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主　論　文　要　旨

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主 論 文 題 名 :

Essays on Mechanism Design and Social Indices

（内容の要旨）

This dissertation consists of five essays on mechanism design and social indices. I study the problems of designing mechanisms and social indices that satisfy “desirable” properties.

Consider a social planner who wishes to implement a social objective. In order for the planner to do this, he/she needs to gather information about individuals' preferences. However, even if the planner directly asks individuals about their preferences, they might not tell him the truth. This is because individuals may have incentives to misrepresent their preferences. Since a proposal based on the misrepresented preferences may fail, designing a mechanism that brings us to the social objective is important. In Chapters 1, 2, and 3, I deal with this problem. I particularly search for mechanisms that satisfy “desirable” properties such as *efficiency*, *individual rationality*, and *strategy-proofness*.

On the other hand, during the stage in which social objectives are decided, an accurate understanding of social conditions is indispensable. However, social conditions are usually determined by complex phenomena such as *polarization*. Using some quantitative indices is a helpful way to perceive such complex phenomena. However, if we use some “bad” indices, we may misperceive the complex phenomena, and also possibly misperceive social conditions, failing to plan appropriate social objectives. Therefore, designing "desirable" indices is important. In Chapters 4 and 5, I deal with this problem. I search for indices that satisfy “desirable” properties to measure the levels of human development and polarization in a society.

In Chapter 1, I study famous Clarke's (1971) pivotal mechanisms. Moulin (1986) characterizes the pivotal mechanisms under the assumption of the full domain of quasi-linear preferences. In this chapter, I provide properties of restricted domains that are necessary and sufficient for Moulin's (1986) characterizations to

hold. I also provide simple economic conditions that imply these properties.

In Chapter 2, I search for a mechanism that overcomes a drawback of the pivotal mechanisms: they do not satisfy *individual rationality*. I consider the problem of designing mechanisms that mediate disputes. A specific feature of the problem I examine is that each disputant may have a veto power to the outcomes of mechanisms. Given the specific feature, I impose *individual rationality* on mechanisms so that each disputant voluntarily accepts outcomes of mechanisms. First, I show that on the full domain of disputants' valuations, a mechanism that always forces disputants to continue the dispute uniquely satisfies a weaker version of *efficiency, strategy-proofness, individual rationality*, and *feasibility*. Second, I show that on mildly restricted domains of disputants' valuations, there exist well-performed mechanisms that satisfy all four axioms and Pareto-dominates all mechanisms as such.

In Chapter 3, I suggest how to find a boundary between the possibility and impossibility of implementing social choice rules. I introduce a new concept of implementation that uses the planner's ``guess'' of individual preferences. Given a family of subsets of possible preference profiles, the planner guesses a subset to which individuals' true preference profile belongs. A social choice rule is said to be *G-implementable* if it is implemented in dominant strategies as long as the planner's guess is correct. I apply this implementability concept to public decision and auction problems. In a public decision problem, I characterize a class of social choice rules satisfying *efficiency, individual rationality, feasibility,* and *G-implementability*. In an auction problem with homogeneous goods, I characterize a class of auction rules that generate more revenue than any other auction rules satisfying *efficiency, individual rationality*, and *G-implementability*. I also show that rules in these two classes only require “minimal information” for the planner to guess correctly.

In Chapter 4 (co-authored with Yoko Kawada and Shuhei Otani), we provide an axiomatic foundation of the Human Development Index (HDI). The aggregation formula of HDI was changed to geometric mean in 2010. In this chapter, we search for a theoretical justification for employing this new HDI formula. First, we find a maximal class of index functions, what we call *quasi-geometric means*, that satisfy *symmetry for the characteristics, normalization*, and *separability*. Second, we show that power means are the only quasi-geometric means satisfying

homogeneity. Finally, the new HDI is the only power mean satisfying two local complementability axioms, what we call *minimal lower boundedness* and *sensitivity to lowest-level characteristics*.

In Chapter 5 (co-authored with Yoko Kawada and Keita Sunada), we consider a design problem of polarization measures. Esteban and Ray (1994) formalize an idea of polarization and develop a theory for its measurement. In their main theorem, they claim that a class of polarization measures, called the *Esteban-Ray measures*, is characterized by a set of axioms that capture an idea of polarization. However, we show that the claim does not hold by presenting a counterexample. We amend the main theorem by strengthening their Axiom 1.