



**Review: [Untitled]**

Reviewed Work(s):

*Rationality and Coordination.* by Cristina Bicchieri  
Maarten C. W. Janssen

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The theoretical development of the concept of coevolution as applied to human action and understanding is the strength of this book. The practical application of these ideas is much more problematic. First there is the problem of justifying any kind of prescription at all. Coevolutionary complexity and unpredictability largely deny the possibility of predictive power. Although Norgaard claims that 'a coevolutionary analysis can have some predictive and prescriptive capacity, even though it is not as amenable to prediction and prescription as analyses which derive from models which assume systems are atomistic and mechanistic' (page 103), it is not clear that the pluralist, subjectivist nature of the analysis can provide the necessary strength of social consensus and commitment to address the grave social and environmental problems which Norgaard has identified as the results of modernity. Second, Norgaard's prescriptions amount basically to the democratisation of knowledge, the decentralisation of power and the re-recognition of community, but it remains very unclear how communities are to be redefined, and how current processes of globalisation and economic integration are either to be halted or redirected to make them compatible with this redefinition. In short, the book's theoretical framework is powerful and attractive, but much more work is required to tease out its implications for policy and practice.

To conclude on a practical note, if the book gets to a second edition, as I hope it does, the publishers will want to correct in the Bibliography the attribution of all references to Norgaard's other writings to William Nordhaus. The two economists may be close together alphabetically, but have very little else in common.

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*Rationality and Coordination.* By BICCHIERI (CRISTINA). (Cambridge and New York: Cambridge University Press, 1994. Pp. xiii + 270. £35.00 hardback, US \$54.95 hardback. ISBN 0 521 38123 1.)

This book gives a clear overview of recent game theoretic work on the issue how individual players can reason towards an equilibrium. The central question is how much knowledge players should be endowed with for them to be able to make the inferences that lead them to choose equilibrium strategies. The title of the book, *Rationality and Coordination*, is then easily explained by noting that an equilibrium of a game can be interpreted as an outcome in which the individual strategies of the players are coordinated. A remarkable feature of the book is that the reader hardly needs any knowledge of game theory in order to follow the arguments: concepts like subgame perfection, proper equilibrium, and forward induction are first introduced before being scrutinised. Thus, the book can be used as an introduction to game theory for students who are interested in the (epistemological) foundations of this discipline.

Contrary to what Bicchieri claims I think that her arguments are also relevant to the analysis of perfectly competitive markets. She claims (pages

6–7) that in such markets it is perfectly understood how individual decisions produce a coordination outcome (equilibrium) at the market level. The micro-to-macro transition is, however, even (more) problematic in perfectly competitive markets than it is in game theory as (to paraphrase Arrow) ‘after every agent has made a choice as to how much to produce or consume at a given price, there is no one left over to set prices’. So, even in the case of perfect competition, Bicchieri’s question of how rational individual agents produce equilibrium outcomes seems important.

A Nash equilibrium is a configuration of strategies, one for each player, such that each player’s strategy is an optimal response to the other players’ strategies. In any particular game it is one thing to determine all the Nash equilibria, but it is quite another thing to argue that the (rational) players will do their part of the equilibrium configuration. Bicchieri mainly explores the second question: ‘why should there be a coincidence between what agents do and what other agents expect them to do? This coincidence means that agents’ actions are coordinated, but is an individual rationality assumption enough to guarantee that this coincidence comes about?’ (page 31).

Chapter 2 of the book is devoted to justifications of the Nash equilibrium assumption in static games. The exposition here is relatively standard. First it is shown that iterative elimination of strictly dominated strategies is founded on the notion of individual rationality and common knowledge of this rationality. If this procedure yields a unique strategy for every player, then these strategies should form a Nash equilibrium and coordination is implied by the assumption of common knowledge of rationality. Many games, however, have multiple Nash equilibria in which case one can either adhere to focal point arguments or try to eliminate some Nash equilibria by eliminating weakly dominated strategies. Bicchieri shows that the formal justification of both notions is problematic.

In chapters 3 and 4 she therefore studies sequential games. She discusses the notions of subgame perfect equilibrium and backwards induction. The epistemological conditions under which backwards induction can be justified are, however, subtle. Bicchieri shows that backwards induction requires the players to have not too little, but (remarkably) also not too much knowledge of each others’ rationality. The argument can be summarised by looking at the example of the centipede game. The standard assumption of common knowledge of players’ rationality is violated if in this game the first decision node of the second player is reached. That means that if rationality is common knowledge player 2 has to revise his beliefs about player 1’s behaviour. Game theory does not specify how player 2 should revise his beliefs in this situation and, accordingly, the theory does not tell player 2 which action to choose. This in turn implies that the expected pay-off to player 1 of continuing the game at the first decision node cannot be ascertained, which further means that it is not clear what the rational choice for player 1 at his first node is. Bicchieri offers two solutions to this problem: (i) the work by Peter Gärdenfors on belief revision and (ii) to endow the players with different amounts of information at different nodes in the game (what she calls knowledge-dependent games).

The final two chapters are devoted to more general issues as how cooperation might be explained in a finitely repeated Prisoner's Dilemma game and how social norms (that also may bring about coordination) may evolve out of an interactive learning process of boundedly rational agents. Here, Bicchieri offers the idea she earlier introduced in an *Ethics* article that social norms might emerge in small groups and subsequently spread to society at large via some evolutionary mechanism. It is a pity she does not discuss recent contributions to this topic that have appeared in economics journals. This small deficiency from an economist's point of view cannot undo the general impression that it is a delight to read Bicchieri's exposition of the epistemological foundations of game theoretic solution concepts in *Rationality and Coordination*.

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*Rules, Games, and Common-Pool Resources*. By OSTROM (ELINOR), GARDNER (ROY) and WALKER (JAMES). (Ann Arbor: University of Michigan Press, 1994. Pp. xvi + 369. £55.00 hardback, £18.95 paperback. ISBN 0 472 09546 0, 0 472 06546 7.)

In an earlier book (*Governing the Commons*, 1990, Cambridge University Press) Elinor Ostrom described and studied examples of social and institutional structures which overcame particular common property resource problems. One way of thinking about the possibility of such institutions is via the interaction between two simple but powerful economic arguments. On the one hand there is the standard non-cooperative game analysis of common property resources, which focuses on the Prisoner's Dilemma structure of the problem and so predicts over-exploitation and even destruction of the underlying resource. On the other hand there is the Coase theorem which suggests that agents may be expected to reach efficient cooperative agreements if certain conditions concerning communication and the ability to enforce contracts are met. The major thrust of the earlier book was to claim that the former line of argument had been over-emphasised in the study of common property resources, and that the 'tragedy of the commons' is frequently avoided by institutional innovation.

This collaborative book (there are contributions by Arun Agarwal, William Blomquist, Edella Schlager, and Shui Yan Tang as well as the three principal authors) elaborates on this theme and investigates the interaction between these broad lines of argument from a variety of perspectives and using a variety of methods. Although a considerable part of this book is based upon previously published articles (including a 1992 article in this *Journal* by Walker and Gardner), this book is far removed from a collection of independent essays. Indeed, it is the range and diversity of the discussion and the skill with which the various themes and styles of argument are drawn together that mark this book out as providing a detailed and well balanced account of the common