Essays in Game Theory

Nimrod Megiddo
Editor

Essays in Game Theory

In Honor of Michael Maschler

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Preface

This volume comprises a collection of essays dedicated to Michael Maschler on the occasion of his 65th birthday. The articles were presented to Michael at the International Game Theory Conference in Stony Brook in July 1992. I am indebted to the authors for their contributions, the efforts they made, and the care they took while preparing the text for publication. I once again thank the referees for their help in improving the quality of the accepted essays.

To the readers who do not know Michael Maschler, here is a biographical sketch followed by a list of selected publications. Born July 22, 1927 in Jerusalem, he received from the Hebrew University his M.Sc. degree in 1952 and his Ph.D. degree in 1956. At that time Maschler's interest was in mathematical analysis. He switched to game theory in the early 1960's and from the beginning was interested in cooperative games. His first two articles in game theory dealt with powers of coalitions and appeared in 1963.

It is interesting to mention that Maschler was one of the first to conduct experiments in game theory. While he was teaching in a Jerusalem high school in the 1960's he ran experiments on formation of coalitions in games with empty cores. Later he published an article on experiments. Since then, exeperiments in game theory became an important discipline.

Maschler's early collaboration with Robert J. Aumann led to a path-breaking approach to cooperative games with the introduction of the bargaining set. It was the first solution concept guaranteed to be nonempty. Shortly thereafter, Morton Davis and Maschler introduced the kernel, a subset of the bargaining set. Maschler investigated the structure of both the bargaining set and the kernel. He collaborated on this subject with Bezalel Peleg and Lloyd S. Shapley.

During the 1960's Maschler was, among other activities, also involved in research projects supported by the U.S. Air Force Office of Scientific Research, the Office of Naval Research, and by Mathematica at Princeton. The foundations of the theory of repeated games with incomplete information were laid by Aumann, Maschler, and Richard Stearns in Mathematica

research reports. One of the first applications of this theory was the problem of gradual disarmament. Maschler's interest in this problem is also reflected in papers on the "Inspector's Game."

In more recent years Maschler worked with Micha Perles on the superadditive solution for bargaining games. He also wrote papers on cost allocation and bankruptcy games and, together with Guillermo Owen, introduced the consistent Shapley value.

Michael Maschler held visiting appointments at top universities such as Cornell, Northwestern, Princeton, Stanford, and UCLA. He was elected Fellow of the Econometric Society, and has been a member of the editorial boards of the leading journals of game theory: *International Journal of Game Theory* and *Games and Economic Behavior.* He was also a member of the editorial boards of *Management Science* and *Journal of Conflict Resolution.*

Maschler has been very active in the education system in Israel. He chaired a curriculum committee for mathematics in elementary schools, was a member of similar committees for high schools, directed projects for teachers, and authored several textbooks.

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A PREFACE TO THE AUMANN-SHAPLEY AND RUBINSTEIN PAPERS

In the Academic year 1975–6, all three of us were working on the model of repeated games. Rubinstein was a master's student at the Department of Mathematics at the Hebrew University, under the supervision of Bezalel Peleg. Shapley was at the Rand Corporation, where Aumann was consulting while spending a Sabbatical from the Hebrew University at Stanford. Simultaneously and independently, we proved two versions of the Perfect Folk Theorem for repeated games with complete information and the limit of the means. Rubinstein summarized his findings in Research Memorandum 26, Center for Research in Mathematical Economics and Game Theory, The Hebrew University of Jerusalem. Aumann and Shapley summarized their findings in a manuscript written in 1976; in 1978 it was distributed in connection with a one-day workshop on repeated games held at the Economics section of Stanford's Institute for Mathematical Studies in the Social Sciences. We had planned to write a joint paper but, being busy with other projects, failed to do so.

Rubinstein's memorandum included also a discussion of the perfect equilibria in a repeated game with the overtaking criterion, and of the strong perfect equilibrium in repeated games. Those sections were published in "Equilibrium in Supergames with the Overtaking Criterion", *J. Econ. Theory* 21 (1979) 1–9; and in "Strong Perfect Equilibrium in Supergames", *International J. Game Theory* 9 (1980) 1–12.

The outlined proof of the standard Folk Theorem in Section 3 of the Aumann-Shapley paper, and the example in Section 5, previously appeared in Appendices 2 and 3 of "Survey of Repeated Games", *Essays in Game Theory and Mathematical Economics in Honor of Oskar Morgenstern*, Wissenschaftsverlag, Bibliographisches Institut, Mannheim, Wien, Zurich, 1981, pp. 11–42.

We are very pleased at this opportunity to make this material, which appears here essentially in its original form, available to a wider public. It seems particularly appropriate for a volume dedicated to Michael Maschler, who has done so much to advance the theory of repeated games.

R. J. Aumann
A. Rubinstein
L. S. Shapley