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| 論文題目 | Essays on the Theory of Indivisible Good Markets<br>（不可分財市場に関する理論研究） | | |

（論文内容の要旨）

This dissertation studies allocation problems of indivisible goods from perspectives of the mechanism/market design. The problems are applicable to various economic issues such as school choice, matching of workers and firms, and provision of public goods.

The dissertation has three chapters. Chapter 1 considers school choice problems and revisits an important criticism of the deferred acceptance mechanism, on the ground that the mechanism nicely performs only when the students' message spaces are unrealistically large. In reality, the students cannot submit a full ranking over the hundreds of schools. Thus, the author assumes that the message spaces are restricted, so that each student can submit only a list of a given number of schools. Given the restricted message spaces, the author studies a broader class of the schools' priority rankings than the previous literature. The class accommodates, for instance, priority rankings where the schools care both test scores and composition of the students' race. A main result is a full characterization of the priority rankings under which the deferred acceptance mechanism implements a stable and Pareto efficient assignment. It is also shown that the Boston mechanism performs equally well under the restricted message space.

Chapter 2 considers matching environments between firms and workers, assuming that the entire market consists of many submarkets where matching takes place via the worker-proposing deferred acceptance algorithm. Each firm can participate in only one submarket, and each worker can participate in all submarkets after learning the composition of the submarkets. The model addresses endogenous formation of the matching submarkets and captures important features of some labor markets like the US medical fellowship markets. A key condition to analysis of those environments is non-overlappedness, which requires firms with different preferences over the workers to have distinct sets of the most preferred workers. Under the non-overlapped preferences, an equilibrium exists such that (i) the firms with the same preferences participate in the same submarket, and (ii) the workers truthfully reveal their preferences. The equilibrium also supports the firm-optimal stable outcomes.

Chapter 3 analyzes public good provision problems where agents are ambiguity averse and have the maxmin expected payoff criterion. Under the standard, ambiguity neutral preferences, it is well known that the efficient

provision of public goods by an equilibrium where the agents truthfully tell their valuations must violate either budget balance or individual rationality. In other words, no mechanism simultaneously achieves efficiency, truth telling, individual rationality, and budget balance. In contrast, this chapter shows that if the agents are sufficiently ambiguity averse, a variation of the VCG mechanism attains all four conditions mentioned above.

（論文審査の結果の要旨）

This dissertation covers various topics on the allocation of indivisible goods, ranging from the school choice problems and the labor market matching to an axiomatic approach to the provision of public goods. The diversity of the topics reflects the author's wide knowledge in this area, and the contents therein demonstrate his analytical skill.

Chapter 1 of the dissertation is motivated by a practical issue on the school choice problems. In these environments, the deferred acceptance mechanism by Gale and Shapley performs well, in the sense that it attains both (student-optimal) stability and strategy proofness on the students' side. However, its good performance depends on the assumption that the students can fully report their preferences, which is not the case in reality. The author thus restricts the number of schools students can list in the same way as Haeringer and Klijn (2009). The innovation here is to extend the schools' priority rankings to the substitutable preferences. This extension reveals that the substitutability is a weaker and a more essential condition for the deferred acceptance mechanism to perform well even under the restricted message space. This constitutes a major contribution of this dissertation.

Chapter 2 studies matching problems between firms and workers, from a viewpoint that many matching markets in reality consist of multiple "submarkets" and that those submarkets are endogenously formed by the firms' entry decisions. The author thus sets up a model where the firms first choose a submarket to enter and then the workers participate in as many submarkets as they want. Under this novel framework, the author identifies a new condition, non-overlapped preferences, as a sufficient condition for a truthful equilibrium to exist when the workers and the firms match according to a deferred acceptance algorithm in each submarket. The setup and the result show the author's creativity and analytical strength, and deserve special mention as an important first step about endogenous formation and coexistence of multiple matching venues.

Chapter 3 extends the axiomatic approaches to the public goods provision to the case of ambiguity averse agents. The author shows that a known impossibility result about a mechanism that sustains efficiency, truth telling, individual rationality, and budget balance crucially depends on the assumption of expected utility (ambiguity neutrality). This observation is illuminating, and further investigation of this issue should be an interesting future research.

Throughout the dissertation, the author scrutinizes conventional wisdom in this area from practical motivations and successfully demonstrates when known

results extend and when they do not. All in all, this dissertation considerably adds to our understanding of the matching theory, mechanism design, and market design.

Nevertheless, the dissertation also leaves something to be desired. For instance, the non-overlappedness condition in Chapter 2 seems quite restrictive, and it would be hard to verify whether it is valid in many matching contexts. Another concern regarding the analysis in this chapter is that it focuses only on a particular equilibrium and therefore is unclear as to how other equilibria would look. Further investigation of the entire equilibrium set may facilitate understanding of this type of market structure.

However, these critiques are something the author can deal with in his future research and do not negate the overall contribution of this dissertation.

Due to those evaluations, this dissertation is recognized as worthy of a doctoral degree in economics. This decision has been made after the thesis defense on January 23, 2020.