CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

Rational behavior and bargaining equilibrium in games and social situations

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

Rational behavior and bargaining equilibrium in games and social situations

JOHN C. HARSANYI

Professor of Business Administration and of Economics
University of California, Berkeley

CAMBRIDGE UNIVERSITY PRESS

Cambridge
London New York Melbourne

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521208864

© Cambridge University Press 1977

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published 1977
Re-issued in this digitally printed version 2008

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
Harsanyi, John C
Rational behavior and bargaining equilibrium in
games and social situations.
Includes bibliographical references.
1. Game theory.
2. Decision-making–Mathematical models.
3. Games of strategy (Mathematics)
4. Social interaction–Mathematical models. I.
Title.
QA269.H37 301.15′54′0184 75-38370

ISBN 978-0-521-20886-4 hardback
ISBN 978-0-521-31183-0 paperback

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

Contents

Preface *page* ix

Part I. Preliminaries

1 Bargaining-equilibrium analysis: a new approach to game theory and to the analysis of social behavior 3
- 1.1. Need for a game-theoretical approach yielding determinate solutions 3
- 1.2. Restriction of our systematic analysis to classical games 6
- 1.3. The concept of rational behavior 8
- 1.4. Analysis of the players' reciprocal expectations and the bargaining problem 11
- 1.5. Bargaining models versus arbitration models 13

2 Rational-choice models of social behavior 16
- 2.1. The rationality assumption 16
- 2.2. Conflicting sectional interests as explanatory variables 19
- 2.3. The problem of dominant loyalties and the balance-of-power problem 21

3 Rational behavior under certainty, risk, and uncertainty 22
- 3.1. Sure prospects and risky prospects 22
- 3.2. Uncertain prospects 25
- 3.3. Utility maximization in the case of certainty 27
- 3.4. Expected-utility maximization in the case of risk 32
- 3.5. Expected-utility maximization in the case of uncertainty 41
- 3.6. Our postulates of rational expectations and the principle of best information 47

4 Morality and social welfare 48
A constructive approach
- 4.1. Disregard of one's personal identity – a model for moral value judgments 48
- 4.2. Interpersonal comparisons of utility: consistency requirements 51
- 4.3. Interpersonal comparisons of utility: conversion ratios 55
- 4.4. Interpersonal comparisons of utility: the question of interobserver validity 57
- 4.5. The boundary problem for our "society" 60
- 4.6. The principle of individual self-determination: some qualifications 61
- 4.7. Rule utilitarianism versus act utilitarianism: the concept of critical rule utilitarianism 62

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

Two axiomatic approaches and concluding remarks

4.8. The first axiomatic approach to an additive social-welfare function 64
4.9. A second axiomatic approach to an additive social-welfare function 69
4.10. The unavoidable need for interpersonal comparisons of utility in ethics 81
4.11. The role of moral attitudes in social conflicts 82

Part II. General principles

5 Some basic concepts of game theory 87
5.1. Introduction 87
5.2. The extensive form of a game 88
5.3. The normal form of a game 94
5.4. Coalitions and strategies 96
5.5. Dominance 97
5.6. Payoff space. Payoff conservation laws 98
5.7. Payoff-dominance relations: reply-dominance 101
5.8. Best-reply strategies 102
5.9. Equilibrium points 104
5.10. Maximin strategies and maximin payoffs 105
5.11. Simple dominance 107
5.12. Joint dominance 107
5.13. Centroid strategies 108
5.14. Games with strictly identical interests, with strictly opposite interests, and with mixed interests 109
5.15. Cooperative and noncooperative games 110

6 Rationality postulates for game situations 113
6.1. Introduction 113
6.2. The rationality postulates 116
6.3. The postulates of rational expectations: their weaker and their stronger form 118
6.4. Analysis of games with strictly identical interests 119
6.5. Analysis of two-person zero-sum games 120
6.6. Note on simple dominance 122

7 The four basic problems facing the players of a game 124
7.1. The four basic problems 124
7.2. The enforcement or stability problem 124
7.3. The joint-efficiency problem 127
7.4. The payoff-distribution or bargaining problem 128
7.5. The strategy-coordination problem 133
7.6. Formal definition of the solution 135
7.7. Discussion: definition of the solution payoffs in unprofitable games 137
7.8. The solutions for unprofitable games as "quasi-solutions" 138

Part III. Solutions for specific classes of games

8 Two-person simple bargaining games: the Nash solution 141
8.1. Definitions and assumptions 141
8.2. The classical approach to the bargaining problem 141

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

8.3. The Nash solution 143
8.4. Zeuthen's model of the bargaining process 149
8.5. Mathematical equivalence of Zeuthen's and Nash's theories 152
8.6. Derivation of Zeuthen's Principle from our "strong" rationality postulates 153
8.7. The role of the "strong" postulates of rational expectations 159
8.8. The compressed Zeuthen model 162
8.9. Risk-dominance relations 164
8.10. Formal definition of the solution 166

9 General two-person cooperative games 167
The problem of optimal threats 167
9.1. Games with and without binding threats 167
9.2. Mutually optimal threat strategies 169
9.3. An alternative characterization of mutually optimal threat strategies 176
9.4. Conclusion 179
Composite bargaining games 180
9.5. Invariance with respect to commensurate changes in the conflict payoffs 180
9.6. Solution of an "embedded" bargaining game 180
9.7. Negative embedded bargaining games 182
Some concepts and theories related to bargaining games 186
9.8. Ultimatum games: the Blackmailer's Fallacy 186
9.9. The game-independence problem: Hicks's theory 189
9.10. Bargaining games and arbitration models 191
9.11. Bargaining models and interpersonal utility comparisons 192
9.12. Conclusion 195

10 *n*-Person simple bargaining games 196
10.1. Introduction 196
10.2. Multilateral bargaining equilibrium 196
10.3. Derivation of the solution directly from Nash's postulates 198
10.4. The *n*-person bargaining process: risk-dominance relations in the *n*-person case 200
10.5. The joint-bargaining paradox 203
10.6. Bargaining by coalitions 205
10.7. The joint-bargaining paradox: a second interpretation 209

11 *n*-Person cooperative games with transferable utility: the modified Shapley value 212
11.1. Simple bargaining games with transferable utility 212
11.2. Characteristic functions 212
11.3. The Shapley value 215
11.4. The Shapley values as bargaining-equilibrium payoffs 226
11.5. Further discussion of our bargaining model: the nondiscrimination assumption 231
11.6. Interpretation of Shapley's additivity postulate in terms of our bargaining model 236
11.7. The Shapley values as expected average payoffs 238
11.8. Games with transferable utility, given in normal form: the "modified" Shapley values 239

12 *n*-Person cooperative games: the general case 244
12.1. Permissible strategies and the payoff space 244
12.2. The dividend-proportionality rule 246

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

12.3. Generalized Shapley-value expressions 248
12.4. Optimal threat strategies 250
12.5. The solution 254
12.6. Existence of the solution 256
12.7. The question of uniqueness 259
12.8. Definition of a unique "stable solution" 261

13 *n*-Person cooperative games: discriminatory solutions 263
13.1. Discrimination in games given in characteristic-function form 263
13.2. Discrimination in games with transferable utility, given in normal form 266
13.3. Discrimination in the general case 269

14 Noncooperative and almost-noncooperative games 273
14.1. Introduction 273
14.2. Comparison between Nash's and our own solution concepts for noncooperative games 274
14.3. Efficiency and bargaining considerations 275
14.4. Defining rational behavior in Prisoner's Dilemma situations 276
14.5. Different types of Prisoner's Dilemma situations 278
14.6. The direct and the extended risk functions 280
14.7. Primary risk-dominance relations 282
14.8. Secondary risk-dominance relations 284
14.9. Bargaining deadlocks: final definition of the solution 287
14.10. Tacit and semivocal games 288

15 Conclusion 289

Notes 291
References 305
Index 309

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

Preface

How to define rational behavior (practical rationality) is a philosophical problem of fundamental importance – both in its own right and by virtue of its close connection with the problem of theoretical rationality. The concept of rational behavior is equally fundamental to a number of more specialized disciplines: to *normative* disciplines such as decision theory (utility theory), game theory, and ethics; and to some *positive* social sciences, such as economics and certain, more analytically oriented, versions of political science and of sociology.

This book presents what I believe to be the first systematic attempt to develop a conceptually clear, and quantitatively definite, *general theory of rational behavior*. No doubt, technically more advanced and philosophically more sophisticated versions of such a theory will soon follow. In fact, the first version of this book was completed in 1963, but game theory has been advancing at a very rapid rate since then, and my own thinking has also been changing. Thus, I have revised this manuscript several times to bring it more in line with new developments, but this process must stop if this material is ever to be published. I hope the reader will bear with me if he finds that this book does not cover some recent results, even some of my own. In such a rapidly growing subject as game theory, only journal articles – indeed, only research reports – can be really up to date.

Even if some details of my theory should eventually need modification in the light of later developments, I will feel my book has achieved its purpose if it can convince some readers of one basic point: that it is both possible and eminently desirable to treat decision theory, ethics, and game theory – including the theories of both cooperative and noncooperative games – as special cases of the same general theory of rational behavior.

I wish to express my sincere thanks to the National Science Foundation for its persistent financial support. I also wish to thank Dr. Lloyd S. Shapley of RAND Corporation, Professors Robert J. Aumann and Michael Maschler of Hebrew University, Jerusalem, and Professor Reinhard Selten of the University of Bielefeld, West Germany, for helpful comments. Special thanks are due to Professor Irving H. LaValle of Tulane University, who read the entire manuscript of an earlier version of this book, pointed out errors, and suggested improvements. This list

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

would not be complete without mentioning my wife, Anne, to whom I am indebted not only for her continual moral support but also for many valuable suggestions.

J. C. H.

Berkeley, California
January, 1977

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-31183-0 - Rational Behaviour and Bargaining Equilibrium in Games and Social Situations
John C. Harsanyi
Frontmatter
More information

TO ANNE

© Cambridge University Press www.cambridge.org