The Nash Equilibrium Meets BATNA: Game Theory's Varied Uses in ADR Contexts

Jeff Hawkins & Neil Steiner

GAME THEORY AND THE LAW. By Douglas G. Baird,[1] Robert H. Gertner,[2] Randal C. Picker.[3] Cambridge and London: Harvard University Press. 1994. Pp. xi, 330.

In the second half of the twentieth century, legal scholars have borrowed heavily from their economic counterparts and have imparted a rigor to legal scholarship through the application of economic reasoning. Ronald Coase, in his pioneering work, *The Problem of Social Cost*,[4] paved the way for the use of economic principles to analyze legal problems.[5] With the publication of Guido Calabresi's *The Costs of Accidents: A Legal and Economic Analysis*[6] in 1970 and the first edition of Richard Posner's *Economic Analysis of Law*[7] in 1973, the application of microeconomics to legal problems became firmly entrenched.[8] The classical microeconomic assumption of complete information, however, severely limited this economic analysis.

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1. Dean, University of Chicago Law School.

2. Associate Professor of Business, University of Chicago.

3. Professor of Law, University of Chicago Law School.

4. Ronald Coase, *The Problem of Social Cost*, 3 J. L. ECON. 1 (1960).

5. Coase analyzed whether farmers or railroad companies should bear the costs of fires caused by sparks from trains. Employing economic reasoning, he concluded that, in the absence of transaction costs, the placement of the initial entitlement would not affect efficiency because the parties would bargain to the socially optimal amount of railroad usage. The allocation of the entitlement, however, would affect the distributional positions of the parties. *See id.* at 29–34.

6. GUIDO CALABRESI, THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS (1970).

7. RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW (1973).

8. Posner's appointment to the United States Court of Appeals for the Seventh Circuit in 1981 and Calabresi's appointment to the Second Circuit in 1994 indicate the further entrenchment of economic analysis of law.

Recently, scholars from specialized areas in economics — game theory and information economics[9] — have focused on legal problems characterized by incomplete information and strategic behavior.[10] Although a few analysts have applied game-theoretic principles to narrow legal questions,[11] *Game Theory and the Law* represents the first attempt to apply such formal concepts to broad legal problems. Through a succinct introduction to game theory, the authors demonstrate the power of this analytic approach to illuminate a wide variety of legal situations, from collective bargaining to antitrust litigation.

We will provide a general overview of *Game Theory and the Law* and then will use an example from the book to explore two concepts fundamental to game theory — strategic behavior and incomplete information. We will conclude by demonstrating the power of these game-theoretic tools in the context of alternative dispute resolution (ADR). We hope that this review will provide a helpful introduction to game-theoretic analysis and convince those interested in ADR practice or policy-making to read *Game Theory and the Law* for themselves.

I. OVERVIEW

The authors synthesize and summarize the major underpinnings of game theory, introducing formal concepts at the beginning of each chapter in easily accessible language aimed at those without formal training in the discipline. Despite game theory's reliance on advanced branches of mathematics, the authors have eschewed unwieldy formulas; for those interested in a more complex analysis, the calculations are set out in the book's endnotes. In a further attempt

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9. *See, e.g.*, DREW FUDENBERG & JEAN TIROLE, GAME THEORY (1991) (introducing game-theoretic reasoning and using it to analyze the bargaining process); ERIC RASMUSEN, GAMES AND INFORMATION: AN INTRODUCTION TO GAME THEORY (1989) (same); DAVID M. KREPS, GAME THEORY AND ECONOMIC MODELING (1990) (discussing the strengths and weaknesses of game-theoretic analysis).

10. Although the rigor and structure of game theory was new, some law and economics scholars had implicitly utilized game theory without taking full advantage of game-theoretic solution concepts (p. 47).

11. *See, e.g.*, Robert Cooter et al., *Bargaining in the Shadow of the Law: A Testable Model of Strategic Behavior*, 11 J. LEGAL STUD. 225–51 (1982) (using the game theoretic model to examine pre-trial negotiations); Lucian A. Bebchuk, *Litigation and Settlement under Imperfect Information*, 15 RAND J. ECON. 404–415 (1984) (using game theory and information economics to show how informational asymmetry influences parties' settlement decisions); Thomas H. Jackson, *Bankruptcy, Non-Bankruptcy Entitlements and the Creditor's Bargain*, 91 YALE L.J. 857–907 (1982) (applying the prisoner's dilemma to bankruptcy law).

to appeal to non-specialists, the authors include a valuable glossary of game-theoretic terms. Each chapter ends with a concise summary and a helpful set of bibliographic notes that guide the reader to more extensive discussions of the problems and concepts presented therein.

From the outset, the authors set as their goal an explanation of how highly technical game-theoretic tools can offer insights into the ways in which legal rules affect behavior (p. xi). The predictive value of game theory rests upon the assumption that two basic principles guide human behavior — that people will act rationally and that they will choose the option with the highest value (p. 271). Throughout their analysis, the authors recognize the limitations of these simplifying assumptions (pp. 125, 167, 271) and the consequent inability of game-theoretic concepts to predict precise outcomes (pp. 45, 62, 165, 268). The elegance of the authors' argument stems from their ability to demonstrate the problems inherent in oversimplification while simultaneously illustrating the power of game theory.

II. Strategic Behavior and Incomplete Information

"Strategic behavior" is a process of interactive decision-making in which each party's choice and payoff are influenced by what it expects the other party to do (p. 1). Each party believes that the other will play its best strategy, and, therefore, chooses a strategy with the highest expected payoff, given its anticipation of the other party's strategic choice (pp. 11–12).

Incomplete information occurs when one party lacks knowledge of either the game's structure or the payoffs to the other party (p. 10). While microeconomic models assume perfect information, game-theoretic tools are useful in analyzing the real-world problem of information asymmetries. One party's lack of information or inability to transmit information to another will affect the bargaining dynamic and frequently frustrate efficient exchanges (p. 270). Each party has the incentive to reveal private information favorable to its own position while attempting to conceal unfavorable information (p. 91). The missing information might be either verifiable or nonverifiable; this information asymmetry will influence each side's ability to communicate credibly with the other (pp. 89–91).

Game theory can be used to analyze the impact of legal rules in situations in which one party possesses information that they cannot communicate directly. In game theory jargon, one party possesses private, nonverifiable information. The uninformed party can only discover the content of this private information by drawing inferences

from the "signals" of the informed party (p. 123). Because the information is nonverifiable, a requirement of mandatory disclosure would not be effective; the party required to reveal information has no incentive to tell the truth (p. 122). Nonetheless, a change in the legal rule could have a substantial impact on the actions parties take in this situation (p. 122). The authors present an excellent example, the "Chair Game," which can be used to illustrate these two concepts.

The Chair Game involves an employer that wishes to hire one additional worker (pp. 126–138). There are two different kinds of workers, those with good backs and those with bad backs; the condition of any worker's back is private, nonverifiable information. The worker must decide whether to request an orthopedic chair or a swivel chair. The employer may be able to draw inferences from the worker's choice. After the employee chooses a chair, the employer must decide whether or not to train the employee. The employer enjoys a benefit if it trains an employee with a good back and a loss if it trains an employee with a bad back. In the solution to this game, both types of workers request a swivel chair and all workers are trained; because the information is nonverifiable, a party that possesses unfavorable information (a bad back) acts strategically by mimicking the actions of those that possess favorable information (a good back) (pp. 133–134).

This type of pooling equilibrium[12] is often inefficient. A legal rule change can produce a more efficient outcome in one of three ways (pp. 156–157). First, the rule change can limit the actions that informed players can take, shifting the outcome to a more efficient pooling equilibrium (p. 135). In the context of the Chair Game, a legal rule that requires employers to furnish all workers with orthopedic chairs would be more efficient because it would allow employees with bad backs to capture more benefits without signaling any negative information to the employer.[13]

Second, a rule change can limit the actions that the uninformed players take in response to the actions of the informed, thereby creating a more efficient separating equilibrium.[14] For example, a legal rule that forbids employers from discriminating against employees

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12. A pooling equilibrium is a solution to a game where different types of informed players take identical actions to prevent an uninformed player from drawing any inferences from the informed player's choice (p. 83).

13. One of the first assumptions made in this game is that an employer spends an equal amount supplying an employee with either a swivel or orthopedic chair (p. 127).

14. In a separating equilibrium, different types of informed players take different actions, thereby signaling their type to the uninformed player (p. 83).

with bad backs would make those with bad backs better off and the employer no worse off (p. 136).[15]

Finally, a legal rule that subjected uninformed players to civil damages for retaliatory conduct would create an efficient solution (p. 138). In the Chair Game, this would bring about an efficient separating equilibrium by forcing the employer to internalize the costs of training (p. 138). An added benefit of this type of rule is that it allows the rule-maker to act without full knowledge of the applicable costs and benefits (p. 139).

III. APPLICATION TO ALTERNATIVE DISPUTE RESOLUTION (ADR)

ADR scholars and practitioners can use these tools to better analyze how legal rules affect the settlement of disputes. Using the formal concepts of game theory for rigorous analysis of strategic behavior in negotiation, mediation, and arbitration processes may lead to novel conclusions regarding decision-making on such questions as whether and when to file a lawsuit, whether to use different lawyers to negotiate and litigate, and whether to enter binding or non-binding arbitration.

To illustrate how game-theoretic reasoning can be applied to analyze these and many other questions presented in ADR, consider two examples of important decisions made during the course of a typical lawsuit — the individual's decision whether to hire a lawyer and the judicial rule-maker's decision whether to use pretrial ADR, such as mediation. Using the tools of game theory to predict the outcome of various possibilities given incomplete information and strategic behavior, parties to a lawsuit can hire a lawyer at the optimal time and rule-makers can create a system that will encourage the most effective use of ADR.

Each party to a legal dispute faces a classic prisoner's dilemma when deciding whether to hire a lawyer.[16] Assume that if neither hires a lawyer, the parties will reach a resolution between themselves.[17] If one side hires a lawyer, that party must compensate its lawyer but will be able to capture a greater share in the ultimate

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15. Workers with bad backs would be able to request orthopedic chairs and still receive training because the employer would not be able to discriminate. The employer is no worse off because without the anti-discrimination rule, the worker would request a swivel chair and receive training (pp. 136–37).

16. The term "prisoner's dilemma" describes a game in which two players have complete information, and each playing its best strategy results in a sub-optimal outcome for both (p. 33).

17. This resolution can be negotiated and can also result from trial, mediation, or arbitration.

resolution.[18] If both parties hire a lawyer, neither will be able to increase its share of the settlement, and each must compensate its attorney.[19] The solution to this prisoner's dilemma would be that each party would hire a lawyer, a sub-optimal solution for both.

Game theory and information economics suggest methods by which litigants can avoid this prisoner's dilemma. For example, Gilson and Mnookin explain that a litigant's inability to signal credibly his intention to cooperate prevents parties from escaping the prisoner's dilemma.[20] They suggest that litigants can overcome this information asymmetry by hiring a lawyer with a reputation for cooperation, thereby mitigating strategic action on both sides.[21] Another method of escaping the prisoner's dilemma, lengthening the shadow of the future, requires parties to view the course of litigation as a number of repeated games.[22] Uncertainty as to when trial will occur and the "game" will end may induce both parties to cooperate and not to hire a lawyer.

One can extend the concept of signaling, illustrated by the author's Chair Game, to analyze how a rule affects the use of ADR procedures such as pretrial mediation. The legal rule can require mediation in every case, in those cases where at least one of the parties requests mediation, or only in those cases where both parties agree to mediation.

The example of an automobile accident provides an opportunity to examine how each of the three possible rules would affect whether parties settle before trial. Assume the plaintiff incurred either high damages or low damages (with equal probability) and the defendant exercised either high care or low care (with equal probability). This information is private to each party,[23] and the defendant knows whether he has exercised high or low care. Without receiving a signal about damages from the plaintiff, the defendant expects to pay

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18. *See* Robert H. Mnookin et al., *Why Lawyers*, in BARGAINING IN THE SHADOW OF THE LAW: THE LAWYER AS NEGOTIATOR (forthcoming 1997).

19. This game requires the assumption that the shares to each side be identical if neither or both hire a lawyer, but not that the resolution be a 50-50 settlement.

20. *See* Ronald J. Gilson & Robert H. Mnookin, *Disputing Through Agents: Cooperation and Conflict Between Lawyers in Litigation*, 94 COLUM. L. REV. 509, 512 (1994).

21. *See id.* at 522–24.

22. *See* ROBERT AXELROD, THE EVOLUTION OF COOPERATION 126–30 (1984).

23. Assume both parties are risk neutral; a high damage plaintiff has losses of $75, while a low damage plaintiff suffers only $25 in losses; and a high care defendant will be found negligent in 25% of the cases, while a low care defendant will be found negligent 75% of the time.

$50 in damages if found negligent.[24] Similarly, the plaintiff knows her damages; without a signal, she expects to recover in only 50% of the cases.[25] If high damage plaintiffs and high care defendants expect to do better by going to court than by mediating, these parties will not request mediation. For low damage plaintiffs and low care defendants, requesting mediation will reveal their status, and they will instead mimic the behavior of the other groups and not request mediation. Under a rule in which mediation occurs only when one party requests it or both agree to it, mediation will not take place.[26] In a system of mandatory mediation in all cases, the signaling effects will be eliminated, and 75% of the cases will settle.[27] As long as the cost of mediation is less than 75% of the cost of trial, a rule which requires mediation in all cases will be beneficial.[28] By using the game-theoretic tool of signaling, it is possible to understand what circumstances would make a rule mandating mediation desirable and also to predict how parties will act under different systems.

IV. CONCLUSION

Applying game-theoretic models to important decisions is not appropriate in all situations. The authors are quick to recognize the shortcomings of their approach (pp. 125, 271), and anyone applying the tools of game theory must also be aware of these limitations. While some fault the application of game theory to legal issues because it appears to only value efficiency and to ignore fundamental

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24. The defendant will expect to pay $75 in half of the cases (those involving a high damage plaintiff) and $25 in the other half (a low damage plaintiff). Without any additional information about the type of plaintiff in a particular case, he will expect to pay $50 if found negligent.

25. The plaintiff will recover in 75% of the cases involving a low care defendant and in 25% of the cases involving a high care defendant. Without additional knowledge about the level of care exercised by a particular defendant, she will expect to recover in 50% of the cases.

26. Low care defendants and low damage plaintiffs will mimic the decision not to request mediation in order to hide their adverse private information.

27. A low care defendant expects to pay $37.50, a high care defendant expects to pay $12.50, a high damage plaintiff expects to receive $37.50, and a low damage plaintiff expects to receive $12.50. In the case of a high care defendant and a low damage plaintiff, settlement can occur at $12.50. In the case of a low care defendant and a high damage plaintiff, settlement can occur at $37.50. In the case of a low care defendant and a low damage plaintiff, settlement can occur between $12.50–$37.50. In the case of a high care defendant and a high damages plaintiff, settlement cannot occur because a high care defendant would not pay more than $12.50 and a high damages plaintiff would not accept less than $37.50.

28. With mandatory mediation, the expense of mediation will be incurred in all cases as will the cost of trial in 25% of the cases; under a system of voluntary mediation, there will be no mediation costs at all but there will be trial costs in every case.

rights,[29] other critics simply contend that psychological and sociological factors need to be built into the game-theoretic model.[30] With game theory, as the examples illustrate, a subset of efficient rule configurations can be identified; with a proper model, the decision-maker will be able to use principled reasoning to choose among equally efficient alternatives.

Notwithstanding the limitations of game theory, the examples discussed above highlight the relevance of the concepts explained in *Game Theory and the Law* to legal decision-making and to the field of alternative dispute resolution. For those interested in a better understanding of the bargaining process and for those who wish to create the rules that shape that process, the ability to utilize the tools of game theory is a must. *Game Theory and the Law* provides the perfect introduction to those tools.

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29. *See* Jeremy M. Miller, *Economic Analysis of Legal Method and Law: The Danger in Valueless Values*, 21 GONZ. L. REV. 425, 448 (1985–86).

30. *See* Robert C. Ellickson, *Bringing Culture and Human Frailty to Rational Actors: A Critique of Classical Law and Economics*, 65 CHI.-KENT. L. REV. 23, 35 (1989); Thomas Schelling, *Self-Command in Practice, in Policy, and in the Theory of Rational Choice*, 74 AM. ECON. REV. PAPERS & PROC. 1 (1984).