RESEARCH STATEMENT

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My research focuses on the fundamentals of both individual and collective decision making, especially on the axiomatic characterizations of decision criteria under *explicit* and *variable information*. In the standard choice theory and decision making under uncertainty, information is often disregarded in the model or considered to be implicit and fixed. Hence, the standard approaches often lead us to experience the following essential yet inevitable problems.

[I] When subjective concepts (e.g., attention structures) are introduced to explain choice behavior, we might fail to separate the preference from the effects of those subjective concepts.

[II] The seminal models often become uninformative about whether and how the behavioral properties (e.g., rationality, uncertainty attitude) translate among different economic contexts.

These problems necessitate the studies that explore the information dependency of individual decision making, where information is given explicit mathematical structures and considered as a variable. This forms the central idea throughout my current papers. The applicability of this line of research is promising in the sense that, once such information dependency is unveiled, it gives insight into *leading decisions* via shaping information structures in the related economic applications.

In what follows, I present the details of my current papers and plans for future research.

In my job market paper, "*Choosing from Graphical Choice Architectures*," I address [I] and [II] in the revealed preference theory framework. The standard revealed preference theory considers choice from sets. However, in the real world, a decision maker's (DM's) choice often involves information about the alternatives. For instance, the exogenous orders that describe specific relations of the alternatives (e.g., hyperlinks connections, or user ratings on shopping sites) might be relevant to the choice. I propose a model of choice from *choice architectures*, the observable structures that comprise the alternatives, and the choice-relevant information. This paper specifies choice architectures as *directed graphs* on sets of alternatives and studies both choice functions and correspondences in this rich domain. I introduce two sets of axioms that are in analogy to the Monotonicity axiom and the Independence of Irrelevant Alternative axiom. The axioms characterize the choice function and correspondence, respectively, by two choice procedures, both of which incorporate *sorting* alternatives into the preference maximization. Concretely, given a choice architecture, the choice function is a position-based selection from the sorted lists, while the choice correspondence is described by the union of alternatives that survive a position-based elimination from each possible sorted list.

In particular, the sorting procedure is represented by the topological sorting of directed graphs, hence being physical and independent of the preference, meaning that the model achieves the separation of the objective architecture-dependency and the preference maximization. Regarding existing work, such separation has the following significant implications: it (a) assures the translation of choice behavior between a non-repeated experiment, which forces single choices, and a cumulative observation; (b) implies a formation mechanism of consideration sets; and (c) signifies a source of the stochastic description of choice. Moreover, the model is of interest since it also has impacts for applications to shaping demand and revealing equilibrium. I show that (i) the interested party can lead the DM's choice and the choice frequency via shaping choice architectures; (ii) the model can be introduced as an alternative formalization of game theory with discrete payoffs, where the choice correspondence reveals the pure-strategy Nash equilibria.

My first paper, "*Uncertainty Attitude and Variable Information Structures*," explores [II] in the context of decision making under uncertainty. Since seminal models consider the information to be implicit

Date: Oct 2019.

and fixed, given two preferences revealing different uncertainty attitude, they might fail to clarify whether one is/become more uncertainty-averse, or is facing a more ambiguous decision problem. The paper specifies the information structures as partitions of a finite state space and studies a class of information-dependent preferences over Anscombe-Aumann acts. Two types of axioms, uniform and consistency, are imposed on the class of preferences, where the latter summarize the invariant properties across variable partitions. For a fixed partition, I show that the uniform axioms are equivalent to a representation in which the DM assigns a probability (the *interpretation of information*) to each event that is learnable from the given partition and uses a unique capacity (the *subjective belief*) to evaluate the likelihood of every sub-event of those learnable events. Under different impositions of consistency axioms, the model obtains several global representations of the entire class of preferences, all of which admit a unique capacity on the state space and a probability for each partition. The imposition of consistency axioms determines the relation between the DM's interpretation of information and subjective belief, and whether the interpretations of information are compatible across variable partitions. The representations also conclude a translation property of uncertainty attitude. It states that the uncertainty attitude is invariant across information structures yet is only revealed on the specific sub-domains determined by the given information structures. This property not only explains the ambiguity-aversion as a manifestation of the translation of uncertainty attitude, but also has applications to the studies of welfare and information design. As an example, I show the possibility of redistributing the market uncertainty via revealing particular information, without lying.

The paper is invited to Revise and Resubmit at the *Journal of Economic Theory*.

In "*Graphical Choice Architectures and Stochastic Choice*," I attempt to *unify* the approaches of preference maximization and stochastic choice in the same domain. The paper also works with the *graphical choice architectures* (directed graphs on sets of alternatives) and considers the choice frequency data drawn from choice architectures as the primitive. I propose two axioms that can be viewed as the modifications of the Stochastic Transitivity axiom with respect to specific properties of directed graphs. The paper is currently in progress, and the goal is to establish a model that suggests a two-fold explanation of choice: (i) preference maximization and (ii) random resolution of indifference/incomparable. An essential feature of the model is that the random resolution of indifference depends on the random realization of the topological sorting of directed graphs. It suggests that how the DM sorts information influences the random tie-breaking, hence playing a role in explaining the stochastic choice data. In analogy to the job market paper, this reasoning of the stochasticity indicates the possibility of leading choice frequency via manipulating choice architectures, which has applications to the studies of marketing and the game-theoretical analyses. Moreover, since the stochasticity is only involved in the tie-breaking, it is independent of the preference maximization. Thus, given the architecture-dependency of random tie-breaking, the model is free from [I] and [II].

In the immediate future, I am interested in the following lines of research.

Axiomatic decision theory— Conduct a series of studies to resolve the reference-frame dependency of decision models. That is, (a) different mathematical specifications of choice objects in the same decision problem result in different characterizations of the same behavioral observation, and (b) whether a decision model can explain a behavior observation depends on how we interpret the abstract choice object given in the model.

Welfare economics and Public choice— Investigate a series of applications of decision-theoretical findings in the studies of welfare and public choice, especially that of the leading decision and choice architectures. This line of research, to which my current studies provide the decision-theoretical foundation, addresses what criteria society pursues (or should pursue) in distributing welfare, and considers the properties of both equilibrium allocations and the choice architectures that lead those allocations, especially when impossibilities arise.

For long-term research, I would like to pursue the decision theory and expand my expertise to the fields of welfare economics and game theory, dedicating not only to the axiomatic studies but also to the operational researches regarding the stylized real-world problems.