

As an economist with a focus in industrial organization and labor, I study firm behavior in settings of imperfect competition. My research currently focuses on establishment decisions and entry dynamics in the advent of newly created (legal) markets. With my studies, I aim to understand the decision-making of a typical retailer, and the consequences of these decisions. I am particularly fascinated with new markets and the transition to potential market equilibria. My work examines the effects of retailers entering newly established cannabis industries, as well as the learning process involved in managerial dynamic-pricing decisions and product choice. With my current research and future agenda, I aim to discern a typical retailer's learning path and create a bridge to frontier operations research in optimal learning.

My research is empirical in nature, and I enjoy performing both reduced form and structural estimation. I have estimated market dynamics with updated versions of foundational frameworks, estimated effects of entry using instrumental variables, and used structural demand and learning models to investigate the learning path of a typical retailer in a new market. While my research is closely linked to theory, it aspires to investigate the real-world decisions being made in a business environment and assess the unintended consequences of those choices.

Equilibrium Entry in California Recreational Cannabis Market

With the formation of new markets, especially markets where the product is perceived to carry potential negative externalities, license quotas are a policy often discussed by state governments. After the legalization of recreational cannabis in 2016 by California, the state decided *not* to restrict the number of cannabis retailers allowed to operate in the state. This decision allows for the observation of unrestricted retailer entry in a completely new (legal) market. Using data from license issuances for retail storefronts, demographic data on Census Designated Places (CDPs), and 2010 replication of USDA-ERS commuter zones and labor market areas, I take a structural approach to study the nature of competition in California cannabis markets. I assess how many retailers on average it takes for a market to resemble a competitive equilibrium. This paper yields a baseline for understanding recreational cannabis markets with unrestricted entry and can be compared to markets in other states that chose alternative paths. In this study, some restrictive assumptions from the canonical framework of Bresnahan and Reiss (1991) were relaxed. This paper shows that the trends exhibited in their work are robust to the relaxation of the assumptions.

This analysis relates to the broader economic impact of restricting entry to markets. When using Washington cannabis markets as a comparison, Washington's license quotas often stop local markets from reaching a competitive equilibrium. This leads to establishments gaining market power, which reduces economic efficiency. The modal number of licenses issued in a Washington CDP (1) is far less than the average number in my research required to reach a competitive equilibrium. The typical local market became close to competitive after 7 entrants. These findings regarding market power in Washington markets are reinforced in Thomas (2019) and Hollenbeck et al. (2021).

Effects of Establishment Entry on Variable Profit

The state of Washington became one of the first states to legalize recreational cannabis in the United States. Washington decided to utilize retail license quotas to restrict entry into local markets. These licenses were allocated in a manner that created exogenous variation in the number of retailers across local markets. The state also chose a path of transparency and made all transactional data available to the public over the first 3 years of legalization. Every transaction from "seed-to-sale" was publicly available, including wholesale prices, retail prices and quantity sold. The data set also allows for observation of retailer entry and exit. This setting is ideal for the examination of entry and its subsequent effects. Using an instrumental variables approach, I estimate the effects of establishment entry on variable profits. I find that an additional retailer in a local market reduces monthly variable profits of existing retailers by approximately 5%, and that this reduction in profits is driven by a reduction in quantity sold. Margins and markups were relatively unaffected by establishment entry. This result is novel, because economists teach that entry causes a decline in variable profits in microeconomic courses, but causal evidence of this result is sparse.

The impact of these interconnected decisions by retailers is especially captivating when pondering the lack of response in margins and markups. Other authors have found causal relationships between entry and prices, but the impact on margins and markups is unclear when wholesale prices are not explicit in the data or experiments.

Learning and Product Choice in Washington Cannabis Markets

Continuing with my investigation of the market dynamics and structure of Washington cannabis markets, I research the learning process of establishments in this newly legalized market. Classical economic theories regarding market structures assume that firms know their demand curve. However, we know this assumption is unrealistic, and modern literature reflects this. My research focuses on learning and product choice through the lens of a monopolistically competitive retailer and also aims to quantify the costs of learning in Washington's recreational cannabis market. I find reduced form evidence that establishments are learning to set margins and markups over time and are less responsive to past quantities sold as they learn the demand parameters of their product. I also find that discontinued products have lower demand and a lower price sensitivity parameter than products that continue to be carried. This result is robust to differences in market population. Beliefs about product demand parameters are initially very similar but diverge over time as establishments learn. Finally, I find that profits could have been increased by a median amount of 92 to 95.14% had retailers known the true demand parameters at the time of adoption. To my knowledge, very few papers report structural estimates of learning about new products while using each product's demand estimates and wholesale costs. An interesting innovation this paper also contributes is the use of covariance restrictions (laid forth in Mackay and Miller (2023)) in demand estimation and a Bayesian learning model. I hope to expand its use to the modeling of more complex demand models within a multivariate-normal Bayesian framework.

The costs of learning and limited information are significant, and a vital concept stemming from this work is whether researchers can assist in reducing the ramifications of the learning process of a typical retailer. Research on dynamic pricing, learning under uncertainty, and optimal learning is rapidly expanding. Are these findings valid in monopolistically competitive settings, and can these techniques reach retailers such that the economic costs of learning are reduced?

Future Agenda

My existing work studies the market dynamics of newly legalized markets. In particular, the paper on establishment learning in the recreational cannabis market lays a foundation and empirically establishes the cost of learning that occurred. Looking forward, I am ecstatic to extend this work to address the limitations not covered in the foundational work and extend to modeling product choice decisions amongst uncertainty. There is an additional opportunity to connect this work to frontier approaches in the field of operations research. This potential connection can also lead to strategic advice for a typical retailer learning to operate their business. Beyond these research plans, I am always looking forward to investigating other constrained choices establishments make in an increasingly competitive business landscape, and the implications that result from those decisions. Although my journey has primarily led me into the realm of applied business economics, I also hope to collaborate with my current and future colleagues on topics related to health and labor in the near future.