

RESEARCH STATEMENT

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My main field of research is *economic theory*. I work on a broad class of problems coming from general equilibrium theory, game theory and the applications of these theories. In particular, I pursue my interest in understanding economic interactions by solving existing problems, developing new models to integrate intuitions from diverse literatures, and proposing new questions based on real-world observations.

Below, I first introduce these three major aspects of my research, explain how my past work relates to these aspects and how I plan to further pursue my academic agenda in the future. Then, I describe my work in more detail.

I. Solving Problems

A central theme of my research is solving problems I encountered from my study and seminar talks. For instance, inspired by a talk on matching, I realized it is not clear whether a stable state exists in a world with a large pool of agents who interact only in small groups. In the first part of my job market paper [1], I addressed this problem by developing a new formulation for the problem and connecting it to the optimal transport literature. Moreover, to ensure the formulation I developed is friendly for applications, I designed my method to have a low computational complexity. In addition, motivated by a talk on experimentation, I studied the stability problem of competitive equilibrium in [3]. During my study of the stability problem, I found Marshall's intuition - that the income effects are small in a world with many commodities - had only been formalized in a partial equilibrium framework in which prices are bounded away from zero. In [2], I dropped this assumption, thus extending Marshall's intuition to a large class of general equilibrium models. In the future, I will continue to develop new tools and solve existing problems, motivated by either theoretical curiosity or practical concerns.

II. Integrating Literature

During my study, there are two general questions on my mind. First, how to define an economic agent? Second, how do these agents, defined in a certain way, interact in a market? Seeking answers to these questions, I found many brilliant intuitions are scattered in different literatures. However, it is unclear to me that these intuitions are consistent with each other. Therefore, I work to integrate models from different literatures. For instance, in the second part of my job market paper [1], I built a bridge between general equilibrium theory and matching theory. This work adds a new dimension to the theory of incomplete markets: rather than trading only a small collection of goods, economic agents can trade only in small groups. Surprisingly, the combined model suggests that, in an incomplete market, in order to ensure the existence of an equilibrium, trading prices must be nonlinear. In [4], I connected work in decision theory to the field

of discontinuous payoff games to develop a game model in which agents care about each other in lexicographic orders. A natural future direction is to explore whether collaborations can be generated endogenously in a group of agents with discontinuous payoff functions. Looking forward, I plan to continue my endeavor to integrate models with diverse intuitions, to establish their consistency, and to produce new insights about economic interactions.

III. Proposing Questions

Part of my work is motivated by my observation of the real world. For instance, observing that human beings often work in groups, I studied small group interactions in my job market paper [1]. Observing that sometimes people are friendly to the others when the cost of being friendly is small, I studied the lexicographic externalities among agents in [4]. I believe that, in order to propose better questions, I need to learn from people with diverse backgrounds. In addition, my graduate training and research experiences have equipped me with the knowledge to formalize vague ideas, as well as the skills to analyze these formalized models. Therefore, I hope to exchange ideas with my future colleagues from different fields or even disciplines, help them to formalize their abstract ideas and be a link between people with different backgrounds.

In sum, the charming combination of beauty and practicality in economics serves as a fundamental source of curiosity for me, which drives me to continue my exciting journey in economic theory.

Below I provide more details about my past research papers.

[1] Small Group Cooperation in Games and Economies, November 2019

In this paper, we study games and exchange economies with transferable utility and a continuum of agents, who may be of different types and can interact only in small groups.

Firstly, we study a game with a continuum of agents who form small groups in order to share group surpluses. Group sizes are exogenously bounded by natural numbers or percentiles. We prove that there exists a stable assignment, where no group of agents can jointly do better. Conceptually, our work provides the only existence result to this problem on our level of generality as well as a uniform way to understand diverse solution concepts, such as stable matching, fractional core, f-core, and epsilon-sized core. Computationally, when there are finitely many types of players and group sizes are finite, we reduce the number of unknowns in the problem of finding stable assignments from about I^N to about I , where I is the number of player types, N is the maximum size of the small group and I is much larger than N . We achieve this reduction by reformulating the welfare maximization problem as a symmetric transport problem.

Secondly, we study an exchange economy with finitely many goods and a continuum of

agents who can exchange commodities only within small groups of some bounded finite sizes. By introducing the idea of a nonlinear price in which expenditures on traded quantities are defined by the same nonlinear function in every group, we prove the existence of a competitive equilibrium with a potentially nonlinear market price, provided that agents have quasi-linear utility functions. It appears that only nonlinear market prices are compatible with models in which all trade surplus might go to one of the trading parties. Therefore, our result suggests that market segmentation might lead to price nonlinearity. This work fills in gaps in the work of Hammond, Kaneko and Wooders (1989) on economies with small groups of arbitrary finite sizes.

[2] Small Income Effects in Economies with a Large Number of Commodities and Patient Consumers, March 2019

We prove that, at any equilibrium of an economy with additively separable utility functions, when the number of commodities is sufficiently large and all agents are sufficiently patient, all entries in the income derivative of the demand are arbitrarily small. By dropping the assumption that prices are uniformly bounded from below by a positive number, we extend the intuition in Vives (1987) on small income effects from partial equilibrium models to general equilibrium models. In addition, we propose a definition of sufficiently patient for non-separable utility functions.

[3] Walrasian Tatonnement Stability near Autarchy without Differentiability and Interiority, September 2018

We prove that, when the initial endowment is close to a Pareto optimal allocation, there is a locally tatonnement stable equilibrium, provided that the utility functions are strictly increasing and strictly concave, and every good is indispensable to some consumer.

[4] Second Order Secret Love, March 2018

Sometimes, when choosing among strategies that maximize their own payoff, agents choose the strategy that is best for their friends. To study this phenomenon, we study games with lexicographic externalities. The novel ingredient is a set of players' preference lists, which represent the order in which players care about the others. The collection of preference lists maps a base game to a game with a lexicographic externality, in which payoff functions are vector-valued and agents compare outcomes according to the lexicographic order. We prove that, for any given preference lists, if the base game has discrete outcomes and upper semi-continuous payoff functions, a Nash equilibrium always exists. In addition, we discuss the efficiency of equilibria in a model with public bads and the epsilon-variations of our formalization.