

Incentives in U.S. Healthcare Operations

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In my dissertation, I aim to understand incentives in U.S. healthcare operations based on my 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 University of Pittsburgh Medical Center (UPMC) Eye Center. I model the physician-patients interaction under the strategic queueing framework, and show that insurance coverage is a key driving force of overtesting. Our further analysis reveals that simply expanding cost-sharing does not constitute the solution: (i) While existing studies hold that lower out-of-pocket expenses lead to higher consumption levels, we refine this statement by showing that the copayment and the coinsurance rate drive the consumption toward different directions. (ii) Setting a low reimbursement ceiling alone cannot eliminate overtesting. (iii) The joint effect of misdiagnosis concerns and insurance coverage can lead to both overtesting and undertesting even when there is no reimbursement ceiling. These and other results continue to hold under more general conditions and so are robust. We also consider other extensions, including patient heterogeneity and information asymmetry in physician type.

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.