Research Statement
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My research focuses on three major themes. The first crafts new tools that policymakers can use to better protect consumers from anticompetitive behavior. The second examines the vertical supply chain, and how incentives throughout this chain can affect downstream consumer prices. The third looks at the importance of dynamics in price competition – that is, how a product's prices and quality yesterday, tomorrow, and beyond can affect the decisions consumers and firms make today.

These themes in my work are directly relevant to major recent developments in the practice of industrial organization and antitriust policy. My research addresses, among other high-profile issues: the mess left over from the largest price-fixing case of all time (in the LCD TV market); a rebate that was at the heart of two of the largest anti-trust settlements of all time (the *AMD vs Intel* case, as well as the European Commission and FTC cases against Intel); and a state liquor-pricing law that the 9th Circuit recently ruled was a violation of the Sherman Act (in *Costco v. Hoen)*, and that a dozen other states currently face challenges on.

Through these cases, theoretical work, and field experiments, my research analyzes existing approaches to antitrust enforcement and suggests new ones. In *An Experimental Approach to Merger Evaluation,* for example, Julie Mortimer and I suggest an innovative and cost-effective new approach to evaluating mergers. By way of background, the 2010 update to DOJ/FTC Horizontal Merger Guidelines represented a major shift in merger policy in the United States. The new guidelines have largely abandoned the practice of computing concentration or the Herfindahl Index, in favor of a new metric known as the "Diversion Ratio." The Diversion Ratio considers a hypothetical experiment where the price of good A is increased, and measures the number of consumers who switch to good B as a fraction of those who leave good A. This represents a middle ground between full merger simulation under a structural model, and a purely descriptive approach. The guidelines are vague on how exactly to estimate this Diversion Ratio and existing theory is unhelpful in filling in the blanks.

In our paper, we design and execute a series of field experiments in order to empirically measure the diversion ratio, and then compare these measurements to those obtained using common parametric forms of demand. We attempt to bridge the gap between the structural demand estimation literature and the treatment effects literature. This provides not only a way to understand potential advantages and limitations in measuring diversion, but also provides an experimental protocol that can be implemented in the field for merger evaluation.

In another experiment conducted in the same industry, we examined the role of a specific contract, known as an All-Units Discount (AUD) or First Dollar Discount, that was the centerpiece of the two biggest anti-trust settlements of all time. These discounts work by triggering a rebate on all sales – both past and future ones -- as soon as a sales quantity target is reached.

Some have argued that this kind of contract is actually pro-competitive, that rebates can better align the incentives of upstream and downstream firms, especially as they pertain to the provision of service by the retailer. The anticompetitive story, on the other hand, is that a dominant upstream firm (such as Mars Inc., in the case of our experiment) can use these rebates to effectively or explicitly exclude a rival by making its own products extraordinarily cheap or even by demanding a certain share of sales. (This was essentially the plaintiff's argument in the *AMD vs Intel* cases).

There are debates in the theoretical literature about this. According to Bork's *Chicago Critique* (1978) -- which U.S. courts have generally seemed amenable to -- the retailer would be willing to sign a contract that excludes a rival only if excluding the rival maximizes industry profits. The more recent game theoretic literature (Bernheim Whinston 1998), however, shows that the Chicago Critique depends heavily on what assumptions. Our work uses a combination of theoretical, experimental, and structural econometric evidence to examine the tradeoff between the provision of retail service, and the potential to exclude competitor's products from the market. We show that in some cases the

contracts are efficiency-enhancing and in other cases they are anticompetitive, and that the welfare impact of the AUD contract is related to retail capacity.

In addition to examining how contractual forms affect the nature of competition in vertical markets, I have also worked on understanding how regulations affect the nature of competition in vertical markets.

In *The Price of Liquor is Too Damn High: The Effects of Post and Hold Pricing*, Nirupama Rao and I investigate a particular pricing law known as "Post and Hold," which is intended to protect mom-and-pop retailers by preventing wholesalers from offering quantity discounts (which would primarily go to big retailers). Twelve states currently have such laws in place for their liquor wholesalers, although Washington State's was recently struck down by the 9th Circuit. In Connecticut -- the state with the highest liquor prices in the country, and whose data we're focusing on -- liquor wholesalers most publicly post the prices they will charge every downstream firm for the subsequent 30 days, and wholesalers can revise prices downward but not below the lowest competitor's price. We show that this mechanism eliminates any incentive for price competition in the wholesale tier, which has the effect of increasing the prices of alcoholic beverages without raising any additional tax revenue for the state. Because the wholesale tier essentially acts as a monopolist, it increases the deadweight loss of taxation on alcoholic beverages, and thus raises the social cost of raising tax revenues.

In addition to looking at how regulatory measures can affect prices, I'm also studying how the business cycle, past behavior, and future expectations can influence pricing and purchasing decisions.

In *Market Power, Countercyclical Quality, and Sticky Prices*, David Berger and I examine inter-temporal pricing in real estate. We show that a firm may want to respond to a negative demand shock by increasing the quality of the good. This is true when consumers form expectations using previous prices, but cannot observe previous quality. We show that firms are more likely to engage in this behavior when they have a large number of additional units to sell in the future, and we provide evidence using data obtained from developers of luxury housing units in Chicago.

In another paper, *A Dynamic Model of Prices and Margins in the LCD TV Industry,* I examine the dynamics of price competition in the LCD television market in the wake of the biggest price-fixing case of all time. Prior to 2006, the LCD panel market was engaged in widespread price fixing. In the years that followed, we saw massive investments in R&D that substantially reduced production costs and led to larger and less expensive LCD televisions. From 2006-2009 manufacturing costs fell more than 50%, but prices fell more than 75%. Though the global market for LCD TV's is nearly $120 billion per year, by 2009 nearly all firms in the industry were reporting losses and were unable to recoup their investments in R&D. Economic theory provided two related explanations within the well-known Coase Conjecture. The first was that firms simply overestimated how much consumers were willing to pay for televisions. The second was that expected future price declines limited the amount of surplus that firms were able to extract in any period. I provide evidence that the second hypothesis was correct.

As necessary along the way, I have also developed new methodology for dealing with problems facing applied researchers.

Before we could understand the strategic implications of product availability, Julie Mortimer and I had to overcome some technical challenges. Failing to account for out of stock events led to underestimating demand for out-of-stock products, and overestimating demand for substitute products; unfortunate most retailers collected data only periodically. In *Demand Estimation Under Incomplete Product Availability*, we introduced new methodology for estimating demand in retail markets when high demand led to out of stock events for products.

Another common problem in demand estimation is that instruments for endogenous prices are often characteristics of competing products (so-called "BLP Instruments"). These instruments are often

weak and highly correlated across products within a market, leading to finite-sample bias when estimating demand parameters. There has been a growing literature of mostly negative results documenting these problems (Knittel and Metaxoglou (2013), Armstrong (2013), Skrainka (2011), Reynerts and Verboven (2012)).

In *The Empirical Likelihood MPEC Approach to Demand Estimation*, I provide an alternative estimator based on Empirical Likelihood that is more robust to highly correlated weak instruments and has better finite sample performance than GMM. The advantages of Empirical Likelihood methods have been understood for almost twenty years, but the estimator is generally believed to be computationally challenging. I provide a computationally tractable version of the Empirical Likelihood estimator and show how to apply it to the demand estimation problem of Berry Levinsohn and Pakes (1995).