Foreword

The equilibrium concept of Nash is without doubt the single game-theoretic tool that is most often applied in economics; in recent years, especially, its use has increased dramatically. Together with this increased use has come a growing preoccupation with the philosophical and logical underpinnings of the concept. The current monumental work of John Harsanyi and Reinhard Selten, in the making for close to two decades, is a major contribution to this effort.

An equilibrium in a game is defined as an assignment to each player of a strategy that is optimal for him when the others use the strategies assigned to them. One of the oldest rationales for this concept, advanced already by von Neumann and Morgenstern (1944), is that any normative theory that advises players how to play games must pick an equilibrium in each game. A theory recommending anything other than an equilibrium would be self-defeating, in the sense that a player who believes that the others are following the theory will sometimes be motivated to deviate from it. Note that this holds only if the theory recommends a unique strategy for each player.

In general, a given game may have several equilibria. Yet uniqueness is crucial to the foregoing argument. Nash equilibrium makes sense only if each player knows which strategies the others are playing; if the equilibrium recommended by the theory is not unique, the players will not have this knowledge. Thus it is essential that for each game, the theory selects one unique equilibrium from the set of all Nash equilibria.

Of course the "theory" rationale makes sense only if all the players are advised by the same theory, and by no other theory, and they must be convinced that all will abide by the advice. This could happen if that theory alone were taught at the business (or law) schools that the players attended. An analogy is to industrial standardization, and to conventions such as driving on the right; indeed, such standards and conventions are illustrations of equilibrium selection.

In this book a coherent theory of equilibrium selection is constructed. The difficulties in constructing such a theory are formidable, as anybody reading this book will quickly realize. The major implication, like that of the first heavier-than-air flying machine, is that it can be done. The theory rationale for Nash equilibrium thus acquires a visible, demonstrated foundation.

The authors will probably be the first to acknowledge that their selection theory is not the only possible or reasonable one. Although the theory

selects a unique equilibrium, as a theory it need not be unique. Every facet of the theory was carefully thought out; but as in any complex construction project, many decisions were made which, though far from arbitrary, could well have been made in some other way. During the fifteen or twenty years during which the theory was in the making, several of its aspects, both major and minor, were reconsidered and revised. No doubt, future streamlining and other improvements will be welcomed by the authors, and indeed, there is every chance that they themselves will participate in the process.

As a spin-off from demonstrating the feasibility of equilibrium selection, this book develops several new ideas that are important in their own right, quite independently of the selection problem. Prominent among these are the notions of risk dominance and the tracing procedure.

A consequence of the availability of a theory of equilibrium selection is the ability to implement what has been called the Nash program. A game is called cooperative if there is available a mechanism, such as a court, to enforce agreements. In a cooperative game any feasible outcome may be achieved if the players subscribe to the appropriate agreement. In the 1951 paper in which he defined equilibrium, Nash noted that by specifying and explicitly modeling the bargaining process by which agreements may be reached, one can view cooperative games as special instances of noncooperative games. Nash suggested that the originally given cooperative game be analyzed by means of one of the noncooperative games associated with it in this way.

One difficulty with this program is that even when the bargaining process is fully specified and completely modeled, the resulting noncooperative game often has many equilibria that are very different from each other; in this case the Nash program is not very informative. By selecting a particular one of the many equilibria appearing in such models, the Harsanyi-Selten theory removes this difficulty.

The authors have not contented themselves with a purely theoretical construction. They realize that the proof of the pudding is in the eating of it, that a game-theoretic concept cannot be judged solely on the basis of abstract considerations of plausibility but where it leads in applications. Chapters 6 through 9 of the book are devoted to applications, with emphasis on bargaining and multilateral trade.

In summary, the publication of this book constitutes a major event in game theory; it is likely to have an important influence on the discipline

itself as well as on its applications to economic and political theory. The authors are to be congratulated for bringing a long and arduous task to a successful conclusion.

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