The Case for Franchise Encroachment

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As franchisors add same brand outlets to a geographical market, the resulting "encroachment" from multiple locations creates conflict via revenue cannibalization. We empirically explore the possibility that encroachment could, in fact, have the opposite effect by increasing revenues as more same brand units are added. In particular, we propose that same brand units create a spillover effect that can heighten joint revenues from multiple units. Using detailed proprietary data from the hotel industry and other publicly available data, we identify the circumstances under which such revenue growth will be greater than cannibalization. We model the possible brand spillover effects from encroachment into a structural demand model, and estimate it along with the supply side. Confirming the model-free evidence, we find a statistically and economically significant customer preference for hotels that have more same brand establishments in the vicinity. We also find that encroachment benefits franchisees in markets with low same brand concentration, but is detrimental in markets where the brand is highly concentrated. A counterfactual analysis examines the impact of encroachment reduction and the impact of legislation that bans encroachment practices outright. Implications for management, public policy, and franchise strategy are discussed.

Key words: franchise management; encroachment; brand spillover; franchise sales and systems; cannibalization

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1 Introduction

One of the most explosive issues in franchise management for decades is encroachment, or network expansion conflict. This occurs when a franchisor opens new same brand units in the vicinity of existing franchisees, cannibalizing the incumbent franchisee's sales. While widely controversial, encroachment received limited empirical attention in marketing until Kalnins (2004) documented its revenue consequences in the Texas hotel industry.

States have considered legislation as a means by which to stem encroachment. In 1992, Iowa enacted the Iowa Franchise Act, banning encroachment as a means to protect franchisees. However, as e-commerce expands, franchisees are even more prone to "virtual encroachment" through the Web, mobile commerce, and other electronic forms, such as kiosks. Since most franchises are multibrand organizations, encroachment can occur not just from same brand entry, but from a different brand entry in the franchisor's brand portfolio. Encroachment thus represents a complex management challenge that is likely becoming increasingly complicated.

The stakes from better understanding this explosive issue are enormous. Franchise organizations are widely viewed as a means by which to achieve rapid market coverage without the high cost of ownership, and are pervasive in various industries, such as quick service and sit-down restaurants and food services, automotive, real estate, clothing, hospitality, and even education. Franchising as a route to market strategy is also critical to our economic future, accounting for roughly 10% of new jobs in the United States,[1] representing 4.7% of GDP (i.e., $493 billion in 2014),[2] and growing. Franchising also represents an important means of economic growth, creating more jobs at a quicker pace and producing higher sales growth than other businesses. For 2015, the International Franchise Association has predicted that the output of franchise establishments in nominal dollars will increase 5.4% from $844 billion to $889 billion.[3]

Despite its importance, research on franchising paints an unequivocal picture of encroachment as a loss to franchisees or an opportunistic act on the part of the franchisor. Encroachment has historically been viewed as the "dark side" or "underbelly" of the franchising world. Could the addition of a same brand franchise ever have a positive effect for the franchisee? We explore

[1] http://www.entrepreneur.com/article/230288

[2] http://www.entrepreneurssource.com/blog/industry-news/franchise-industry-expected-grow-faster-rest-economy-2014/

[3] http://emarket.franchise.org/FranchiseBizOutlook2015.pdf

this possibility and identify the conditions under which this might be the case. In particular, we consider the possibility that encroachment can create a brand spillover effect, as opposed to a cannibalization effect, that in essence, raises revenues for the encroached franchisees. We further identify the boundary conditions under which these spillover effects can improve the franchisee's revenue position, thus illuminating a range of encroachment that, in fact, can be beneficial.

Specifically, we pose the following research questions:

1. Is there evidence of brand spillover effects via an increase in multiple establishments of the same brand? If so, what is the economic impact?
2. After accounting for brand spillover effects, what are the conditions under which encroachment further benefits franchisees?
3. What would be the impact of legislation such as the outright banning of encroachment on franchisee and franchisor performance?

While past empirical research has considered encroachment at its aggregate or market level effects, we consider its effects on individual customers. We focus on *same brand encroachment* that involves franchisees which "sell essentially the same goods or services under the same trademark, service mark, trade name, logotype, or other commercial symbol as an existing franchisee" (State of Iowa). We develop a structural model that illustrates a spillover effect on customer choice due to the brand overlap, and we quantify this economic impact, which is estimated to be \$58,500 (\$15,000) or 9.69% (8.41%) of the average hotel franchisee monthly revenue (profit) in the focal market. This model also accounts for the unique competitive and market specific effects of each location.

We then consider the market implications and revenue outcomes from a range of possible approaches to better manage encroachment. For example, we examine (1) the economic impact of less encroachment by removing one encroaching hotel from a market, (2) the removal of a hotel in markets where the concentration of encroached hotel brand is high versus low, and (3) the impact of a legal policy, such as the Iowa Franchise Act, in which encroachment is banned outright. This is achieved via a novel data set of the monthly price and demand data of one of the largest hotel groups in the world over a six year period. We find an overall reduction in franchisee revenue by 6.37% as a result of additional encroachment. In other words, encroachment hurts franchisee revenues. However, for franchisees whose brand is not highly concentrated in their market, more

encroachment leads to slightly higher revenues due to small intrabrand competition effects compared to increased brand spillover effects. Taken together, this research suggests the need to update our view of brand encroachment as a universally dysfunctional phenomenon for franchisees, and allow for the possibility that revenues can be enhanced through the addition of multiple units via a brand spillover effect. This has significant implications for the management of franchise systems, franchisor-franchisee relationships, and the franchising literature at large.

In the sections to follow, we develop the arguments for the brand spillover effect of increased same brand units in Section 2. We also review the relevant literature on encroachment in the franchising arena. In Section 3, we describe the proprietary data, including the customer, property, and market level attributes that enable us to examine the effect of customer heterogeneity on demand, and a wide range of geographical markets across various metropolitan statistical areas, as well as the brand type, market shares, and average room prices charged. In addition, we provide the model-free evidence of the brand spillover effect in demand: prices increase as the number of same brand units increases. In Section 4, a customer utility model along with the supply side incorporates these spillovers and heterogeneous customer preferences; the model also accounts for price endogeneity and brand and hotel differences in a region's portfolio offering. Estimation is described in Section 5, and the results are presented in Section 6. In Section 7, we present the series of counterfactuals to evaluate the implications of various encroachment scenarios, and we conclude with a discussion and implications for management in Section 8.

2 Relevant Literature

2.1 Encroachment

Geographic encroachment has its genesis in real estate law, having been initially defined as an illegal invasion or intrusion of a landowner's building or other structure on someone else's property. This negative connotation has been transferred to the franchising arena, where it has come to refer to any interference by the franchisor with a franchisee's perceived market rights. In contrast to its real estate law roots, the franchisor's behavior is not per se illegal, though it is often viewed as opportunistic; i.e., market development and expansion intended to adversely impact the franchisee.

Encroachment is sufficiently evidenced by the cost, or cannibalization of demand, that an in-

cumbent franchisee incurs as a result of the franchisor opening a same brand outlet within the franchisee's immediate market area (Kalnins 2004). Why does encroachment occur? The primary reason is an incentive conflict. Franchisors receive a sales royalty from franchisees, while the latter receives a profit royalty (Kaufmann and Rangan 1990). Although franchisors can also extract fixed fees from franchisees, these typically represent only 8% of the total payments from franchisees (Lafontaine and Shaw 1999), which is not sufficient to extract all rents (Kaufmann and Lafontaine 1994; Michael and Moore 1995; Villas-Boas 1998).

The franchisor's solution is to grow the market to the point of saturation; as long as new units grow system revenues at a rate that is greater than the revenue losses at existing locations, the franchisor has an incentive to encroach. This problem is particularly acute in mature systems, where the franchisor may face fewer new domestic markets to exploit.

Industrial organizational theorists have long contended that the prices and revenues of an incumbent firm will decrease as new firms enter that market. This is easily extended to the case of franchise brands, where the entry of a same brand franchise unit can lead to greater revenue losses of the incumbent franchisee, as customers view the units as close substitutes.

Cannibalization also leads to increased price competition among the same brand incumbents, which cuts directly into their profits. Empirical evidence of this effect is available among branded hotels (Conlin 2003) and fast food chains (Kalnins 2003, Thomadsen 2005, Pancras et al. 2012). In 2004, Kalnins provided the first systematic evidence that encroachment does indeed lead to franchisee sales cannibalization, and concluded that it was the result of the nature of governance in place between the franchisor and the franchisee.

As encroachment became a major concern, franchisee trade associations have emerged to establish codes of conduct, set and manage expectations, and monitor compliance between franchisors and franchisees. The Network Expansion Conflict Handbook was developed by the International Franchise Association's Franchise Relations Committee to assist in this regard. In 1992, Iowa passed the most stringent anti-encroachment law in the United States, the Iowa Franchise Act, which prohibited franchisors from encroaching an incumbent franchisee's business market. All told, there have been extensive lobbying efforts to convince policy makers that franchisees should be legally protected from encroachment, which is widely viewed as anticompetitive (Coughlan et al 2000, Dutta et al 1999, Blair and LaFontaine 2002).

2.2 Brand Spillover

Regardless of the misalignment in goals, the fact remains that it is in the best interests of both the franchisor and the franchisee for market profits and revenues to be maximized, and this may require a critical mass of units (Blair and Lafontaine 2010). Bassuk (2000) suggests that "encroachment is the disease of the rich and successful," while "lack of clusters and adequate marketing penetration is the disease of the masses." Although the primary focus of the literature has been the cannibalization effect, disputes about franchisors developing "too few" outlets can also arise in some territories. In other words, a critical number of same brand locations can improve the revenues of all locations, if their joint effect is of value. As an example, brand awareness might be increased with the presence of multiple locations, or purchase convenience is improved. If customer value is increased, we should observe higher prices among encroached hotels.

This suggests that there may exist a spillover, or interdependence between the revenues of an existing brand outlet and the addition of a proximate same brand outlet. This is analogous to the finding of spillover effects in other empirical work such as when competitors simultaneously advertise and their sales increase (Anderson and Simester 2013). Compelling evidence of a spillover effect comes from Chiou and Tucker (2012), who consider whether the use of trademark brand names on third party seller's ads online help or harm the trademark brand. For example, when a consumer searches for a "DoubleTree" hotel in a city, using a search engine website, she is presented with a number of paid ad links to the direct channel (DoubleTree.com) and third party resellers such as Hotels.com. They found that additional exposure of "DoubleTree" trademarks in search results by third party sellers generates an overall net increase in consumer clicks, suggesting a brand spillover effect in the hotel industry. Spillovers are often thought to be the results of perception transfers that occur from a brand entering the market or from consumer learning that takes place over time through consumption experience and marketing communications exposure (Janakairaman, Sismeiro, and Dutta 2009).

Anecdotally, companies such as Starbucks believe that the resulting spillover benefits can outweigh the risk of cannibalization. CEO Howard Schultz has readily conceded that "we self-cannibalize at least a third of our stores every day."[4] In other words, the company believes that a location's sales

[4] http://www.washingtonpost.com/archive/business/2002/08/25/pouring-it-on/b62fa46f-f67b-443c-b6e5-9a7b9b759581/).

loss can be more than offset by the gain in total sales resulting from the concentration of locations. This suggests that there may be valuable spillover that results from a cluster of locations.

Spillover versus agglomeration. Economists have long argued that firms can gain from a phenomenon referred to as agglomeration (Marshall 1920), but this should not be confused with a spillover effect. Conceptually, agglomeration gains stem from (1) supply side efficiency in production (such as improved bargaining power with suppliers, greater information flows, faster adoption of new technology, etc.) and (2) heightened demand resulting in consumer search cost reduction (i.e., the ability to inspect and visit locations). Benefits accrue when the agglomerated neighbors are differentiated, such as by size or desired traits, and possess inter-linked demand (Barnett and Carroll 1987, Baum and Haveman 1997, Chung and Kalnins 2001). A key distinction between agglomeration and a spillover effect is that information search costs plays a central role in agglomeration; the geographical proximity of firms increases the consumer's knowledge that the firms exist, but also increases the likelihood that customers will visit and inspect the properties and their goods or low prices (Dudey 1990, Stahl 1982).

Brand spillover is also differentiated from agglomeration in that the focus is not on the aggregate number of different brands within a category type, such as Burger King, McDonalds, and Taco Bell, in a given market area, but on the increasing number of *same brand* businesses. For instance, an agglomeration mechanism would predict that as the total number of units of all fast food outlets increases in a market, customer preference for fast food in the aggregate should increase. Empirically, we observe the opposite, which suggests that an agglomeration effect could not explain our results. A brand spillover explanation might instead suggest that revenues can in fact increase in the number of same brand businesses, whether it be that franchise locations serve as giant billboards and make the brand more salient to customers, or other similar effects that might stem from increased brand visibility at the point of sale (whether it be online or physically). In Section 3, controlling for the total number of hotels, we observe a positive relationship between price and the number of same brand hotels, supporting a brand spillover effect. Brands might also be important when a customer's destination is relatively inelastic, as in business travel. If a business meeting is to be held at the O'Hare airport in Chicago, having multiple Marriott brand locations allows the franchise to use the hotels as billboards in lieu of advertising. This was Starbucks' approach in its strategy to purposefully cluster their locations.[4] This approach also increases the likelihood that a suitable

location will be found when needed.

Spillovers may not equally affect all customers. Frequent travelers such as management consultants often revisit the same geographic location for an extended period of time while working on a corporate project at a remote site or dealing with the same distant customers on a regular basis. In contrast, vacationers rarely visit the same location again in short time windows. If hotels serve as giant billboards by making the brand more salient, we would expect frequent travelers to be responsive to more hotels of a brand, as it increases visibility and awareness of the brand. In Section 6 this point is supported by the significantly positive relationship between the number of hotels of the same brand and the proportion of frequent travelers.

Same brand concentration. While the number of same brands in a market area may have a positive effect on demand, we expect this effect to vary across markets with varying locations of the same brand. As an example, consider two markets with the same size: if one market has five Marriott hotels and another area has one Marriott hotel and four other hotels, we would expect that an incumbent Marriott hotel would be worse off from additional brand encroachment in the market with five locations. This is because as the concentration of same brand hotels increases, cannibalization due to intrabrand competition would dominate over a brand spillover gain. Put differently, in markets with low same brand concentration ratios, we would expect that a brand spillover effect dominates. In this vein, more encroachment could leave franchisees better off. Our counterfactual result in Section 7 demonstrates such a role of brand concentration on franchisee revenues in situations of encroachment.

3 Data

We obtained a unique set of hotel sales data from one of the major hotel franchise networks in the United States, in which almost all hotels are run by independent franchisees who set their own prices and pay a royalty fee to the franchisor. Data include monthly revenue and demand of its franchise hotels operated between January 2006 and March 2012 (75 months), information on hotel characteristics (brand and capacity), and tract identifiers. A tract is a geographic market defined by Metropolitan Statistical Area (MSA) designation and market type, such as airport, interstate, resort, suburban, etc. In the San Francisco-Oakland-Fremont MSA, for example, the Oakland

airport and San Francisco downtown area are defined as two separate tracts. The monthly average per room price is deduced from dividing the revenue by the demand (nights x rooms) in each month. The data, however, lacks information on the exact location of individual hotels.[5]

The data record the percentage of frequent travelers (i.e., hotel loyalty program members) among guests in each hotel, which allows us to compare their demand response to that of infrequent travelers. The market potential is defined as the maximum sum of an individual hotel demand and its competitors' total demand in a particular tract. This definition of the market potential causes a problem for tracts that are much larger than the actual competitive market. A hotel in a very large suburban MSA, for instance, may consider only a few hotels around it as competitors, as opposed to all hotels in the MSA. To address this concern, our analysis focuses on small, well-defined tracts[6] , including airport, resort, and urban. We also focus on sizable markets, with more than one hotel of this chain, where encroachment is of interest. This leaves us with 447 unique hotels in 128 geographic markets (tracts) across 34 states over 75 months, creating over 27,000 hotel month observations.[7]

We also collect data to supplement the proprietary data. The annual U.S. population and the total number of local businesses at MSA level are collected from U.S. Census and U.S. Small Business Administration, respectively. In addition, we gather data that are relevant to the marginal cost in the hotel industry, and use them in the supply side estimation. We collect publicly available data on the median hourly wages of occupations in the hotel industry (hotel/motel desk clerks and hotel maids) from the U.S. Bureau of Labor Statistics. The agency collects data annually at the MSA level.[8]

[5]Some studies in the franchising literature (Kalnins 2004, Pancras et al. 2012) have finer location data and use radius distance among hotels to study franchise encroachment.

[6]The defined market potentials in airport, resort and downtown locations are greater than the sum of hotel franchise network's combined demand in the market, whereas the opposite holds in many of larger markets. This validates our assumption that market potentials are well-defined in smaller geographic markets.

[7]There are some small tracts have just one hotel of this chain in more than 6 years of data period. We assume that these tracts are not representative samples of markets that are prone to franchise encroachment and exclude them from the analysis.

[8]http://www.bls.gov/oes/tables.htm

3.1 Descriptive Statistics

The hotel franchise network owns a mix of multiple economy and luxury hotel brands. Hotels in this franchise network have 7.92% (standard deviation of 4.71%) market share with the average price of $107.87 (standard deviation of $38.91) per room per night. The large standard deviation is driven by the fact that there are multiple brands in the franchise mix. The high-end brand has a 9.25% market share with the average price of $194.64, whereas the lowest-end brand has a 7% market share with $74.25 per room per night on average.

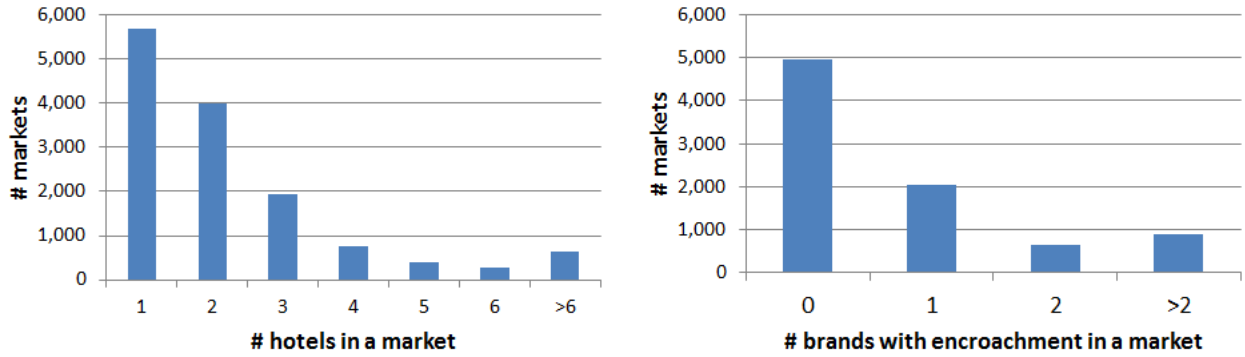
Table 1 shows market-level summary statistics. A market in our analysis is defined as geographic location (tract) by month. We analyze 9,235 markets with the average of 2.97 hotels of this franchise network per market. All of the franchise brands have at least one market with multiple encroached hotels. The brand with the greatest encroachment has a presence of 0.99 average hotels per market, suggesting that almost all markets have this hotel brand.

Table 1: Markets and hotels

Total # markets	Mean # hotels/mkt	Std. dev. # hotels/mkt	Min. # hotels/mkt	Max. # hotels/mkt
9,235	2.97	2.08	1	18

To study the effect of encroachment, we need markets with varying degrees of brand encroachment in the data. Figure 1 describes the distribution of hotels of this franchise network across markets. The first graph shows that approximately 60% of markets have multiple hotels of the focal hotel chain, a necessary condition for encroachment to occur. The second graph shows that approximately 38% of the markets with multiple hotels have at least one encroached hotel brand. Some markets even have two encroached brands or more. Such variation is essential to study franchise encroachment and brand spillover.

Figure 1: Markets with encroachment



3.2 Model-Free Evidence of Brand Spillover

In Section 2, we argue that having multiple hotel establishments of the same brand increases the visibility of the brand, and hence, increases customer preference for the hotel. If this were true, customers would have higher willingness to pay when there are more same brand hotels in a market. Thus, the hotel price should be higher as spillover increases. For cannibalization effects, however, the prediction on price is the opposite. More same brand encroachment implies higher competition among close substitutes, which should result in a lower price. Therefore, the equilibrium hotel price is the net result of brand spillover and a cannibalization effect. A positive relationship between price and the number of encroaching hotels would suggest that a brand spillover effect is greater than a cannibalization or competition effect. In this section, we show model-free evidence of dominant brand spillover effect, and illustrate the need to account for it in studying encroachment

In the first column of Table 2, a simple ordinary least squares regression of price (log of the average per-room, per-night hotel price) on the number of same brand encroaching hotels[9] results in a positive and statistically significant relationship (0.051, $p < 0.01$), suggesting the existence of substantial brand spillover dominating a cannibalization effect. The same relationship holds in Model (2) (0.009, $p < 0.05$), where we add controls for market-specific (the total number of hotels of the focal chain, population, the number of local businesses) and hotel-specific factors (hotel age and individual hotel dummies), as well as seasonality (month dummies). It is noteworthy that price is lower (-0.01, $p < 0.01$) in markets with a higher total number of hotels (i.e., more competition or cannibalization), as expected. Controlling for overall market competition along

[9]For example, with 3 Hilton hotels in a market, there are 2 brand encroaching hotels for each Hilton hotel.

with other factors, this model again shows that the hotel prices are higher when there are more same brand hotels in the vicinity. Results also suggest that the number of local businesses is a significant predictor of price, whereas population is not statistically significant. This is in line with what we learned from interviews with hotel industry executives; unlike fast food chains, the local population is not an important business predictor, since for many hotels, their main customers are not local residents. Instead, they call local businesses (e.g., amusement park, museums, bars, colleges, corporate headquarters, etc.) "demand generators" that attract people from outside to visit and stay at hotels.

We also test the relationship between price and squares of the number of encroaching hotels in Model (3) and again find increasing price in brand encroachment.[10] Recall that a prominent explanation of the benefit of having multiple hotels of the same brand is operational efficiency that lowers marginal cost. Moreno and Terwiesch (2013) find that automobile companies with more products that can share parts and processes can achieve greater economies of scale in unit production cost, hence the lower price. In hotel encroachment, this would mean multiple franchisees with the same brand buying hotel amenities (e.g., shampoo, soaps, towels, coffee, etc.) as a group to achieve economies of scale. We would expect a lower price with more brand encroachment; however, our data suggest otherwise. These results support our proposal that brand spillover effects can substantially outweigh the cannibalization effects (and possibly operational efficiency) resulting from increased encroachment. We now consider a customer utility model that incorporates this spillover effect.

[10] Additional model specifications are tested and reported in the Appendix.

Table 2: Evidence of Brand Spillover

Model	(1)	(2)	(3)
# same brand hotels	0.051***	0.009**	
	0.002	0.004	
(# same brand hotels)^2			0.002***
			0.001
Total # hotels		-0.01***	-0.01***
		0.001	0.001
Population (M)		0.016	0.013
		0.01	0.01
# local businesses (000)		0.013***	0.013***
		0.001	0.001
Hotel age (years)		-0.03***	-0.03***
		0.003	0.003
Constant	4.600***	4.162***	4.165***
	0.002	0.057	0.057
Time dummies	N	Y	Y
Indiv. hotel dummies	N	Y	Y
R-squared	0.03	0.805	0.805
N	27,412	27,412	27,412

The dependent variable is log(price). Standard errors are reported below estimates.
* p $<$ 0.1; ** p $<$ 0.05; *** p $<$ 0.01

4 Model

To study franchise encroachment, we need a demand model that accounts for brand spillover effect, competition among differentiated hotels, customer heterogeneity, and price endogeneity. Berry et al. (1995) model an individual customer choosing a product with the highest indirect utility out of a discrete set of available options in a given market, which is a natural framework of static competition among hotel franchisees with customer heterogeneity and endogenous price. The following sections detail how we modify the model to incorporate a brand spillover effect.

4.1 The Demand Side

We model brand spillover using a random coefficient demand model that incorporates firm competition and customer heterogeneity. Consider market m, in which H differentiated franchise hotels compete. As mentioned earlier, a market in our analysis is defined as a geographic location (tract)

by month. The H hotels are franchisees of the focal hotel franchise network. In each market, customer i either decides to stay at one of the H hotels[11] or chooses the outside option.[12] Customer i gets the following utility if she stays at hotel h. Otherwise the customer gets the normalized mean zero utility (i.e., the outside option):

$$u_{ihm} = X_{hm}\beta_i + \xi_{hm} + \epsilon_{ihm}$$

The number of same brand hotels in a market proxies brand spillover through encroachment, and is included in X_{hm}. X_{hm} also includes market-specific factors (the total number of hotels of the focal chain, population, the number of local businesses), hotel-specific factors (price, number of same brand hotels, hotel age, and individual hotel dummies), and seasonality (month dummies). The common demand shock, ξ_{hm}, is observed by customers but not by the researcher. ϵ_{ihm} is an idiosyncratic random term, and is assumed to be independently and identically distributed Type I extreme value.[13]

The data also include information on the percentage of frequent travelers at each hotel in each period and allow us to examine customer heterogeneity in response to product characteristics. For price, we specify the coefficient with an expected negative sign and incorporate unobserved customer attributes into lognormal distribution:

$$\beta_i^p = -exp(\beta^p + A_i\beta^o + v_i^p\beta^u)$$

where β^p is the price sensitivity parameter that is common across customers. A_i denotes a vector of customer i's observed attributes, and β^o represents a matrix of taste coefficients that vary with observed attributes. β^u is a scaling matrix for unobserved customer attributes on price v_i^p, assumed to be distributed standard normal.

[11] At daily level, it is possible that some of the hotels are sold out due to capacity constraint and leave the choice set. However, our monthly data only report the maximum occupancy rate of 87.6% (mean of 66.6%) as it smooths out daily occupancy levels. Therefore, we do not consider capacity constraint problem in this study.

[12] The outside option for hotel guests can range from staying at a competing hotel chain, staying at a hotel alternative (e.g., Airbnb), staying with family or friends to not traveling at all.

[13] Trials of other functional forms of the number of same brand hotels, such as a quadratic function, produce similar and statistically significant results.

For other product characteristics, we focus on the covariance between taste for product characteristics and customer attributes (Petrin 2002). We define customer i's taste for a non-price product characteristic X^{NP} as follows:

$$\beta_i^{NP} = \beta^{NP} A_i^m v_i^m$$

This allows customers of different observed characteristics in market m, A_i^m, to value X^{NP} differently. v_i^m is an idiosyncratic taste of customer i in market m. This parametrization allows covariance between hotel brands and observed customer attributes; if customers with higher A_i^m have higher preference for X^{NP}, the model estimates a positive β^{NP}. The idiosyncratic customer preference v_i^m are assumed to be independent $\chi^2(3)$ distributions truncated at 95 percent.[14]

By grouping demand parameters into $\theta = (\theta_1, \theta_2)$, where θ_1 are macro parameters that are common across customers, and θ_2 are micro parameters that are individual taste dependent (e.g., β_i^p and β_i^{NP}'s), the customer utility is rewritten as follows:

$$u_{ihm} = \delta_{hm}(X_{hm}, \xi_{hm}; \theta_1) + \mu_{ihm}(X_{hm}, A_i, v_i; \theta_2) + \epsilon_{ihm}, \tag{1}$$

$$\delta_{hm} = X_{hm}\theta_1 + \xi_{hm}, \quad \mu_{ihm} = X_{hm}\theta_2$$

The term δ_{hm} is the mean utility that is common across individuals, and μ_{ihm} accounts for customer heterogeneity in preference toward different product characteristics. The predicted market share is then calculated by integrating the probability of each customer staying at hotel h in market m over all customers:

$$s_{hm}(\mu_{\cdot m}, \delta_{\cdot m}; \theta_2) = \int \frac{exp(\delta_{hm} + \mu_{ihm})}{\Sigma_{h'} exp(\delta_{h'm} + \mu_{ih'm})} dP(v) dP(A) \tag{2}$$

[14] As Petrin 2002 notes, these distributions are bounded above and below and suggest positive skewness in the population. We tested with alternative specifications such as $\chi^2(1)$ and obtained similar results.

4.2 The Supply Side

For the focal hotel chain, each hotel franchisee sets its own hotel rate without any restrictions from the franchisor.[15] Hence we assume that hotel h decides on the room price to maximize the following profit function:

$$\max_{p_h} \left[p_h - mc_h\right] M_h s_h(X;\, \theta)$$

where p_h, mc_h, $s_h(\cdot)$, and M_h are price, marginal cost, predicted market share, and the total market potential of hotel h, respectively. Note that market share s_h depends on other hotels' optimal prices $p_k\,(k \neq h)$, which is part of X. The J first-order conditions with respect to price competition is then given by

$$s_h(X;\, \theta) + \sum_{h'} \left[p_{h'} - mc_{h'}\right] \frac{\partial s_{h'}(X;\, \theta)}{\partial p_h} = 0 \;\; \forall h = 1, ..., \, H \tag{3}$$

Marginal cost mc_h is not observed in the data but estimated by inverting the first-order conditions to the following equation:

$$mc = p - \Delta(X;\, \theta)^{-1} s(X;\, \theta) \tag{4}$$

where mc, p, $s(\cdot)$ are the vectors of marginal cost, price, and predicted market shares, respectively. $\Delta(X;\, \theta)$ is a matrix of own- and cross-price share derivatives $\frac{\partial s_{h'}(\cdot)}{\partial p_h}$. We use the supply side model of Berry et al. (1995) by adding observable margin cost components W_h at hotel h:

$$mc_h = W_h \gamma + \omega_h \tag{5}$$

where γ is the vector of marginal cost parameters, and ω_h is the unobserved component. W_h includes the median hourly wages of motel/hotel desk clerks and hotel maids, age of hotel, squared terms of them, and individual hotel dummies. Note that franchisees pay a portion of revenue to the

[15] A small percentage of franchisees employ management companies for daily operations including pricing. We assume that the management companies serve in the best interest of the franchisees.

franchisor as a royalty fee, which is not observed in the data.[16] Since royalty fees are individual hotel specific, but are time consistent in a typical 15-20 year franchise contract, we include individual hotel dummies to absorb them as part of marginal cost.

5 Estimation

The estimation strategy is based on the Generalized Method of Moments (GMM) estimation combined with micro moments (Berry et al. 1995, 2004, Petrin 2002).

5.1 Berry et al. (1995) Moments

The first set of moments matches the predicted market shares, $s_j(\cdot)$, to the observed market shares in the data, s_j^N:

$$G_1(\delta) \equiv s_j(\delta(\theta), \theta) - s_j^N = 0 \tag{6}$$

where θ is the set of parameters to be estimated. Berry (1994) shows that there is a unique value of δ that matches these two market shares through a contraction mapping as in Berry et al. (1995).

Additional moment conditions are constructed by assuming that demand shock ξ is uncorrelated with Z, a set of instrumental variables including exogenous variables:

$$G_2(\theta) \equiv E[\xi_j(\theta) \mid Z_j] = 0 \tag{7}$$

Note that price is potentially correlated with the demand shock ξ; this can create an endogeneity problem and result in an unrealistically small price coefficient in magnitude (Villas-Boas and Winer 1999). The demand shock is not observed by the researcher, but the franchisee observes it and takes it into account when it makes pricing decisions, which can bias the estimate. To deal with this endogeneity issue, we use Berry et al. (1995) instruments, which are the sum of other hotel

[16] The best information we can find is HVS Global Hospitality Services between 2077 and 2013 that publish the average royalty rate information of different hotel brands on a biannual basis, which are not granular enough to be used in this analysis.

characteristics in the market, $\sum_{k \neq h} x_{kmt}$, where x_{kmt} includes hotel size (i.e., number of hotel rooms), hotel age, and the constant term. The number of rooms in each hotel is determined by the combination of the availability of land for commercial use and the local government's zoning restriction on the land use (e.g., the total number of floors due to height restriction or the shape of the building), that are deemed to be exogenous with respect to the demand shock ξ.[17] The exclusion restriction assumption for hotel age and constant term is that the presence and history of competing hotels are long-term decisions made before the short-run pricing decision that involves ξ_j. Other instrumental variables include cost information, such as the median hourly wages of hotel/motel desk clerks and hotel maids that are assumed to be uncorrelated with ξ_j. The full test results of different instrumental variables are included in the Appendix.

Another endogeneity concern involves the brand spillover variable defined by the number of same brand hotels in a market. Part of ξ may contain unobserved heterogeneity that affects the number of hotels of the encroached brand in a given market. One way to deal with this is to include geographic location dummies. However, this may not be sufficient to control for unobserved heterogeneity. For instance, a hotel within walking distance to a popular tourist attraction (e.g., Disney World) would draw higher customer preference over a hotel that is far from it, despite competing in the same geographic market. This is supported by an alternative specification of model-free evidence in Table 3. The first column includes only location dummies, and we observe a non-significant relationship between the total number of hotels in a market and hotel price, which is not realistic. However, once individual hotel fixed effects are included (second column), the relationship becomes negative at 1% significance, thereby implying more reasonable firm competition. The R-squared also jumps by more than 25 percent point, suggesting that individual hotel dummies have strong explanatory power in hotel competition. We therefore include 446 individual hotel dummies as part of product characteristics to exploit the panel structure of our data.

While individual hotel dummies control for endogeneity from time-consistent demand heterogeneity, there is still a concern about time-changing heterogeneity. If such unobserved heterogeneity exists at the individual hotel level, it may induce different hotel entry patterns, which ultimately affect the number of same brand hotels (Manuszak and Moul 2008, Pancras et al. 2012). We address

[17] An article explains that the hotel industry constantly deals with fickle zoning restrictions in New York City: http://observer.com/2013/02/rise-of-the-sliver-hotel-why-blah-buildings-are-blighting-midtown/

this issue by exploiting institutional knowledge of the industry. While the hotel entry decision is endogenous at large time intervals (e.g., hotel entry planned in the second half of 2015), interviews with hotel executives reveal that the exact timing of hotel entry is difficult to predict, due to the nature of the commercial real estate development process. The exact timing of opening a hotel varies between 3 and 6 months, depending on many unpredictable external forces, such as financing commercial real estate mortgages, passing inspections, and obtaining permits from local government. Therefore, we assume that the variation in the number of same hotel brands is exogenous within a 6-month window. We then tested a model that includes half-year fixed effects, individual hotel fixed effects, and the interaction terms between the two, and we found that the interactions are not statistically significant. This suggests that the time-changing unobserved heterogeneity at the individual hotel level may not be a significant source of endogeneity given our market- and hotel-specific controls, though we cannot completely rule it out.[18]

Table 3: Endogeneity on Brand Spillover

Model	Location dummies	Indiv. hotel dummies
# same brand hotels	-0.045***	0.009**
	0.002	0.004
Total # hotels	-0.003*	-0.01***
	0.002	0.001
Population (M)	-0.048	0.016
	0.014	0.01
# local businesses (000)	0.014***	0.013***
	0.001	0.001
Hotel age (years)	-0.001***	-0.03***
	< 0.001	0.003
Constant	4.094***	4.162***
	0.027	0.057
Time dummies	Y	Y
Location dummies	Y	N
Indiv. hotel dummies	N	Y
R-squared	0.544	0.805
N	27412	27412

The dependent variable is log(price). Standard errors are reported below estimates.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

[18] A model with quarter fixed-effects also shows non-significant interaction terms.

5.2 The Micro Moments

By matching the predicted average of observable customer attributes of a customer A_i, given that the customer chooses a particular hotel to the observed average, we can pin down the effects of customer heterogeneity micro parameters on hotel characteristics. We match the predicted covariance between product characteristics S_j and observed customer attributes A to the observed covariance (Petrin 2002, Berry et al. 2004):

$$\begin{aligned} G_3(\theta) &= x_k \left\{ \frac{1}{n_b} \sum_{i_b=1}^{n_b} A_{i_b} - E(A \,|\, y_i = 1,\, \beta) \right\} \\ &\approx x_k \left\{ \frac{1}{n_b} \sum_{i_b=1}^{n_b} A_{i_b} - \frac{\frac{1}{N_s} \sum_r A_r P(y_i = 1 \,|\, A_r,\, v_r,\, \theta_2,\, \delta(\theta_2))}{s^N} \right\} = 0 \end{aligned} \tag{8}$$

where n_b is the total number of customers who bought the product, and i_b is the index for customer i who bought.[19] Product characteristics other than dummy variables are used in these moments.

Studies in the retail industry have used publicly available census or community survey data at the firm location to obtain customer's demographic distribution data for income, education, ethnicity, etc. In the hotel industry, by contrast, the customer demographics often do not match with those of the local population, as many hotel guests travel from other parts of the country or the world. Fortunately, our data record the percentage of frequent travelers at every hotel in each month, from which we take simulation draws of A_i. We denote these micro moments as $G_3(\theta)$.

5.3 The Supply Moments

From Equation 5, estimates γ are obtained by assuming the following orthogonality condition:

$$G_4(\gamma) \equiv E[\omega_j(\gamma) \,|\, Z_j^C] = 0 \tag{9}$$

where Z_j^C is a set of instrumental variables, which is equivalent to W_j .

[19] The derivation of the second equation follows Bayes' rule. More details are found in Berry et al. (2004)

5.4 The Objective Function

Denoting the sample analog of stacked moment conditions $(\, G_2(\theta)\, G_3(\theta)\, G_4(\gamma)\,)'$ as $\hat{m}(\psi)$ where $\psi = (\theta, \gamma)$, the optimal estimators are obtained through a two-step GMM approach (Hansen 1982) with the following expression:

$$\hat{\psi} = \underset{\psi \in \Psi}{arg\,min}\ \hat{m}(\psi)'\, \hat{W}(\psi)\, \hat{m}(\psi) \tag{10}$$

where $\hat{W}$ is a consistent estimator of weighting matrix.[20] Given a new set of ψ that the outer loop of optimization routine finds by minimizing the above objection function, δ that satisfies market share moment condition G_1 in Equation (6) is found via contraction mapping as Berry et al. (1995, 2004) outline.[21] These combined moments allow us to estimate demand-side parameters and franchisee's supply-side parameters.

6 Results

6.1 Parameter Estimates

Table 4 presents demand parameter estimates on observed hotel and market characteristics. The first parameter represents a customer's response to the number of same brand hotels in the market, a proxy for brand spillover. Confirming the model-free evidence in Section 2, the parameter estimate is positive and statistically significant. This suggests that customers have a higher preference for encroached hotels where spillover might be higher. Customers also have a higher preference toward older hotels. This may be counterintuitive if the focal product is a durable good, such as laptops and cars. For hotels, the building age may be correlated with better location or superior service through management learning and experience.

The next two parameters suggest that the number of local businesses is a significant predictor of demand, whereas population is not statistically significant, consistent with the model-free evidence in Table 2 and interviews with hotel executives; the local population is not an important consideration because hotels' main customers are not local residents. Instead, local businesses (e.g.,

[20] For details on the expression of the weighting matrix, see pg. 862 of Berry et al. (1995).
[21] Standard errors of the estimates are calculated by finding the analytical derivatives of $\hat{m}(\psi)$.

amusement park, museums, bars, colleges, corporate headquarters, etc.) are "demand generators" that attract people from outside to visit and stay at hotels. Parameter estimates for time dummies and individual hotel dummies are summarized in the Appendix.

Table 4: Demand macro parameter estimates

	Coef.	Std. err.	Sig.
Brand Spillover	0.080	0.022	***
Age (month)	0.320	0.029	***
Population (00M)	-0.860	5.090	
Number of businesses (M)	74.037	3.972	***
Constant	-6.245	0.235	***

Note: Time dummies and individual hotel dummies are included in the estimation.
*** p $<$ 0.01; ** p $<$ 0.05; * p $<$ 0.10

The left table in Table 5 shows the estimates of price parameters along with customer heterogeneity parameters. These are the mean and the standard deviation of the log of the coefficient. For instance, the mean of the actual coefficient for frequent travelers is $\mu = -exp(c + \frac{s^2}{2}) = -exp(1.113 - 0.05 + \frac{0.203^2}{2}) = -2.955$. A negative estimate on the frequent travelers implies that they are less price sensitive, although this is not statistically significant.[22] The unobserved parameter estimate suggests that unobserved customer heterogeneity is statistically significant.

Other random coefficients are also presented in Table 5. First, frequent travelers prefer this hotel chain compared to outside options, based on the estimate of the constant term. The parameter on brand spillover suggests that frequent travelers have a higher preference for hotels with high brand encroachment in a market. This supports our explanation about brand spillover in Section 2.2; frequent travelers, who are more likely to revisit a city in short time windows, are more responsive to the number of same hotels as it increases visibility and spillover. Perhaps too, more same brand locations help to ensure that customer needs are always met. Finally, a negative estimate on hotel age shows that frequent travelers prefer newer hotels, compared to infrequent travelers.

[22]Since frequent travelers tend to be business customers whose companies pay for their hotel accommodation, some may argue that they should be less price sensitive. In contrast, many of them are transient business travelers receive corporate volume discount and are seen as more price sensitive.

Table 5: Customer heterogeneity

Price	Coefficient	Std. Error	Sig.
β^p	1.113	0.093	***
Freq. traveler	-0.050	0.094	
Unobserved	0.203	0.012	***

Others	Coefficient	Std. Error	Sig.
Constant	0.042	0.007	***
Brand Aware	0.026	0.002	***
Hotel age	-0.038	0.001	***

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

Table 6 summarizes parameter estimates from the supply side and shows that higher median wages of occupations related to the hotel industry contribute to higher marginal costs. The table also shows a negative estimate on hotel age, implying a lower cost with more management experience. Note that individual hotel dummies not only affect customer utility, but also change the marginal cost of a hotel as hotel-specific and time consistent factors. The summary statistics of the individual hotel dummies are found in the Appendix.

Table 6: Supply side parameter estimates

Variable	Coefficient	Std. Error	Sig.
Median wage of hotel/motel desk clerk	0.981	0.233	***
Median wage of hotel maids	0.685	0.235	***
Hotel age	-0.183	0.010	***
hotel/motel desk clerk^2	-0.494	0.119	***
Hotel maids^2	-0.088	0.124	
Hotel age^2	0.006	0.002	***
Constant	-0.074	0.090	

Note: Individual hotel dummies are included.

*** p < 0.01; ** p < 0.05; * p < 0.10

6.2 Economic Value of Brand Spillover

The parameter estimate on brand spillover in Table 4 shows statistical significance. We estimate the economic value of this effect by comparing the observed data to a counterfactual result that "switches off" brand spillover (i.e. setting the parameter to zero); the difference between these results points to the incremental value that is created by spillover. Importantly, in the counterfactual, hotel franchisees that lose brand spillover are expected to reoptimize the price they can charge. Our supply side model allows us to predict the new optimal price according to first-order conditions in Equation 3. The economic significance of brand spillover is summarized in Table 7:

Table 7: Economic Value of Brand Spillover

Variable	No Brand Spillover	Data	% change
Avg. price ($)	116.96	118.16	1.03
Avg. market share (%)	6.60	6.76	2.44
Avg. franchisee revenue ($000)	598.86	656.90	9.69
Avg. franchisee profit ($000)	180.18	195.33	8.41
Total royalties ($M)	908.22	941.09	3.62
# markets with brand encroachment	3,024	3,024	
# hotels with brand encroachment	14,294	14,294	

Note: Franchisee revenue and profit are monthly figures while royalties are summed up across the data period.

The analysis shows that brand spillover contributes to 1.6 percentage points of the 6.76% average market share and accounts for approximately $58,000 ($15,000) or 9.69% (8.41%) of the average hotel franchisee monthly revenue (profit) in the focal market. Also, 3.6% of the $941 million gross royalty income is estimated to result from brand spillover effect.[23] These figures suggest that brand spillover is not only statistically significant, but also economically relevant.

7 Policy Simulation

Having accounted for a brand spillover effect, we now investigate the net impact of encroachment under various conditions. The first counterfactual (7.1) considers the overall economic impact of encroachment by removing a single encroaching hotel in each market and comparing it to data. This could represent one possible strategic response of the franchisor to address encroachment conflict. The second counterfactual (7.2) further considers whether the impact of encroachment differs across markets with varying brand concentration. For example, does removing a single encroached hotel heighten or decrease the impact of a brand spillover effect relative to a cannibalization effect if the market already has a high or low concentration of the brand? And finally, the third counterfactual (7.3) considers the impact of a legislation intervention, in which encroachment is banned outright.

[23]The royalty rate is assumed at 10.61% of the gross franchisee revenue, which is the average of the focal hotel chain in HVS studies without much variation across brands.

7.1 Overall Impact of Encroachment

We assess the economic impact of removing one encroaching hotel in a market; importantly, we allow the remaining franchisees to reoptimize their prices through Equation 3 in the supply model. We then compare the counterfactual market outcome of less encroachment to the current data to quantify the encroachment effect.[24]

The process of hotel removal. There are many ways to remove a hotel when there exists more than one encroached brand in a market area. Imagine, for example, a market with three A hotels and two B hotels. We can remove an A hotel, a B hotel, the oldest hotel, the newest hotel, etc. However, rather than relying on an ad-hoc rule, we randomize the process of hotel removal in the following manner:

1. For each market with encroachment, an encroaching brand hotel is randomly removed.
2. The remaining hotels reoptimize their prices, according to the first-order conditions in Equation 3.
3. Market outcomes, including price, demand, franchisee's profit, and franchisor's profit, are then recalculated.

Table 8 compares the results of this counterfactual against observed data. The first column shows the result of the counterfactual with one less encroachment in each market. The next column reports the observed market outcomes that have one more encroachment compared to the counterfactual. With more encroachment, the average price slightly decreases. The average franchisee market share, revenue, and profit also decrease by 6-7%, as they suffer from more cannibalization. These results suggest that, on average, cannibalization looms larger than brand spillover effect for franchisees. By contrast, the royalty fees collected by the franchisor are estimated to be higher (12%) when there is more encroachment. There are two ways that encroachment helps the franchisor. First, there are more hotels that pay royalties to begin with. In addition, encroachment draws enough demand from the outside option (e.g., other hotels chains, Airbnb, no travel, etc.) to overcome the cannibalization effect among franchisees of the focal chain.

[24] Although the focal hotel chain commands close to 30% market share with multiple hotel brands, we do not have data on other hotel chains or independent hotels. Therefore, all results here are under an assumption that the hotels outside the focal chain do not respond to the policy changes.

Table 8: Market outcomes comparison

	Less encroachment (Counterfactual)	More encroachment (Data)	% change
Avg. price ($)	118.67	118.16	-0.43
Avg. market share (%)	7.24	6.76	-6.57
Avg. franchisee revenue ($000)	701.57	656.90	-6.37
Avg. franchisee profit ($000)	210.72	195.33	-7.30
Franchisor royalty income ($M)	838.90	941.09	12.18

Note: Franchisee revenue and profit are monthly figures while royalties are summed up across the data period. 14,294 hotels months in 3,024 markets are affected by the counterfactual. Royalty income is summed up at market level, while other figures are calculated using the remaining hotels in the counterfactual (11, 270 hotel months).

Overall, more brand encroachment leads to a substantial decrease in the average revenue for the remaining franchisees, which is consistent with their opposition to encroachment in general. Now we examine whether this effect differs by brands. Suppose there are two A hotels and two B hotels. If one of the A hotels is randomly removed in the counterfactual, we refer to the remaining A hotel as the *same brand hotel* and B hotels as *different brand hotels*. The results in Table 9 show that the encroachment effect differs for these two types of franchisees: the revenue of same brand franchisees modestly decreases (-2.49%), while that of different brand franchisees declines substantially more (-7.69%) when there is more encroachment. Although both types of franchisees experience the cannibalization effect, only same brand franchisees gain from the additional brand spillover effect with more encroachment, which mitigates some of the cannibalization effect.[25]

Table 9: Average franchisee monthly revenue by brands

	Less encroachment (Counterfactual)	More encroachment (Data)	% change
Same Brand ($000)	523.57	510.51	-2.49
Different Brand ($000)	793.89	732.83	-7.69

7.2 Encroachment and Brand Concentration

The effect of encroachment also depends on market brand configuration. Suppose there are two markets with respect to A hotels:

[25]The revenues of same brand franchisees are generally lower because brand encroachment is more prevalent among economy hotels than luxury hotels.

- Low brand concentration market: two A hotels, one B hotel, one C hotel, and one D hotel. The brand concentration ratio for A hotels is 40%.
- High brand concentration market: three A hotels, one B hotel, one C hotel. The brand concentration ratio for A hotels is 60%.

For A hotels, competition against other brands is more important in the low brand concentration market, whereas competition against the same brand is more salient in the high brand concentration market. Now consider removing one A hotel and reducing the brand spillover effect for the remaining A hotels in both cases. It is then preferred by the remaining A hotel franchisees in the high brand concentration market than in the low brand concentration market, because the intrabrand competition is higher in high brand concentration markets. We investigate this relationship between encroachment and brand concentration by dividing the relevant markets into low ($\leq 50\%$) and high ($> 50\%$) brand concentration ratio markets, with regards to the removed hotel brand.[26]

Table 10 shows that more encroachment in markets with low brand concentration slightly benefits same brand franchisees (a 0.57% increase in revenue). These are the markets where a gain in the brand spillover dominates a cannibalization effect. In contrast, different brand franchisee revenues decrease by 7.66%, as more encroachment increases competition. Similar patterns are observed in high brand concentration markets; same (different) brand franchisees experience a 4.39% (8.3%) revenue decrease due to cannibalization. Overall, encroachment benefits franchisees whose brand is not highly concentrated in the market, and hurts them otherwise.

[26]There are 3,024 markets that are affected by the counterfactual. Suppose there are three A hotels and two B hotels in a market. If the random hotel brand removal process outlined earlier removes an A hotel, then this market is considered a high concentration market as A hotels account for the majority of the hotels in the market. Had the random process removed a B hotel, on the other hand, this market would have been considered a low brand concentration market as B hotels consisted of less than 50% of the hotels. Note that the total number of hotels in our data is the total number of hotels of the focal chain.

Table 10: Encroachment and brand concentration ratio

Markets with Low Brand Concentration Ratio ($\leq 50\%$)

	Less encroachment (Counterfactual)	More encroachment (Data)	% change
Same brand ($000) < **Case LS** >	586.17	589.54	0.57
Different brand ($000) < **Case LD** >	797.64	736.57	-7.66

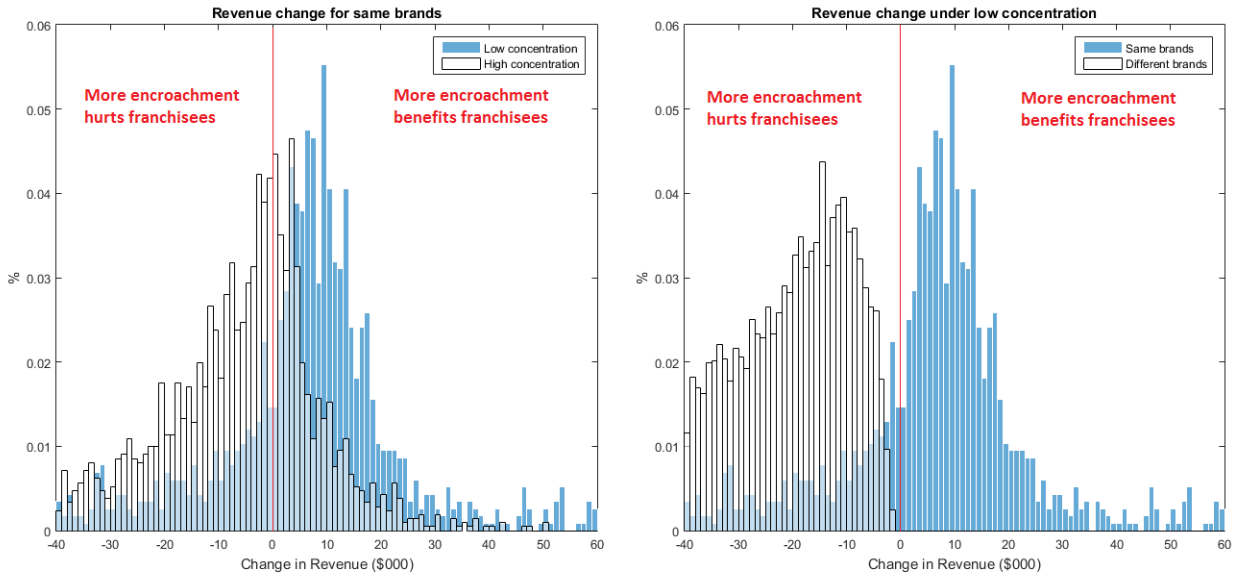
Markets with High Brand Concentration Ratio ($> 50\%$)

	Less encroachment (Counterfactual)	More encroachment (Data)	% change
Same brand ($000) < **Case HS** >	491.19	469.65	-4.39
Different brand ($000) < **Case HD** >	735.03	674.02	-8.30

We can further inform the impact of encroachment by examining individual hotel performances. Figure 2 illustrates the distributions of individual franchisee month revenue changes (= revenue under more encroachment - revenue under less encroachment); a positive (negative) change in revenue implies that more encroachment benefits (hurts) franchisees. The first graph compares the revenue change of the same brand franchisees as the removed hotel under varying brand concentration (Case LS vs. Case HS in Table 10). Under low brand concentration, more encroachment benefits 71.7% of franchisees as a brand spillover effect dominates a cannibalization effect. Under high brand concentration, the distribution shifts to the left, leaving only 30.8% of franchisees benefiting from encroachment, as cannibalization effect prevails among brands that are already highly concentrated. Similar patterns are observed when we compare profit instead of revenue.

The second graph compares franchisee revenues by brand in low concentration markets (Case LS and LD in Table 10). As we already saw in the first graph, encroachment benefits the majority of same brand franchisees. By contrast, an increase in encroachment only hurts different brand franchisees as competition increases without any upside in brand spillover. The distributions in Figure 2 collectively suggest that encroachment is beneficial for the majority of individual franchisees with the same brand when the brand concentration is low. However, encroachment hurts most franchisees under other circumstances.

Figure 2: Distribution of individual franchisee revenue change



7.3 Legal Policy Simulation

In 1992, Iowa passed the most stringent anti-encroachment law in the United States, the Iowa Franchise Act, which effectively prevented franchisors from encroaching an incumbent franchisee's business with the same brand. Here, we consider the impact that banning encroachment, in a law similar to the Iowa Franchise Act, might have had if enacted across the entire U.S. during the data period. In the data period, 60 hotel entries involve brand encroachment. Let's now consider the possibility that these hotels are not legally permitted to enter the market. The general direction of the results is similar to those in Section 7.1, in that the average hotel price increases only marginally because of the loss of brand spillover, and the average market share jumps by 8.23%. Although individual franchisees would benefit substantially (an 11 % increase in profit and revenue), franchisor's royalty income would decrease by 11% as a result of fewer hotels owing royalties. Thus, the simulation results suggest that if the Iowa Act was adopted throughout the US, then franchisees would have gained substantially, while franchisors would not.

Table 11: Market outcomes comparison

	Data	Anti-encroachment law in effect	% change
Avg. price ($)	118.43	118.97	0.46
Avg. market share (%)	6.69	7.24	8.23
Avg. franchisee revenue ($000)	704.74	783.63	11.20
Avg. franchisee profit ($000)	201.74	225.14	11.60
Franchisor royalty income ($M)	579.72	514.33	-11.28

Note: 8,360 hotels months in 1,403 markets are affected by the counterfactual.

8 Conclusions and Implications for Management

Franchise network growth in a given geographic market will inevitably result in more franchisees with the same brand being located closer to one another. The resulting encroachment can create conflict, particularly if the addition of franchisees cannibalize the incumbent's revenues. Prior to our research, it was always assumed that this would be the outcome of encroachment. However, our research provides an important insight into the circumstances under which this might not be the case. We argue that brand encroachment is not universally dysfunctional if the addition of multiple units increases brand spillover to a larger extent than revenue cannibalization. Our results, whether model free or with a more complete structural model, converge on the same general conclusion that encroachment can be both positive and negative if the franchisees share the same brand. We propose that this might be due to the creation of an economic brand spillover effect that arises between incumbent franchisees and the encroaching hotel. We incorporate the brand spillover into a structural demand model and estimate it along with supply side factors. Confirming the model-free evidence, we find a significant and positive customer preference for hotels with more establishments of the same brand in the vicinity. Our findings underscore several key results. The first is that brand spillover is economically relevant as it accounts for $58,000 ($15,000) or 9.69% (8.41%) of the average hotel franchisee monthly revenue (profit). Other demand and supply parameter estimates, along with customer heterogeneity parameters, are generally in line with our understanding of the company and the industry. Having established that a significant spillover effect is possible, and that the impact is economically significant, we then draw on policy simulations to assess the possible strategic options that franchisors and legislators face to better manage the cannibalizing effects of encroachment. The first is that, while removing an encroaching hotel does improve the franchisee's

economic outcomes, it does so at the expense of the franchisor's position. Put differently, while encroachment can have a positive spillover effect under some market conditions for franchisees, encroachment always creates gains for the franchisor. Thus, any attempts to reduce encroachment will always leave the franchisor worse off. However, this does not mean that the franchisor cannot be smarter about when and where reducing encroachment could be valuable for reducing franchisee conflict or improving relationships via a credible commitment to the exchange or a good faith gesture.

This is the role of the second counterfactual, which further informs the results of removing a single encroaching hotel. The results suggest that when the extant brand concentration in a given market is low, additional encroachment not only helps increase same brand franchisee revenue, but also helps a greater proportion of same brand franchisees than in markets where brand concentration is high. Specifically, same brand franchisees experience a 0.57% revenue increase in low brand concentration markets versus a 4.39% decrease in high brand concentration markets. This implies that encroachment reduction is more effective in markets where there already exists a high concentration of same brand hotels. Put differently, as described in the opening of this paper, encroachment can in fact be beneficial to franchisees, although we find that this effect is limited to markets with low same brand concentration levels. This result also has implications for research on market entry: entering markets where same brand outlets or service providers are in place may in fact create a positive spillover effect, such that the joint economic impact is greater than either outlet would have achieved alone.

Last, we consider what the legislative impact of banning encroachment across the United States might have been via a counterfactual in which an impact similar to the Iowa Franchise Act occurred across the U.S. during the data period. Results show that although individual franchisees would benefit substantially (an 11 % increase in profit and revenue), the franchisor's royalty income would decrease by 11% as a result of fewer hotels owing royalties. Insights such as this are useful in informing the differential impact of allowing individual states versus the Federal government control of policies on franchise management.

In sum, this research makes several key contributions. First, managers need to rework their understanding of encroachment to recognize that it is not universally negative. It is possible for the effects of encroachment to be positive, and we empirically explore where and when cessation occurs.

The effect of encroachment on brands depends on the market brand configuration. We find that encroachment benefits franchisees whose hotel brand is not highly concentrated in the market, but hurts them otherwise. When the brand concentration is low in a market, brand spillover is more important than demand cannibalization within the brand or intrabrand competition. A loss of brand spillover can therefore loom larger than a reduction in competition in these markets, and this possibility needs to be incorporated into our understanding and practice of franchise management.

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Appendix

Instrumental variables

The following table shows the need for instrumental variables on price and tests various combinations of instrumental variables. The first column lists the parameter estimates of a multinomial logit model (e.g., turn off all micro parameters in the main model) and shows that the price coefficient is significantly positive due to endogenous price. These results suggest an unrealistic result that customers in the hotel industry are hardly price sensitive. To deal with this endogeneity issue, we instrument price using product characteristics of other hotels (constant, number of rooms, age) and median wages (hotel/model desk clerks and hotel maids) in the market. As a result, the price coefficient becomes statistically negative (-0.005 ~ 0.003 in Models IV1 - IV3) that provides more realistic substitution patterns. The first-stage F-statistics for both instrumental variables are large and suggest that the instrumental variables have substantial explanatory power. The last model includes individual hotel dummies to control for unobserved heterogeneity with respect to the number of same brand hotels and results in a significantly positive positive parameter estimate on brand spillover as well as a more negative and realistic price coefficient.

Table 12: Instrumental variables

Model	Logit	IV1	IV2	IV3	IV3 + indiv. hotel dummies
Price ($)	0.001***	-0.005***	-0.003***	-0.005***	-0.032***
	0.000	0.000	0.001	0.000	0.003
# same brand hotels	-0.117***	-0.099***	-0.105***	-0.099***	0.055***
	0.004	0.004	0.004	0.004	0.015
Population (M)	0.020***	-0.024***	-0.009	-0.025***	0.058
	0.006	0.007	0.008	0.007	0.048
# local businesses (000)	-0.001***	0.001***	0.001*	0.001***	0.079***
	0.000	0.000	0.000	0.000	0.007
Hotel age (years)	0.002***	0.002***	0.002***	0.002***	0.003***
	0.000	0.000	0.000	0.000	0.000
Constant	-2.825***	-2.314***	-2.486***	-2.310***	-6.386***
	0.016	0.031	0.054	0.030	0.263
Time dummies	Y	Y	Y	Y	Y
Indiv. hotel dummies	N	N	N	N	Y
Price IVs used	-	Product characteristics of other hotels (constant, number of rooms, age)	Median wages (hotel/model desk clerks and hotel maids)	Product characteristics of other hotels Median wages	Product characteristics of other hotels Median wages
R-squared	0.185	-	-	-	-
F-stat	389.21	-	-	-	-
First-stage r-squared	-	0.253	0.170	0.262	0.810
First-stage F-stat	-	515.92	330.48	487.20	246.83
N	27,412	27,412	27,412	27,412	27,412

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Parameter estimates of time dummies and individual hotel dummies

The following table shows parameter estimates of time dummies included in demand estimation to control for seasonality effect. They suggest that customers have high preference to stay in hotels in summer and low preference to stay (or travel) in winter. Parameter estimates for individual hotel dummies for the demand side and the supply side show a large range among 446 hotels.

Table 13: Time Dummies and Ind. Hotel Dummies

Variable (month)	**Coefficient**	**Std. Error**	**Sig.**
2	0.246	0.023	***
3	0.732	0.031	***
4	0.638	0.029	***
5	0.637	0.028	***
6	0.700	0.032	***
7	0.729	0.033	***
8	0.535	0.025	***
9	0.494	0.027	***
10	0.736	0.030	***
11	0.259	0.020	***
12	-0.090	0.020	***

Ind. hotel dummy parameters stat.	Median	Mean	Std. dev.	Min.	Max.
(Demand side)	1.906	-1.073	8.840	-29.980	8.912

Ind. hotel dummy parameters stat.	Median	Mean	Std. dev.	Min.	Max.
(Supply side)	-0.189	-0.093	0.391	-0.821	2.121

Note: The reference month is January.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Various specifications of evidence of brand spillover

OLS regression shows a statistically significant and positive relationship between the number of same brand hotels in a market and hotel price, suggesting brand spillover effects in play. In the second and the third columns we include controls and add location dummies. The resulting estimates of the total number of hotels are not realistic as they suggest either a strong positive or non-significant relationship between price and the level of total market competition. Once the effect of individual hotels are accounted for, this relationship turns negative. More important, it implies a positive relationship between price and the number of same brand hotels, suggesting dominant brand spillover effect. The result is robust with the squared term of the number of same brand hotels.

Table 14: Evidence of Brand Awareness

Model	OLS	Some controls	Location dummies	Indiv. hotel dummies (1)	Indiv. hotel dummies (2)
# same brand hotels	0.051***	-0.002	-0.045***	0.009**	
	0.002	0.002	0.002	0.004	
(# same brand hotels)^2					0.002***
					0.001
Total # hotels		0.021***	-0.003*	-0.01***	-0.01***
		0.001	0.002	0.001	0.001
Population (M)		-0.085***	-0.048	0.016	0.013
		0.003	0.014	0.01	0.01
# Firms (000)		0.004***	0.014***	0.013***	0.013***
		< 0.001	0.001	0.001	0.001
Hotel age (years)		0.002***	-0.001***	-0.03***	-0.03***
		< 0.001	< 0.001	0.003	0.003
Constant	4.600***	4.409***	4.094***	4.162***	4.165***
	0.002	0.017	0.027	0.057	0.057
Time dummies	N	Y	Y	Y	Y
Location dummies	N	N	Y	N	N
Indiv. hotel dummies	N	N	N	Y	Y
R-squared	0.03	0.164	0.544	0.805	0.805
N	27412	27412	27412	27412	27412

The dependent variable is log(price). Standard errors are reported below estimates.

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