**Application Letter (Jun Zhang)**

My research interests are in economic theory, industrial organization, operation management and marketing. I have been working on various projects in mechanism design, regulation, auctions, innovation, contests, market segmentation strategy, production technology estimation, disruptive technology, consumer fairness concerns, context effect and Bayesian persuasion.

My works on auctions and contests are games with discontinuous payoff. In “Simultaneous Signaling in Elimination Contests”, we allow each round to be a Tullock contest, which includes the all-pay auction as a special case. We show that the nonexistence result arises if the first round sensitivity is low or the second round sensitivity is high. When the first round is an all-pay auction, there exists a separating equilibrium under some regularity conditions. Otherwise, the existence is hard to establish. The Econometrica piece by Professor McLennan, Monteiro and Tourky “Games with Discontinuous Payoffs: a Strengthening of Reny’s Existence Theorem” will provide insights for establishing the existence in the paper.

My research in mechanism design problem often combines hidden information, hidden actions and multiple agents. Although such a setup is technically challenging to analyze, it arises naturally in real life applications. My job market paper “Optimal Mechanism Design with Aftermarket Interactions” is based on a simple question. Consider the situation where the Macdonald's is going to issue a franchise in a certain area among several interested potential entrants in the primary market. If an entrant obtains the franchise, he needs to compete with the KFC in the aftermarket, say in Cournot fashion. The common observation is that the Macdonald's usually has no power to control the KFC's production level in the aftermarket. Let us also assume that the Macdonald's cannot dictate a production level for the winning entrant as well due to high monitoring cost or lack of information (the paper also examines the opposite situation). Hidden information arises because the potential entrants have private production costs. Hidden actions arise because production levels in the aftermarket are not dictated by the Macdonald's. The Macdonald's problem is how to sell the franchise optimally. An important decision for the Macdonald's is how much information to reveal to the aftermarket, since such information will change players' beliefs about each other and influence their decisions in the aftermarket. The finding is that the optimal revenue can be achieved by a deterministic mechanism where the Macdonald's fully reveals the winning entrant's private production cost to the KFC. Furthermore, when there is only one potential entrant, it is never optimal for the Macdonald's to make a take-it-or-leave-it offer; meanwhile, when there are multiple symmetric potential entrants, the optimal mechanism can be implemented by a first-price auction with a reserve price and the announcement of the winning bid. The techniques developed in this paper as well as in the JET paper “Optimal selling mechanism with resale via bargaining” can be applied to solve mechanism design problem with moral hazard, adverse selection, and multiple agents in other applications. Two areas in my mind are environmental economics and public economics. Professor Friesen, Asafu-Adjaye and MacKenziej are experts in environment economics, and Professor Marco Faravelli is an expert in public economics. I am sure they will provide me with very useful advice.