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Book Review

Shubik, M.: Game Theory in the Social Sciences, Concepts and Solutions. The MIT Press, Cambridge, Massachusetts 1982, 514 p.

Game theory might be described as a mathematical theory of multilateral decision making. The use of the singular "theory" is somewhat misleading because several different models and solution concepts have been formulated to describe or prescribe behavior of decision makers in a wide range of circumstances. Questions of existence and nature of solutions and of the relationships among models and solutions often lead to interesting mathematics.

The social sientist, however, is interested in building new or using "prepackages" models that capture the significant factors in a real situation. The mathematical theory of games provides a good conceptual framework for the study of the interactions of independent rational decision makers. But for the mathematical results to be used effectively, a critical analysis must be made of underlying assumptions and limitations of the various models and solution concepts. The now classic book by Luce and Raiffa is the type of critical analysis needed to prepare a social scientist to evaluate the use of game theory models. However, game theory has progressed as a subject over the past quarter-century producing a need for a more up-to-date treatment. Martin Shubik's *Game Theory in the Social Sciences* fills that need handsomely.

Martin Shubik is Seymour H. Knox Professor of Mathematical Institutional Economics at Yale University and a long time advocate of the use of game theoretic models in the social sciences. His long time collaboration with Lloyd Shapley resulted in many ground breaking results in both the mathematical theory and its political economic applications. In fact much of the book is based on jointly authored RAND Memoranda and notes.

Game Theory in the Social Sciences is a book about the *"fruitful application* of the mathematical theory of games to the subject matter of general economic theory in particular and to . . . other applications to the behavioral sciences in general" (p. 1, reviewer's emphasis). The reader is continually reminded of the real situation that is being modeled. Questions of how well a model specifies a given situation are addressed throughout. For example, in the discussion of Arrow's "general possibility theorem", the main concern is with the sensitivity of Arrow's conclusion to changes in the model. The reader is challenged to not immediately accept the core – even if it is a large nonempty set – as an adequate description of behavior because of the existence of "social forces or taboos powerful enough to deny classes of players their birthright" (p. 150). The relevance and import of gaming experiments is discussed at various times, and a strong argument is made for modeling individual preferences by cardinal utility.

Shubik convincingly argues that the variety of questions asked by researchers and the fundamental indeterminancy arising from the interaction of players with free will requires a pluralistic approach to modeling. This requires the social scientist to have a plethora of models and solution concepts at his disposal when investigating social phenomena. The author gives an almost completely comprehensive accounting of game theory models and solution concepts. An especially nice feature of the book is the several tables that summarize the characteristics of the various models and solution concepts. Complementing the comprehensive overview, an extensive bibliography allows the reader to find more details and in depth treatment of the topics covered by Shubik.

Despite the comprehensive nature of the book, it was written to provide social scientists an introduction to game theory concepts. Therefore, there are no proofs but plenty of examples and exercises that help clarify the concepts. Even without the mathematical orientation, the statement of results are for the most part precise, and when they are not, the reader is informed as, for example, in the discussion of the Pareto principle (p. 112–117). To keep the exposition readily understandable and "to push forward those applications that seem to promise the greatest immediate returns on new advances and insights" (p. 9), the book emphasizes static models with complete information. Nontheless, there is a reasonable amount of discussion (with references to the literature) of models with temporal elements and incomplete information.

The emphasis of the first three chapters is on questions of modeling: "What are the boundaries that define the model? Who are the decision makers, and how free are they to choose their courses of action? What are the rules of the game, and how do we reduce them to a systematic description?" (p. 4). The next two chapters are concerned with the modeling of individual and group preferences. Except for the final chapter, the remainder of the book is concerned with game forms and solution concepts. The core, stable set, bargaining set, kernel, nucleolus, Shapley value, Banzhaf value, Nash and Kalai-Smorodinsky bargaining solutions, minimax and Nash noncooperative equilibrium, perfect and proper equilibria, and the tracing procedure are all covered, and others are also. Games in partition function form, games without transferable utility, stochastic games, and gamed against Nature have a place in the discussion along side the more standard models. The final chapter contains a list of applications from economics and political science to psychology and sociology. The descriptions are concise and many references to the literature are provided. This chapter is a valuable resource for any social scientist wanting to make a contribution to the field or just wanting to know what has been done.

This book is must reading for social scientists who are looking for a readable introduction to the theory of games, social scientists who want a quick reference to the basic results and possible applications of the theory, and mathematicians who are interested in the applications of game theory. It should be a suitable text for upperclass undergraduates who have a minimal mathematic or economic intellectual maturity.

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Owen, G.: Game Theory. 2nd edition. Academic Press, New York 1982, 344 p., U.S. $ 29.50.

The field of game theory has suffered somewhat from the lack of an abundant supply of good text books for courses as typically offered in various mathematical sciences departments. The first edition of this book has served as the traditional standby text for fourteen years, and this updated revision is a most valuable contribution. This book is intended for advanced undergraduates and beginning graduate students, and assumes some background in calculus, simple probability and linear algebra. A few sections require additional prerequisites, but can be skimmed with little loss in continuity.

The first seven chapters are changed only slightly from the previous edition. Chapter 1 describes n-person games in extensive form and proves the existence of pure strategy equilibrium n-tuples for finite games with perfect information. The next four chapters are devoted to two-person zero-sum games in normal form: matrix games, linear programming, infinitely many strategies, and multistage games. The essentials of utility theory appear in Chapter 6. Chapter 7 introduces the general-sum, two-person theory; including both the noncooperative and cooperative models of Nash.

The last three chapters of the form edition on the n-person cooperative games has been greatly expanded by some 100 pages and restructured into six chapters. This now provides an excellent selection of the various models and solution concepts for the multiperson models. The theories of the core and stable sets (von Neumann-Morgenstern solutions) have been expanded into two chapters, with many more examples and the inclusion of the theory of balanced collections. The chapter on value theories now includes much more on their popular application as measures of power. A full chapter is now devoted to the nucleolus, the kernel and the bargaining set models. The non-sidepayment theory is also introduced. Finally, a most welcome chapter on nonatomic games, including the application to Cornell telephone rates, has been added. The only models deleted are ψ-stability and games in partition function form, which are concerned with partition structures (i.e., coalition formation) as is the bargaining set theory. This is an important but underdeveloped aspect of the cooperative games.

The bibliography for the latter chapters has increased somewhat. However, the author could have simplified the efforts of the more serious students and researcher scientists by inserting explicit reference numbers at appropriate points throughout the text, as well as adding references to other textbooks. The number of problems has increased from 64 in the first edition to 86.

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