



Review: [Untitled]

Reviewed Work(s):

Knowledge, Belief and Strategic Interaction by Cristina Bicchieri; Maria Luisa Chiara Dalla
Maarten Janssen

The Economic Journal, Vol. 103, No. 421. (Nov., 1993), pp. 1557-1559.

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The author is critical of the standard approach of industrial economists to technical change using econometrically estimated production functions and data on R. and D. expenditure or patents. He shows how his matrix of production elements can be used to study the economic effects of technical change by separating it into two components – the quantitative–temporal and the organisational scheme. The former shows the dated input and output flows in the elementary production unit and defines the characteristics of the labour input and of the final product. He applies his model to data from three Italian textile firms where production is described in terms of his framework in a way which demonstrates the complexity of production in even this relatively simple industry. He has some interesting comments on innovation in replies to his questionnaire but I was not totally convinced of his methodology and results regarding technical change. Perhaps a case study in an industry with a more sophisticated technology would be interesting but perhaps such an industry would throw up so much data that the model could not handle it.

In his final two chapters he examines two particular aspects of technical change – scale and flexibility. In both he emphasises the need to consider organisational and qualitative aspects of production in addition to the underlying technology. When looking at returns to scale the indivisibilities and complementarities of the individual component production processes must not be forgotten because an increase in overall scale will affect costs differently in each of these processes. Decisions on how to combine these processes are crucial to ultimate impact of scale on total costs.

The author has given us a within-firm analysis of production and technical change and a very useful description of the need to be aware of what goes on inside the production unit. There is a danger that economists building models for empirical work take too simple a view and work at too general a level. They should not regard a firm as a single unit, production as a single activity nor the production process as a single process which can be described by something like a Cobb–Douglas function. We are shown that it is only by understanding the complexities of the production process that we can ask the right questions and hope to understand returns to scale and technical change.

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Knowledge, Belief and Strategic Interaction. Edited by BICCHIERI (CRISTINA) and DALLA CHIARA (MARIA LUISA). (Cambridge and New York: Cambridge University Press, 1992. Pp. xiv + 413.) £40.00 hardback, US \$64.95 hardback. ISBN 0 521 41674 4.)

There is a growing number of areas, concentrated around foundational issues in game theory, where the contributions of economists and philosophers overlap. I think here of areas as the emergence and stability of social norms and conventions and, the topic of the book under review, the interdependence between agents' knowledge and beliefs and their actions. Thinking of the

growing number of economists using tools as epistemic logic and the growing number of philosophers referring to *Econometrica* papers on foundational issues in game theory, one can even say that the contributions from philosophers and economists tend to become more and more integrated. The book contains twenty-three articles by philosophers and economists that were presented during an interdisciplinary conference held in Castiglioncello (Italy) in June 1989. Some of the articles have appeared before in economics or philosophy journals.

Many of the preeminent figures in logic, philosophy, and game theory working on the formalisation of knowledge and beliefs and foundational problems of rationality have contributed to this volume. Here lies also the main strength of the book: it brings together different approaches to issues such as how to define or attain common knowledge and the foundations of different solution concepts for games. Economists who are working in this field or who are simply interested in the recent developments, but unaware of existing philosophical approaches, will find the book extremely useful as an up-to-date overview of this increasingly important area. There is, for example, an article by Edward McLennan arguing that Pareto-optimality should be seen as a condition for a solution concept that is based on a consequentialist perspective on human actions. One of the things he points out is that the fact that Nash equilibria are, in general, not Pareto-optimal is because they are based on a separability condition, which basically says that agents do perceive their own choice as causally and/or probabilistically independent of the other choices made. McLennan questions the acceptability of this assumption. The article by Bryan Skyrms argues that a process of rational deliberation leads agents to choose Nash equilibria in static games. Basically, the argument he employs is a sort of Bayesian updating taking place in notional time before the game is actually played. Most of these and other arguments are not completely new in the literature, but this does not mean that they cannot be refreshing for economists not yet acquainted with them.

There are also articles by Bicchieri and Reny on backward induction in games with perfect information. The general idea of these articles is that the assumption of common knowledge of rationality is inconsistent with the backward induction solution. This is a theme that is developed by Reny in several other articles as well. Bicchieri introduces the notion of knowledge-dependent games to overcome this inconsistency. Roughly speaking, she argues that a limited number of knowledge hierarchies is sufficient and, more surprisingly, also necessary for the backward induction solution to obtain.

Apart from these articles there are contributions using epistemic logic, contributions on computability and algorithms, and on the acquisition of common knowledge and the dynamics of belief change. The wide range of topics shows that this is a rapidly growing area of research. It is also interesting to see how some problems are tackled from different points of view. This is, however, at the same time also the main weakness of the book. As most of the articles stand on their own, the book really is no more than twenty-three separate articles. A more lengthy preface or a written version of the main

themes that came up during the discussions that took place at the conference could have improved the coherency of this nice collection of articles.

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Handbook of Game Theory: With Economic Applications, Volume 1. Edited by AUMANN (ROBERT J.) and HART (SERGIU). (Amsterdam, New York and Oxford: North-Holland, 1992. Pp. xxvi + 733. Dfl. 250.00 hardback, US \$87.50 hardback. ISBN 0 444 88098 4.)

The 1980s were the decade of Michael Milken, Ivan Boesky... and game theory. While financiers were behaving strategically in the urban jungles of New York and London, game theorists were studying the logic of strategic behaviour in the comfort of their offices in Jerusalem and Palo Alto. Now, in the 1990s, the outcome of this research has been codified and summarised in at least half-a-dozen textbooks and numerous scholarly volumes. The volume under review is the first of a series of three volumes; it consists of a number of essays summarising various topics of game theory, and is suitable for use as a reference work for academic economists and advanced graduate students.

The organisation is along the lines of the rest of the North-Holland handbooks: twenty or so 20–30-page review articles by eminent scholars. Herb Simon and Jonathan Schaeffer lead off with a review of the history of research on the game of chess. Sergio Hart describes the basic concepts of game theory. Jan Mycielski describes the mathematics of finite and infinite games of perfect information. Sylvain Sorin, Shmuel Zamir, and Françoise Forges each have a chapter on various aspects of repeated games. Ken Binmore, Martin Osborne, and Ariel Rubinstein provide an admirably complete chapter on bargaining. Robert Wilson presents excellent reviews of both auctions and entry deterrence. Jean J. Gabszewicz and Jacques-François Thisse describe location models in oligopoly. Mort Kamien describes work in patent licensing. Yakar Kannai, Bezalel Peleg, Robert Anderson, and Jean J. Gabszewicz and Benyamin Shitovitz review various aspects of the core of a cooperative game. Alvin Roth and Marilda Sotomayor describe games involving two-sided matching. William Lucas examines von Neumann–Morgenstern stable sets, while Michael Maschler reviews aspects of the bargaining set. Finally John Harsanyi describes game-theoretic models in ethics.

The articles are generally of high quality, as one might expect given the reputations of the authors. However, the collection as a whole does not hang together. Articles on the foundations of mathematics sit side-by-side with articles on applications of game theory to industrial organisation. Both of these areas are worthy topics, to be sure, but each appeals to a rather different audience.

The editors plan (at least) two more volumes of this series that will cover many additional topics – biological games, incomplete information, signalling, etc. In an ideal world, the volumes in this series would be organised by subject