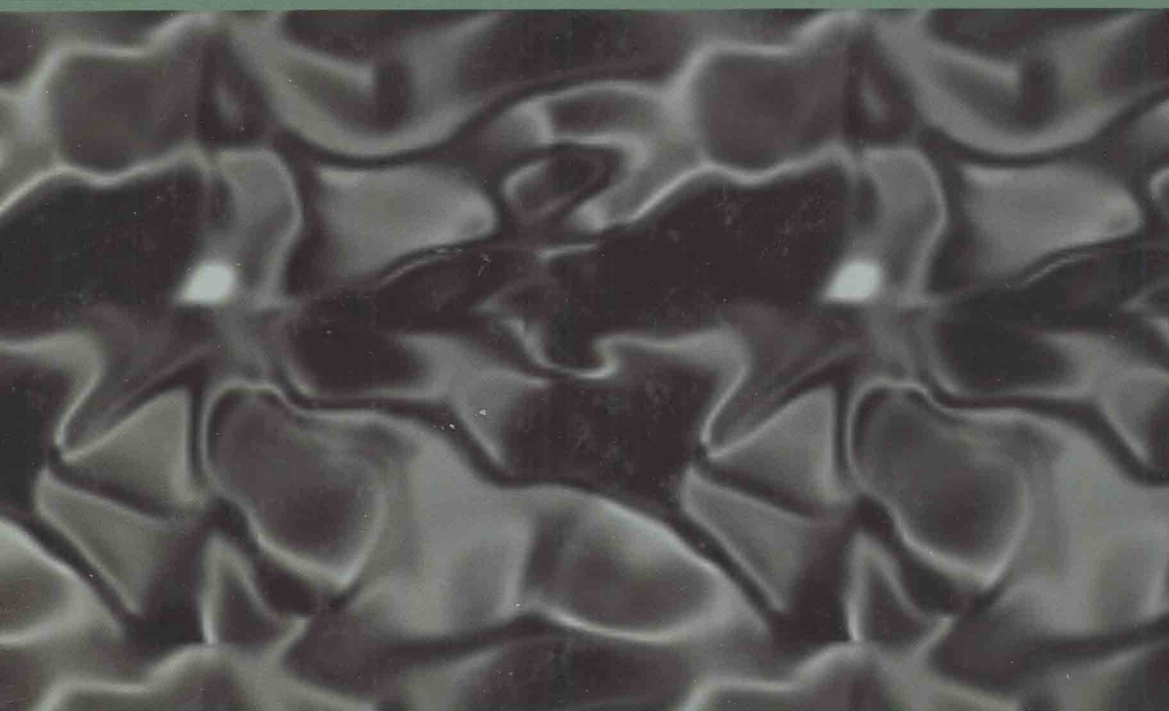


Game Theory and the Law

Edited by Eric B. Rasmusen



Game Theory and the Theory

Edited by

Eric B. Rasmusen

*Dan R. and Catherine M. Dalton Professor of Business Economics and
Public Policy*

ECONOMIC APPROACHES TO LAW

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Introduction

Eric B. Rasmusen

Game theory is an approach to analyzing situations that has been increasingly used in economics from 1970 to 2000 and has, correspondingly, been increasingly used in law-and-economics. Economic theory since Adam Smith has been based on the idea that people's behavior responds to incentives, which generate unexpected results at the level of the market. Alfred Marshall introduced an elegant way to combine incentives and markets with supply and demand curves, which put the focus on the incentive of price, with costs and benefits of transactions in the background. The supply and demand diagram was the foundation of the Chicago School of economics, which gave rise to the Law-and-economics Movement. The limitations of that diagram, however, are particularly apparent when it is applied to the subject of law. A legal penalty is a price for breaking a law or a legal obligation, but two difficulties arise. First, asymmetric information, something hard to incorporate in supply and demand, is the common setting in the situations which law addresses. Only the criminal knows he committed the crime. Only the defendant knows precisely the damage caused by the tort. Second, legal actors often do not operate in a competitive market, taking prices as given. Rather, they bargain to reduce the price, or try to evade paying it, or 'buy the product' without knowing what price the court or regulator will make them pay.

These problems appear in economic settings as well, and account for much of the success of game theory, which is peculiarly well suited to deal with them. Instead of the isolated, price-taking individual buyer and seller, or the anonymous market-place, game theory begins with a group of individual players, each equipped with his own information, possible strategies, and payoff function. Incentives are still the center of attention, but now a player is conscious of his effect on what other players do and know.

Game theory is used in law in the same way that economics in general is used: to simplify situations enough to show the key forces at work. This involves ruthlessly stripping away any features of the situation being analyzed that are unconnected to these key forces. Judith Lachman put this well in her 1994 review of A. Mitchell Polinsky's *An Introduction to Law and Economics*, where she compares the simplifying models of economics to completely different maps of a single region that are different because they depend on the purpose each map is intended to serve (p. 1587, footnotes omitted):

Fortunately for us – and despite Professor Polinsky's humble caveats to the contrary – his book comes equipped with everything. In particular, it comes equipped with an early chapter about the role of assumptions, and about the uses of abstraction in the process of economic inquiry. There Polinsky points out that '[e]conomists make assumptions for the obvious reason that the world, viewed economically, is too complicated to understand without some abstraction'. He therefore suggests isolating one or two issues at a time 'by making simplifying assumptions that eliminate the others', and later expanding the inquiry by adding various complications to the framework. In other words, the challenge of economic thinking is the proper use of abstraction; in determining how properly to use abstraction, one needs to take into account concerns about tractability, the realism of assumptions,

the particular questions to be pursued, and the relationship of the assumptions to the goals of the inquiry. To use Polinsky's phrasing, '[t]he art of economics is picking assumptions without inevitably causing those features to be unimportant ones'.

Because the process of economic abstraction is, by assumption, unfamiliar to the book's readers, I approach it by analogy to a more familiar concept, specifically, to abstraction in the form of maps. A map is an abstraction of the world, and its use requires a theory by which one can link the abstraction with the world. Before this linkage is established, however, one needs to know the questions the map should answer. Humbug. A map is a map is a map, you say? Then, by all means, help yourself to a soundscape map of Boston: 'A composite view of the variety of city sounds perceived along a sequence of streets ... [in which s]ymbols represent qualities of sounds ... for example, soft, intense, roaring, muffled, sharp, echoing, expansive.' Or if that's not quite what you had in mind, how about an Eskimo Coastline Relief Carving (yes, you read that correctly), convenient for carrying on and around your ship? Or a color-coded map showing 'The Percent of [the US] Population Unchurched ... 1971'? And so on.

Somehow, these maps offer little help in getting from Madison to Chicago. Instead I want a road map, and a certain kind at that: I need to be given the details of the street plan for the cities at each end, but not such details for everywhere in between. I need to know about the roads, and seasonal temperature and precipitation indicators would be nice. What about cloud movements, wind direction and color-keyed info on vegetation? National and local parks, population centers, and Howard Johnson restaurants? The map darkens progressively with colors and symbols, and darkens still some more until ... until I notice that even as I gave free rein to my desire to know more, I consigned myself to a map from which I could only know less.

This is the paradox of abstraction to which Polinsky succinctly referred: The skillful use of abstraction requires one to forego including some considerations that would indeed add information, so that the resulting abstraction will, in the end, tell us more.

So it is with game theory models. Stripping a situation down to particular players, actions, and payoffs puts in focus interactions between people or organizations that would otherwise be obscured by reality's details.

Introductions such as you are now reading are seldom read, but when they are, it is for two reasons. Newcomers to the field want guidance as to which of the articles contains the information they want, and which articles are best known in the field. Those more experienced already know which articles are most famous and what is in those famous articles, but wonder whether they should read the articles they have not seen before. I will try to do both.

Part I: General

I start this collection with four articles useful for thinking about the application of game theory to law generally. Ian Ayres's 'Playing games with the law' (Chapter 1) is a review of my book, *Games and Information: An Introduction to Game Theory*, but it is a review that cleverly replaces the book as an introduction by using examples from law to illustrate game theory's basic models. The most important book on game theory and the law is *Game Theory and the Law* by economics professor Robert Gertner and law professors Douglas Baird and Randal Picker (Baird *et al.*, 1994). Rather than select a chapter from the book, I have chosen to include the review of it in dialog form, 'Review dialog: on game theory and the law', organized by Kenneth Dau-Schmidt for *Law and Society Review* (including also Michael Alexeev, Jeffrey Stake, Robert Heidt and myself) (Chapter 2). The third article in this part is 'Agency models in law and economics', by Eric A. Posner, which appeared in *Chicago Lectures in Law*

and Economics (Chapter 3), a book of overview essays which deserves to be better known. In the field of law and game theory, Professor Posner is best known for his 2002 book, *Law and Social Norms*, which interprets social norms as signals, but the present article is concerned with the problem of principal and agent, boss and worker, where players must contract under asymmetric information.

All three of those articles are enthusiastically in favor of the use of game theory, though including, of course, caveats about its potential for misuse. I've thought it useful also to include an overview that focuses on the bad things about game theory and complains about its tendency to lead scholars into models too distant from the real world to be useful for analysis of any actual situation we might come across. For this, I've included Franklin Fisher's 'Games economists play: a noncooperative view' (Chapter 4). Fisher is an economist known for his research in both econometrics and mathematical economics, but also for his consulting work both for the defendant in the IBM and the plaintiff in the Microsoft antitrust cases. His complaint is that game theory has given little guidance for economic policy, and its users have therefore left antitrust law without the economic theory it really needs.

Part II: Bargaining and Procedure

The second part of the book concerns what might seem the most natural area for strategic behavior in the law. Robert Cooter and Daniel Rubinfeld's 'Economic analysis of legal disputes and their resolution' (Chapter 5) has long been a standard survey of the literature on suit and settlement, a literature that greatly expanded after publication of Ivan P'ng's 'Strategic behavior in suit, settlement, and trial' (Chapter 6). 'Settlement, litigation, and the allocation of litigation costs' by Jennifer Reinganum and Louis Wilde (Chapter 7), an alternative to P'ng's model, views settlement offers as signalling and gives a good explanation of how failed bluffing prevents some cases from settling before trial. This problem of why not all cases settle is the basis for one strand of the literature; another strand asks why plaintiffs who bring 'nuisance suits' ever obtain settlements, since they would lose at trial. 'A new theory concerning the credibility and success of threats to sue' by Lucian Bebchuk (Chapter 8) represents that literature, and is particularly good as an illustration of the use of game theory.

The other two articles in Part II on bargaining and procedure are about labor law and discrimination rather than suit and settlement. Keith Hylton's 'An economic theory of the duty to bargain' (Chapter 9) uses game theory to analyze the curious requirement that union and employer bargain with each other in good faith, even though there is no requirement that either side make an acceptable offer to the other. Ian Ayres's 'Fair driving: gender and race discrimination in retail car negotiations' (Chapter 10) is an example of empirical game theory. Ayres gave a group of testers of different races and both sexes a script with a bargaining strategy they were to follow in trying to buy a car. The results give an interesting picture of how professional bargainers (the salesmen) use their prior expectations to choose their responses to a given strategy.

Part III: Contracts

Contract law is another natural area to which to apply game theory, since it involves two parties each choosing actions in anticipation of how the other party will respond. The best-known contribution of game theory to this subject is 'Strategic contractual inefficiency and the optimal choice of legal rules', by Ian Ayres and Robert Gertner (Chapter 11), which suggests that the government impose legal default rules that are purposely inefficient so as to induce the contracting parties to fully specify what they desire in contracts. Game theory is useful in explaining why parties make incomplete contracts in the first place, when drafting extra terms has relatively low cost. My own 'Explaining incomplete contracts as the result of contract-reading costs' (Eric Rasmusen (Chapter 12)) is one example of that literature, which not only satisfies this editor's sense of what is important, but gives notice of the entry of purely electronic journals into the scholarly world. Finally, 'Legal rules in repeated deals: banking in the shadow of defection in Japan', by J. Mark Ramseyer (Chapter 13), applies the theory of repeated games (in simple form) to contracts in the particular context of Japanese banking.

Part IV: Torts, Crime, and Taxes

Litigation and contracts are the areas which are perhaps best suited to game theory since they both involve two players who know each other and know that their actions have intertwined effects. I have included four articles in Part IV on other areas of law, because the method of game theory can be applied even when one player is simply responding to the incentives created by a legal rule. The classic article on tort law, 'Toward an economic theory of liability', by John Prather Brown (Chapter 14), precedes the conscious use of game theory in legal research, but follows exactly the same method: establish payoff functions for various players and see what actions they will take to maximize their payoffs. There is by now a large literature on torts. Here 'Decoupling liability: optimal incentives for care and litigation', by A. Mitchell Polinsky and Yeon-Koo Che (Chapter 15), is chosen because it shows how carefully disentangling different incentives through the use of game theory can lead to both surprising and understandable results.

The other two articles in this part address public law. An early example is 'The tax compliance game: toward an interactive theory of law enforcement', by Michael Graetz, Jennifer Reinganum, and Louis Wilde (Chapter 16). This uses what even in the theoretical economics literature is known as an auditing model to look at how taxpayers respond to tax collectors and vice versa. Tax enforcement is just one area of public enforcement of law. A. Mitchell Polinsky and Steven Shavell's 'The economic theory of public enforcement of law' (Chapter 17) surveys public enforcement generally, including, especially, criminal law.

Part V: Courts

The last part of this volume consists of three articles about the behavior of courts. The first article, 'The selection of disputes for litigation', by George Priest and Benjamin Klein

(Chapter 18), is famous for destroying the commonsense – but false – idea that if defendants win most of the cases in a court, that court is pro-defendant. This is false because what may be happening is that the court is so pro-plaintiff that only the defendants with extraordinarily strong evidence on their side bring their suits to trial, or because the majority of cases filed settle in favor of the plaintiff but the few that reach trial are a special set which happens to include mostly cases that the defendant will win. That article is about how litigants respond to court behavior, while ‘A rational choice theory of supreme court statutory decisions with applications to the *State Farm* and *Grove City* Cases’, by Rafael Gely and Pablo Spiller (Chapter 19), examines how court and legislature interact. Each can replace the rules set by the other at some cost, but a court might, for example, carefully change a legislative rule just enough that it is not worthwhile for the legislature to change the statute to defeat the court’s action. Finally, in ‘Stability and reliability in judicial decisions’, Frank Easterbrook (Chapter 20) addresses strategic interactions within a multi-member court, and the potential effects of vote ‘cycling’.

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Part I

General

[1]

REVIEW ESSAYS

Playing Games with the Law

Ian Ayres*

GAMES AND INFORMATION: AN INTRODUCTION TO GAME THEORY. By Eric Rasmusen. Oxford: Basil Blackwell. 1989. 352 pp. \$29.50.

In the last two decades, the theory of games has increasingly dominated microeconomic theory. Frank Fisher recently asserted that game theory has become "the premier fashionable tool of microtheorists":

That ascendancy appears fairly complete. Bright young theorists today tend to think of every problem in game-theoretic terms . . . Every department feels it needs at least one game theorist or at least one theorist who thinks in game-theoretic terms. . . . The field appears to be in an exciting stage of ferment.¹

Seminars, economic journals, and Ph.D. dissertations are awash with game-theoretic models of economic phenomena.² The marginalist revolution of Samuelson³ is quickly being supplanted by the strategic models of a new breed of game theorists.⁴

This dramatic change in methodology stems from a series of break-

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1. Franklin M. Fisher, *Games Economists Play: A Noncooperative View*, 20 RAND J. ECON. 113, 113 (1989). Fisher's description of the "ascendancy" is echoed by other economists. See, e.g., Carl Shapiro, *The Theory of Business Strategy*, 20 RAND J. ECON. 125, 125 (1989) ("This new wave of [industrial organization] research consists almost exclusively of game-theoretic studies of behavior and performance in imperfectly competitive markets.").

2. A casual glance at any issue of the leading microeconomic journals such as *Rand Journal of Economics* or *Review of Economic Studies* will reveal several game theory articles. See, e.g., Joseph Farrell & Garth Saloner, *Standardization, Compatibility, and Innovation*, 16 RAND J. ECON. 70 (1985); Drew Fudenberg & Jean Tirole, *Sequential Bargaining with Incomplete Information*, 50 REV. ECON. STUD. 221 (1983).

3. Nobel Prize winning economist Paul Anthony Samuelson formalized the marginalist method of utility and profit maximization. See PAUL ANTHONY SAMUELSON, *FOUNDATIONS OF ECONOMIC ANALYSIS* (1947).

4. The new game theory is dominated by a closely knit group of co-authors which includes David Kreps, Eric Maskin, Roger Myerson, Garth Saloner, Jean Tirole, and Robert Wilson. These theorists often collaborate, and the history of game-theoretic advances turns on the axes of their academic institutions: Stanford, M.I.T., Northwestern, and Harvard. See, e.g., David M. Kreps, Paul Milgrom, John Roberts & Robert Wilson, *Rational Cooperation in the Finitely Repeated Prisoners' Dilemma*, 27 J. ECON. THEORY 245 (1982); Eric Maskin & Jean Tirole, *Correlated Equilibria and Sunspots*, 43 J. ECON. THEORY 364 (1987).

throughs in the ability to model dynamic games with asymmetric and incomplete information.⁵ Economists can now tractably analyze complicated models (or "games") in which individuals ("players") are uncertain or uninformed. These advances have enabled economists to apply the "new" game theory to strategic aspects of everything from bankruptcy to plea bargaining and patent "races."⁶ The reality of today's economic academy is that one cannot "do" microeconomic theory without being able to model and solve economic games: Game-theoretic literacy is simply a prerequisite.⁷

It is time that both friend and foe of law and economics take notice of these developments. If history repeats itself, the dominant paradigm of economics today will likely influence the legal scholarship of tomorrow.⁸ Just as the efficient capital markets hypothesis has come to influence our current conceptions of corporate law—demonstrated, for example, by the Supreme Court's recent acceptance of the "Fraud on the Market" theory for securities standing⁹—the "new" game theory may very well seep into future law and economics scholarship.

So far, however, the advances of game theory have been slower to diffuse into legal reasoning than other economic contributions. For example, the capital asset pricing model, developed in the mid-sixties, has gained much wider acceptance in the legal community than has game-theoretic modelling.¹⁰ One explanation for this slow diffusion is that new game theory techniques in a sense represent a research technology with high barriers to entry. Even legal academics well-schooled in law and economics have found it intimidating to master new concepts such as "perfect Bayesian equilibria."¹¹ The exclusionary aspects of learning the new modelling techniques have also been felt within the economics profession. The economists who pioneered and mastered these new modelling tools were simply too busy applying them to take the

5. These terms are defined below. See text accompanying notes 47-50 *infra*.

6. See, e.g., Jeremy I. Bulow & John B. Shoven, *The Bankruptcy Decision*, 9 BELL J. ECON. 437 (1978); Jennifer F. Reinganum, *Innovation and Industry Evolution*, 100 Q.J. ECON. 81 (1985); Jennifer F. Reinganum, *Plea Bargaining and Prosecutorial Discretion*, 78 AM. ECON. REV. 713 (1988); Robert Gertner & David Scharfstein, *The Effects of Reorganization Law on Investment Efficiency* (May 1989) (unpublished manuscript) (on file with the *Stanford Law Review*).

7. It should be noted that economists are not unanimously in favor of this ascendancy. For a recent debate on whether the game theory approach is fruitful, compare Fisher, *supra* note 1, at 123 (game theorists have concentrated "on the analytically interesting questions rather than on the ones that really matter for the study of real-life industries") with Shapiro, *supra* note 1, at 134 ("the introduction of game-theoretic tools into the study of oligopolistic competition has made it possible to analyze carefully a whole range of questions that were not previously amenable to economic analysis").

8. For example, evolving economic theories of competition have affected antitrust analysis. See Herbert Hovenkamp, *Antitrust Policy After Chicago*, 84 MICH. L. REV. 213 (1985).

9. *Basic, Inc. v. Levinson*, 485 U.S. 224 (1988); see Daniel F. Fischel, *Use of Modern Finance Theory in Securities Fraud Cases Involving Actively Traded Securities*, 38 BUS. LAW. 1 (1982).

10. See, e.g., RICHARD BREALEY & STEWART MYERS, *PRINCIPLES OF CORPORATE FINANCE* (2d ed. 1984); Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549 (1984).

11. See p. 110.

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time to write systematically about *how* to apply them.¹²

Into this pedagogical void comes Eric Rasmusen's new book, *Games and Information: An Introduction to Game Theory*. Rasmusen succeeds not only in making game theory more comprehensible but also in enabling readers actually to use these new techniques. In the jargon of economics, Rasmusen succeeds in lowering the costs for academics who wish to enter the field. The book is sure to become the standard reference in game theory and may by itself be responsible for significantly increasing the diffusion rate of this new modelling "technology." If Johnston's textbook has been responsible for teaching a generation of students how to run econometric regressions,¹³ Rasmusen's text is likely to teach the next generation of students how to model games with asymmetric and imperfect information.¹⁴

With surprising clarity, *Games and Information* lays out the new contributions of game theory in language that will be accessible to a large proportion of the legal community.¹⁵ The book's contribution is threefold: It synthetically organizes and catalogs the sprawling literature on games with imperfect information; it simplifies the games and distills the insights of the path-breaking articles; and, more abstractly, it introduces readers to the process of writing down and solving games. The first two contributions respond to a well-defined need. The clarified versions of important articles will make it easier to read and understand the originals.¹⁶ But it is in achieving the final goal that the book

12. The situation has strong parallels to the recent development of cloning techniques in biology. The few insiders with applied knowledge of recombinant DNA theory were so busy doing their own research that outsiders had difficulty learning the details of genetic sequencing and the like. The first comprehensive guide to cloning did not appear until 1982. See TOM MANIATIS, E.F. FRITSCH & J. SANBROOKE, *MOLECULAR CLONING* (1982).

13. JOHN JOHNSTON, *ECONOMETRIC METHODS* (2d ed. 1972).

14. I echo Roger B. Myerson's comment on the back of the hardcover edition: [Rasmusen's] book . . . will do much to bring game theory into the mainstream of economics education. There has been an explosion of applications of game theory in economics, especially in the area of information economics over the past decade. . . . Rasmusen's book is well-positioned to be the key text in such courses.

15. Although Rasmusen cautions in his preface that readers who "do not know the terms 'risk averse,' 'first order condition,' 'utility function,' 'probability density,' and 'discount rate' . . . will not fully understand this book," p. 11, those with an undergraduate background in economics or familiar with the law and economics literature will often have the requisite level of sophistication. Indeed, because game theory is in some ways a more self-contained discipline than other aspects of economics, even those innocent of economic training may find the book a rewarding reference. And Rasmusen's lively style is "user friendly." For example, he often includes tips for proper syntax in the game theory community. In exhorting readers to attend game theory seminars, he waxes, "[T]here is a real thrill in hearing someone attack the speaker with 'Are you sure that equilibrium is perfect?' after just learning the previous week what 'perfect' means." P. 10.

16. The author explains:

Journal articles are more complicated and less clear than seems necessary in retrospect; precisely because it is original, even the discoverer rarely understands a truly novel idea. After a few dozen successor articles have appeared, we all understand it and marvel at its simplicity. But journal editors are unresponsive to new articles that admit to containing exactly the same idea as old articles, just presented more clearly. . . . This book tries to present an alternative.