Multi-Unit Ownership and Market Power: A Study of the Lodging Industry in Texas

Jung Hwan Koh*

September 26, 2019

Abstract

Franchisees in the retail and service industries often own multiple units. As franchisees become experienced and acquire local market knowledge, they are likely to own more than one unit. Given non or weak exclusive clauses in franchise contracts or industry norms, some of the multi-unit owners are affiliated with multiple franchisors. Agency and transaction cost theories, the classic theoretical framework to analyze franchising, can not explain this type of ownership since this would create additional conflicts between two franchisors in addition to the conflicts between franchisors and franchisees. Instead, this paper uses the framework of market power to explain the presence of multi-unit ownership by testing whether multi-unit owners can exercise such power when their units are geographically clustered. This paper uses data on hotels near the interstate highway exits in Texas to test this hypothesis. The results of this paper show that multi-unit owners have contracts with more than one franchisor and that multi-unit owners charge higher prices than single-unit owners. Counterfactual analysis shows that without multi-unit ownership, prices would decrease by 4.1%, on average. This price change increases market share by 7.2%. These results support that franchisees can exercise market power through multi-unit ownership.

1 Introduction

Franchising is one of the widely used business governance formats in the U.S. retail and service industries. In a franchise contract, franchisees sell franchisors' products or use their brand names (trademarks), or managerial skills at a given location for a certain period time by paying initial installments (franchise fees) in addition to sales-based fees (royalties). With franchise contracts, franchisors can grow by adding more units, or stores under their franchise system with less capital investments.

*Resource Economics at University of Massachusetts Amherst, jkoh@umass.edu

With initial and ongoing supports from franchisors, franchisees can take advantage of established management skills, or national/regional marketing campaigns that is not possible by individual franchisees. As franchisees become experienced and more efficient in their operation in their local markets, some franchisees tend to expand their business by owning additional units under the same franchisor. This is known as multi-unit franchising. Multi-unit franchising are not rare, although the majority of franchisees remain single unit owners. Various studies in franchising show the prevalence of multi-unit franchisees. Kalnins and Lafontaine (2004) indicates that among franchised units of the seven major fast food chains in Texas in 1995, 49% of franchisees operated more than one unit; these owners accounted for 84% of total franchised units in the fast food chains.

In addition to multi-unit franchising, some of these franchisees own units affiliated with multiple franchisors due to weak exclusive clause in franchise contracts (Blair and Lafontaine, 2005; Wilson, 2011). Traditional theories of franchising, which consider transaction costs and agency-based frameworks, cannot explain the emergence and prevalence of this type of ownership in franchising. Agency-based frameworks suggest franchising is beneficial since the costs of the separation between owners and operators are minimized: as residual claimers, franchisees have an economic incentive to invest more effort than managers hired by franchisors. As owners of franchised units add addition units, this advantage would disappear since the franchisees start to manage multiple units by hiring managers at their units In addition, if multi-unit owners are affiliated with multiple franchisors, these owners would have more operations in operation and management, making franchisors face higher costs of monitoring and controls over these franchisees.

The transaction-cost perspective provides reasonable arguments for multi-unit franchising but not for franchisees associated with multiple franchisors. In multi-unit franchising, franchisors can reduce transaction costs, such as monitoring, or training costs, with multi-unit franchisees since these franchisees are more experienced and tend to invest more efforts/funds than single-unit owners. However, it is not clear that franchisors can reduce such transaction costs if franchisees have franchise contracts with multiple franchisors.

Rather than relying on the classic literature about franchising, this paper explores whether a framework of market power helps explain why franchisees are affiliated with multiple franchisors. Specifically, I empirically test how multi-unit ownership affects market outcomes, focusing on how multi-unit owners exercise market power. The lodging industry is suited to the evaluation of multi-unit ownership for several reasons. First, in the lodging industry, franchising is one of the widely used business formats, and multi-unit owners are prevalent; some of these owners are affiliated with more than one franchisor in this industry (Kalnins, 2006a). Multi-unit ownership is also observed in small geographic markets in this industry since hotels tend to cluster together in small areas where consumer demand is high, such as central business districts and tourist destinations. Hotel chains with multiple brands tend to operate multiple hotels in these small markets, while owners are likely to own more than one hotel under either the same or different hotel chains.

I use data on hotels and motels near interstate highway exits in Texas, where

hotels tend to be closely located near exits, creating distinct clusters away from other geographic markets. In these clusters, as opposed to metropolitan areas, franchisees have strong control over their operational and pricing decisions. This results from franchisees being distant from the national/regional headquarters of the franchisors. Another reason is that franchisors of economy/budget, or mid-scale hotel brands (low to medium quality brands) tend to provide discretion to franchisees. The franchisees are likely to have more control on management and pricing decisions. Most hotels near highway exits fall in these categories. Given these conditions, this paper can analyze the effect of franchisees, with minimal influence from franchisors. In order to focus on the behavior of franchisees, it is required to identify the owners of individual hotels in the markets. I use data on hotel occupancy taxes from the Texas Comptroller's Office, matching information on each taxpayer with hotel data.

To measure the market power of multi-unit owners in these markets, I adapt the approach of Berry et al. (1995): a random coefficient logit model is used to estimate demand parameters. With the estimated demand parameters, marginal costs are recovered under an assumption on the supply side: firms jointly maximize profits across their units (the pre-scenario). Using demand estimates and the recovered marginal costs, I conduct a counterfactual analysis in which all franchisees are assumed to be single-unit owners (the post-scenario). Comparison between the pre- and post-scenarios allows testing whether multi-unit owners exercise market power. The results of this paper shows that firms with multi-units charge higher prices, supporting the hypothesis of the market power of multi-unit ownership. In addition, without multi-unit ownership, market shares, on average, would increase, while consumer welfare would be improved.

This paper is one of the first papers to analyze the effects of multi-unit ownership using a structural approach. Most studies in the franchising literature have focused on the issues of multi-unit franchising, even though there is evidence that multi-unit ownership is common (Blair and Lafontaine, 2005). Using data on taxpayer information from hotel occupancy tax receipts, I separate upstream (franchisors) and downstream(franchisees) firms, and then analyze the effects of the behaviors of the downstream firms. Moreover, I limit the sample of this paper to hotels and motels near the interstate highway exits in Texas to minimize the possibilities that franchisors have strong controls over day-to-day operation, or pricing at their franchised hotels.[1]. Another benefit of choosing these remote markets is to circumvent the possibilities of cross-market competitions (i.e., a hotel in a highway exits competes with other hotels at different exits.).

The rest of the paper proceeds as follows: Section 2 reviews the relevant literature. Section 3 discusses the multi-unit ownership in franchising and the characteristics of the U. S. hotel industry in the current study. Section 4 presents the models of demand estimation and counterfactual analysis. Section 5 summarizes the data and estimation strategies. Section 6 covers the results of the demand estimation and the counterfactual analysis. Section 7 concludes the paper.

[1]Major hotel chains tend to have strong control over franchised hotels in larger markets, such as metropolitan areas through regional quality control, or revenue managers.

2 Literature Review

Most studies in the literature on franchising have viewed franchising to represent a type of organization between vertical separation and vertical integration (e.g., Lafontaine (1992); Dahlstrom and Nygaard (1999); Blair and Lafontaine (2005)). These studies have examined conflicts, incentive alignment, control, or monitoring over other parties between upstream and downstream firms using a classical theoretical framework of franchising, such as transaction costs (e.g., Dahlstrom and Nygaard (1999)) and agency cost theories (e.g., Kidwell et al. (2007)). In addition, the majority of empirical studies in economics and management focus on franchisors' decisions – double distribution channels (corporate owning and franchising), and optimal franchising proportions – while only a handful of studies analyze the decisions of local owners or franchisees. The majority of these studies analyze the trade-offs between being independent and being franchised units from the viewpoint of franchisees (e.g., Mazzeo, 2004; Kosová et al., 2011, 2013; Chaudey and Fadairo, 2008).

Rather than relying on these theoretical frameworks, this paper focuses on cases in which franchisees have more initiatives in day-to-day operations and management, with less control from franchisors. These cases are considered to be close to vertical separation. With this setup, this paper analyzes franchisees' behaviors.

The findings of this paper are consistent with the literature on multi-unit franchising (Kalnins and Lafontaine, 2004; Thomadsen, 2005), entry/exit (Davis, 2006a; Kalnins, 2004b; Mazzeo, 2002b) and brand proliferation (Wilson, 2011). Using Texas fast food chains as a sample, Kalnins and Lafontaine (2004) show that units owned by multi-unit franchisees are close to each other, or are located in demographically similar markets. This enables multi-unit franchisees to transfer local knowledge and experience across their units. Thomadsen (2005) simulates counterfactual analysis: mergers between units of fast food chains in small geographic markets. His results show that simulated mergers increase prices, similar to my results. His analysis focuses only on multi-unit franchisees, excluding the presence of multi-unit owners in the markets.

In the literature on encroachment and entry/exit, Kalnins (2004b) finds empirical evidence for why multi-unit owners have contracts with different franchisors. He shows that cannibalization effects (revenue reduction by entry of firms with the same brands) are greater than business-stealing effects (revenue reduction by entry of firms with different brands) in the Texas hotel industry, supporting the observed benefits of franchisees associated with different franchisors. However, Kalnins, without considering the role of the hotel owners, assumes that there is no direct coordination of the entry and exit decisions of different brands. This paper takes into account the existence of multi-unit owners that are affiliated with multiple franchisors with a structural approach and the information of owners of individual hotels.

Similar to Kalnins (2004b), Wilson (2011) analyzes the effect of brand proliferation of hotel chains from the viewpoints of franchisors. He finds that revenue reductions due to new entrants do occur, but the magnitude of these reductions is smaller if the entry is made by different branded hotels under the same hotel

chain, or by branded hotels under the different chains. He also examines the effect of multi-unit ownership by using a reduced-form model, but the results are insignificant, which might be driven by a lack of data. I circumvent this issue by incorporating several data sets and employing a structural approach.

Even though multi-unit franchising and ownership are prevalent in many industries, few studies have empirically analyzed the effect of multi-unit ownership in the context of franchising. Kalnins and Mayer (2004) employ survival analysis to franchised units of fast food chains in Texas. They find that multi-unit franchising lowers failure rates if owners accumulate local knowledge and experience and can transfer that knowledge to the operation/management of their units, or hotels. Moreover, Kalnins and Lafontaine (2004) argue that multi-unit franchising utilizes local specific knowledge of well-performing franchisees, reduces free-riding issues between franchisees (i.e., franchisees in the same market are not incentivized to invest similar efforts to maintain, or promote their brand). Moreover, with multi-unit franchisees in the same market, franchisors can avoid criticism from incumbent franchisees when new franchised units are added since the owners of these units are the same.

Moreover, Kalnins (2004a) and Thomadsen (2005) show new units under multi-unit ownership tend to be located close to existing units or in demographically similar markets. While these studies focus on knowledge transfer between units under the same ownership, this paper focuses on how multi-unit owners compete in the markets, providing a different view on the motivation of owning multiple units in local markets. One exception is Kalnins (2004a) who analyzes the multi-market contacts between franchisees in fast food chains in Texas, rather than between franchisors. Since multi-unit franchisees have contact with other franchisees within and across franchisors, this creates possible conditions of mutual forbearance. Kalnins finds that in markets with high uncertainty, franchisors tend to assign new units to franchisees with higher levels of multi-market contacts. This effect of multi-market contacts requires analysis of multiple markets, which is beyond the within market competition approach of this paper.

Studies in entry and exit (or encroachment) are quite similar to this paper in that these studies examine the effects of inter- and intra-firm competitions (Davis, 2006b; Mazzeo, 2002a; Kalnins, 2004b). Even though these studies assume firms make decisions by taking into account strategic interactions among competitors, there is little consideration on the ownership structure at the local market level. Without considering ownership, it is hard to analyze competition unless firms are perfectly separated in a vertical structure.

3 The U.S. Lodging Industry and Multi-Unit Ownership

The U.S. lodging industry provides vertically and horizontally differentiated products. Although there are different ways to measure hotel quality at the brand or property levels, most hotels are rated by popular hotel rating systems (*AAA*, *TripAd-*

visor, or major online travel agencies). These provide relatively consistent measures of product quality that consumers trust and can easily access before any consumption. Major hotel chains also provide a range of hotel brands with different levels of quality. In some geographic areas, a hotel chain provides multiple hotels with different qualities, resulting in higher market concentration than the ones of markets where hotels were owned by different chains (Mazzeo, 2002a; Kalnins, 2004b; Wilson, 2011).

In addition to vertical differentiation, hotels are differentiated by location, even within a geographic area, like cities. Depending on travel distances to tourist destinations or other preferred places, consumers may consider the same brand hotels to be different products. Also, hotels of the same brand can be perceived differently if they offer different sets of amenities, or services. Variations in these sets of amenities and services differentiate one hotel from the others, even within the same geographic area. Thus, hotels in metropolitan areas face only a more limited set of competitors than expected. For example, Kalnins (2006b) shows that, on average, hotel managers recognize only four to five competitors in their markets. Thus, hotels face limited competition, thereby marking markets more likely to be oligopolies.

Agglomeration is one of the widely observed market phenomena. Hotels tend to locate close to other competing hotels since consumer demand is high for staying close to desired destinations within a city. In these areas, hotels try to differentiate from other competitors, vertically or horizontally. Mazzeo (2002b) supports this notion for vertical differentiation of hotels and motels near highway exits in the United States. In addition, Kalnins (2004b) shows if hotels face competition from other hotels that exhibit different product qualities, their revenues or profits are higher than if the competition comes from hotels of similar qualities.

Most branded hotels take form of vertical relationship. As mentioned earlier, Franchising, one of the most popular forms of the vertical contracts, allows franchisees to use brand names, management formats, or centralized reservations systems, while paying to franchisors initial franchise and royalty fees. [2] The average length of a franchise contract is about 20 years, which is longer than in other industries. Most franchisors have established their own centralized reservation systems and management standards to control the quality of products and services.

While franchise contracts are more prevalent among low- or mid-quality hotels since operations at these hotels are more standardized, for upscale hotels, management contracts, another form of vertical contract, are more widely used. Management contracts allow franchisees limited control over day-to-day hotel operations, while franchisors, as operators of the hotels, supervise hotel business. This is highly related to the complexity of operating upscale hotels and the difficulties of maintaining their service standards required by hotel chains.

Since this paper analyzes hotels near the interstate highway exits, hotels have at most three star rating out of the maximum five given by the standard *TripAdvisor*'s rating system. This is largely because demand for hotels near interstate highway

[2]Franchise fees are one-time lump sum payment to franchisors when franchise contracts are signed. Royalty fees are generally a combination of fixed and variable terms; the variable terms are normally based on the units of sales, or total sales

exits is not enough to accommodate four to five star hotels. Thus, most branded hotels in these locations are likely to be under franchise contracts. Under franchising contracts, local hotel owners become residual claimants of revenues after paying the franchising and royalty fees to franchisors. Franchisees also have more control over their business, including pricing policies, while following the business standards set by the franchisors.

It is common in markets with high demand that a single hotel chain operates hotels under different brands to attract different types of travelers. This might create some conflicts between franchisors and franchisees, such as cannibalization effects (Kalnins, 2004b) and free-riding over other franchisees(Wilson, 2011).[3] To prevent these conflicts, most franchise contracts include exclusive clauses which prevents either franchisees or franchisors from engaging in any actions against other interests. Exclusive territory clauses grant franchisees the right to be the sole provider in a certain geographic area. Non-compete clauses, another type of exclusivity clauses frequently included in franchise contracts, prevents franchisees from engaging in similar businesses during and after the franchise contracts. However, these are negotiable or not strictly enforced in many cases, especially in the hotel industry. For example, if the franchised hotels locate in high demand markets, these terms might be loosened, allowing other franchisees to enter the market with the same or different brand names. If the franchisees are experienced and have accumulated local knowledge or relationship in a certain area, adding additional units by these franchisees would be beneficial for both franchisees and franchisors (called multi-unit franchising).

Multi-unit franchising has become more popular in service industries, especially in the restaurant industry (Blair and Lafontaine, 2005), while hotel owners tend to own single units due to financial constraints (Wilson, 2011). In general, franchisees tend to own both land and physical properties, including the building and equipment in rooms. These high initial costs may deter current hotel owners from adding new units (hotels). However, as management of the low- or medium- quality hotels across hotel chains has become more standardized, it is increasingly more common to see local hotel owners add additional units in the same market or geographically close markets. This paper finds that 240 hotels out of 5,186 hotels located near the interstate highway exits in Texas were owned by multi-unit owners. While this figure suggests that multi-unit ownership might not be widespread, my estimates suggest their economic effect is not negligible.

4 Model

4.1 Demand

To estimate demand, I use a random coefficient logit model, which allows for flexible substitution patterns by accounting for consumer heterogeneity in preference over

[3]Franchisees have less incentive to sustain the franchisors' quality standard while benefiting from good reputations from other franchisees or franchisors.

product characteristics (Berry, 1994; Berry et al., 1995; Nevo, 2000).

The indirect utility of consumer i purchasing product j at market t is

$$u_{ijt} = \alpha_i p_{jt} + X_{jt}\beta_i + \xi_{jt} + \epsilon_{jt}, \tag{1}$$

where p_{jt} is the price of product j in market t, X_{jt} represents observed product characteristics, including the distance to the highway exit, the number of activities, the number of room types, and the number of services provided for business travelers.[4] ξ_{jt} is an unobserved product characteristic, and ϵ_{ijt} is a random shock that is assumed to follow type I extreme value distribution.

To control the characteristics of local markets, location fixed effects (highway exits) are included. In Equation (1), I assume that the coefficients of price and product characteristics (α_i and β_i) have normal distributions with an average preference, α and β, respectively, and idiosyncratic terms: $\sigma_p v_i^p$ and $\sigma_k v_i^k$. Term σ measures the standard deviation in consumer preference and v_i represents the idiosyncratic preference. Thus, the coefficients of prices and product characteristics are rewritten as: $\alpha_i = \alpha + \sigma_p v_i^p$ and $\beta_i = \beta + \sigma_k v_i^k$.

The utility of the outside option is

$$u_{i0t} = \xi_0 + \sigma_0 v_i^0 + \epsilon_{iot},$$

where the utility from the outside option is normalized to zero. This completes the specification of the utility function.

Given the assumptions of the random coefficient, the utility function can be divided into two parts: the mean utility and the deviation from the mean as follows:

$$u_{ijt} = \delta_{jt}(X_{jt}, p_{jt}, \xi_{jt}; \theta_1) + \mu_{ijt}(x_{jt}, p_{jt}, v_i; \theta_2) + \epsilon_{ijt}, \tag{2}$$

$$\delta_{jt} = \alpha p_{jt} + X_{jt}\beta + \xi_{jt},\ \mu_{ijt} = p_{jt}\sigma_i^p v_i^p + x_{jt}\sigma^k v_i^k. \tag{3}$$

where $\theta_1 = [\alpha, \beta]$ and $\theta_2 = [\sigma^p, \sigma^k]$. Based on the framework of McFadden (1989), the choice probability of individual i choosing j in market t is the following under the assumption of the distribution on ϵ_{ijt} :

$$s_{ijt} = \frac{\exp(\delta_{jt} + \mu_{jt})}{1 + \sum_{l=1}^{j} \exp(\delta_{lt} + \mu_{lt})}.$$

Aggregating the probability of the individual consumer probabilities, market share can be written as:

$$s_{jt}(\delta, \theta) = \int s_{ijt} dF(v) = \int \frac{\exp(\delta_{jt} + \mu_{jt})}{1 + \sum_{l=1}^{j} \exp(\delta_{lt} + \mu_{lt})} dF(v). \tag{4}$$

There is no closed from solution for the integral in Equation (4), so this should be numerically approximated. This paper uses the Halton draw for numerical approximation, which creates lower simulation errors (Reynaert and Verboven, 2014;

[4]Hotel rating and hotel age were tested, but showed high correlation with other product attributes. Thus, these variables are excluded.

Brunner et al., 2017). With this set up, the estimated market shares can be obtained as follows:

$$s_{jt} = \frac{1}{NS} \sum_{i=1}^{NS} \frac{\exp(\delta_{jt} + \mu_{jt})}{1 + \sum_{l=1}^{j} \exp(\delta_{lt} + \mu_{lt})}. \tag{5}$$

4.2 Supply

I assume that firms play a Bertrand-Nash game by setting prices of their products to maximize their profits. The focus of this study is whether franchisees can exercise market power via multi-unit ownership. To ensure conditions for this hypothesis testing, I choose franchisees in markets where franchisors have less control over their franchisees. This is also empirically examined in Section 6 by using a reduced-form analysis.

Hereafter, it is reasonable that I assume firms are franchisees. If firms (franchisees) own multiple units (hotels), the firms jointly maximize their profits in setting prices of their units. Otherwise, single-unit firms (franchisees) set prices for their single-units. The profit function is as follows:

$$\max_{p_{jt}, j \in F_f} \pi_f = \sum_{j \in F_f} (p_{jt} - mc_{jt}) M_t s_{jt}(p) - C_f, \tag{6}$$

where firm f has product j in F_f(a set of products of firm f), mc_{jt} is the marginal cost, $s_j(p)$ is the market share of product j, M_t is the market size, and C_f is the fixed cost of firm f.

From the profit function, the first-order condition is derived and can be rewritten for the equation of markup in matrix forms:

$$p - mc = [\Omega^{pre}]^{-1} s(p) \tag{7}$$

where

$$\Omega^{pre} = \begin{cases} -\partial s_j / \partial p_k & \text{if } j, k \in F_f \\ 0 & \text{otherwise.} \end{cases}$$

The ownership structure term, Ω captures the existence of multi-unit firms in the market. From Equation (7), the marginal costs are estimated as $\hat{mc} = p - \Omega^{pre} \cdot s(p)$. These marginal costs rely on demand estimates and the Bertrand-Nash assumption of the supply-side model. If the demand estimates or the assumptions of the supply side change, marginal costs would change accordingly. For the counterfactual analysis, I assume that marginal costs are constant. Later, this assumption is relaxed to check the robustness of the counterfactual analysis.

I conduct the counterfactual analysis, using the demand estimates and the estimated marginal costs. New equilibrium prices under a counterfactual scenario in which all firms own single units are estimated as follows:

$$p^* = \hat{mc} + [\Omega^{post}]^{-1} s(p^*), \tag{8}$$

where $\hat{mc}$ represents the marginal costs estimated under the multi-unit ownership.

To obtain the equilibrium prices under the post-scenario, I make two assumptions. First, the cost structures are the same under the pre- and the post-scenarios. As Nevo (2000) mentions in merger simulations, firms with other brands or more units would enjoy cost efficiency, thus lowering costs. However, in the analysis used in this paper, marginal costs are assumed to be the same under these scenarios. Later, this will be relaxed with different assumptions on marginal costs. Second, to obtain Ω^{pre} and Ω^{post}, I use the same demand estimates, even though firms may change their policies or product characteristics (both observed and unobserved ones) depending on their market positions. However, these decisions of changing product characteristics are rather long-run ones, while pricing decisions are short-run ones since hotels often change or update their prices daily. This paper assumes that these demand estimates are constant between the two scenarios.

4.3 Consumer Welfare

I use the compensating variation to capture the change in consumer welfare, which is calculated as follows:

$$CV_i = \frac{\ln[\sum_{j=0}^{J} \exp(V_{ij}^{post})] - \ln[\sum_{j=0}^{J} \exp(V_{ij}^{pre})]}{\alpha_i} \tag{9}$$

where $V_{ij} = \alpha_i p_j + X_j \beta_i + \xi_j$. When calculating V_{pre} and V_{post}, the price (p^{pre} and p^{post}) varies, while other components, including ξ_j, stay the same. The average CV at the market level is given by

$$CV_t = M_t \int CV_i dP_v(V) = M_t \cdot \frac{1}{ns} \sum_{i}^{ns} CV_i \tag{10}$$

where P_v is the distribution function of v. M_t is the market size at market t. Market size is the number of rooms sold in the market plus the number of consumers using outside goods. Since prices and market shares are daily based, to capture the annual level of consumer welfare, CV is converted to the annual level by multiplying by 365. The following results (changes in prices, CV at the market level, and others) are based on a sample of 116 markets with multi-unit owners.

5 Data and Estimation

5.1 Data

Data for this paper is derived from three sources. First, prices, quantities, capacities (the number of rooms), and chain affiliation are from the *Texas Hotel Performance Fact book* provided by Source Strategic, Inc, a Texas-based consulting firm. Second, taxpayer identification numbers, which are used to identify actual hotel owners, are collected from *Hotel Occupancy Tax* provided by the Texas Comptroller's Office. Third, amenities and services at the hotel levels are collected from from *TripAdvisor*.

The market definition used in this paper is narrow: Hotels located within a half-miles radius of interstate exits in Texas. If hotels in one exit are close to other exits, or if hotels are located in metropolitan areas, they are excluded. Thus, markets and sample hotels chosen by these criteria are remote and narrow, compared to geographic markets in metropolitan areas. Even though the sample might not be a perfect representation of all multi-unit owners in Texas, using this restricted definition of markets creates two major advantages. First, with this definition, this study minimizes the possibility of cross-market competition, the competition of hotels neighboring highway exits, or near hotels in the same city. Second, selecting these remote and isolated markets supports the assumption that franchisees have more control over their pricing policies than franchisors. Since these hotels are far from the national/regional headquarters of their franchisors or other hotels under the same brand, franchisors face high costs of controlling or monitoring. Thus, franchisors tend to make franchise contracts that do not require high levels of oversight of franchisee. In these markets, most branded hotels and motels are medium quality ones (budget or mid-scale hotels), and tend to have franchise contracts, rather than management contracts. Thus, it is reasonable to assume that franchisees have control over their pricing.

Since this paper uses quarterly data set from 2008 to 2014, a market is defined as an exit-quarter pair, yielding 5,186 hotels in 1,595 markets. In this sample, only 240 hotels can be identified as ones owned by multi-unit owners. These multi-unit owners exist in 116 of the identified markets.

To estimate demand parameters, the market share of the outside goods needs to be specified. The most common way of defining outside options is to use demographic information, such as the population of the market (Berry et al., 1995; Nevo, 2000). However, this approach may not be valid for this paper since most consumers staying at hotels are not residents. Instead, this paper uses unsold rooms in the markets to determine the share of consumers choosing the outside option. Table 1 reports descriptive statistics.[5]

Table 1: Descriptive Statistics of Key Variables

	Mean	SD	Min.	25%.	Median	75%	Max.
Price ($100s)	0.681	0.329	0.134	0.436	0.615	0.857	2.736
Market Shares	0.182	0.152	0.011	0.077	0.135	0.233	0.973
Distance to Exit	0.276	0.112	0.026	0.186	0.282	0.356	0.499
No. of Activities /10	0.267	0.117	0.100	0.200	0.300	0.400	0.500
No. of Room Types /10	0.384	0.141	0.100	0.300	0.400	0.500	0.700
No. of Service for Business /10	0.201	0.087	0.100	0.100	0.200	0.300	0.300
No. of Obs.	5186						
No. of Markets	1595						

[5]Details of variables are in the appendix.

5.2 Estimation

Following Berry et al. (1995), I estimate the demand parameters defined in Section 4. Similar to Nevo (2000), I include the fixed effects of highway exits and hotel chains which accounts for a portion of unobserved product characteristics associated with the markets and hotel chains. The error term (ξ_{jt}), captures the unobserved product specific deviation from the mean valuation of the unobserved product characteristics. This deviation is assumed to correlate with prices. To deal with this price endogeneity, this paper uses the nonlinear generalized method of moments (GMM) estimation. Given the initial guess of the unknown parameters, this error term is calculated and then is interacted with a set of the instruments to form the following the population moment condition of the GMM estimation:

$$E[\xi \cdot Z] = 0, \tag{11}$$

where Z is a set of instruments. In order to construct the sample moment conditions of the GMM objective function, the mean utility δ is needed. To obtain δ, the contraction mapping approach is used. This approach retrieves δ by equating the estimated market shares with the observed market shares given a value of parameters:

$$s_{jt}^{pred}(x, p_{jt}, \delta_{jt}, \theta_2) = s_{jt}^{obs}, \tag{12}$$

where s^{pred} and s^{obs} is the predicted and observed market shares, respectively. Unlike the logit and nested logit models, random coefficient models do not have a closed form solution for δ. Thus, this should be numerically solved, and δ is retrieved by the following the fixed point iterations:

$$\delta_{jt}^{k+1} = \delta_{jt}^{k} + \ln s_{jt}^{obs} - \ln s_{jt}^{pred}(x.p, \delta_{jt}^{k}; \theta_2) \tag{13}$$

where δ^k is δ at the kth iteration. Given the initial guess of δ and θ_2, the first iteration starts. In this paper, the criteria for stopping the iteration is $\delta^{k+1} - \delta^k < 10^{-8}$. Given the estimated δ, θ_1 are obtained from the instrumental variable regression.

Once the contraction mapping is completed, δ is estimated. Given this, ξ are obtained:

$$\xi_{jt} = \delta_{jt} - (\alpha p_{jt} + X_{jt}\beta).$$

Once ξ is obtained, θ_2 is estimated by using the following GMM objective function:

$$Q(\theta_2) = \xi(\theta)' Z W^{-1} Z' \xi(\theta), \tag{14}$$

where $W = 1/n \sum \xi(\theta_1)\xi(\theta_1)^{-1} Z'Z$ is the weighting matrix. This paper uses the continuously updating weighting matrix, which provides more efficient estimates (Hansen et al., 1996; Baum et al., 2007). The GMM convergence tolerance is 1^{-8}. Since the computation burden is high in the contraction mapping, to speed up the iteration, I use the squared polynomial extrapolation method (SQUAREM)(Reynaerts

et al., 2012). SQUAREM speeds up the fixed point iteration and produces more robust convergence results.

I use the optimal instrument approach to obtain efficient demand estimates, especially non-linear ones. Reynaert and Verboven (2014) shows using the optimal instrument approach adds additional moment conditions. Thus, with these additional conditions, the parameter estimates become less biased and more efficient. To do this, I, first, estimate demand parameters without optimal instruments. With these estimates, optimal instruments are formed as the expected Jacobian of the moment condition: $E(D_j(z_t)|z_t)\Phi^{-1}$ where Φ is an identity matrix since the only demand side is considered.[6] Second, I estimate the demand parameters with these obtained optimal instruments and the initial instruments.

Even though the optimal instrument approach is used, one must still find valid instruments to deal with price endogeneity. Valid instruments are correlated with price, but not correlated with unobserved product characteristics. BLP-type instruments (Berry et al., 1995), which are based on the similarity of products by comparing with other products in the market, are commonly used. Another option is Hausman-type instruments (Hausman, 1996), which capture common components of costs of the same brands across markets. However, these instruments would be inappropriate since a large number of markets have only one or two hotels. In addition, hotel prices are largely determined by local demand and local hotel attributes, rather than common costs under the same brand hotels. Thus, within a brand, variation in prices is high across markets. Instead, Berry and Jia (2010) use the characteristics of the market as instruments to measure competition when firms face capacity constraints and entry is not exogenous (see route level characteristics in airlines in Berry and Jia's paper). I tested the numbers of restaurants and gas stations in this paper, but this did not resolve the issue of price endogeneity. Instead, instruments capturing competition and costs are used. To measure competition, the distance to the closest rival within the same exit, and the sum of the rooms of the rivals are used. To measure costs, the number of rooms is used. In addition, interaction terms between the above variables are included when such interactions present any collinearity issues.[7]

6 Estimated Results

6.1 Preliminary Analysis: The effect of Multi-Unit Ownership on Prices

This section includes a descriptive analysis of single- vs. multi-unit owners and a reduced form analysis. The reduced form analysis is preliminary before the structural model approach and the following counterfactual analysis. This analysis targets only

[6] In general cases where demand and supply sides are jointly estimated, optimal instruments are defined as $E(D_j(z_t)\Phi^{-1}|z_t)$, where Φ is a covariance matrix of error terms(ξ, ω).

[7] The results of the first stage estimation, which is the regression of price on product characteristics (X) and the instruments, are reported in the appendix.

on examining the effects of the multi-unit ownership on market prices in markets.

Table 2: Multi-Unit Ownership (All Markets)

Ownership Type	Markets	Hotels
Single-unit (franchisee or independent owner)	1,479	4,946
Multi-unit (with a franchisor or franchisors)	116	240
Total	1,595	5,186

Tables 2 and 3 summarize the characteristics of markets with and without multi-unit ownership. Of 1,595 markets, 116 markets have multi-unit owners (240 hotels). Among the 116 markets, only 16 markets have multi-unit franchisees, the ones associated with a single franchisor, demonstrating that more multi-unit owners are associated with more than one hotel chain.

Table 3: Hotel Characteristics in Markets with Multi-Unit Ownership

		Single-Unit	Multi-Unit
Mean price ($)		81.68	84.62
Standard Deviation of prices		38.33	37.50
No. of Hotels			
Rating [8]	1	5	3
	2	104	69
	2.5	214	168
	3	32	0
Total		355	240

For the reduced form models, I use fixed effects models. To measure these effects, the following indicator variables are included as regressors: 1) multi-unit ownership, 2) multi-brand, and 3) multi-chain. First, the value of the dummy variable of multi-unit ownership(Multi-Owner) is one if a hotel is owned by multi-unit owners (hotels could have the same brand or different brands), regardless of its brand. Second, if a hotel faces competition from another hotel with the same brand, or under the same franchisors, not owned by the same owners, the value of this dummy variable (Multi-Brand) is equal to one. Otherwise it is zero. Third, if a hotel faces competition from hotels within the same hotel chain, the value of this dummy variable (Multi-Chain) is equal to one. Otherwise this is zero.

In addition to these variables, the models with the market concentration index (HHI), of the interaction term of HHI and the dummy variable of the multi-unit

[8]Hotel ratings collected from *TripAdvisor* are originally provided by *Expedia*, an online travel agency. See the following website for details of its rating system (https://www.expedia.com/Hotel-Star-Rating-Information).

ownership (HHI*Multi-Owner) are examined to determine how market concentration associated with multi-unit owners affects prices. To do this, the Herfindahl-Hirschman Index is calculated based on the assumption of multi-unit ownership in markets (i.e., both single- and multi-unit owners exist in the markets.)

In Table 4, column 1 indicates the effect of multi-unit ownership on price. The coefficient is significant and positive, indicating that multi-unit owners charge higher prices than single-unit owners. Consistent with this result, market concentration has positive effects on prices, even though it is not significant (column 4). The interaction term between HHI and Multi-Owner (column 5) is significant, indicating that multi-unit owners that are in concentrated markets have pronounced effects on prices. The presence of the same branded (column 2) and of the presence of hotels under the same hotel chain (column 3) have positive effects on prices, but these effects are not significant. This may indicate that in these markets, franchisors, or hotel chains have less impact on prices.

The results of the preliminary regression analysis may be not conclusive, because multi-unit ownership and multi-brand hotels are, for example, likely to be observed in markets with high demand, associated with higher prices. The ordinary least squared regression models with dummy variables for location may not capture the true effects of multi-unit ownership.

Table 4: Effect of Multi-Unit Ownership (Market Structure) on Prices

Dep.Var: Price($100)	(1)	(2)	(3)	(4)	(5)
Multi-Owner	0.091***				
Multi-Brand		0.020			
Multi-Chain			0.007		
HHI				0.403	0.398
Multi-Owner * HHI					0.278***
Distance to Exit	−0.034	−0.059	−0.062	−0.057	−0.049
No. of Activities	0.790***	0.767***	0.764***	0.766***	0.789***
No. of Room Types	0.231***	0.218***	0.216***	0.219***	0.224***
No. of Service Bus.	1.024***	1.053***	1.060***	1.054***	1.025***
Constant	0.031	0.040	0.041	−0.150	−0.150
Fixed Effects (Market)	Yes	Yes	Yes	Yes	Yes
Observations	5,186	5,186	5,186	5,186	5,186
Adjusted R^2	0.545	0.543	0.543	0.543	0.544

*p<0.1; **p<0.05; ***p<0.01

6.2 Demand Estimates

This section reports demand estimates under the random coefficient model discussed in Section 4 and important estimate obtained from these demand estimates, including price elasticities of demand, marginal costs, and markups.

Table 5 summarizes the results of demand estimation of the model with the optimal instruments. The first column reports the means of the demand parameters (α, β). The second column shows the standard deviations (σs) of the constant and the price variables.[9] These standard deviations capture heterogeneity of consumer preference.

All means of taste parameters (βs) are significant, except the one for the number of room types provided by hotels. All these coefficients have expected signs. Consumers, on average, prefer to stay close to highway exits. As hotels add more amenities and activities, such as bar, restaurant, and pool, consumer utility increases on average. As expected, consumers favor more room type options, while providing amenities targeted at business travelers at hotels— basic office equipment, meeting rooms and conference facilities— increase consumer utilities.

The mean price coefficient (α) is statically significant with a negative sign. The standard deviation of this coefficient (σ for α), which is significant, measures the consumer heterogeneity of their willingness to pay for hotel rooms. This helps to obtain more reasonable substitution patterns than those from a simple logit model. Even though the standard deviation of the constant is not significant, this accounts for the consumer heterogeneity of choosing outside options.

Table 5: Results of Demand Estimation

Variables	Means (α, β)	Standard Deviations (σ)
Price ($100s)	-10.517***	3.715***
	(1.989)	(0.921)
Distance to exit	-1.268***	
	(0.523)	
No. of activities/10	3.4***	
	(0.998)	
No. of room types/10	0.758	
	(0.48)	
No. of services for business/10	3.569***	
	(1.133)	
Constant	5.037***	2.918
	(1.755)	(2.8)
Fixed Effect	Location, Hotel Chain	
GMM objective value	1.24E-18	

* p<0.10, ** p<0.05, *** p<0.01.

To check the economic implications of the demand estimates, I calculate the following estimates: own price elasticities of demand, marginal costs, and markups.

[9]Different sets of random coefficients were tested, but the reported and final model are statistically significant and makes economics senses.

These are calculated under the pre-scenario, even though price elasticities are not affected by the ownership structure. Figure 1 shows the distribution of the own-price elasticities (The mean of the own-price elasticities is -4.289 and its standard deviation is 2.081). Even though there are some observations with inelastic price elasticities, these results are reasonable.[10]

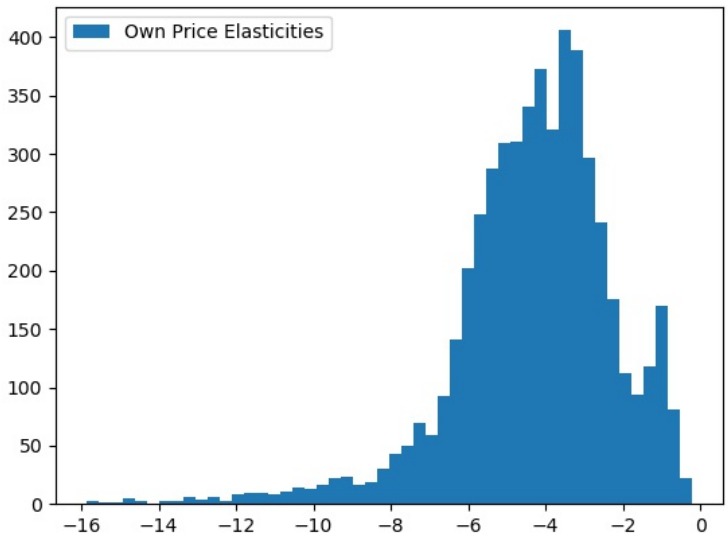


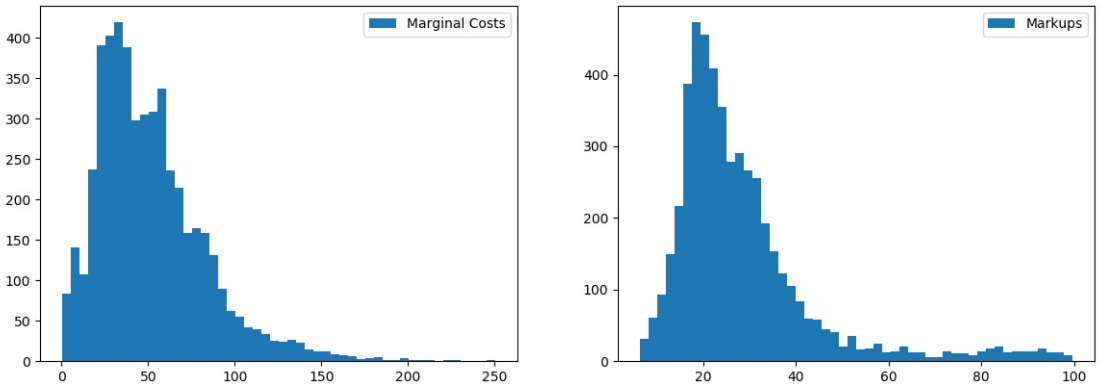
Figure 1: Distribution of Own Price Elasticities

Marginal costs and markups are recovered under the pre-scenario. Table 6 and Figure 2 show the descriptive statistics and the distribution of those two estimates. Even though some marginal costs are estimated to be too small or too big, most of them are within reasonable ranges, compared to price and markups. These confirm that the demand estimations are properly conducted.

Table 6: Descriptive Statistics of Marginal Costs and Markups ($)

	Mean	Std	Min.	25%	50%	75%	Max.
Marginal Costs ($)	51.439	31.445	0.122	28.768	45.781	67.031	250.674
Markups ($)	28.510	15.941	6.299	18.651	24.211	32.565	99.710

[10]This may result from the existence of markets that are highly concentrated markets, such as monopolies and oligopolies.



(a) Marginal Costs (b) Markups

Figure 2: Marginal Costs and Markups under the Pre-Scenario

6.3 Counterfactual Analysis

6.3.1 Changes in Prices, and Market Shares

The purpose of counterfactual analysis is to examine how multi-market owners exercise market power. To perform this analysis, I create two different scenarios related to changes in ownership structures: 1) pre-scenario, and 2) post-scenario. The pre-scenario reflects current markets (a mix of single- and multi-unit owners), whereas in the post-scenario, all firms are assumed to be single-unit owners. Under the post-scenario, I estimate equilibrium prices by using demand estimates and the assumption of ownership structure.

By comparing the estimated prices under the post-scenario with the observed prices, I empirically measure the market power of multi-unit owners. As mentioned earlier, I assume that marginal costs, which are recovered under the pre-scenario, are constant under the post-scenario, even though multi-unit owners are considered to be more efficient than single-unit owners. Later, this assumption is relaxed to check the robustness of the results of the counterfactual analysis.

Table 7 shows that prices, on average, decrease if all firms were single-unit owners (the post-scenario). The magnitude of the price decrease is higher for multi-unit owners, while that of the single-unit owners does not change significantly. This indicates that multi-unit owners charge higher price because of joint profit maximization, or their market power. Due to price reductions, multi-unit owners increase market shares in the counterfactual analysis.

6.3.2 Robust Checks of Price Changes Under Post-Scenario

So far, I assume that marginal costs are constant between pre- and post-scenarios. In this section, this assumption is relaxed since multi-unit owners are considered more efficient than single-unit owners. Some argue that the marginal costs that multi-unit owners face are smaller than those of the single-unit owners. Thus, depending

Table 7: Changes in Prices and Market Share in Counterfactual Analysis

Variable	Ownership (Pre-Scenario)	Pre[1]	Post [2]	$\frac{\text{Post}-\text{Pre}}{\text{Pre}}$
Price($)	All	82.9	79.5	-4.10%
	Multi	84.6	76.7	-9.34%
	Single	81.7	81.4	-0.37%
Share	All	0.125	0.134	7.20%
	Multi	0.165	0.208	26.06%
	Single	0.098	0.084	-14.29%

1: Both single and multi-unit owners.

2: Single-unit owners

ownership structures (single- vs. multi-unit owners), marginal costs would vary. To deal with the assumption on marginal costs related to the types of ownership, I adjust the marginal costs that obtained under the pre-scenario when conducting the counterfactual analysis. Figure 3 supports the following argument: marginal costs obtained under the condition as if the pre-scenario were the current status in the market are smaller those under the post-scenario, especially for multi-unit owners.

In order to incorporate this argument related to the marginal costs, I recalculate series of marginal costs of multi-unit owners. With the new marginal costs, I, then, estimate equilibrium prices under the post-scenario. The marginal costs obtained under the pre-scenario are used as a benchmark for single- and multi-unit owners. For the single-unit owners, marginal costs are constant under both the pre- and post-scenarios. However, marginal costs of the multi-unit owners under the post-scenario are higher than those obtained under the pre-scenario. I use a series of the percentage increases (5% to 10%) of marginal costs of the multi-unit owners (the benchmark costs of the multi-unit owners). Details of the setup of the counterfactual analysis are summarized in Table 8:

Table 8: Additional Counterfactual Analysis with Different MC

	Pre		Post		Estimate Price
Model	Single-Unit	Multi-Unit	Single-Unit	Multi-Unit	(p_c^*)
Baseline	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	p^*
Model 1	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$ * 1.05	p_1^*
Model 2	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$ * 1.06	p_2^*
Model 3	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$ * 1.07	p_3^*
Model 4	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$ * 1.08	p_4^*
Model 5	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$ * 1.09	p_5^*
Model 6	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$	$\hat{mc}$ * 1.1	p_6^*

With these newly adjusted marginal costs, corresponding equilibrium prices are obtained. The results of this additional counterfactual analysis are summarized in

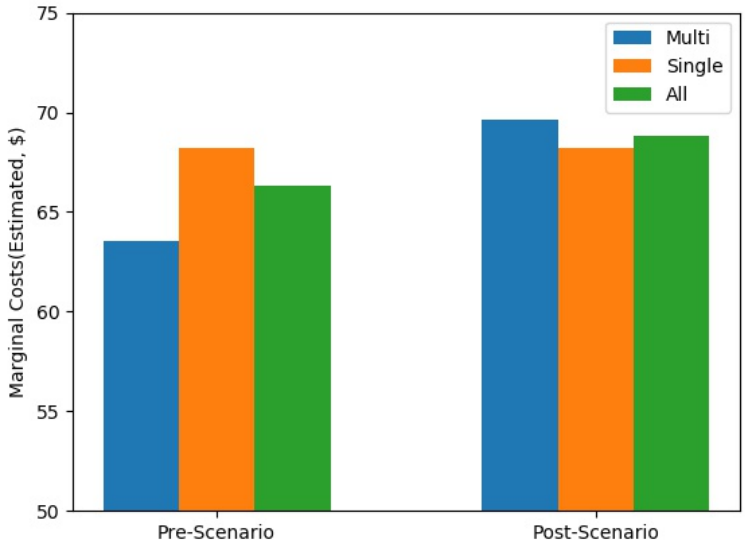


Figure 3: Recovered Marginal Costs under the Pre-and Post-Scenario

Table 6.3.2. As the marginal costs that are used in the counterfactual analysis increase, the estimated prices increase as well. However, the estimated prices (p_c^*) remain less than the observed prices (p), indicating that prices would decrease without the multi-unit owners in the markets, even after considering that converting multi-unit owners to single-unit ones may increase their marginal costs. Specifically, the estimated prices of the multi-unit owners with the highest marginal costs (p_6^*) are smaller than the observed prices (p). However, the estimated prices of the single unit owners do not change.

In sum, the estimated prices under the post-scenario are lower than the ones under the pre-scenario (observed prices). This result is consistent with various robustness checks with the series of assumptions on marginal costs.

Ownership	p	p^*	p_1^*	p_2^*	p_3^*	p_4^*	p_5^*	p_6^*
All ($)	82.865	79.487	80.775	81.04	81.307	81.577	81.848	82.123
(%)		-4.08%	-2.52%	-2.20%	-1.88%	-1.55%	-1.23%	-0.90%
Multi ($)	84.623	76.674	79.591	80.187	80.787	81.392	82.002	82.617
(%)		-9.39%	-5.95%	-5.24%	-4.53%	-3.82%	-3.10%	-2.37%
Single ($)	81.677	81.388	81.576	81.617	81.659	81.701	81.745	81.789
(%)		-0.35%	-0.12%	-0.07%	-0.02%	0.03%	0.08%	0.14%

p: the observed prices, p^*, p_c^*: estimated prices

%: Percentage changes (%) from the observed prices

6.3.3 Consumer Welfare

To measure changes in consumer welfare, I calculate the market-level compensating variation(CV). Table 9 show that all 116 markets have positive CV, indicating that consumer welfare would improve if multi-unit ownership would disappear from these markets. Total annual CV for all markets is $ 3,479,000, which is equivalent to 4.13% of total consumer annual spending (Table7). Thus, without multi-unit ownership, consumers would spend 4% less than what they actually do, holding their utility constant. This results from the decreased prices under the counterfactual scenario, increasing consumers' mean utilities higher, resulting in positive CV across markets.

Table 9: Market Compensating Variation ($100s)

Mean	Std.	Min.	25%	Median	75%	Max.
29.99	21.7	4.235	12.47	24.77	49.65	79.84

7 Conclusion

This paper investigates the effects of multi-unit ownership on prices, market shares, and consumer welfare by analyzing data on hotels near the interstate highway exits in Texas to answer the following question: Why do franchisees have multiple units that are associated with more than one franchisors? Using multiple data sources of prices, quantities, ownership, and hotel characteristics, I identify hotels owned by multi-unit owners in narrowly defined, geographical markets. Given the sample and the market definition, I conduct reduced-form model analysis and find evidence suggesting that multi-unit ownership and multi-unit franchising are associated with higher prices.

Motivated by the results of the reduced-form analysis, I estimate demand parameters by using a random coefficient logit model. With the estimated parameters, I conduct a counterfactual analysis to analyze how firms would have charged prices in the absence of multi-unit ownership. I measure the market power of multi-unit owners by comparing observed prices in the markets with estimated prices under the post scenario. The results support the hypothesis that multi-unit owners exercise market power. With the post scenario, prices, on average, decrease by 4.1 %, with the price decreases being larger for multi-unit owners (9.34%). This result is consistent with additional counterfactual analyses under the different assumption of marginal costs. The market shares of all owners increase by approximately 7.2%, on average, while most increases in market shares occur for the multi-unit owners (26.06%). Consumer welfare increases under the counterfactual scenario: consumers would pay, on average, 4.13% less than they do with the multi-unit ownership.

The findings of this paper provide a unique view on franchising, especially the role of franchisees. Franchisees have been considered as parts of a vertical relationship comprised of both vertical separation (i.e., two independent firms at each

vertical level) and vertical integration(i.e., an integrated firm controlling both vertical levels). In the examples of the current paper where franchisors may have both limited power and resources of control over franchisees, franchisees can act as vertically separated firms within the vertical relationship. Using these cases, this paper finds that some franchisees have multiple franchise contracts with more than one franchisors, charging higher prices. With multi-unit ownership, these owners can conduct joint-profit maximization when their units are in the same market. This evidence provides one explanation for why owners might want to operate multiple units in local markets.

Some limitations need to be considered when interpreting the results of this study. First, the narrow market definition in this paper might exclude some markets with multi-unit owners. Similar to markets near interstate highway exits, multi-unit owners may exist in cities, especially metropolitan areas. If these large markets were included, it is not certain whether I would be able to obtain relevant substitution patterns across firms in a market, which is crucial for counterfactual analysis. It is also impossible to exclude the cross-market competition across neighbor markets. Second, multi-unit owners might operate units in different markets in which the owners exercise market power through different mechanisms, such as multi-market contact. Even though this is beyond the scope of this paper, it would be interesting to analyze other operational/management decisions by multi-unit owners.

References

Baum, C. F., M. E. Schaffer, S. Stillman, et al. (2007). Enhanced routines for instrumental variables/gmm estimation and testing. *Stata Journal 7*(4), 465–506.

Berry, S. and P. Jia (2010). Tracing the woes: An empirical analysis of the airline industry. *American Economic Journal: Microeconomics 2*(3), 1–43.

Berry, S., J. Levinsohn, and A. Pakes (1995). Automobile prices in market equilibrium. *Econometrica: Journal of the Econometric Society*, 841–890.

Berry, S. T. (1994). Estimating discrete-choice models of product differentiation. *The RAND Journal of Economics*, 242–262.

Blair, R. D. and F. Lafontaine (2005). *The economics of franchising*. Cambridge University Press.

Brunner, D., F. Heiss, A. Romahn, C. Weiser, et al. (2017). Reliable estimation of random coefficient logit demand models. Technical report, University of Düsseldorf, Düsseldorf Institute for Competition Economics (DICE).

Chaudey, M. and M. Fadairo (2008). Contractual design as a determinant of performance: Evidence from franchising. *International Journal of the Economics of Business 15*(1), 117–127.

Dahlstrom, R. and A. Nygaard (1999). An empirical investigation of ex post transaction costs in franchised distribution channels. *Journal of marketing Research 36*(2), 160–170.

Davis, P. (2006a). Measuring the business stealing, cannibalization and market expansion effects of entry in the us motion picture exhibition market. *Journal of Industrial Economics 54*(3), 293–321.

Davis, P. (2006b). Spatial competition in retail markets: movie theaters. *The RAND Journal of Economics 37*(4), 964–982.

Hansen, L. P., J. Heaton, and A. Yaron (1996). Finite-sample properties of some alternative gmm estimators. *Journal of Business & Economic Statistics 14*(3), 262–280.

Hausman, J. A. (1996). Valuation of new goods under perfect and imperfect competition. In *The economics of new goods*, pp. 207–248. University of Chicago Press.

Kalnins, A. (2004a). Divisional multimarket contact within and between multiunit organizations. *Academy of Management Journal 47*(1), 117–128.

Kalnins, A. (2004b). An empirical analysis of territorial encroachment within franchised and company-owned branded chains. *Marketing Science 23*(4), 476–489.

Kalnins, A. (2006a, Aug). Markets: The u.s. lodging industry. *Journal of Economic Perspectives 20*(4), 203–218.

Kalnins, A. (2006b). Markets: The us lodging industry. *Journal of Economic Perspectives 20*(4), 203–218.

Kalnins, A. and F. Lafontaine (2004). Multi-unit ownership in franchising: evidence from the fast-food industry in texas. *RAND Journal of Economics*, 747–761.

Kalnins, A. and K. J. Mayer (2004). Franchising, ownership, and experience: A study of pizza restaurant survival. *Management Science 50*(12), 1716–1728.

Kidwell, R. E., A. Nygaard, and R. Silkoset (2007). Antecedents and effects of free riding in the franchisor–franchisee relationship. *Journal of Business Venturing 22*(4), 522–544.

Kosová, R., F. Lafontaine, and R. Perrigot (2013). Organizational form and performance: evidence from the hotel industry. *Review of Economics and Statistics 95*(4), 1303–1323.

Kosová, R., F. Lafontaine, and B. Zhao (2011). Scale, scope, ownership changes, and performance. *Available at SSRN 1931021*.

Lafontaine, F. (1992). Agency theory and franchising: some empirical results. *The rand journal of economics*, 263–283.

Mazzeo, M. J. (2002a). Competitive outcomes in product-differentiated oligopoly. *Review of Economics and Statistics 84*(4), 716–728.

Mazzeo, M. J. (2002b). Product choice and oligopoly market structure. *RAND Journal of Economics*, 221–242.

Mazzeo, M. J. (2004). Retail contracting and organizational form: Alternatives to chain affiliation in the motel industry. *Journal of Economics & Management Strategy 13*(4), 599–615.

McFadden, D. (1989). A method of simulated moments for estimation of discrete response models without numerical integration. *Econometrica: Journal of the Econometric Society*, 995–1026.

Nevo, A. (2000). Mergers with differentiated products: The case of the ready-to-eat cereal industry. *The RAND Journal of Economics*, 395–421.

Reynaert, M. and F. Verboven (2014). Improving the performance of random coefficients demand models: the role of optimal instruments. *Journal of Econometrics 179*(1), 83–98.

Reynaerts, J., R. Varadhan, J. C. Nash, et al. (2012). Enhancing the convergence properties of the blp (1995) contraction mapping. Technical report, KU Leuven, Faculty of Economics and Business, VIVES Research Centre for Regional Economics.

Thomadsen, R. (2005). The effect of ownership structure on prices in geographically differentiated industries. *RAND Journal of Economics*, 908–929.

Wilson, N. (2011). Branding, cannibalization, and spatial preemption: An application to the hotel industry. *Federal Trade Commission Bureau of Economics Working Paper* (309).

A Appendix

A.1 Multi-Unit Owners in Texas

Table 10: Multi-Unit Owners in Different Market Definitions

(Unit: Hotel)

Market Definition		Period	Total	MUO Hotels[0]	Avg. MUO Hotels
State[1]	All		18,050	2,494 (13.8%)	623.50
	MSA	4[5]	14,318	2,165 (15.1%)	541.25
	Non-MSA		3,732	245 (6.6%)	61.25
City[2]	All		18,050	1,391 (7.7%)	347.75
	MSA	4[5]	14,318	1,266 (8.8%)	316.50
	Non-MSA		3,732	125 (3.3%)	31.25
Highway[3]		28[6]	5,186	240 (4.6%)	8.57

0: Hotels owned by multi-unit owners
1: State as a single market
2: Cities as markets
3: The definition of market in this paper
4: 4 periods (2014Q1 to 2014Q4
5: 28 periods (2008Q1 to 2014Q4)

Table 11: Market Size by Market Types

Type	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
All	1,595	3.251	2.297	1	2	4	12
Single & Multi[1]	116	5.129	2.656	2	3	9	10
Single[2]	1,479	3.104	2.200	1	2	4	12

1: Markets with both single- and multi-unit owners
2: Markets with only single-unit owners

Table 12: Descriptive Statistics by Ownership Types in All Markets

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Price							
All	5,186	68.101	32.930	13.379	43.589	85.742	273.621
Multi[1]	240	84.623	37.503	22.800	60.006	98.645	223.530
Single[2]	4,946	67.300	32.483	13.379	43.017	85.227	273.621
Room							
All	5,186	62.594	26.910	9	46	74	200
Multi[1]	240	67.046	23.854	24	52	97	105
Single[2]	4,946	62.378	27.033	9	45	74	200
Rating							
All	5,186	2.125	0.536	1	2	2.5	3
Multi[1]	240	2.337	0.272	1	2.	2.5	2.5
Single[2]	4,946	2.115	0.544	1	2	2.5	3

1:Multi-Unit Owners, 2:Single-Unit Owners

Table 13: Descriptive Statistics of Owners in Markets with Multi-Unit Owners

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Price							
All	595	82.865	37.994	22.800	58.066	96.403	223.530
Multi[1]	240	84.623	37.503	22.800	60.006	98.645	223.530
Single[2]	355	81.677	38.330	26.518	55.420	94.766	210.890
Room							
All	595	73.613	35.609	24	52	96	200
Multi[1]	240	67.046	23.854	24	52	97	105
Single[2]	355	78.054	41.165	25	55	96	200
Rating							
All	595	2.361	0.312	1	2	2.5	3
Multi[1]	240	2.337	0.272	1	2.	2.5	2.5
Single[2]	355	2.377	0.336	1	2	2.5	3

1:Multi-Unit Owners, 2:Single-Unit Owners

A.2 Variable Definitions

- Prices of hotels ($p_j t$): Average Daily Room Rate ($100)
- Distance to Exit: Distance to the nearest highway exits (Miles)
- Shares of hotels: Rooms sold / total rooms available in the market
- No. of Activities: Restaurant, bar, lounge, pool, gym, spa, and kid-activities
- No. of Room Types: No. of Room types available in hotels
- No. of Services for Bus.: Meeting room, conference facility, business center, fax/office support.

A.3 Results of First Stage IV

Table 14: Results of First Stage IV

Dep. Var.: Price	Coef. (Std.Err.)
Exogeneous Var.	
Distance to Exit	-0.099^{***} (0.036)
No. of Activities	0.361^{***} (0.044)
No. of Room Types	0.090^{***} (0.034)
No. of Services Bus	0.367^{***} (0.061)
Instruments	
Distance to Rival	-0.031^{*} (0.018)
No. of Rooms	-0.110^{***} (0.016)
Sum of Rivals' Rooms	0.056^{***} (0.005)
No. of Rooms * Distance to Rival	0.002 (0.028)
Sum of Rivals' Rooms * Distance to Rival	0.010^{*} (0.005)
Fixed Effect:	Location, Chain
Observations	5,186
Adjusted R^2	0.641
F Statistic	129.654^{***}

*p<0.1; **p<0.05; ***p<0.01