# Research Statement

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## 1 Overview

My research is in the intersection of Empirical Industrial Organization and Health Economics. Within the Health Economics literature, I am interested in competition in healthcare markets. Within the broader Industrial Organization literature, I am interested in the estimation and application of dynamic games.

My long-term research goal is to study competition between healthcare providers and understand how we can design policies to promote better outcomes. Healthcare markets are distinct from many industries due to a mix of strong government regulation and asymmetric information. Such differences are further heightened by presence of agents with significant market power, importance of innovation, and societal values such as viewing healthcare access as a right. By studying healthcare markets across many industries and under different settings, I aim to understand decision-making by providers and how it is influenced by different market regulations. In this context, choices by firms include entry and exit decisions, pricing, quality choice, product/service portfolio, investment, and technology adoption.

In terms of methodology, I use structural models to study strategic interactions between firms and perform counterfactual experiments to predict the effects of alternative policies. In particular, I use tools from the dynamic games literature to understand how forward-looking firms make decisions in a competitive setting.

## 2 Current research

In my job market paper **"Quality choice with reputation effects: Evidence from hospices in California"**, I study hospices, which are firms that give palliative care to dying patients. The hospice industry is a large and growing industry in US, with significant implications for patient welfare and cost savings. Hospices are reimbursed at a fixed price

per patient by Medicare, with expenses totaling over $21 billion in 2019. I use annual firm-level data from California to study quality choice by hospices under reputation effects and explore counterfactual policies to improve hospice quality. I measure hospice quality as the average visits-per-patient it makes in a year. I define reputation of a hospice to be a nonlinear function of its past quality choices, meaning that a hospice can accumulate reputation over time by consistently choosing high quality.

To see if reputation matters to consumers, I first estimate a structural model of hospice choice by consumers. Reputation has a strong influence on consumer demand but decays at an annual rate of 53%. I incorporate this into a dynamic oligopoly model of hospices choosing quality to compete on reputation against rivals. I estimate this using the two-stage estimator of Bajari, Benkard and Levin (2007) to recover hospices' cost functions. An additional visit costs a hospice around $200, for-profits enjoy an efficiency advantage over non-profits, and hospices in rural counties suffer a cost disadvantage compared to those in urban counties.

Armed with these structural estimates, I solve for equilibrium quality choices in a hypothetical market under alternative policy environments. As reputation becomes more persistent, hospices choose higher quality. Hospices also choose higher quality as Medicare prices increase, but the response depends on how differentiated it is in terms of characteristics from its rivals. Finally, I find that a hybrid per-day per-visit hospice reimbursement scheme can achieve the same quality at a lower cost than the current per-day scheme.

In my paper **"Entry and pricing with fighting brands: Evidence from the pharmaceutical industry"** (with Rena Conti), I study market dynamics and aggregate pricing in the pharmaceutical industry after generic entry. In the pharmaceutical industry, branded drug manufacturers can compete with generics by releasing an Authorized Generic, which is identical to the branded drug but without the brand label attached. This is used to price discriminate between consumers of different preferences, with branded drugs charging high prices and Authorized Generics charging low prices to compete with generics. Such "fighting brand" strategies are common across many industries, and in this paper I analyze such strategies by studying the release, timing and pricing decisions of Authorized Generics and rival generics in US. Using total drug sales and revenue data on US for 2004-2016, I uncover product release and pricing patterns after generic entry begins. I use these to motivate a structural model of drug entry and pricing. First, I estimate a random-coefficients discrete choice demand model to quantify the heterogeneity in brand valuation and price sensitivity among consumers. Next, I estimate a two-stage supply model. In the first stage, generic manufacturers make a static entry decision on whether to enter a molecule-formulation market. In the second stage a dynamic game begins where every period, generics who decided to enter are randomly approved for entry by the FDA and the branded drug manufacturer

decides whether to release an Authorized Generic. I solve this model by backward induction, and as a result allow for a rational expectations framework where Authorized Generic and generics form expectations about each others' entry decisions when making a choice. I estimate the supply side to back out the entry costs of releasing an Authorized Generic and of generics entering the market. The structural model is then used to conduct counterfactuals exploring factors that affect whether/when an Authorized Generic is released. I change heterogeneity in brand and price elasticities, increase the rate of generic entry, lower generic entry costs, raise price sensitivity, and increase market size, to see how it affects the timing of Authorized Generic release. My final counterfactual involves banning Authorized Generics - a proposal discussed by the FTC - and studying the effects on pricing and generic entry in the market.

# 3 Future research

Going forward I would like to continue studying strategic interactions and regulation in healthcare markets, as well as contribute to the literature on dynamic games. The following are some areas I am keen to explore.

First, I am interested in how public and private providers interact in healthcare markets. For instance, in UK a well-known phenomenon is that private providers only offer the most profitable treatments with a variety of amenities at higher prices, in sharp contrast to public providers. What would the market look like if public providers were not present, or with the government paying a fixed price per patient to every private provider? How would it affect entry decisions, quality choice, and technology adoption by private providers? There are many countries where such public-private provider interaction takes place, so this can be useful for policymakers in understanding the dynamics in such settings as well as optimal market design.

Second, I am interested in endogenous product offerings by healthcare providers. In particular, I would like to understand the factors that drive technology adoption by various providers such as specialized hospitals, clinics, and physician practices. A myriad of economic and policy factors affect such technology adoption, which in turn has effects on patient welfare and cost.

Third, I plan to study healthcare markets in Europe, Canada and developing countries. We now live in a world where countries are borrowing healthcare policies from each other. Many policies currently being proposed in US are already practiced in Europe; on the other hand, there has been a trend of introducing competition and choice in European healthcare markets, similar to US. My strong belief is that by studying healthcare markets in other

countries it is easier to shed light on policy debate. I have already built up extensive knowledge regarding the institutional details of many of these countries, because part of my work as an Instructor for undergraduate Health Economics involved writing up comprehensive reviews on healthcare systems across the world. Even if one does not care about the healthcare industry in and of itself, provider competition under different settings can uncover new economic mechanisms that are present in other industries.

Finally, I hope to contribute to the literature on dynamic games. All my papers until now, as well as most of my planned projects, use dynamic games. This is not a coincidence, because many of the significant decisions that healthcare providers make have dynamic effects. As a result I have great interest in the application of dynamic games in various contexts, as well as furthering our understanding of estimation methods. A project I am currently exploring involves accounting for firm-specific persistent unobserved heterogeneity in two-stage estimation methods using machine learning techniques.