## DISSERTATION PROPOSAL

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## Incentives in U.S. Healthcare Operations

My dissertation aims to understand incentives in U.S. healthcare operations based on collaboration with various health organizations.

In my first essay, I investigate the underlying operational and economic drives behind physicians' test-ordering behavior in an outpatient setting, motivated by a collaborative study with UPMC Eye Center. I model the strategic interaction between a single physician and a group of patients with health insurance coverage. While existing studies hold that lower out-of-pocket expenses lead to higher consumption levels, I refine this statement by showing that the copayment and the coinsurance rate drive the consumption toward opposite directions. I then investigate different service settings and find several insights that differ from conventional wisdom: (i) Setting a low reimbursement ceiling alone cannot eliminate overtesting. (ii) The joint effect of misdiagnosis concerns and insurance coverage can lead to both overtesting and undertesting even when there is no reimbursement ceiling. (iii) Patient heterogeneity can further encourage physicians to overtest in order to achieve service selection. (iv) Under asymmetric information in physician type, physicians' signaling efforts can lead to more salient overtesting behavior, especially when technological advancements flatten out differentiation among physicians.

Motivated by the influenza vaccine industry, in my second essay, I study a supply chain contracting problem under the presence of uncertainties that are related to product design, delivery, and demand, respectively. The supply chain consists of a manufacturer and a retailer, where the retailer places an order before the flu season starts and the manufacturer decides on when to produce the products. Because production after the design freeze can result in late deliveries and hence lost sales, the manufacturer may initiate production prior to the design freeze at its own risk. I show that a negative feedback loop in the firms' incentives may arise in this supply chain; as a result, some of the traditional coordinating contracts (e.g., revenue sharing) could perform even worse than a wholesale price contract. To break the negative feedback loop requires complex contracts that are reported in practice but never studied in the literature. In view of the complexity of the coordinating contracts, I also analyze two simpler formats and show that they are efficient in chain coordination under various settings.

My third essay applies queueing and game theories to model a proposed organ donation policy. I model the current organ donation and allocation system, and evaluate the effect of introducing the donor priority policy under which registered organ donors are given priority to receive organs over non-donors, a frequently discussed policy being considered by U.S. policy makers. I characterize the equilibrium donating behavior and show that, as opposed to popular beliefs and extant literature, the social welfare can be worse off after introducing the donor priority policy due to the unbalanced incentive structure for individuals with heterogeneous health status. Finally, I propose a simple freeze-period mechanism and prove that it improves the welfare outcome of the donor priority rule by increasing the donation rate without distorting the quality distribution of the donated organs.