Almost fifty years have passed since the publication of von Neumann and Morgenstern's classic work: "Theory of Games and Economic Behavior." As a result of their seminal contribution an entire new field of economics has emerged. While there remain many important areas of research for game theorists to examine (in both cooperative and non-cooperative situations), concepts and tools they have already developed have found rapid and widespread application in all fields of economics. For example, the core, the Shapley value and the Nash equilibrium concepts (with their refinements and extensions), have become common analytical tools among economists. Further, the extensive form game has become an indispensable tool for studying economic behavior under incomplete information.

This is the second special volume on game theory and economics in The Economic Studies Quarterly. This volume is the product of conferences on game theory and economics held at Kyoto (in 1989) and Gotenba (in 1990), and the regular workshop series held mainly at the University of Tokyo.

In this volume, there are six articles which examine a wide range of topics. The first paper (by Nakayama, Quintas and Muto) investigates how information (for example, regarding a technological innovation) is traded in the absence of patent protection. By extending Noguchi's (1974) model, the authors are able to define the notion of a resale-proof set of traders in which traders enter into a self-enforcing agreement to prevent resales. A resale-proof set of traders is defined recursively such that no agent in it has an incentive to resell his information to agents outside the set, provided that the enlarged set of information holders is also resale-proof. By applying the solution concept of the core in a cooperative game, the authors show that information is shared in a resale-proof set that is as small as possible. Further, the initial holder of the information obtains the total feasible profit if the set of all traders is not the minimal-size resale-proof set. The relationship between Pareto optimality and resale-proofness is also studied.

The second paper is by Wako, who analyzes the exchange market with indivisible goods developed by Shapley and Scarf (1974). Wako applies the two fundamental solution concepts (the core and the von Neumann-Morgenstern solution) of cooperative games to this model. Special emphasis is placed on the core in terms of weak domination, called the strong core, and on the relationship between the strong core and the set of competitive market allocations. First, two

* We thank Japanese Ministry of Education (Grant No. 63301075, Hiroyumi Uzawa as the chief researcher) for financial assistance.
specific properties of weak domination in the indivisible goods market are derived. Then, by utilizing these properties, the author proves that any strong core allocation weakly dominates all other allocations not in the strong core. This result fully characterizes the nonempty strong core as a von Neumann-Morgenstern solution. He further demonstrates that the strong core is nonempty and coincides with the set of competitive allocations if and only if, every trader is indifferent between any two competitive allocations.

The third paper (by Okada and Sakakibara) provides a game theoretic approach to the classical problem in the theory of social contract concerning the emergence of the state. They investigate how a democratic state can emerge and evolve in a society with a (productivity enhancing) public good that confronts the prisoners' dilemma. All individuals in the society are assumed to play a game of institutional arrangements, to establish a state in which two classes emerge; an enforcer who collects a tax (to pay for the public good and his salary) and enforces (citizens) who pay the tax. It is shown that the state emerges with a positive probability, if and only if, society's productivity is lower than a specified critical level, which is determined jointly by the population and the marginal productivity of the public good. However if a state ensuring the existence of the public good does emerge, society's productivity will increase over time (as the stock of the public good rises). Consequently, the state will cease to exist once society's productivity becomes greater than the critical level.

The fourth paper (by Kawamata and Shimomura) utilizes a simple two-product-one-factor oligopolistic model with \( n \) identical firms in industry \( i \). Assuming the concavity of the profit functions, they establish, among other things, that if firms behave "more collusively" in an industry, the individual outputs and the aggregate output of the industry diminish and the price increases. They also show that the aggregate profit of an industry and profits of individual firms may change rather counter-intuitively when behavioral rules of firms change. In particular, they give examples in which the aggregate profit of the first industry is smallest when all the firms in the industry (or in each of the two industries) cooperate, at an intermediate profit level when they act as Cournot oligopolists and largest when they act as price takers.

The fifth paper (by Kiyono, Okuno-Fujiwara and Ueda) was written with a view to analysing trade disputes which arise between importing and exporting countries. They construct a small country model where more than three goods are produced with industry specific factors and a general mobile factor. The paper compares two different processes to determine the tariff levels of the industries. In the first case, protection to each industry is determined independent of the decision for other industries (non-cooperative game). In the second case, protection to all the import-competing industries is determined jointly and simultaneously (cooperative game). It is shown that the cooperative game outcome may be better for not only the lobbying industries but also for the non-lobbying (exporting) industries and that strategic interaction among lobbying industries gives rise to non-equivalence between tariffs and quotas.

The final paper (by Yanagawa) investigates the moral hazard problem that arises between a consumer and an incumbent producer (with many potential entrants) when the product's quality is unverifiable. The author explores a mechanism which may lead to an efficient trade (i.e., the high quality product is supplied at the perfectly competitive price), when the producer possesses the ability to act strategically and exit from the market. The author's primary innovation is to
introduce a third party (i.e., a distributor) and to consider the contract between the producer and the third party. It is demonstrated that if the producer posts a bond (which is delivered to the third party if the producer exits from the market) then, in a repeated game situation, the bond-posting mechanism leads to the desired efficient outcome. Finally, the author discusses several actual distribution systems (for commodities like books and clothing), which illustrate the paper's theoretical results.

(Kunio Kawamata, Keio University)

(Akira Okada, Kyoto University)