Essays on Elections and Markets as Information Aggregation Mechanisms in a Large Society (Abstract)

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We investigate two of major mechanisms, which are widely used in our society to settle conflicting interests: the majority voting rule and a decentralized market. It is of most fundamental social decisions that economic decisions, how to allocate goods among individuals, and political decisions, which policy might be implemented. On those decisions in a group consisted of very few members, it may be adequate to reaching an agreement through some communication process, e.g., discussions or bargaining. In a large society, however, it is not practical way to decide something by such a procedure, since it is extremely costly to aggregating and coordinating individuals' opinions. Therefore, simple and inexpensive mechanisms are required in a large society. In this dissertation, we show that in a large society, we can achieve social efficiency by the majority voting rule or a decentralized market.

In a classical view, if each individual's action only have negligibly small effect on others in a society, then pursuit of self–interests, as a result, leads to a

socially optimal outcome. It sounds a plausible assumption that one's action is insignificant in a large society: It is extremely rare that one's vote becomes pivotal; One's demand for a good is very small relative to the aggregate demand for the good. Therefore, social efficiency is achieved through elections or price-adjustment processes. Such observations are known as Smith's *invisible hands* concerning the laissez-faire economy and Condorcet's *july theorem* concerning the majority voting rule.

Game theory, in contrast, is opposed to such an optimistic view. Prisoner's dilemma or the tragedy of commons are indicative examples showing that selfish actions taken by individuals will cause social inefficiency. In our daily life, as you can imagine, there are many situations in which some individual can be better-off by deviating from an efficient state. Therefore, it is reasonable to consider that the society is always facing danger that strategic actions taken by individuals harm social efficiency. Certainly, it may be true that an effect of strategic action taken by each agent becomes small as the society becomes large. However, even if we assume this, there still remains a possibility of social inefficiency. We analyze strategic effects in a large election (Chapter 2), and in a large decentralized market (Chapter 3 and 4).

In Chapter 2, we analyze a symmetric model of an election in which voters are uncertain about which of two alternatives is desirable for them. Each voter must incur some cost to acquire information about the alternatives. We show that by focusing on *unbiased* voting strategies, such that each vote is symmetric between the two alternatives, general symmetric signal structures can be degenerated to a two-signals model. In addition, we show that for any sequence of unbiased voting equilibria, if the second-order derivative of the information cost function at no information is zero, then the probability of electing the desirable alternative converges to one, that is, the Condorcet Jury Theorem is valid. Otherwise, this probability converges to some value less than one, that is, the "rational ignorance" hypothesis is valid.

In Chapter 3, we analyze the endogenous price formation in a large decentralized market consisting of two populations, say, sellers and buyers. Our model is a so–called the *directed search* model in which sellers can commit to price offers in an attempt to induce buyers to match with them. We show

that the set of market equilibria outcomes is generically equivalent to the set of competitive equilibria outcomes. In particular, in each equilibrium, every transaction occurs at the same price and the equilibrium allocation is efficient.

In Chapter 4, we study capacity constrained Bertrand–Edgeworth competition in which finitely many firms producing a homogenous good simultaneously decide on price and quantity. We provide necessary and sufficient conditions for the existence of the unique pure strategy Nash equilibrium, which corresponds to the competitive equilibrium outcome, under a general class of rationing rules. In addition, we show that under the rationing rule derived from buyers' best responses to the prices and the quantities posted by firms, the upper bound of demand functions that ensure the existence of the pure strategy equilibrium is the hyperbolic demand function that maintains the producers' surplus being constant. And in the case that if buyers who cannot purchase are allowed to visit another firm any number of times, then the pure strategy equilibrium exists if and only if the inverse demand function is below this upper bound at all quantities less than the sum of the capacity of each firm. That is, the existence condition is independent of the number of the firms and is equivalent to the condition that the monopolist sets the competitive equilibrium price. On the other hand, each buyer can visit only one firm, the pure strategy equilibrium exists if and only if the inverse demand function is below this upper bound at all quantities less than the capacity of each firm. Therefore, as the number of firms increases, the competitive equilibrium outcome becomes easy to attain and if the number of firms is sufficiently large, the pure strategy equilibrium exists.