Research Statement
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My research addresses the role that digital technology plays in retailing and distributing products, and the impact that it has on firm incentives, inter-firm relationships, and consumers. This area of research is important not only because digital technology affects a growing set of product markets, but also because the nature of digital technology allows for the construction of much more granular data than researchers and firms have historically been able to access. In my research, I identify three broad impacts of digital technology in retail and distribution settings. First, it creates opportunities to adopt more sophisticated contractual arrangements between firms in supply chains. Second, it changes the tools that firms use when designing stocking policies and choosing product availability. Third, it alters the incentives to create information goods. More recently, I have also begun extensive work studying the market for advertising, which is another crucial input for distributing products that has been upended by digital technology.

Each of these four areas address long-standing problems in economics, on which the field of industrial organization (IO) has struggled to provide convincing empirical evidence. An important contribution of my work is the collection of new and detailed data that enable us to analyze these issues from an empirical perspective. I combine these new data sources with thoughtful economic models to understand how technology impacts the ways in which firms bring products to the market place.

1 Contractual Arrangements Between Firms in Supply Chains

Coordinating supply decisions between upstream and downstream firms is challenging because the incentives of downstream outlets need not align with the incentives of upstream producers. This is an important issue in many markets, and an extensive theoretical literature addresses the impacts of various vertical contracts for social welfare. However, different theoretical models come to different conclusions about the welfare effects of vertical arrangements, making empirical work crucial for understanding these markets. In spite of the clear need for empirical work in this area, empirical evidence on the impacts of alternative vertical contracts for firms and consumers is scarce, in part because one requires extremely rich data to convincingly analyze these arrangements.

In Mortimer (2008), I fill this gap by collecting an extensive dataset from the video-rental industry to analyze the effects of contracts between separately-owned movie distributor and retailers. The new contracts are similar to two-part tariffs: rather than charging a fixed, linear price for each unit of inventory, a manufacturer transfers inventory to retailers at a price that is close to marginal cost, and the manufacturer and retailer share revenues from subsequent rentals or sales of the good. The revenue-sharing contracts require extensive computerized monitoring, and were
widely adopted only after online monitoring and suitable software was developed in the mid-nineties. I find that the contractual innovation increased both manufacturer and retailer profits, and also increased consumer surplus substantially.

In Ho, Ho, and Mortimer (2012b), Kate Ho, Justin Ho, and I provide the first empirical study of the effects of full-line forcing contracts, which require retailers to accept the full bundle of goods produced by a manufacturer. The impact of bundling hinges critically on the nature of demand, and empirical studies of bundling require extremely detailed information on both the purchases of bundles and the consumption of the products in the bundle in order to capture correlation in tastes across products and markets. In a vertical setting, one also requires detailed data on the contractual forms used by firms. We extend the data used in Mortimer (2008) in order to study the use of full-line forcing contracts between movie distributors and video retailers. We find that upstream firms make rational choices about the types of contracts to offer. An important determinant of whether to offer full-line forcing contracts is the product mix of the upstream firm: firms with very strong product lines don’t benefit from the bundling arrangements because retailers take nearly all of their products even in the absence of full-line forcing contracts. However, firms with more heterogeneous product lines do benefit from offering the contracts, because the contracts induce retailers to carry many more of the upstream firm’s products.

We extend this work in Ho, Ho, and Mortimer (2012a), in which we measure three welfare effects of full-line forcing contracts for social welfare: market coverage, leverage, and efficiency. We find that bundling increases market coverage and efficiency, but has little impact on one distributor gaining leverage over another, and conclude that full-line forcing contracts increased consumer and producer surplus. The analysis of bundling contracts is a quickly growing literature, and our work provides a model for how to utilize detailed demand and supply data in order to understand firms’ choices and the implications of those choices for social welfare.

In Conlon and Mortimer (2017a), Chris Conlon and I study a form of vertical rebate known as an all-units discount. Vertical rebates, which are prominently used across many industries, are known for having the potential to induce greater retail effort, but also to prompt retailers to drop competing products. The former is generally good for society, while the latter can be anticompetitive. As both effects typically will be relevant in reality, empirical analysis is important to understanding the contracts’ net effects. Chris and I analyze such a contract using detailed data from a retailer in the vending industry. In addition to providing detailed information on his rebate terms, the retailer also allowed us to conduct a field experiment, in which we remove the top-selling rebated goods. The experiment allows us to show directly how the rebate allocates the cost of effort between manufacturer and retailer, but doesn’t permit us to analyze what the effects of removing the contract might be. In order to do this, we combine the experimental variation with models of consumer choice and retailer behavior to quantify the rebate’s effect. We find that the rebate increases industry profitability and consumer surplus compared to removing the rebate but
leaving wholesale prices unchanged. However, we also find evidence that the rebating firm would not offer the contract if it did not foreclose the rival producer, and that the contract fails to maximize social surplus.

The broad class of contractual arrangements between firms in supply chains is often referred to by anti-trust authorities as “Conditional Pricing Practices,” because the rewards paid to downstream firms require them to meet conditions set by the producer. In work with a current graduate student, Genchev and Mortimer (2017), Bogdan Genchev and I review economic theories of conditional pricing practices as well as empirical evidence on their impacts on consumer welfare. We cover all-units discounts, full-line forcing contracts, and exclusivity arrangements in a variety of industries. A common thread is that conditional pricing practices tend to have both procompetitive and anticompetitive effects, which may depend on the details of the arrangement and the characteristics of the market. This necessitates a careful analysis of their relative magnitudes on a case-by-case basis.

2 Firm Stocking Policies and Product Availability

In contrast to other literatures, the IO literature has focused primarily on price when modeling competition in most markets, taking the set of products as given. While price competition is clearly important in many settings, the choice of product mix also plays a key role in markets for which storage costs or capacity constraints matter. Accessibility of data has been a challenge for studying the role of product availability empirically, because product availability may change across consumers in unobservable ways (e.g., due to stock-outs). In contrast, price changes are often easier to measure (e.g., promotions and coupons are observed in many data sources).

In Conlon and Mortimer (2010), we investigate the importance of stocking decisions and product availability for firms and consumers. We address the challenge of data collection by running a series of field experiments in which top-selling products are randomly removed and consumer responses and profit impacts are tracked. The experimental nature of our data is unusual for studies in IO, and allows us to analyze the impacts of product availability using two widely-used methodologies from the economics literature. First, we report nonparametric analyses using techniques common to the treatment-effects literature. Second, we analyze the data using structural demand estimation more common to the field of IO. The implementation of alternative estimation methods allows us to generate insights into the trade-offs and sources of identification of different empirical methods.

In Conlon and Mortimer (2017b), Chris Conlon and I return to the experimental data in the vending industry to highlight the role that changes in availability can play in merger analyses. Merger analyses often rely on the notion of a ‘diversion ratio’: the fraction of consumers that switch from one product to another after a price increase for the first product. If diversion is high, then a merger between the two products is more likely to induce a price increase for the first product because the merged firm
gains from sales of both goods. Two measures of diversion are: the ratio of estimated cross-price to own-price elasticities (which captures small price increases), and second-choice data (more relevant to changes in product lines induced by a merger). Policy-makers may be interested in either effect, depending on context. For example, small price increases may be important in the retail gasoline and airline industries, whereas changes in coverage or availability may be relevant for understanding health care markets and digital content industries. In principle, experimental variation in pricing can recover diversion that varies with the size of a price increase, but is rarely feasible. We analyze the impacts of several hypothetical mergers using experimental variation in product availability to analyze diversion in the snack food industry and illustrate differences between the two approaches to measuring diversion.

Typical methods for estimating demand in IO assume that the availability of products is fixed across all consumers in a market, and that variation in product mix across markets is exogenous. While these assumptions may be sensible in many settings, they are restrictive in markets for which availability plays an important role, such as retail outlets, performance events, transportation, health care, and school choice. In Conlon and Mortimer (2013), we provide evidence that failing to appropriately account for changes in product availability can result in a substantial bias in demand estimates, and we develop a method for estimating demand that allows for changes in product availability even when availability is only observed periodically. To accomplish this, we collect new data from a digital technology for managing inventory: a wireless network installed on a set of 54 vending machines that provides updates on elapsed sales and inventory levels every four hours. Our work shows that models of demand that ignore changes in product availability produce biased estimates of substitution, and under-predict the negative profit impacts of stock-out events by 8 - 12 percent in this setting.

In Ioannou, Mortimer, and Mortimer (2011), Ioannis Ioannou, Richard Mortimer and I analyze the impact of product availability in retail settings by examining the effects of capacity on retail demand. Several mechanisms may lead capacity levels to affect sales. For example, a larger capacity may reduce the incidence of stock-out events, or may be seen as a signal of quality by consumers. Using the data collected in Mortimer (2008) from the video-rental market, we find that larger capacity can substantially increase retail sales, and that alternative vertical contracts used by upstream and downstream firms for distributing inventory can have a large impact on the relationship between capacity and rentals. We leverage the richness of the dataset and the presence of multiple types of supply contracts in order to address concerns about the endogeneity of firms’ choices of inventory levels.

The importance of variation in product availability for demand estimation has been highlighted in recent assessments of the literature, and I have contributed to that effort in two ways. First, in work with a current graduate student, Hickman and Mortimer (2016), Wills Hickman and I review the literature that develops methods for estimating demand in settings with changes in product availability. We emphasize
two mechanisms through which product availability may vary: product assortment decisions, and stockout events. We also briefly discuss variation in availability that may arise from limited consumer information. Finally, in cross-disciplinary work with several co-authors, I synthesize these contributions across the economics, marketing, and operations research literatures in Musalem, Olivares, Borle, Che, Conlon, Girotra, Gupta, Misra, Mortimer, Vulcano, and Zheng (2017).

3 Creating and Distributing Information Goods

In markets for physical goods, digital technology affects the logistics of distribution and data collection at the retail outlet, which in turn affects the set of contracts that can be enforced in the vertical channel. In markets for information goods, the logistics of distribution and retail activities become issues of Intellectual Property (IP) protection.

The effects of IP protection depend on how firms respond to the legal environment that IP laws create. In Mortimer (2007) I examine the impact of firms’ pricing decisions for DVD’s, which are protected by Copyright laws. The Copyright laws in the U.S. differ from those in many other countries because they do not permit a copyright holder to charge different prices for different intended uses of a product. This led movie distributors to adopt indirect forms of price discrimination for their goods in an effort to segment the purchase and rental markets for movie titles. I derive theoretical predictions about the use of indirect price discrimination and find that firms’ choices are consistent with the predictions of theory. Using a detailed dataset, I provide evidence that firms’ use of indirect price discrimination benefits consumers but harms retailers. I also examine the impact of an alternative form of IP protection that allows firms to charge different prices for different uses of a protected good, and find that this further benefits consumers and producers at the expense of downstream retailers.

Changes in the distribution technology of information goods affect the ways in which society creates and consumes information goods not only for the digitalized product itself, but also for complementary non-digital uses. In Mortimer, Nosko, and Sorensen (2012), we examine firms’ responses to digital redistribution technologies in the context of recorded music. Our study uses a new and extensive dataset on concert events and album sales to examine how file-sharing affected the complementary market for live concert performances. We expect two effects of file-sharing on live performances. The first is a demand shift: if recorded music and live performances are complementary in consumption, then file-sharing should lead to increased demand for live performances. The second effect is a supply shift: to the extent that file-sharing reduces profits from recorded music, we expect artists to reallocate effort toward concert tours. We document changes in both markets for this industry and show that the changes are consistent with both of these effects. We observe these changes over time, as well as across different types of artists.
Digital technologies for sharing creative goods create the potential for new forms of copyright infringement and challenge established enforcement methods. In a pair of papers, Hong Luo and I examine the effect of illegitimate use in the market for digital images. In Luo and Mortimer (2016), we establish several important facts about the nature of copyright infringement and efforts to settle past infringing use in the market for digital images. Infringement in this, and many other markets, is often uninformed: users may be unaware that their use infringes, with no information on the cost of a license. The uninformed nature of infringement implies that price may not be the primary factor in the decision to settle past use; in contrast, non-price methods may affect settlement outcomes.

In Luo and Mortimer (2017), we study how resolution of infringement responds to changes in price and communication using a new, extensive dataset of copyright infringement incidences by firms. The data cover two field experiments that we ran with a large stock-photography agency. We find that substantially reducing the requested amount generates a small increase in the settlement rate. However, for the same reduced request, a message informing infringers of the price reduction and acknowledging the possible unintentionality generates a large increase in the settlement rate; including a deadline further increases the response. The small price effect, compared to the large message effect, can be explained by two countervailing effects of a lower price: an inducement to settle early, but a lower threat of escalation. Furthermore, acknowledging possible unintentionality may encourage settlement due to the typically inadvertent nature of these incidences. The resulting higher settlement rate prevents additional legal action and significantly reduces social costs.

4 New Work on Television Advertising

I've recently begun new work on the television advertising market using a collection of new and extensive datasets that have not been previously available to researchers. The primary data for this new line of research come from two sources: Rentrak Corporation (now ComScore) and SQAD. Rentrak collects television viewership data from over 13 million households and 29 million set-top cable boxes, including second-by-second viewership data for all content and advertisements, including time-shifting, ad skipping, and the ad’s rating. The information about each advertisement is extensive, and describes the advertiser, industry, product, ad copy, and the timing and placement of each ad. The Rentrak data also contain information on the corporate relationships across advertisers (e.g., identifying parent companies for brands across products in different industries), as well as demographic information for each household.

Prices of individual ad purchases are negotiated between a network and an advertising agency on behalf of a group of clients. Networks may require agencies to purchase bundles of ads across multiple telecasts in this negotiation process. SQAD collects data on the prices that result from these transactions, reporting the aver-
age transaction price for an ad spot in a specific telecast.\footnote{SQAD also surveys advertisers and reports aggregated information from the survey results at the level of a market. These data are commonly accessed through arrangements with Nielsen and various university libraries, but do not capture the transaction-level prices with which we are working. SQAD holds a patent on their method for reporting transaction-based prices.} We observe three years of viewership and pricing data from both Rentrak and SQAD (January 2011 - December 2013).

My first project to leverage these data, in what I expect will be a series of papers, is joint work with two graduate students (Nick Diebel, a current student, and Sylvia Hristakeva, a former student). Although not yet released as a working paper, we have completed all background data work, as well as several underlying machine-learning methods designed to intelligently reduce the dimensionality of the data. With this background work as an input, we are currently analyzing the nature of the ‘upfront’ market for television advertising. This market has a number of unusual characteristics, including the use of unexpected pricing methods based on an advertiser’s history with a network, a remarkably compressed schedule (the market lasts for three days each year), and extensive negotiations between media buyers and television networks. The upfront market was valued at $9.2 billion in 2017, covering roughly 80% of prime-time network television advertisements. Our goal is to shed light on the impacts of this market structure for the participants (i.e., advertisers and television networks).

5 Inference on the Effects of Job-Training Programs

In Hotz, Imbens, and Mortimer (2005), I have also investigated the problem of predicting average treatment effects for training programs based on prior experiences from “similar” programs. Using data from four randomized job-training programs across the US, we investigate two principle difficulties in estimating these effects. One difficulty is that the population in which a new program will be implemented may differ significantly from the population in which the old program was implemented. Second, the two programs may differ in the mix or nature of their components, or in their efficacy across different sub-populations. We investigate the empirical importance of these issues. We find that adjusting for pre-training earning and individual characteristics removes many of the differences across control groups (i.e., those who received no training). We find similar results for trainees, suggesting that differences in treatment components across programs are not large enough to affect inference.

6 Concluding Remarks

Empirical research into the industrial organization of retail and distribution has been challenging for the field, due to the extremely proprietary nature of data in these relationships. Contracts between firms tend to be even more closely guarded than market shares or prices, and obtaining this information requires a great deal of effort.
However, these data can provide a wealth of information on long-standing questions in economics generally, and IO in particular. In addition to obtaining detailed data sources on supply relationships, it is also necessary to combine extensive knowledge of an industry with thoughtful economic models in order to appropriately understand the impacts of new technologies on the ways in which firms bring goods to the market place. My research provides several influential models of how to do this, and informs policies that govern relationships between firms and the use of digital technologies for distributing goods.

References


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