

Research Statement

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Traditionally, the primary focus of Industrial Organization, my main field of interest, is to study how firms set their prices. However, firms make many more decisions such as the variety and the quality of their products, whether and when to enter a market, and how to organize themselves internally. Much of my research focuses on these firm decisions. They are not only important for firms, but also key determinants of consumer welfare. Some of my more recent projects also study the economics of small businesses, which are an important part of the economy in terms of their contribution to overall economic activity and employment.

My projects are organized around three common themes: (1) how firms decide about the number and the characteristics of their products (Fan, 2013, *American Economic Review*, Fan and Yang, 2016, working paper); (2) firms' decisions to enter markets and certain organizational forms (Fan and Xiao, 2015, *RAND Journal of Economics*, Fan, Kuhn and Lafontaine, 2016, accepted for publication at *Journal of Political Economy*, Fan, 2016, working paper), and (3) the economics of small businesses (Fan, Ju and Xiao, 2016, *International Journal of Industrial Organization*). The industries studied in these projects span from established markets such as the daily newspaper market and the local telephone market to emerging markets such as smartphones and e-commerce. All these markets play a vital role for economic development, social interactions, and, sometimes, for the functioning of democratic societies.

This research statement explains my research agenda and describes each of my published and working papers. I conclude with an overview of on-going projects and a summary of the broader impact of my work.

Firms' Product Choice

An important decision firms have to make is how many products to offer and the characteristics of each product. This product-choice decision is important not only from the firms' perspective but also for consumers because it directly determines the availability and diversity of products in a market. For example, holding prices fixed, economists generally believe that consumers are better off when they can buy higher-quality products and have access to a greater product variety. At the same time, firms' product-choice decisions also affect price competition, which leads to an indirect effect on consumer welfare. For instance, if firms offer very different products, markets may become less competitive. As a result, prices could rise and consumers could be worse off.

Economic theory relating to how firms choose their products is well established. On the one hand, all firms want to offer the "right" product to capture more demand. On the other hand, they might want to differentiate their products from those their competitors offer to avoid intense price competition. Empirical work quantifying the relative importance of these considerations is, however, less developed. There is also little empirical work on how changes in the level of competition (for example through mergers) affect how firms choose their products. My work has helped fill this gap. Analyzing merger effects is an important area of research in Industrial Organization. The traditional analysis of mergers has focused on how they affect prices. My work takes one step further and addresses the following questions: How do mergers affect product characteristics (e.g., product quality)? Do mergers lead to an increase or a decrease in product variety?

I study these questions by combining economic models that characterize the institutional settings of specific markets and industries with detailed and often newly collected industry data. Specifically, for each market, I develop a structural model describing the behavior of each economic agent in that market, and estimate key determinants of consumer utility and firm profits. Such a so-called structural approach allows me to quantify consumer welfare and conduct decomposition exercises to study the relative importance of product adjustments versus price adjustments for welfare.

In "Ownership Consolidation and Product Characteristics: A Study of the US Daily Newspaper Market" (*American Economic Review*, 2013), I quantify the effect of ownership consolidation on product

characteristics and prices in the US daily newspaper market. This paper advances the traditional merger literature by jointly examining the quality and price effects of mergers. Quantifying these effects is important not only for understanding the welfare effects of ownership consolidation in media markets, but also has broader implications for the access of the public to news and a variety of opinions, which is essential for the functioning of modern democracies.

To address these questions, I develop a structural model of the US daily newspaper market and estimate it using a unique data set that I compiled from multiple industry sources. The main findings are: first, ownership consolidation typically leads to a decrease in the news content quality (measured by the non-advertising space, the number of reporters and the number of staff for the opinion section), the content variety (measured based on editorial staff for different sections), and the local news ratio. It also leads to an increase in the subscription price; second, ignoring the post-merger adjustment of product characteristics leads to an underestimation of the welfare losses for readers and advertisers, and an overestimation of the welfare gains for publishers. For antitrust policy, these results mean that merger assessments should take into account not only price effects but also consequences for product quality.

In the newspaper project, I focused on how newspaper publishers adjust the characteristics of their newspapers after a merger, while holding the number of newspapers fixed. I make this modeling choice because there was little entry into and few exits from the US daily newspaper market during my sample period of 1997 – 2005. In contrast, in my new working paper **“Competition, Product Proliferation and Welfare: A Study of the US Smartphone Market” (working paper, 2016, joint with Chenyu Yang)**, my co-author and I move one step further and study firms’ choices of both the number and the composition of the products they offer, a product portfolio choice. This is challenging because, in theory, firms have a substantial number of product portfolios they can choose. For example, suppose a firm has 20 potential products it can offer. Then, the firm has more than 1 million potential product portfolios to choose from: any one product, any two . . . , or all 20 products. This imposes a computational challenge, which Chenyu and I overcome with a new heuristic algorithm to compute firms’ optimal product portfolio choices.

With this problem solved, we empirically investigate (1) whether, from a welfare point of view, oligopolistic competition (i.e., a small number of firms, each of which maximizes its own profit) leads to too few or too many products in a market, and (2) how a change in competition (e.g., due to a merger) affects the number and the composition of product offerings, and eventually welfare. We study these questions in the US smartphone market and find that there are too few products, and that a merger would further reduce product variety. These findings suggest that merger policies may have to be stricter when the product portfolios offered are an important form of competition in an industry.

While my newspaper project focuses on product *quality* for a fixed number of products, this new paper advances my research agenda on how firms choose their products by adding product *variety* into the mix and studying effects of mergers on prices, product quality, and product variety jointly. Despite the difference in focus and the very different industries studied (the mature newspaper industry versus the more vibrant smartphone industry), the two papers make similar and potentially generalizable policy recommendations: merger policies may have to be tougher when we take into account firms’ post-merger adjustments in product portfolios, whether such adjustments only concern the characteristics of a fixed set of products or also involve changes in the number of products.

Firms’ Entry Decisions

Another important decision that firms have to make is whether and when to enter a market and how to organize themselves internally. Like the product choices of firms, their entry decisions also influence welfare, because they determine how many firms and what kind of firms compete in a market, which in turn affects how these firms behave. Thus, entry decisions of firms, through competition, have important implications for consumer welfare.

My paper **“Competition and Subsidies in the Deregulated US Local Telephone Industry” (RAND Journal of Economics, 2015, joint with Mo Xiao)** studies firm entry in the deregulated US local telephone industry after the 1996 Telecommunications Act. Because affordable access to telephone service is widely

recognized as a fundamental part of public infrastructure that is important for economic development and equity, ensuring a competitive and thus customer-oriented market structure after deregulation is an ongoing policy concern. One natural policy remedy would be to subsidize firms' entry costs. This paper studies the question of how to design such subsidies as a function of the economic environment.

To this end, we estimate a dynamic oligopoly model describing firms' entry decisions in the US local telephone industry. For estimation, we take advantage of a unique feature of the industry to identify potential entrants: a firm needs to obtain certification, one per state, to operate in any local market within that state. The consensus in the industry is that obtaining state certification is a time-consuming process, and only those with certification are likely to enter in a given year. Any firm without a real intent to enter any local market in a state will likely not apply for certification. Knowing who the potential entrants are allows us to observe how long a firm waits before entering a market as well as firm-level attributes associated with the cost of entry. Our data indicate that some of the potential entrants wait for several years before entering a particular local market. To capture this feature of the data, our model expands the standard models in the literature by recognizing that waiting to enter has value. The estimation results show that our model indeed explains the observed variation in the data better than the standard models.

We then use this empirically improved model to study the design of entry subsidies. Our results provide guidance to policy makers about a fundamental infrastructure industry, and our policy recommendations exploit information that regulators can readily access (e.g., size of the market) and actions that they can easily control (e.g., timing of the subsidy). We find, for example, that entry subsidies can be more effective in reducing monopoly markets if offered only in smaller markets. This is because small markets are more likely to be monopolized before a subsidy so that a subsidy encouraging entry into a small market may immediately eliminate a monopoly. We also find that subsidies restricted to the period right after deregulation speed up the initial arrival of competition, due to a reduction in the value of waiting and an increase in the value of entry.

By contrast, in **“Estimating the Costs of Market Entry and Exit for Video Rental Stores” (working paper, submitted to *Review of Industrial Organization*, 2016)**, in a simple application of the entry model above to a small-business setting, I find that entry decisions are more like one-shot decisions where the option value of waiting plays little role. This difference in results is likely explained by the fact that video rental stores are businesses with lower entry costs than telecommunications companies. As a result, it is natural to think of their entry decisions as less complex.

While the above two papers focus on firms' entry *into a market*, in **“Financial Constraints and Moral Hazard: The Case of Franchising” (accepted for publication at the *Journal of Political Economy*, 2016, joint with Kai-Uwe Kühn and Francine Lafontaine)**, my co-authors and I study firms' entry *into a specific organizational form*, namely, franchising. Franchising, an organizational form that allows them to grow through opening franchised outlets in addition to company-owned outlets. A franchised outlet is a store owned by an individual who pays a chain for the right to sell the franchisor's product and to use its trademarks in a given location for a specific period of time. For example, the Michigan-headquartered moving company, Two Men and A Truck, is a chain in our data that was started in 1984, started franchising in 1989, and by 2006, had grown to 8 company-owned and 162 franchised stores.

This paper begins with a theoretical model formalizing the following intuition: when taking out a business loan, how much collateral a franchisee can put up for this loan will affect her incentives to work hard because higher collateral makes her more averse to default on her loan, which, in turn, leads her to exert more effort. A potential franchisee's ability to come up with such collateral thus affects a chain's interests in engaging in the franchising relationship, both in terms of the initial decision to enter into franchising and subsequent decisions on whether to open a specific new outlet as a franchisee-owned or company-owned outlet. In the empirical part of the paper, we find strong support for this intuition.

This paper contributes to the literature by highlighting the role of franchisees' financial constraints in a chain's organizational form decisions, its growth and the timing of entry into franchising, a topic that has not been previously studied. The literature thus far has focused mainly on the prospect of claiming residual profits (after paying franchising royalties) as an incentive for franchisees to work hard. We propose collateralizable

wealth as a new quantitatively important incentive mechanism in franchising relationships, which we think is complementary to that of residual claims. Note that collateralizable wealth gives incentives to franchisees in their early years of operation, a period during which profits, and hence residual claims on them, are often negative but the amount of own wealth put up in the business might be large.

This paper is also related to the macroeconomic literature, as it provides and quantifies an additional channel through which a decline in home values can lead to recessions. In our paper, a decrease in collateralizable housing wealth makes a franchisee less “attractive” to a chain. As a result, chains that would otherwise have found franchising profitable and used two ways to expand (through company-owned outlets or franchised outlets) are now more constrained, and hence open fewer stores and create fewer jobs. We find that a negative shock to housing wealth comparable in size to the one experienced in the recent Great Recession would lead to an employment reduction in the franchising industry by around 10% through this channel alone.

The Economics of Small Businesses

A new research focus of mine is the economics of small businesses. It emerged while I was working on the franchising project, which, in its empirical implementation, focuses mainly on small businesses. Small businesses are an important contributor to overall GDP, to innovation and to employment. Different from large businesses, they are likely to be more vulnerable to so-called asymmetric information problems. For example, while a large company may have developed a comprehensive system to evaluate the effort put in by its employees, it is more difficult for small businesses to determine how hard a hired manager has worked. Therefore, making sure that a manager has incentives to exert effort may be vital for small businesses. This was the issue we studied in the franchising paper.

Another example is reputation and its active management. Since the products of small businesses tend to be less known and less standardized, potential buyers may not know the qualities of these products and may not trust these sellers. Such an information problem hinders the process of bringing consumers and small businesses together. This is especially true in e-commerce markets where buyers and sellers trade anonymously. To deal with this problem, many online platforms provide a public reputation system that invites and collects feedback from members regarding past transactions. How does reputation affect the business performance of online sellers? Does it also affect the behavior of sellers?

I study these questions in **“Reputation Premium and Reputation Management: Evidence from the Largest e-Commerce Platform in China”** (*International Journal of Industrial Organization*, 2016, joint with Jiandong Ju and Mo Xiao). Using a panel data set from the largest e-commerce platform in China, Taobao.com, which is larger than Amazon and e-Bay combined in terms of transaction values, we find that established sellers sell larger volumes and receive more revenue as their reputation ratings increase. For new sellers, however, as reputation increases, revenue decreases while transaction volumes increase. This seemingly paradoxical finding (if one thought that sellers statically maximize current profits) indicates that sellers behave in a forward-looking way: as the ratings of new sellers increase, they have more incentives to cut their prices in order to boost transaction volumes, and hence gain even better ratings in the future. As a result, their revenue might even decrease in the short-run.

We thus empirically document in an important market how dynamic considerations enter into the decisions of economic agents, and consequently provide empirical support for a large theoretical literature on reputation and its management. This is significant because, for small businesses, particularly those in e-commerce markets, reputation is a crucial determinant of their earnings and their survival.

Future Work

Firms’ product choice, firms’ entry decisions and small businesses are all exciting and important areas of research that, in new work, I integrate. I now focus more on the interconnections among the choice of product portfolios, entry decisions and economic policies to better understand how they jointly determine the market structures and market outcomes we observe, and to better quantify the effect of certain economic policies, subsidies and antitrust measures, on consumer welfare.

In **“Subsidies and Medicare Prescription Drug Plans”** (work in progress, joint with Colleen Carey and Elena Krasnokutskaya), my co-authors and I study how the system of diagnosis-specific subsidies in Medicare Part D (the Medicare Prescription Drug Coverage) affects the characteristics and prices of Part D plans, and, eventually, consumer welfare and firm profits. We develop an economic model to capture the interaction between drug companies and insurance companies, and how consumers choose both insurance plans and drugs. We also leverage detailed consumer-level data on their plan choices and prescription drug demand. This project stems from my interest in how firms choose their products, but shifts the focus from merger effects (in Fan (2013) and Fan and Yang (2016)) to subsidies. In recent years, subsidies to private insurance companies have become a new model of public service provision, replacing the old model of direct government provision. The effects of this switch, in particular, those on plan attributes, are not well understood empirically. Our project fills the gap.

In another new project, **“Threat of Entry and Entry: Airline’s Product Responses”** (work in progress, joint with Yesim Orhun), I switch the focus from firm entry to the threat of entry. While there is a large theoretical literature studying why and how incumbents react to the mere threat of entry before the actual entry occurs, the empirical literature on this topic is considerably smaller. We focus on the airline industry and contribute to the literature by combining a structural model with publicly available data describing demand in the airline industry and proprietary data on flight schedules. We take a structural approach, in contrast to the regression approaches thus far used in the literature, for three reasons. First, it allows us to quantify welfare effects. Second, it allows us to compare the competitive effect of the threat of entry (before the actual entry plays a role) to that of entry *if the threat of entry had played no role*. Such a comparison provides an answer to the following policy question: is it worth subsidizing an airline’s entry into the route between two airports once it serves both these airports from other locations (i.e., once a threat of entry occurs), or just let the threat of entry play its role of curbing the market power of incumbents. Third, we study in what kind of markets we expect the competitive effect of entry threat to be large, which is relevant for merger analysis. This project combines my interests in product choice (flight frequency decisions) and firm entry.

My third on-going project **“Market Size and Firm Turnover”** (work in progress, joint with Francine Lafontaine) combines my interest in firm entry with my interest in small businesses. Using detailed data on the entry and exit of small businesses in Texas, we document a negative relationship between market size and firm turnover, i.e., firms in a larger market are less likely to exit the market. Our current working hypothesis to explain this new empirical finding is that it is harder to enter a larger market. As a result, those firms who do enter are likely to be of a higher quality or more productive, and thus are likely to survive longer.

Summary

My research belongs to the field of Industrial Organization. It starts with product choice, progresses to firm entry, and then to organizational form decisions and the economics of small businesses. My contributions to this field include highlighting the importance of considering firms’ product adjustments in merger analyses, providing empirical support for economic theory such as the dynamic effect of reputation and its management, pointing out the quantitative significance of potentially important omissions in the current literature (e.g., the option value of waiting in entry models), and offering new insights on how financial constraints affect small business growth.

However, the broader impact of my research goes beyond my main field of specialization. For example, my research has connections to other fields of Economics: my newspaper paper contributes to Media Economics, the Medicare Part D project is related to Health Economics, and the franchising paper adds to the discussion on the adverse effect of house price collapses (a macroeconomic topic).

More importantly, my papers also have important implications for current policy discussions. For example, both the newspaper paper and the smartphone paper make specific suggestions for merger policies. In addition, the former points out that antitrust policies can influence the informational infrastructure of a society in an important way. My telecommunications paper, on the other hand, derives practical guidance for the design of subsidy policies to provide affordable access to means of telecommunication. These are important societal problems. I believe the rigorous empirical economic analyses in my research contribute to understanding and solving these problems.