

2.2. Revelation with Correlated Information

For our second set of experiments, we made one change in the experimental instruments for each case scenario, to modify the "additional information" given to "Mr. Right" to supply that subject a clue to the hidden information possessed by "Mr. Wrong." Otherwise, the experimental design and conditions remained the same as under private information.

Under this correlated information structure, we took an additional 42 observations (21 for each rule system) in experimental sessions occurring on June 16, 1997, and February 20, 1998, at the Economic Sciences Laboratory at the University of Arizona. In each of these sessions, maximum payoffs per round remained at $20 for both parties and referees, and the referees' incentive structure remained the same.

8. An initial day of preliminary experimentation on March 1, 1996, was used to refine the experimental instruments and design. Data from that day are not reported below.

3. Experimental Findings and Analysis

Our principal experimental findings are that fact-finding efficiency in adjudication is significantly affected by both the rule system and information structure and that the relative fact-finding efficiency of adversarial versus inquisitorial rule systems is profoundly affected by the information structure. Under the "private" information structure, inquisitorial procedure was superior in revealing hidden information, while under the "correlated" information structure, adversarial procedure was superior in revealing hidden information. Similar results were obtained under the second measurement variable of "accuracy," although the exact relationship between revelation and accuracy remains somewhat ambiguous under our results. While revelation significantly contributed to accuracy under both rule systems, accuracy also is influenced by factors other than revelation in both systems.

3.1. Revelation under Private Information

Under private information, the experimental inquisitorial procedure produced more revelation than adversarial procedure. The comparative descriptive statistics are presented in Table 1, and the mean results displayed in Figure 1. In Table 1, the means, standard deviations, and number of observations are tabulated for each rule system and each of the two scenarios. Figure 1 is a bar chart of the relative mean revelation of the two rule systems, combining both scenarios. As revelation is a 0-1 variable in each case, its mean represents the percentage of cases in which revelation was achieved.

As is obvious from the descriptive statistics, revelation rates are markedly higher in inquisitorial than in adversarial procedure under this information structure: inquisitorial procedure produced revelation in 28% of cases versus only 7% for adversarial procedure. However, the standard deviations are high, the two scenarios appear to differ, and, as discussed above, payoff levels varied across experimental sessions.

To analyze all of these effects, we ran a logit regression on revelation as the dependent variable, with dummy variables representing the rule system, the scenario, and the payoff levels. Those results, reported in Table 2, show that only the coefficient on the rule system is significant at the 10% level ($p = .07$). Higher payoff level has the correct sign, but neither

Table 1. Revelation under Private Information

		Scenarios		
		1	**2**	**Both**
Inquisitorial	Mean	0.40	0.14	0.28
	STD	(0.51)	(0.36)	(0.45)
	# of Obs.	15	14	29
Adversarial	Mean	0.08	0.07	0.07
	STD	(0.28)	(0.27)	(0.27)
	# of Obs.	13	14	27
Both	Mean	0.25	0.11	0.18
	STD	(0.44)	(0.31)	(0.39)
	# of Obs.	28	28	56

payoff level nor scenario has a significant coefficient at conventional levels. As indicated by the descriptive statistics, the regression output shows a negative and significant effect of adversarial presentation on revelation, under the "private" information structure.

In order to assess the importance of the referee's payoff structure to these results, we added the eight observations taken under a "fixed" payoff structure for the referee and reran this same logit regression with a new dummy variable entitled "Fixed Payoff," which identified those observations. The results are given in Table 3. The results under this respecified model are identical to the logit model (Table 2), except that the additional variable for fixed-payoff had a coefficient with a sign in the expected negative direction but statistically insignificant.

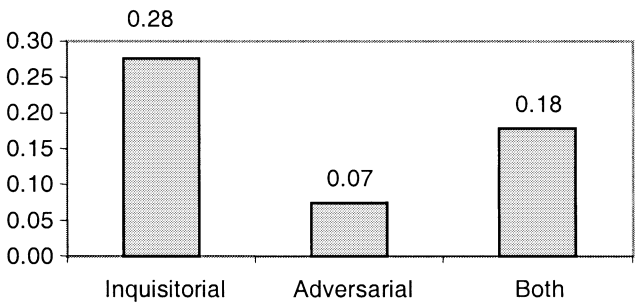

Figure 1. Revelation rates under private information.

Table 2. Logit Regression—Private Information

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
C	−1.030	1.282	−0.803	.425
Higher Payoffs	0.033	0.075	0.434	.666
Adversarial	−1.575	0.858	−1.836	.072
Scenario 2	−1.053	0.779	−1.352	.182
Log-likelihood	−23.148			
Obs with Dep = 1	10			
Obs with Dep = 0	46			
Dependent Variable is REVELATION				
Included observations: 56				

3.2. Revelation under Correlated Information

In the second set of experiments, changing the information structure from private to correlated information completely reversed the relative performance of the two rule systems: in this context, adversarial procedure produced dramatically higher rates of revelation than inquisitorial procedure. These results are summarized in Table 4 and Figure 2.

As shown in Figure 2, under the correlated information structure, adversarial procedure produced revelation in 71% of cases, while inquisitorial procedure produced revelation in only 14% of cases. In Table 5, the coefficient on the rule system again is shown to be statistically significant by

Table 3. Logit Regression Private Information with Differing Referee Payoff Structures

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
C	−1.030	1.282	−0.803	.425
Higher Payoffs	0.033	0.075	0.434	.666
Adversarial	−1.575	0.858	−1.836	.071
Scenario 2	−1.053	0.779	−1.352	.181
Fixed Payoff	−0.516	1.287	−0.401	.690
Log-likelihood	−26.163			
Obs with Dep = 1	11			
Obs with Dep = 0	53			
Dependent Variable is REVELATION				
Included observations: 64				

Table 4. Revelation under Correlated Information

		Scenarios		
		1	**2**	**Both**
Inquisitorial	Mean	0.09	0.20	0.14
	STD	(0.30)	(0.42)	(0.36)
	# of Obs.	11	10	21
Adversarial	Mean	0.60	0.82	0.71
	STD	(0.52)	(0.40)	(0.46)
	# of Obs.	10	11	21
Both	Mean	0.33	0.52	0.43
	STD	(0.48)	(0.51)	(0.50)
	# of Obs.	21	21	42

a logit regression of revelation against dummy variables representing the rule system and scenario.[9]

As shown by the regression results, scenario remains insignificant, but the coefficient on rule system, i.e., Adversarial, is highly significant ($p = .002$). However, under the correlated information structure, the sign has now changed from negative to positive, thus showing that adversarial procedures now produce superior revelation under this information structure.

3.3. Revelation and Accuracy

In both sets of experiments, in addition to measuring whether the hidden information was revealed explicitly, we also measured the correctness

9. Unlike the private information observations, under correlated information the payoff levels remained constant at \$20 per round for each subject.

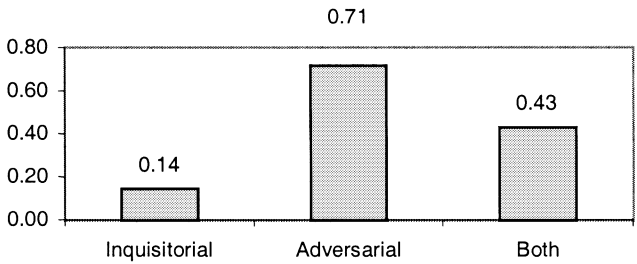

Figure 2. Revelation rates under correlated information.

Table 5. Logit Regression—Correlated Infromation

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
C	−2.377	0.825	−2.882	.006
Adversarial	2.810	0.828	3.394	.002
Scenario 2	1.031	0.804	1.283	.207
Log-likelihood	−20.307			
Obs with Dep = 1	18			
Obs with Dep = 0	24			
Dependent Variable is REVELATION				
Included observations: 42				

or accuracy of the referees' decisions. The alternative variable of "Accuracy" was defined as the degree of correspondence (in dollars) between the referee's actual award and the predetermined "correct" decision under full information and a proper application of the given decision rule, normalized to the $20 maximum payoff level used in most rounds of the experiments.[10] Thus, a completely accurate decision by the referee received an "accuracy" value of 20, a completely inaccurate decision received an "accuracy" value of 0, and so on.

The general results of the experiments showed a pattern of relative accuracy that involved the same rank-ordering as revelation, as summarized in Table 6.

10. Observations from the first experiment session of March 4, 1996—involving payoff levels of $10—are normalized to the $20 level in Table 6.

Table 6. Comparative Accuracy Rates: Private and Correlated Information

		Information		
Rule System:		**Private**	**Correlated**	**Both**
Inquisitorial	Mean	11.22	8.57	10.11
	STD	(7.93)	(9.13)	(8.47)
	# of Obs.	29	21	50
Adversarial	Mean	6.70	12.29	9.15
	STD	(6.53)	(6.98)	(7.22)
	# of Obs.	27	21	48
Both	Mean	9.04	10.43	9.64
	STD	(7.58)	(8.24)	(7.86)
	# of Obs.	56	42	98

Each cell of Table 6 reflects an accuracy relationship consistent with the revelation outcomes: under private information, inquisitorial procedure is more accurate than adversarial procedure; while under correlated information, adversarial procedure is more accurate than inquisitorial procedure; and overall, the correlated information structure produces more accuracy than the private information structure.

However, although the relative rankings are the same for accuracy as for revelation, the relative magnitudes differ. When measuring revelation, the superior system under each information structure produces dramatically higher levels than does the inferior system: four times higher for inquisitorial procedure under private information and five times higher for adversarial procedure under correlated information. When measuring accuracy, the differences are all in the same directions, but much smaller. Of course, in order for the accuracy ratio to be the same as the revelation ratio, accuracy would have to be perfect when revelation took place and completely inaccurate when revelation did not take place.

A more interesting comparison would be with the accuracy level that results from "getting it right" (perfect accuracy) in the presence of revelation and random accuracy in the absence of revelation. Table 7 displays this comparison with the rows labeled "forecast," generated as described above, and those labeled "experiment," containing the accuracy levels from our experiments.

An interesting feature of this comparison is that the forecast accuracy levels are always higher, and in some cases substantially higher, than the accuracy level achieved in the experiment. Our subjects appear to make

Table 7. Comparative Accuracy Rates: Private and Correlated Information: Experiment versus Forecast from "Perfect" Accuracy

		Information		
Rule System:		**Private**	**Correlated**	**Both**
Inquisitorial	Experiment	11.22	8.57	10.11
	Forecast	12.80	11.40	12.20
Adversarial	Experiment	6.70	12.29	9.15
	Forecast	10.70	17.10	13.50
Both	Experiment	9.04	10.43	9.64
	Forecast	11.80	14.30	12.90

less-than-perfect use of the revealed information. Or perhaps our subjects are particularly bad at guessing in the cases where there is no revelation. In fact, our subjects evidence both defects: the accuracy level in those case with revelation is only 15 and in those cases without revelation it is only about 7.5.

In order to more precisely investigate the effects of revelation on accuracy, we ran an ordinary least squares regression including all 106 observations in the series (64 for private information, including the 8 fixed-structure referee payoff observations, plus 42 for correlated information) The model specified accuracy as a function of scenario, revelation, payoff level, payoff structure, rule system, and a new variable named "Information," taking the value of 0 for the private information cases and 1 for the correlated information cases. The results of that analysis are given in Table 8.

In this model, as expected, the coefficient on revelation was highly significant ($p < .001$) with a large positive coefficient. Higher payoff level also was significant ($p = .06$) and positive. Because accuracy—not revelation—was most directly correlated with the referees' payoffs, it is comforting to observe more accuracy supplied as the returns to accuracy increase. Although the scenario difference was marginally significant ($p = .095$), the coefficients on all of the other three variables—fixed payoff, rule system, and information structure—were statistically insignificant.

Table 8. Least Square Regression: Accuracy All Observations

Dependent Variable is ACCURACY
Included observations: 106

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
C	2.058	3.207	0.642	.523
Scenario 2	2.393	1.421	1.683	.095
Revelation	6.553	1.616	4.056	.000
Higher Payoff	0.360	0.189	1.907	.060
Fixed Payoff	−3.960	2.968	−1.335	.185
Adversarial	−1.869	1.438	−1.300	.197
Information	−1.890	1.719	−1.099	.274
R^2	0.203	Mean dependent var		9.552
Adjusted R^2	0.154	F-statistic		4.194

These results suggest that most of the difference in accuracy between adversarial and inquisitorial procedure is explained by their relative revelatory efficiency under given information structures, as both rule system and information structure are insignificant after controlling for revelation. However, it is worth noting that the R^2 of the regression is quite modest (0.20).

4. Discussion

The experimental work reported here represents only a starting point for a more rigorous investigation of the comparative features of adversarial and inquisitorial procedures. Our considerations of experimental design, the variations of parameters across experimental sessions, and differing models in the theoretical literature all suggest future directions of research.

4.1. Revelation, Accuracy, and Information Structure

Our principal experimental finding is that the performance of adjudicatory systems is profoundly affected by the ex ante information structure, both in absolute terms and in the relative performance of adversarial versus inquisitorial procedure. These results held for both revelation and accuracy, as summarized in the bar charts provided in Figures 3 and 4, below.

A comparison of Figures 3 and 4 shows the relationship of the comparative rule system results for revelation and accuracy. As noted above, the relative performance of inquisitorial and adversarial rule systems fol-

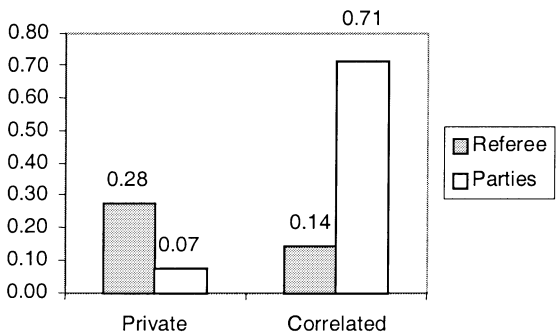

Figure 3. Comparative revelation rates: private and correlated information.

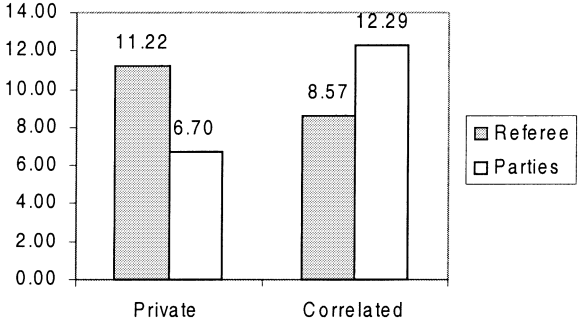

Figure 4. Comparative accuracy rates: private and correlated information.

lowed the same pattern for both revelation and accuracy. However, after controlling for revelation (Table 8), the difference in accuracy as across the rule systems (and information structures) was not statistically significant at conventional levels.

To some extent, these results reflect the inherent definitional differences between revelation and accuracy in our experiment. Revelation is the more direct measure of fact-finding efficiency as such—it simply measures whether hidden information was brought out explicitly. Accuracy is a composite of both explicit fact-finding efficiency and diligence in applying the decision rule to the revealed facts.[11] While revelation was by far the most powerful influence on accuracy, the analysis of accuracy results (Table 8) shows that payoff levels and scenario difficulty also were statistically significant.

The analysis of our accuracy results suggests that the rule system and information structure were important to accuracy basically through their effects on revelation. The analysis of revelation shows that both rule system and information structure were important to revelation and that the relative performance of the rule systems was profoundly a function of the information structure.

The importance of information structure to the relative fact-finding efficiency of inquisitorial and adversarial procedure has implications for institutional design. In particular, our analysis shows that the fact-finding

11. This, of course, abstracts from the point in Shin (1998) that inference from what is not revealed by the presumptively better informed party is also an important determinant of accuracy.

efficiency of adversarial procedure depends critically upon information structure. In terms of relative performance, the adversarial system was ten times more efficient in revelation under "correlated" as opposed to "private" information. This suggests that certain institutional adjuncts to the Anglo-American adversarial system—notably the expansive pretrial "discovery" system in civil litigation—may be crucial to its fact-finding efficiency.[12]

In contrast, our experimental results showed that inquisitorial procedure was relatively more efficient under "private" as opposed to "correlated" information, though the relative difference was smaller and in the opposite direction. In our results, the fact-finding efficiency of the "questioning referee" (inquisitorial judge) actually dropped under "correlated" information. Although this result could be an artifact of the relatively small number of observations in each cell of the analysis, it also might suggest that inquisitorial judges could be "overloaded" in correlated-information cases, without the assistance of adversarial party presentations on the facts. Conversely, it suggests that the best case for inquisitorial procedure may be situations in which—for cost reasons or otherwise—the institutions can not be arranged to promote the correlated information structure.

Our experimental design suppressed considerations of the cost of producing one or another of the information structures tested. Future experimental research could investigate this factor, through a design that permitted the parties or judge to "purchase" additional information prior to the definitive adjudication.

4.2. Payoff Levels and Structure

As reported in the previous section, a change in general payoff levels from \$10 to \$20 for all subjects had no significant effect on revelation (Tables 2 and 3) but did have a significant effect on accuracy after controlling for revelation (Table 8). This is interesting, not in that it supports

12. The leading model of this system is that provided by rules 26–37 and 45 of the Federal Rules of Civil Procedure, which authorize parties to compel pretrial disclosure of information possessed by other parties to the lawsuit and even by nonparties, mostly on the initiative of the adversarial parties and, at least traditionally, with little intervention by the court.

the rather unsurprising conclusion that, ceteris paribus, raising subjects' payoffs produces more effort but rather that such "local" incentive effects appear to be swamped by institutional factors in the case of revelation.

In terms of payoff structure, our limited investigation of eight cases of fixed referee payoffs revealed negative but statistically insignificant effects on both revelation (Table 3) and on accuracy after controlling for revelation (Table 8). The lack of a significant effect may be due to the very small number of observations, as there is a basis in theory to expect that judges' payoff structures may have profound effects on the performance of adjudicatory systems.[13]

In most of our experimental observations, judges were permitted to achieve maximum payoffs by coming as close as possible to externally verifiable "accuracy." However, even so, and even with highly transparent decision rules that directed their attention to the potential relevance of hidden information, the levels of revelation and accuracy were surprisingly low under both systems, with the possible exception of adversarial procedure in a correlated information structure. If judges' incentives were disconnected from "accuracy," then presumably the rates of revelation and accuracy would drop still further. Such disconnection might even change the observed relative performance of the two systems.

Furthermore, judges' payoffs in actual procedural systems may produce even more severe effects, by being inversely related to "public" expenditure, i.e., trial time, via such "throughput" measures as the number of case dispositions per time period that are commonly encountered in annual reports of judicial performance. Our small number of observations with fixed payoffs and our focus on an experimental design emphasizing rule system did not permit us to test the potential effects of judicial incentives in anything like a comprehensive manner. Our results, however, are suggestive of fruitful directions for future research.

4.3. Expertise and Types of Disputes

Our experimental design sought to suppress the effect of either legal or fact-finding expertise on the part of judges and advocates. Expert

13. Posner (1992, p. 520) argues that one of the differences between adversarial and inquisitorial procedure may lie in the relatively heavier reliance of the inquisitorial system on the effectiveness of public-sector judges, whose incentives may not be well aligned with the social interest in accuracy.

advocacy (professional lawyers) is argued to be especially important to adversarial systems (Bundy and Elhauge 1991) and has been shown empirically to affect outcomes by Ashenfelter and Bloom (1990). Similarly, judicial expertise has been argued as one of the "advantages" of inquisitorial procedure (Langbein 1985).

Although our design was not intended to address these issues, some of our findings suggest the roles that expertise may play. In our experiment, there was an extremely low incidence within the inquisitorial rule system of the subjects playing the role of referee asking an "open-ended" question of one or both parties. Presumably, "expert" judges would ask that type of question in almost every case. Nevertheless, under "private" information, the "inexpert" subjects playing the roles of referee in the inquisitorial system achieved more revelation than the similarly "inexpert" subjects playing the role of advocate in the adversarial system. Similarly, under "correlated" information, the "inexpert" advocates achieved more revelation in the adversarial system than did the "inexpert" referee in the inquisitorial system. Furthermore, the relative differences in revelation rates could be consistent with the hypothesis that expert advocacy is relatively more important to the operation of adversarial systems than expert judging is to inquisitorial systems, even if the inquiry is confined to fact finding alone.

If the range of inquiry is broadened to include the ascertainment and application of legal rules as well as facts, then expertise could operate in a different way, with possibly different results in terms of the legal accuracy of adjudication. Both Thibaut and Walker (1978) and Langbein (1985) argue that inquisitorial procedure may be more appropriate to certain disputes or components of disputes—those focusing on the determination of fact alone, under agreed rules—than on disputes where the legal rule is unclear or the legal significance of historical facts (whether or not disputed) is unsettled or ambiguous. In other words, if there is no unambiguous "Mr. Right" and "Mr. Wrong" under rules that are settled and agreed upon by the parties ex ante lite, the relative results of two systems may differ.

As the "legal" component becomes relatively more important, the two rule systems could have different attributes in terms of "legal" as opposed to "factual" accuracy. Based upon anecdotal observations by monitors, in our experiment subjects playing the role of party-advocates under the ad-

versarial system sometimes used their questioning period to advance what were in essence legal arguments to the passive referee. This effect may have influenced outcomes where questioning failed to achieve revelation.

However, in our experiments, these influences were suggestive and anecdotal only. Further research will be required in order to establish the effects, if any, of legal or fact-finding expertise on the relative performance of adjudicatory systems.

5. Concluding Remarks

By reporting the results of this experimental series, we hope to generate broader interest in applying the methods of experimental economics to questions of legal infrastructure, particularly in the field of legal procedure. Much work remains to be done, even within the relatively narrow domain of comparing adversarial and inquisitorial methods for revealing factual information to decision makers, which was the focus of our investigation.

Our principal experimental finding is that information structure profoundly affects the relative fact-finding efficiency of adversarial versus inquisitorial procedure. Inquisitorial methods resulted in a higher rate of revelation than did adversarial methods under conditions of private and asymmetric discrediting information in the possession of an interested party. Adversarial methods resulted in a higher rate of revelation than did inquisitorial methods under conditions of correlated information in which both interested parties had access (albeit unequal access) to the hidden information. These findings have implications for institutional design, in terms of the relative fact-finding strengths and weaknesses of adversarial and inquisitorial procedures.

Our experimental findings may be strictly limited by the incentive and information structure conditions imposed by the experiment. In particular, modifying the incentive structure of the decision maker, allowing costly information structures, or permitting legal or fact-finding expertise to be applied by the parties or judge may produce very different experimental findings. Further experimental and theoretical research will be required to establish the significance of these and other conditions that we have not taken into account. Until that work is completed, perhaps the most important implication of our findings is that fully developed experimental research can and should be an important input into future reform efforts,

particularly given the dearth of other empirical work in this field and the difficulties encountered by empirical research using data from functioning judicial systems.

Appendix

Description of Experimental Procedures

In general, all aspects of our experimental design and management were affected by the need to draw a balance between the level of abstraction desirable for isolating the variables of interest and the richness of institutional detail necessary to a role-playing experiment. Thus, while we sought to abstract away from some of the institutional details and terminology associated with legal procedure, in order to motivate the subjects it was necessary to convey that they were involved in a conflict to be decided by a third party. Accordingly, the experimental instruments used terminology such as "referee" rather than "judge," and referred to the two rule systems as "questioning parties" rather than "adversarial" and "questioning referee" rather than "inquisitorial," in order to minimize the secondary connotations associated with the more pointed terminology. In that same vein, students of law were screened from the subject population. Otherwise, subjects were recruited from the general university community in accordance with the standard procedures of the Economic Sciences Laboratory at the University of Arizona, where experimental sessions were held in March 1996, June 1997, and February 1998.

Nevertheless, it was necessary to provide enough institutional detail to motivate the subjects to undertake essentially a role-playing exercise. Accordingly, the experiments were built around two case scenarios involving gender-neutral characters to be played by subjects, entitled "Chris and Leslie" (scenario 1) and "Jan and Pat" (scenario 2), both involving a loss to one of the parties ("complaining party") followed by a request for compensation from the other ("defending party"), to be decided by a third subject ("referee").

Case scenario 1, entitled "Chris and Leslie," involved a complaint by a farmer against a pesticide supplier that the pesticide killed off a local pheasant population relied upon by the farmer for supplemental income. "Mr. Wrong" was the defending party Leslie, the pesticide supplier, who was provided with private information that the pesticide in question had not been tested properly for toxicity to other animals, as the testing technician had been intoxicated at the time of the tests. Under full information, the correct decision in this scenario was to award the full stake to Chris, the complaining party.

Case scenario 2, entitled "Jan and Pat," involved a complaint by a farmer against a veterinarian alleging that the veterinarian's malpractice killed the farmer's cow. In this case, the complaining party Jan, the farmer, was "Mr. Wrong," who

was supplied with private information that a self-administered home remedy had killed the cow. Under full information, the correct decision in this scenario was to award the full stake to Pat, the defending party.

In the experimental sessions, subjects were assigned at random to play one of six roles—complaining party, defending party, or referee, under either "questioning parties" or "questioning referee"—as to each scenario, which were played successively in two rounds per experimental session. Learning effects were sought to be minimized by alternating the sequence of the scenarios across successive experimental sessions, by the randomized reassignment of roles and rule systems between rounds, and by isolating subjects between rounds. Subjects were told the payoff levels in advance (in most sessions, a maximum of $20 per round, times two rounds, plus a $5 show-up fee). At the end of the second round, the subjects were paid and discharged and were then disqualified from further participation.

At the beginning of each round, each of the six roles were provided with instruction sheets explaining the rule system and their role within that system. Adversarial procedure was represented by the system called "questioning parties," in which the "referee" is entirely passive during the hearing and merely decides the case afterward. Inquisitorial procedure was represented by "questioning referee," in which *only* the referee may ask questions and the parties are relegated essentially to the role of interested witnesses. The same time limits were provided under both systems. In "questioning parties," the total time was divided equally between the parties, with provision for both an initial "case in chief" phase and a follow-up "rebuttal" phase. In "questioning referee," the time allocation was left to the referee. Neither rule system involved any explicit burden of proof (though the decision rule might be interpreted as implicitly casting the burden on the complaining party) or any explicit rules of evidence, except for a strong antiperjury rule.

The three subjects involved in each observation were isolated in a separate room with a fourth person as "monitor." The role of the monitor was to enforce time limits, role limitations, and the antiperjury rule and to record the observations on both revelation (whether the hidden information possessed by "Mr. Wrong" was brought out during the questioning phase) and accuracy (based on the referee's award of the stake).[14]

Each experimental round began with the distribution of information sheets on both roles and "basic information" on the case scenario being played, which included a description of the decision rule to be applied by the referee, which was

14. The subjective aspect of these observations is one possible weakness in the experimental results, as the monitors' assignments were not randomized. However, different monitors were employed in different experimental sessions, without any detectable differences in results.

made known to both parties and referee.[15] The subject playing referee received only the "basic information," whereas each of the parties received a sheet of "additional information." In the case of the party who was "Mr. Wrong" in the scenario, this "additional information" included the private and discrediting information that would cause "Mr. Wrong" to lose the case under the decision rule and advised "Mr. Wrong" of the significance of that fact. However, none of the materials given to subjects specified that one of the contesting parties necessarily was "right" and the other "wrong" under full information, and both the instructions and case scenarios permitted compromise solutions by the referee, albeit solutions that deviated from the given decision rule.

In the first set of "private information" experiments, the additional information given to "Mr. Right" was completely ambiguous as to who, if anyone, was in the right.[16] In the second set of "correlated information" experiments, the only change was to add a clue to the additional information supplied to "Mr. Right" that, if pursued effectively, would result in the revelation of the hidden and discrediting information possessed by "Mr. Wrong."[17]

Following a questioning phase, conducted exclusively by the referee in "questioning referee" (inquisitorial system) and exclusively by the parties in "ques-

15. In case scenario 1 (Chris and Leslie; "Pheasant"), the decision rule was stated as "Leslie has to pay compensation only if Leslie's company failed to perform the standard testing or if the standard testing was performed improperly." In case scenario 2 (Jan and Pat; "Cow"), the decision rule was "Jan is entitled to compensation only if improper performance of veterinary services caused Jan's cow to die."

16. If anything, the private information conveyed to "Mr. Right" might have suggested to that subject that he or she in fact would turn out to be "Mr. Wrong," by indicating that, in the absence of further information, that subject would lose the case. In addition, Mr. Right's private information included both useful and false "leads" to the hidden information, whereas Mr. Wrong's private information left no doubt that Mr. Wrong was wrong, i.e., would (or, under the decision rule, should) lose the case if the hidden information were revealed.

17. The following are exact transcriptions of the supplemental information provided to "Mr. Right" in each scenario under the "correlated information" variant:

Scenario 1 (Chris and Leslie; the "Pheasant" scenario): "You are aware that Leslie's testing technician, Jordan, was an alcoholic. Since the events in question here, Jordan was killed in an automobile accident that police reports indicated had been caused by Jordan's drunken driving. One week ago, you received an anonymous telephone call from a woman who identified herself only as one of Leslie's employees, who told you that, after Jordan's death, Leslie discovered that Jordan did not properly perform the product testing, and, upon re-testing, that the pesticide in question was shown to be poisonous to other plants and animals by the standard tests."

Scenario 2 (Jan and Pat; the "Cow" scenario): "Yesterday, you received a telephone call from Fran, who said that he/she had heard from Jan's neighbors that Jan had used a home remedy on the cow, and that, after the cow's death, Jan found out that the home remedy is always fatal to cows, whether or not they are sick. However, neither Fran nor the neighbor are available to give this information to the referee."

tioning parties" (adversarial system), there was a decision phase after which the referee announced her or his decision. The subjects were then randomly reassigned to new roles to play the second scenario. At the end of the second round, subjects were informed of the "correct" outcomes and received their payoffs for both rounds combined.

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