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Abstract

In many settings where spatial preemption might be expected to produce tightly concentrated industry structures, firms share the market instead. Using a strategic investment model, I show that this can be rationalized by heterogeneous brand preferences, which cause new product introductions by incumbent firms to disproportionately cannibalize sales from existing affiliated products. I then present an empirical example using data on the branded segment of the lodging industry, which has many characteristics associated with spatial preemption, but is also characterized by strong brand-preferences. Consistent with the theoretical model, I find large within-firm revenue cannibalization effects from new hotel openings. These effects are attenuated – but not removed – by brand-proliferation strategies. Moreover, I find evidence that the industry practice of franchising through non-exclusive contracts softens inter-firm competition. Analyses of growing hotel markets support the conclusion that intra-firm cannibalization inhibits spatial preemption. Growth is far more likely to occur as a result of entry than expansion.

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1 Introduction

Increasingly, many industries feature large firms targeting a national market with their advertising and marketing programs. However, product competition in such industries often still appears to occur at a local level, with firms' relative positions differing significantly across geographic areas. Such situations pose important questions to researchers and practitioners interested in competition. For example, can assessments of local product market competition effectively ignore the national character of firms? Should researchers focus only on nation-wide competition? Do the answers to these questions vary across industries, and if so, under what conditions? To date, the industrial organization literature does not have good or comprehensive answers to these questions.

The hotel industry provides an interesting opportunity to investigate these issues empirically. On the one hand, the industry is dominated by a moderately small number of large firms, which cultivate national reputations. On the other, local hotel markets bear a close resemblance to the setting considered in Eaton and Lipsey (1979), who showed that incumbents could preserve market power by "spatially preempting" through the early introduction of new products. In isolation, this would suggest that local markets should be quite concentrated as a result of entry-deterrence by first-movers. However, casual examination of local hotel markets suggests they are rarely concentrated.

In this paper, I argue that heterogeneity in consumers' impressions of the national firms – such as might be created by the endogenous sunk cost (Shaked and Sutton, 1987, Sutton, 2007) of nation-wide marketing campaigns or loyalty programs – can explain the comparatively un-concentrated nature of local hotel markets. I begin by presenting a game-theoretic model of strategic product entry, which I have tailored to fit the stylized facts of the hotel industry. Prominent amongst these facts are consumers' brand preferences, which industry insiders emphasize for their economic significance. The model shows that a national firm becomes less able to credibly engage in spatial preemption in a local market as consumers' preferences about firms' products grow more heterogeneous. This occurs because more varied preferences make it profit-maximizing for firms to concentrate on those consumers who especially like their products. However, such a focus exacerbates

within-firm cannibalization, limiting the appeal of spatial preemption.

The model also extends easily to accommodate several other important characteristics of the hotel industry. First, most of the major hotel firms own multiple brands, even within a given quality tier (e.g. Marriott owns both the Fairfield Inn and Courtyard brands in the mid-market tier).[1] The model shows that such brand-proliferation strategies soften cannibalization and intra-firm competition. As a result, they make spatial preemption more credible on the margin.

Second, like many other retail industries (e.g. fast food, gasoline sales), many hotel firms use franchise arrangements that empower local managers in order to efficiently elicit hard-to-monitor effort. Unlike most other such industries, however, the major hotel firms do not make their franchisees sign exclusive contracts. This allows an individual property owner to have, for example, both a Marriott- and Hilton-affiliated hotel in the same market. The model shows that these non-exclusive arrangements soften inter-firm competition as they facilitate more concentrated – in terms of local ownership – markets. Having more local hotels controlled by the same price-setting decision-maker raises prices, benefiting franchisors insofar as franchise contracts typically allocate them a share of their affiliated franchisees' revenues (Blair and Lafontaine, 2005). However, it means that firms are less likely to retain monopoly power in local markets via spatial preemption.

Using rich data on Texas lodging markets, I test the model's predictions. Overall, the results strongly support the model. First, examining the revenues of individual hotels, I find that new hotels cannibalize a significant amount of their revenue from existing hotels affiliated with the same firm. However, this effect is softened if the two hotels do not share a national brand. In other words, the revenues of a Courtyard by Marriott are more negatively impacted by the presence of another Courtyard than the presence of hotels affiliated with other Marriott brands (e.g. Fairfield Inn). Hotels affiliated with other national firms also have negative impacts, but ones that are smaller in magnitude. Second, I find evidence that the industry practice of franchising through non-exclusive

[1] For the rest of the paper, I use "firm" to refer to a central firm (e.g. Marriott), "brand" to refer to a product line large enough to generate its own impression on consumers (e.g. Courtyard), and "hotel" to refer to a specific outlet in a given local market. To be consistent, I discuss consumers' preferences in terms of "firm preferences" that impact all products affiliated with a single company and "brand preferences" that impact just a single brand.

contracts effectively softens inter-firm competition. These effects are not estimated with a high degree of precision but are consistent in relative magnitudes with the predictions of the theoretical model. Third, examining how existing markets grow, I find evidence that the lodging companies in the branded segment do not engage in entry deterrence. Instead, my baseline estimates show that conditional on growth taking place, a new hotel is almost 50 percent more likely to be associated with a firm that did not previously operate a hotel in that market than an incumbent firm with one hotel. Thus, in equilibrium, local market growth occurs on the extensive margin through entry rather than on the intensive margin through incumbents' expansion. Unfortunately, the data are not rich enough to identify what impact – if any – franchising or brand proliferation plays in the evolution of market structure.

The paper contributes to an emerging literature considering how brand preferences influence local market structures in endogenous sunk cost industries. Like Bronnenberg et al. (2009), who consider the long-run implications of being a first mover in local branded consumer goods markets, I investigate how consumer opinion affects market structure. Whereas Bronnenberg et al. (2009) find that first movers retain their dominance for long periods in local markets, my results show that incumbency provides no long-run advantage to branded hotel firms. I believe our different findings reflect the fact that whereas consumers in Bronnenberg et al. (2009) are highly local, the hotels in my study cater to a customer base drawn from a wide area. Thus, the initial experience effects documented in Bronnenberg et al. (2010) do not systematically affect the firms in my sample.

The paper also provides insight into why the empirical evidence for spatial preemption has been equivocal. The model rationalizes why in industries where brand affiliations play a large role in determining consumer interest, such as fast-food (Thomadsen, 2005) or personal computers (Hui, 2004), cannibalization appears particularly significant, making spatial preemption less likely.[2] By contrast, when it is likely that branding is opaque or consumers are driven more by product

[2]Toivanen and Waterson (2005) present evidence of network economies in fast food, which may lead to more aggressive expansion strategies. Stavins (1995) finds evidence consistent with spatial preemption by incumbent computer makers; however, the firms in her study separate their products widely, forcing entrants into tight clusters. This is consistent with concerns about intra-firm cannibalization.

characteristics – as for movie theaters (Davis, 2006), radio markets (Berry and Waldfogel, 2001), or consumer product marketing (Smiley, 1988) – revenue stealing and/or preemption strategies have been documented.

Finally, the paper contributes to a small but growing literature examining the relationship between vertical contracting and local market structure. Using data on retail gasoline markets, Wilson (2011) shows how the use of vertically separated contracts (such as franchising) can lead to moral hazard problems both in terms of pricing and the maintenance of reputational assets. Similarly, Thomadsen (2005) shows that fast food outlets affiliated with the same franchisee engage in softer price competition than those affiliated with different franchisees. Kalnins (2004) also relies on data on the Texas lodging industry to assess differences in the extent of cannibalization between brands that utilize franchising and those that rely on company-owned local outlets. He finds that cannibalization is larger among franchisor brands. Thus, the prior literature also implies that separating ownership of affiliated outlets in local markets can lead to moral hazard problems for franchisors. However, the present paper is the first, to my knowledge, to consider how inter-firm franchising can relax overall competition.

The paper proceeds as follows. Section 2 discusses the characteristics of the hotel industry. Section 3 presents the theoretical model. Section 4 discusses the data used in the empirical analysis. Section 5 analyzes the impact of market structure on individual hotel revenues, while Section 6 examines whether or not incumbent hotel firms engage in spatial preemption. Section 7 concludes.

2 The Lodging Industry

In many ways, the characteristics of the lodging industry are consistent with Sutton's theory of endogenous sunk costs (Shaked and Sutton, 1987, Sutton, 2007). The intuition is quickly sketched: Most individual hotel traffic is non-repeat. This makes it difficult for any given hotel to credibly signal quality, because customers enticed by false promises of a high quality experience cannot "punish" the offending hotel by withholding future business. However, a firm affiliated with multiple

hotels can escape this trap. Since consumers are likely to travel somewhere again, they can credibly threaten a national firm by withholding future business. Thus, the ability to be collectively punished allows multi-hotel firms to credibly commit to higher levels of quality. If there are scale economies to advertising and varying consumer tastes for quality, firms that choose to incur the endogenous sunk cost of alerting consumers to their network of properties will constitute a concentrated high quality segment and can earn higher price-cost margins. Meanwhile, a fragmented low-quality, independent segment will cater to more price sensitive consumers.[3]

Consistent with this framework, the lodging industry is highly vertically differentiated by the quality and amenities available to guests. Indeed, research indicates that the degree of differentiation across vertical segments is so large that competition across the different quality segments is extremely weak (Freedman and Kosova, forthcoming); there may even be cross-segment agglomeration economies (Kalnins and Chung, 2004). Moreover, despite the fact that hotel construction costs are modest, which might imply an atomistic industry structure, the industry is moderately concentrated. For example, data compiled by Hotel and Motel Management (2004) show that 50% of all hotels in the country are affiliated with 10 large firms. However, this understates the level of concentration, for – consistent with Sutton's theory – the bulk of the corporate hotels are of relatively high quality (i.e. 2 or more stars according to AAA) while the bulk of independent hotels tend to be low-quality. Finally, the large firms' marketing efforts are large and sophisticated, featuring prominently in executives' discussion of strategy. For example, Accor's 2008 Annual Report (p. 16) discusses how brand development and revitalization are a large part of its strategy in the hotel sector.[4]

Importantly, the details of the lodging industry also depart from canonical endogenous sunk cost models in important respects. First, individual local hotel markets have many of the character-

[3]With the rise of sites like TripAdvisor and Yelp, where consumers can leave public evaluations of hotels' quality, it is possible that the character of the lodging industry will change. One might imagine that branding would become less important as a signal of quality. However, this possibility relies on the credibility of online reviews, and recent reporting suggests there is ample evidence of gaming (Streitfeld, 2011).

[4]Further evidence of the size and sophistication of hotel firms' marketing efforts can be found in the fact that many hotel brands appear in *Brandweek*'s annual "Superbrands" issues listing the world's most valuable brands.

istics of those considered in the canonical work of Eaton and Lipsey (1979) on spatial preemption. They are often small and geographically distinct. This suggests that there is scope for dynamic interaction between incumbents and potential entrants, which the past literature has found evidence of (Mazzeo, 2002, Conlin and Kadiyali, 2006). Moreover, it suggests that local markets should be quite concentrated.

Second, and also seeming to point towards highly concentrated local markets, the national lodging firms often own multiple brands within, as well as across, quality segments. For example, Marriott Hotels controls the Fairfield Inn and Courtyard brands, both of which are in the mid-level segment. Nor is it the case that the existence of multiple brands within a given segment is accidental, perhaps as a result of firms' acquisition strategies. For example, Marriott created both its Fairfield and Courtyard brands itself. Canonical oligopoly models of horizontal differentiation suggest that firms can strategically differentiate their products in order to deter competitors and ensure softer price competition (Schmalensee, 1978). Such brand proliferation capabilities might be thought to further heighten firms' abilities to spatially preempt in local hotel markets. However, anecdotal evidence suggests that it is very rare for one firm to dominate a given local market.

Third, while little may objectively differentiate hotel brands within a segment, it is conventional wisdom in the industry that individual consumers perceive different brands quite differently.[5] Moreover, consumers' heterogeneous, horizontally-differentiated preferences are believed to be of large economic significance. An industry professional explained to me that while consumers may not exactly know why they prefer certain firms' hotels, their choices indicate they will pay a significant premium to stay in a hotel affiliated with their preferred firm. Such behavior is consistent with what researchers have found in other apparently homogeneous but brand-differentiated industries (Allenby and Ginter, 1995, Dekimpe et al., 1997, Bronnenberg et al., 2010). Moreover, focusing on loyal, high-value customers has become accepted strategy in the industry (Shoemaker and Lewis,

[5]Within a given quality segment, the extent of "objective" horizontal differentiation is limited. For example, Bowen and Shoemaker (1998) state that in a survey of high-end hotel managers, many could not identify the brand of pictured hotel rooms – even when the picture was of their own hotels.

1999, Bechard, 2011). The existence of brand-differentiated preferences also helps to explain the decision to own multiple brands that compete within the same market segment. In order to exploit consumer preferences over the long run, hotel firms are also focused on fostering and maintaining them. For this reason, they pursue sophisticated marketing campaigns designed not only to separate their hotels from the unbranded competitive fringe (as emphasized by Sutton) but also to influence consumers' intra-segment preferences. For example, the industry has adopted marketing innovations like loyalty programs and firm specific internet booking services for all of their affiliated hotels (Shoemaker and Lewis, 1999). It is worth noting that such programs will amplify or create preferences that span all of a firm's brand offerings.

Fourth, similar to other retail industries where distance from headquarters makes the monitoring of local effort difficult, many large hotel firms use franchising contracts (Kalnins, 2004). The contracts typically give residual rights to the revenues of a hotel affiliated with one of their national brands to the local manager, who will have full control – including price-setting authority – subject to their adherence to rules designed to preserve the brand's reputation. In exchange, the franchisor receives a set percentage of the hotel's revenues and, perhaps, a fixed fee. By giving local managers high-powered incentives, franchising can lead to higher franchisor profits, because the franchisee has the incentive and ability to elicit greater effort.[6] However, a franchisor's use of multiple franchising contracts in the same market can lead to problems if the same franchisee is not used. This is because neither of the local managers has an incentive to internalize the effect of their pricing on their brand-affiliate's profits.[7] Indeed, their private incentive is to cannibalize as much of their affiliate's sales as possible.

Because of this incentive conflict, there is widespread concern among hotel franchisees about cannibalization from affiliated entry (Kalnins, 2004). Some franchise contracts contain exclusive territory provisions to mitigate such fears. It is important to note, however, that there are strong

[6]See Blair and Lafontaine (2005) for more details on the economics of franchising.
[7]See Lafontaine and Slade (2007) for a survey of this literature or Wilson (2011) for more discussion and an example of such behavior in gasoline stations.

reasons not to expect such exclusive territory clauses to bind. This is because franchisors can address the encroachment problem directly either through the use of company-ownership of hotels or by utilizing the same franchisee at all local outlets. As Krueger (1991) notes, while franchisees can propose locations, the franchisor ultimately has veto power. Thus, ultimately, it is the hotel firms who have the final say in whether or not multiple affiliated hotels are introduced in a single market.

Fifth, and finally, unlike many other industries where multi-outlet franchising is widespread (Kalnins and Lafontaine, 2004), it is not the case in lodging that a franchisee is restricted to working with just one firm.[8] This may stem from the strong degree of intra-segment standardization, which means that there are fewer trade secrets. Alternatively, it could indicate that hotel franchisees have greater leverage because they own their hotels whereas fast-food franchises are typically owned by the franchisor.[9]

3 A Strategic Model of Hotel Market Growth

3.1 Model Overview

In this section, I present a strategic growth model based on the stylized facts of the lodging industry, which I use to understand how the various factors discussed above interact to influence local market structure.

In the model, there are two rational hotel firms competing in the branded segment of a hotel market: incumbent I and entrant E. I assume that a market where the incumbent has one hotel has grown and can now support two hotels. Although the entrant does not yet have a hotel in the market, it is a well-known company about which consumers already have (mixed) opinions. As mentioned above, competition across segments has been shown to be extremely weak, so I abstract

[8] Gasoline retailing represents another such industry insofar as a jobber may have contracts with multiple refiners.

[9] For example, McDonald's website states, "The site selection process is separate from our franchisee selection process. We make the decision to develop a location because we believe it will be a success. McDonalds manages all the site evaluation, acquires the property and constructs the building. After making the decision to develop a site, McDonalds awards the franchise to the most qualified candidate." See `www.aboutmcdonalds.com/mcd/franchising/us_franchising/franchising_faqs.html` (accessed October 21, 2011).

from the presence of the low quality fringe segment.

A sequential game determines which firm introduces the new hotel. Figure 1 shows the timeline of events. First, the incumbent decides whether to add a second hotel. Second, the entrant has the option of opening a single hotel of its own. Third, and finally, the incumbent has the option of closing its new hotel. The market structure is fixed once the incumbent has made its disinvestment decision, and firms engage in Bertrand-Nash competition.

In order to assess preemption, I make certain simplifying assumptions about the costs involved in changes to the market structure. In particular, I assume that the entrant's fixed costs are too high to offset in a three hotel market. Building in potentially random entry and/or exit costs would be straightforward; however, I believe no additional insight would be gained from their inclusion.

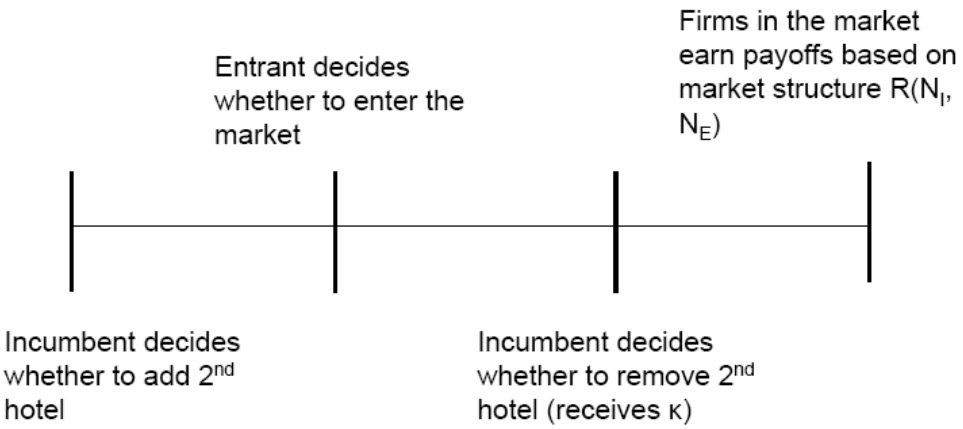

Figure 1: Timing of events in the game

3.2 Consumer Demand and Firm Profits

To account for consumer heterogeneity, I assume that individual hotels' payoffs stem from a random utility model (RUM) of consumer demand, which has become the standard approach in empirical demand modeling (Berry et al., 1995, Nevo, 2001). This approach implies that individual consumers decide which (if any) of the existing hotels to stay at based on the utility it would provide.

I specify that the utility that consumer i gains from choosing a given hotel j affiliated with firm B is:

$$V_{i,j,B} = \delta - p_j + \mu_{i,B} + \epsilon_{i,j}. \quad (1)$$

The utility from choosing the outside option o is:

$$V_{i,o} = \mu_{i,o} + \epsilon_{i,o}. \quad (2)$$

δ is the baseline benefit to all consumers of staying in a hotel and is common across hotels. p_j is the price charged at hotel j. For the sake of simplicity, I assume that consumers are homogeneous in how they perceive the value of lodging and its price. Therefore, there are no individual specific subscripts on δ or p_j.

The $\mu_{i,B}$ capture consumer i's heterogeneous taste for firm B, and are independent draws from identical Normal distributions with mean zero and standard deviation σ. (While I assign a utility shifter to the outside option, this could be normalized to 0 with no qualitative effect on the results.) The draws will be independent across consumers and firms, so hotels associated with the same firm share the same μ for any given person. The $\epsilon_{i,j}$ are independent draws from a type 1 extreme value distribution with variance normalized to 1.

Following the standard results for the mixed logit (Train, 2003), hotels' market shares are determined by integrating out the μ. Thus, the market share of each hotel j is:

$$\begin{aligned} S_j &= \int \frac{\exp V_{i,j}}{\sum_j \exp V_{i,j}} f(\mu) d(\mu) \\ &= S_j(p_j, p_{-j}), \end{aligned}$$

where $f(\mu)$ is the joint density function of the firm-specific utility shifters. This formulation shows that hotel j's share of the market as a function of its own price (p_j) and the prices of all other

hotels in the market (p_{-j}).

As noted in Kalnins (2006), marginal costs are very low in the hotel industry relative to fixed costs. Therefore, I assume that marginal costs are 0, but being in the market requires payment of a fixed cost f in each period. I abstract without loss of generality from entry or exit costs. Thus, normalizing the size of the market to 1, the per period profit of hotel j affiliated with firm B can be written as:

$$\Pi_j \quad = \quad p_j * S_j(p_j, p_{-j}) - f.$$

Firms simultaneously set prices to maximize overall profits. As is common in the applied literature using these models of demand (Berry et al., 1995, Nevo, 2001), I assume the existence of a unique, symmetric pure-strategy equilibrium in positive prices conditional on market structure. Because the products are horizontally differentiated, I assume that an incumbent with two hotels charges the same price in both.

3.3 Equilibria and Spatial Preemption

Firms play sub-game perfect investment strategies. Thus, the incumbent will not open a second hotel if it knows that it would close it in the event that entry occurs. Similarly, because of the aforementioned assumption about the magnitude of their fixed costs, the entrant will not challenge the incumbent if it opens two hotels and would not remove the second in the event of entry. As shown in Judd (1985), entry deterrence will not be sub-game perfect when it is more profitable for the incumbent to remove one of its two hotels from the market once it sees that the entrant was not deterred. This occurs when:

$$\begin{aligned} R^I(2,1) - 2f &< R^I(1,1) - f \\ R^I(2,1) - f &< R^I(1,1), \end{aligned} \tag{3}$$

where $R^B(\cdot)$ represents the revenues earned by firm B conditional on the market's structure. The first term inside the parentheses in $R^B(\cdot)$ indicates the number of hotels affiliated with the incumbent, and the second indicates the number affiliated with the entrant.

Equation (3) shows that entry deterrence will not occur when the profits of sharing the market equally plus the scrap value are greater than the profits from operating two hotels in a three hotel market net of the fixed cost of operating one hotel. The magnitude of f thus affects the viability of entry-deterrence in a straightforward way. As the fixed cost of operating a hotel increases, the incumbent is less able to credibly deter the entrant.

Due to the model of consumer demand employed here, σ also affects the viability of entry deterrence. Unfortunately, the use of the RUM framework means there are no analytic solutions for elements of interest (e.g. optimal prices, profits) with respect to σ^2. Nevertheless, the consequences of the demand system (explored through numerical simulations) are intuitive. Rewriting Equation (3) as $R^I(2,1) - R^I(1,1) < f$ shows that as the difference between the incumbent's total revenues when it has 2 hotels versus 1 hotel while competing with a hotel affiliated with the entrant falls, preemption becomes less credible. In other words, the more the incumbent's second hotel simply cannibalizes sales from the first, the less credible spatial preemption becomes.

My numerical results demonstrate that as σ increases, the cannibalization effect increases in magnitude. This occurs because as σ increases there are more consumers with very strong feelings about each firm's products. The presence of such partisan consumers allows firms to earn higher profits by increasing prices and catering more to the segment of the population that really likes them, even if this drives away consumers who were on the margin. However, as the firms focus more on the segments of the population that have strongly favorable feelings about their firm, there is significantly less inter-firm competition. This makes it less likely that spatial preemption will be credible, because the incumbent gains few additional consumers when it adds a second hotel.

Figure 2 illustrates the relationship between the heterogeneity of firm preferences and the viability of spatial preemption. The X-axis shows the ratio of σ^2 to δ, representing the relative

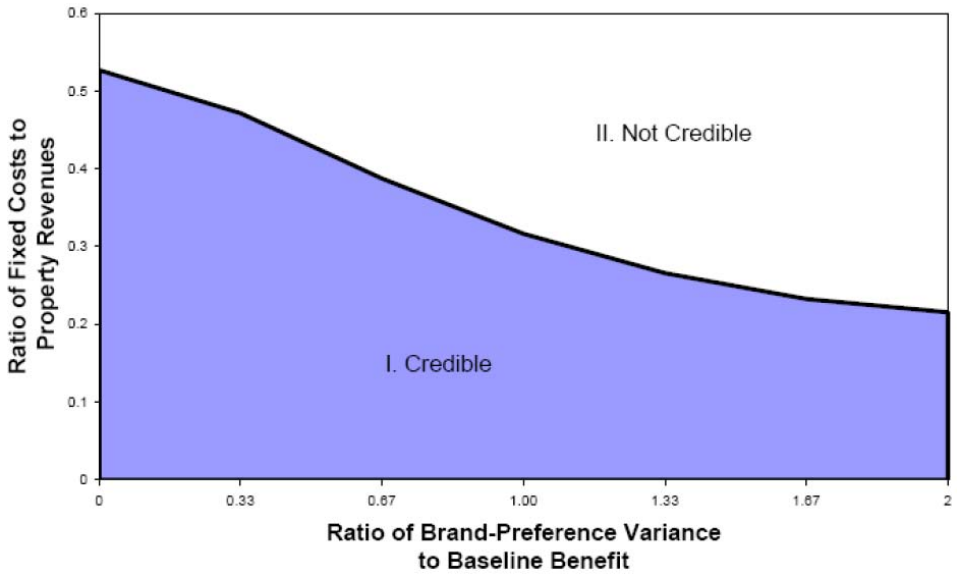

Figure 2: The Variance of Consumer Preferences and the Credibility of Preemption: Base Case

importance of consumer heterogeneity, while the Y-axis is the ratio of the per period fixed cost f to the per-hotel revenues received by the incumbent in a market with 2 incumbent hotels and 1 entrant.[10] The changing frontier of Region I illustrates that as the relative importance of firm preferences increases, the magnitude of the per period fixed costs (relative to per hotel variable profits) needed to make preemption non-credible falls.

3.4 Extension: Brand Proliferation

The model presented above can straightforwardly extend to account for the common industry practice of brand proliferation. If firms differentiate their hotels using different brands, Equation (1) becomes:

$$V_{i,j,B} \quad = \quad \delta - p_j + \mu_{i,B} + \alpha_{i,j} + \epsilon_{i,j}, \tag{4}$$

where α indicates the effect on consumer i's utility of brand j. I impose that the α are also independent draws from identical Normal distributions with mean 0 and variance τ^2.

[10] The model is parameterized with $\delta = 3$.

Because the α differ for each consumer across products, firms can more easily expand their product lines. This is because the relative impact of the firm preferences are diluted, reducing cannibalization. Now, firms can extract surplus from a larger population, targeting a wider variety of consumers with strong feelings about the firm and/or its products' specific characteristics. As noted elsewhere, this implies that in industries where firms are able to distinguish their products from each other in the product space, larger product portfolios should be expected. Moreover, on the margin, spatial preemption by the hotel-property-owner should be more likely since the extent of intra-firm cannibalization has been reduced.[11]

The prediction that greater control over product location should be correlated with larger product portfolios appears upheld both anecdotally and in the empirical literature. For example, large consumer products firms like Unilever offer a variety of closely related goods that are differentiated at least as much by branding (e.g. the Dove and Axe brands of personal hygiene products) as by product characteristics. Similarly, Berry and Waldfogel (2001) exploit a natural experiment to show that the ability to position (and re-position) products in an industry where firm preferences are small relative to preferences for product characteristics facilitates pre-emption.

3.5 Extension: Cross-firm Franchising

The model also extends straightforwardly to account for the possibility of non-exclusive franchising. In this case, it is appropriate to think of the incentives of a local franchisee already working with one brand in that market.

Recognizing that the market has grown, the franchisee assesses whether or not they should add a second hotel to deter entry from hotels affiliated with other owners (be they firms themselves or other franchisees). To add an additional hotel, the incumbent hotel-owning franchisee can partner

[11] These results connect straightforwardly to the earlier work of Gilbert and Matutes (1993), who consider competition between two brand-differentiated competitors able to offer two quality-differentiated products. They model consumers as being spread across a plane where one dimension reflects their taste for the two different firms and the second their taste for quality. Though our models emphasize different elements and rely upon different formulations of demand, both lead to the conclusion that stronger firm preferences relative to other product characteristics lead to smaller product portfolios.

with the same firm again or open a hotel affiliated with a different company. If they partner with the same firm, then the implications for cannibalization and spatial preemption are unchanged from the baseline model results presented above.

However, if the franchisee partners with a new lodging firm, which will have a separate μ, then the implications are quite different. The common manager has no incentive to reduce price at either of the hotels it controls to try to poach sales from the other. They will set prices to extract as much surplus as possible from the different consumer "types", much as the monopolist studied in Mussa and Rosen (1978) does for vertically-differentiated products. This has the opposite effect on the franchisee's propensity to engage in spatial preemption relative to the baseline model.

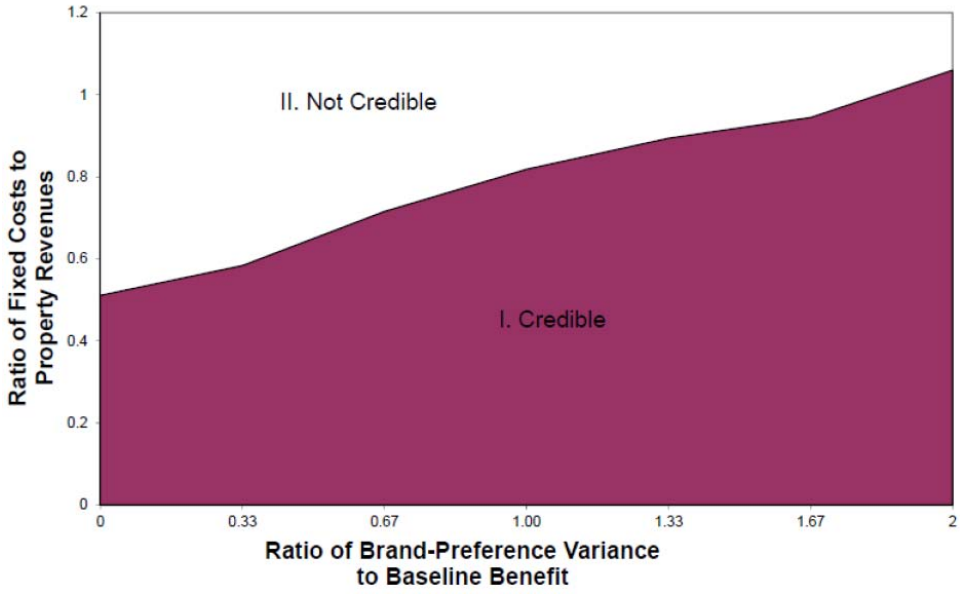

Figure 3: The Variance of Consumer Preferences and the Credibility of Preemption: Franchising Case

I illustrate this relationship graphically in Figure 3 by varying σ^2. All other parameters are set at the same level as before. Intuitively, the Figure shows that as hotel owners are able to more differentiate their products by affiliating with other firms, the viability of preemption increases. This is consistent with the results found in Conlin and Kadiyali (2006), which suggested that within individual markets hotel owners (as opposed to firms or brands) appear to engage in entry-deterring

capacity building.

It is worth emphasizing that if the franchisee rebuffs its original partner, that franchisor is unlikely to wish to try to preempt by finding a new local franchisee to open a second hotel. (I ignore the possible issue of exclusive territory clauses.) This is because of the resulting incentive conflict between the two local franchisees. Each would be focused on their own hotel's profits, and would set price accordingly. In an effort to win consumers from each other, both of the highly empowered local managers would cut prices significantly. Moreover, because of the importance of branding, the lower prices at the franchisor's affiliated hotels would not attract many new customers that would not have gone with the original hotel at a higher price. Insofar as franchising contracts give franchisors a cut of a local hotel's revenues, an additional hotel might thus actually lead to lower overall profits for franchisors.

Moreover, while the commonality of franchising and the lack of exclusive contracts means that the hotel firms are unlikely to maintain monopoly power, they nevertheless benefit from the arrangement. This is because spatial preemption by local franchisees raises prices and profits within the market. Insofar as franchisors receive a defined portion of the franchised hotel's revenues, the strategic behavior of multi-unit franchisees benefit their brand-owning franchisor partners as well as themselves. In future work, I hope to formalize the factors affecting contract choice and the potentially exclusionary usage of non-exclusive vertical relationships.

3.6 Motivating the Empirical Exercise

The simple framework presented above highlights the relationship between spatial preemption, cannibalization, and heterogeneous consumer opinions about a finite number of known firms. It shows that as consumers' preferences about the different firms grow more varied, the magnitude of intra-brand cannibalization increases. This, in turn, has clear implications for the feasibility of spatial preemption by brand-owning firms.

One possible test of the model's predictions would exploit cross-industry product portfolio data

in conjunction with information on the importance of branding in that industry to consumers. Unfortunately, such data are difficult to find. Moreover, such a study would suffer from the need to ensure that the nature of competition across the different industries was broadly similar. Because of these problems, I pursue a narrower approach, exploiting data on one industry that seems to have many of the hallmarks associated with spatial preemption, but which also has been characterized as an industry where consumer tastes for firms display significant variance.

4 Data

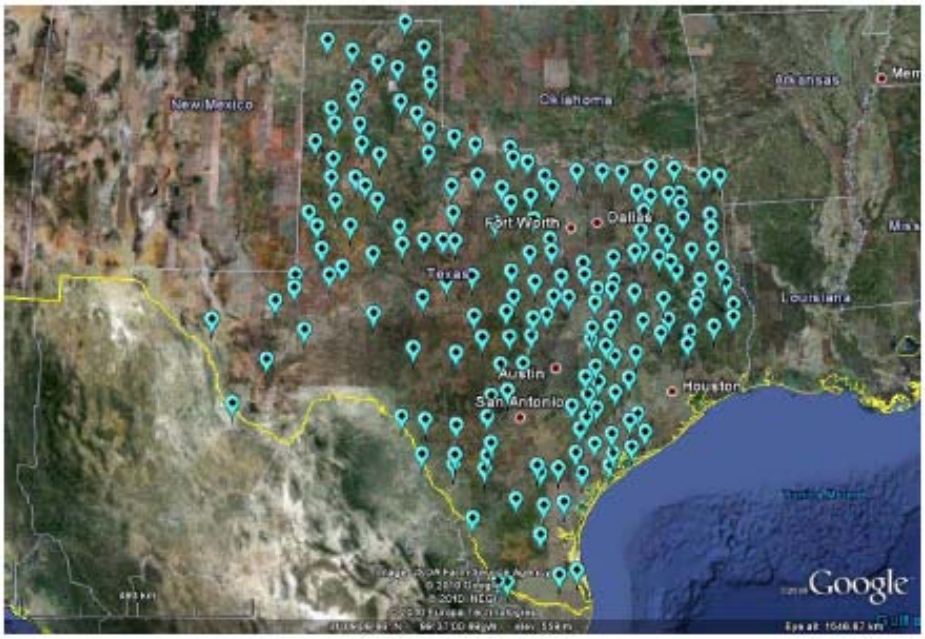

Figure 4: Map of Market Locations in Texas

To test the implications of strong firm preferences on cannibalization and spatial preemption, I use hotel revenues data from the Comptroller of Public Accounts (CPA) for Texas.[12] These data are based on each hotel's sales tax receipts, and are collected at monthly and quarterly intervals

[12]The CPA data are available at: http://www.window.state.tx.us/taxinfo/taxfiles.html. Several other papers (Kalnins and Chung, 2004, Kalnins, 2004, Conlin and Kadiyali, 2006, Suzuki, 2009) interested in studying differentiated competition in the hotel industry have also used various periods of CPA data.

depending on the hotel's characteristics. I aggregate the monthly submissions up to quarterly level. Between 2000 and 2008, my sample of the CPA data identifies each hotel in the state by name, city of location, and address. It also provides each hotel's owner, capacity (in rooms), and revenues. In order to focus on the hotel and motel market (as opposed to the boutique and bed and breakfast segments), I exclude hotels with less than 30 rooms. To control for variation in corporate affiliation and branding, I matched the hotel names to an author-constructed data set containing the names of the national brands and their parent firms. To control for quality, I follow Kalnins and Chung (2004) in assuming that hotels have the average quality rating of their brand, which I determine using AAA Texas Tourbooks.

Like Mazzeo (2002), I use cities rather than zip-codes as the relevant market definition as even cities of modest size often have more than one zip code. Moreover, focusing on cities follows the convention adopted by the industry insofar as hotels advertise themselves based on their city of location, and guidebooks organize their reviews around cities.

As in Bresnahan and Reiss (1987, 1991a,b), I focus on isolated markets to minimize concerns about spillovers from nearby markets. I select isolated markets in the following manner. First, I use Google Earth to determine the "centrum" of each city in the CPA data, where the centrum is defined as the latitude-longitude point that the software converges to when the city is entered into the search bar. Second, I calculate the distance between each of the centrums using the Great Circle methodology. Third, I discard those cities whose centrums are less than 10 miles from that of their nearest neighbor or less than 50 miles from the major economic hubs of San Antonio, Austin, Dallas, El Paso, and Houston. Then, I drop the cities that never had a population of more than 1,000 people during the sample period according to U.S. Census data; I also drop the resort cities of South Padre and Corpus Christi. These restrictions leave a total of 183 cities, none of which is large enough to pose a concern that location within the city is likely to dramatically affect competition. Figure 4 shows the locations in Texas of all markets in the sample.[13]

[13]The Census data can be downloaded at factfinder.census.gov. I exclude the coastal resort cities as they had vastly more hotels than other markets of similar size. As in Bresnahan and Reiss (1987), I explored whether cities near the

The restriction of the sample to geographically isolated markets means that the very high end of the quality spectrum is largely absent.[14] Moreover, the data indicate both that the hotels in the low quality tier are almost all independents with no national firm affiliation, and that almost all independents are low-quality. In my empirical analysis, I focus on firms with substantial operations in the mid- to high-level (i.e. at least two star) segment in Texas, and assume that the hotels associated with smaller firms do not benefit from the same reputation effects as those affiliated with the large firms. Instead, consumers view them as analogous to independents, though I do allow for different competitive effects from high and low quality independents.[15] Henceforth, I refer to the mid- to high-quality segment as "branded."

As seen in Table A-1 there is a natural break point in the number of high-quality branded hotels that leaves six large firms: Choice Hotels, Continent Hotels, Hilton Hotels, La Quinta Inns and Suites, Marriott International, and Wyndham, which together account for 9823 hotel-year observations (over 91 percent of all branded hotels in the sample) in 94 different markets. Table A-2 in Appendix A shows the brands affiliated with each firm in the sample.[16]

Consistent with the anecdote from Bowen and Shoemaker (1998) cited above, the hotels within the branded segment are quite similar in terms of size. Overall, the coefficient of variation for the number of rooms for all the branded hotels affiliated with the major firms is just 0.5. The degree

borders with Mexico or other states are outliers. I found that excluding these cities did not affect the results, so I have left them in the sample.

[14] Quality averages are based off of ratings in the 2001, 2002, 2005, and 2006 AAA guides for the sample markets. Individual hotels' qualities range from 0 (in rare instances) to 5 (also rare) stars. Firms whose hotels do not appear in the AAA data were set to 3 stars. Table A-1 in Appendix A shows the number of hotel-market-period observations associated with each of the firms and their quality tiers, where the high quality tier is composed of all brands with average ratings of between 2 and 3 stars.

[15] A further complication is the fact that several firms in the sample changed hands during the sample period. Baymont Suites shifted from being a largely independent national firm to part of Wyndham's brand portfolio in 2005; and La Quinta was acquired by Blackstone in 2005, a private equity group. I assume that Baymont hotels were always affiliated with Wyndham. I believe this assumption is innocuous as Baymont accounts for only 1% of all Wyndham hotels. I also assume that Blackstone's acquisition did not affect a change in La Quinta's overall strategy. I also make the assumption that the possibility of such transactions had no anticipatory effect on firm behavior.

[16] Careful observers will note that Best Western is not listed among the large brands in the data. This reflects the fact that it is a membership association, imposing much less stringent rules on its members. Moreover, individual affiliated hotels are allowed to keep their own name and/or incorporate Best Western into it. Such latitude is not afforded to hotels affiliated with more traditional brands. Therefore, these hotels are different in kind from those affiliated with the six major firms identified above.

of similarity is even higher within individual markets as the average within-market coefficient of variation is 0.18.

Table 1 summarizes the level of concentration in terms of firm-affiliation for those market-periods with at least two branded hotels. In some senses, it provides insight into the average market structure. The Table examines the extent of concentration using Herfindahl-Hirschman Indices (HHI) computed in three different ways: by firms' shares of the total number of branded hotels, by firms' shares of the total number of rooms in branded hotels, and by firms' shares of branded revenues. It is useful to compare these figures to the reference value that assumes a perfectly symmetric division among firms in all markets as well as to a score of 10000, which would indicate that all hotels in all market-periods are associated with just one firm.

Overall, I believe that the Table is consistent with what my theoretical model predicts about market structures in local hotel markets. While the HHI values always are greater than the reference column, this necessarily occurs if market shares are ever other than perfectly symmetric; there is no possibility of a score lower than the reference category that would serve to "balance" out the average. Thus, I believe that the Table indicates that the equilibrium market configurations are inconsistent with spatial preemption or other forms of entry deterrence by the large lodging companies in the branded segment. Instead, they are in line with what my theoretical model predicts based on the anecdotal evidence about the importance of consumer opinion. In addition, it is worth noting how similar the different HHI measures are, supporting the inference that hotels within a market have roughly the same size and perform similarly.

Table 1: HHI Summary Statistics by Market Size

# Branded	**Equal Share**	**Obs**	**HHI of Properties**	**HHI of Revenues**	**HHI of Rooms**
2	5000	359	5836	6536	6014
3	3333	291	4166	4478	4282
4	2500	250	3735	4070	3922
5	2000	241	3291	3298	3430
6	1667	96	2581	2536	2641

Notes: The Table shows how concentration varies with the number of hotels affiliated with the large firms.

Further insight into the possible presence of spatial preemption can be gained through an analysis of changes to market structure. After reducing the sample to just annual observations – to account for construction delays – I consider whether growth in expanding markets came about as a result of hotels affiliated with incumbent firms or not. Specifically, Table 2 looks at markets whose total number of branded, high-quality hotels increased by one, and did not see any of the six large hotel firms reduce their stock of hotels. The Table suggests that it is overwhelmingly likely that market growth occurs on the intensive margin via entry by "new" firms, even when there are many more incumbents capable of expanding than potential entrants.

While the descriptive results shown in Tables 1 and 2 support the model's implications about an industry where consumer heterogeneity in firm preferences is important, they do not account for important factors that might vary across markets. Nor do they speak to the incumbents' incentives for expansion (or lack thereof). To obtain a more precise understanding of cannibalization and spatial preemption, it is necessary to employ formal econometric frameworks, which I do in the following sections.

Table 2: Origin of New Hotels in Growing Markets

Number of Incumbents	Incumbent	Entrant	Total
1	3	12	15
	20	*80*	*100*
2	4	13	17
	23.53	*76.47*	*100*
3	5	9	14
	35.71	*64.29*	*100*
4	5	7	12
	41.67	*58.33*	*100*
5	3	4	7
	42.86	*57.14*	*100*
Total	33	69	102
	32.35	*67.65*	*100*

Notes: Entries in *italics* represent percentages of observations within the row.

5 Cannibalization and Revenue Stealing

5.1 Econometric Approach and Identification

In this section, I assess the empirical relationship between branding and cannibalization, which the theoretical model showed to be a critical element in understanding the feasibility of spatial preemption.

My empirical approach in this section is fundamentally a static one, examining hotel revenues as a function of contemporaneous market structure. This market structure, however, is the result of firms' entry decisions in the first stage of a dynamic game (Reiss and Wolak, 2007). Since Bresnahan and Reiss (1987, 1991a,b), scholars have shown that information about the relationship between market structure and outlet profits can be gained by considering the number of firms in the market, assuming that entry continues up until the point that one additional outlet would lead to profits that do not cover the cost of entry. When profit data are available, however, the parameters of the second stage product market competition game can be directly estimated using a functional representation of the local market structure as explanatory variables. Moreover, profit functions can be estimated even in the absence of profit data by using revenue data so long as marginal costs can reasonably be assumed to be 0. As noted above, this is a reasonable assumption in this industry. Thus, I can exploit the CPA data's information on hotel revenues.

As noted by Davis (2006), the function representing market structure can either be a reduced form representation of an unspecified game or a derivation from a specific form of competition. As in Davis' (2006) study of movie theaters, it is difficult to assume a particular game structure in the second stage for hotels. This is due to such issues as the commonality of temporal variation in room pricing (Celen and Thomas, 2009), which makes the common assumption of a Bertrand-Nash game impossible. Therefore, I estimate a reduced form model of hotel revenues as scholars can draw causal inferences from both the reduced form and structural approaches.

I begin by taking an approach similar to that of Berry (1992) and assume that the variable

profits of an individual hotel h in market m at time t can be represented as:

$$v_{h,m,t} = X_{m,t}\beta - f(\sigma, N) + \mu_{h,m} + \epsilon_{h,m,t}, \quad (5)$$

where X are market-level characteristics affecting demand and supply, $f(\sigma, N)$ is the function mapping local market structure N to hotel revenues, μ is persistent unobserved hotel and/or market level heterogeneity, and ϵ is information unobserved to the econometrician.

I take a hybrid approach to identifying the impact of local market structure (i.e. $f(\sigma, N)$). Like Davis (2006), I account for differentiation among market participants using linear parameterizations of different types of market participants to allow for effects of different magnitudes. However, whereas Davis (2006) addressed geospatial differentiation of homogeneous products, I exploit a focus on small markets as in Mazzeo (2002) and Bresnahan and Reiss (1987) to abstract from geospatial elements. Instead, I account for horizontal differentiation stemming from variation in corporate ties, branding, and/or franchisee-affiliation. It is necessary to account for such heterogeneity insofar as the theoretical model predicts that hotels closer together in the characteristic space or under different management will have different impacts on each other's revenues. In addition, I exploit the longitudinal aspect of my data in order to deal with the possibility of significant unobserved heterogeneity.

Thus, I model the variable profits of hotel h affiliated with category f in market m at time t as:

$$v_{h,f,m,t} = log(revenues)_{h,f,m,t} = X_{m,t}\beta - \sigma_f(N_{f,m,t} - 1) - \sum_{c \neq f} \sigma_c N_{c,m,t} + \mu_{f,h,m} + \epsilon_{h,f,m,t}, \quad (6)$$

where N_c represents the number of hotels affiliated with some category c. Given this specification, σ_f captures the net effect of cannibalization and any market growing effect from a hotel in exactly the same category as hotel h. Similarly, each of the other σ_c represents the net effect of business-stealing

and, again, any market-growing influence of hotels affiliated with the other possible categories.[17]

It is important to remember that the market structure variables represented by the Ns in Equation (6) represent the outcome of choices made in the aforementioned first stage of the entry game. As a result, there should be significant concern about the endogeneity of the market structure variables. An obvious problem might be unobservable factors leading to large numbers of branded hotels in specific markets. This would lead to upwardly biased estimates of the impact of the market structure variables on revenues.

I can partially address this concern through the inclusion of observable information about the different markets. I therefore supplement the CPA data with the aforementioned U.S. Census data on the cities' populations (in thousands) and data on average household income (in thousands) taken from the Statistics of Income (SOI) collected by the Internal Revenue Service.[18] In addition, I include the number of high and low quality "independent" hotels as controls. These variables are control rather than key independent variables because past research (Kalnins and Chung, 2004, Freedman and Kosova, forthcoming) has shown that hotel segments are sufficiently differentiated as to not compete.[19]

Of course, it is reasonable to fear that these additional controls will not solve the endogeneity problem and that some markets will be disproportionately attractive for unobservable reasons. I address these concerns in standard ways. First, I use market, firm, and/or hotel-level fixed effects to address the possible presence of persistent, unobserved factors influencing the attractiveness of different locations. Second, I estimate simple instrumental variables models using lagged values of the different market structure variables as in Davis (2006). Previous periods' market structure should have no influence on current competition other than through its relationship with current

[17] This specification makes strong assumptions about the homogeneity of the hotels within each category. Given the coefficient of variation evidence as well as industry anecdotes discussed above, I believe there is substantial evidence for the objective similarity of hotels within quality segments, especially within individual hotel markets, making this assumption reasonable.

[18] The SOI data are only available at the county level, so I use the value for the most common county for each city. As the SOI data are only available through 2005, I linearly extrapolate the data for the remaining years. See: http://www.irs.gov/taxstats/article/0,,id=120303,00.html.

[19] The results are qualitatively robust to simply aggregating all independent hotels.

market structure, and hence, in theory, make for appropriate instruments. However, one might reasonably worry about serial correlation of errors. I believe that the market fixed effects included in all models (implicitly in the hotel-fixed effects models) will control for this to a large extent; nevertheless, I explore the implications of varying the lag order. Further details are provided below.

5.2 Results

Table 3 shows descriptive statistics for the variables used in the revenue analyses. Consistent with the previously described choices made in defining the sample markets, the Table shows that the majority of observations are in small cities, which have only a few branded hotels for travelers to choose from. Moreover, the vast majority of hotels in any given market are affiliated with different brands, which is not surprising given the market concentration results shown in Table 1. Furthermore, in these small markets, the Table shows that it is rare that the same owner has more than one hotel in a given market. This may reflect that franchisees are capital constrained, leaving them unable to pursue profitable expansion. Alternatively, it may stem from the fact that the same decision-maker may register legally distinct entities as the owner of the different properties, which might be beneficial for tax or liability reasons.[20]

Table 4 shows the results of six different models of market structure impact revenues that exploit between- and within-hotel variation to identify competitive effects. Models 1-3 pool observations within markets, and address the possibility of firm or brand level differences using firm or brand effects. In addition, time invariant market differences are addressed through the use of market-level fixed effects. Column 1 focuses on the competitive effects of hotels affected with the same and different firms. Column 2 considers the impact of brand-proliferation strategies, while Column 3 addresses the possible impact of franchising. Models 4-6 are analogous but identify effects based solely upon within-hotel variation. In all cases, I include quarter-year effects and cluster the standard

[20] In addition, the Table suggests that in the few cases of an owner having two separate properties, it is more common for owners to be affiliated with the same firm than multiple firms. However, these results are slightly misleading about the role of inter-firm franchising insofar as several of the firms in the sample rely more heavily upon company-ownership than others (this is particularly true of La Quinta, for example). This would increase the incidence of multiple hotels in the same market affiliated with the same owner.

Table 3: Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
Sales ('000)	9341	315.41	236.84	1.94	2547.46
Log (Sales ('000))	9341	5.50	0.75	0.66	7.84
Same Firm	9341	1.07	1.47	0.00	8.00
- Same Brand	9341	0.10	0.35	0.00	2.00
- Diff. Brand, Same Firm	9341	0.97	1.31	0.00	8.00
Different Firms	9341	5.95	5.58	0.00	24.00
Premium Independent	9341	2.86	2.93	0.00	12.00
Budget Independent	9341	6.97	5.70	0.00	21.00
Own Same Firm	9341	0.04	0.21	0.00	1.00
Own Different Firm	9341	0.02	0.15	0.00	2.00
Own Independent	9341	0.02	0.15	0.00	2.00
Population ('000)	9341	68.59	70.42	1.68	223.18
Income ('000)	9341	44.24	8.99	22.05	93.61

errors. In the pooled models, I cluster at the market level, while in the fixed effects models I cluster at the hotel level.

Overall, the different models' results are strikingly consistent with each other and with the core prediction of the theoretical model that in an industry where consumers value brands heterogeneously, there will be significant cannibalization following affiliated product entry. For example, Columns 1 and 4 show that if a new hotel is opened that is affiliated with the same firm it reduces revenues by 10-12 percent. By contrast, a hotel affiliated with a different national firm only reduces revenues by 5 percent. (This difference is statistically significant at the 1 percent level.)[21]

Moreover, the models' results are supportive of the other elements of the theoretical model. As predicted, Columns 2 and 5 indicate that a given hotel firm can partly mitigate cannibalization through the use of multiple different brands. However, in neither case is the difference between the coefficient on the number of hotels sharing a brand as well as firm affiliation statistically significantly different from the coefficient on the number of hotels sharing only a firm affiliation. The absence of statistical significance is not very surprising given the small number of observations to identify

[21] These effects are broadly in line in magnitude with the competitive effects findings of Suzuki (2009), who uses a different sample of the CPA data and a different econometric approach.

Table 4: Revenue Cannibalization and Market Structure

	OLS	OLS	OLS	FE	FE	FE
	b/se	b/se	b/se	b/se	b/se	b/se
Same Brand		-0.132**			-0.140**	
		0.06			0.06	
Diff. Brand, Same Firm		-0.120***			-0.093***	
		0.02			0.02	
Same Firm	-0.119***		-0.119***	-0.097***		-0.097***
	0.01		0.01	0.02		0.02
Different Firms	-0.048***	-0.049***	-0.048***	-0.049***	-0.049***	-0.049***
	0.01	0.01	0.01	0.01	0.01	0.01
Own Same Firm			0.049			0.039
			0.19			0.05
Own Different Firm			0.075			0.011
			0.06			0.09
Premium Independent	-0.034*	-0.033**	-0.033*	-0.019	-0.018	-0.019
	0.02	0.02	0.02	0.01	0.01	0.01
Budget Independent	0	-0.003	-0.001	-0.018*	-0.017*	-0.017*
	0.01	0.01	0.01	0.01	0.01	0.01
Own Independent			0.146			-0.04
			0.16			0.1
Population ('000)	0.003	0.002	0.004	0.005	0.005	0.004
	0.01	0.01	0.01	0.01	0.01	0.01
Income ('000)	0.021***	0.019**	0.021***	0.022***	0.022***	0.022***
	0.01	0.01	0.01	0.01	0.01	0.01
Firm Effects	Yes	No	Yes	No	No	No
Brand Effects	No	Yes	No	No	No	No
Market Effects	Yes	Yes	Yes	No	No	No
Hotel Effects	No	No	No	Yes	Yes	Yes
Quarter-Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9341	9341	9341	9341	9341	9341

* p<0.10, ** p<0.05, *** p<0.01 in two-sided tests. Standard errors clustered at market-level for OLS models and hotel level for FE models.

these effects from. Nevertheless, the implication of only a minor effect from sub-brand proliferation is interesting. It could reflect the increasing importance of firm loyalty programs relative to the greater ease of expansion enabled by sub-brand proliferation. I hope to explore these issues further in future research.

Turning to the possible impact of non-exclusive franchising, Columns 3 and 6 show that if an incumbent is the owner of the of the new outlet, it substantially offsets its cannibalization effect. This is particularly true if the hotel is affiliated with a branded competitor (or independent hotel), which is in line with the prediction of the model. However, none of these effects are precisely identified. Again, this is not terribly surprising given the low frequency of such events in the data.

The impacts of the control variables are broadly in line with intuition, theory, and previous empirical work. Supporting the idea that they are further away in the product space than other branded hotels, I consistently find that independent hotels have smaller revenue-stealing effects than branded hotels, and that low-quality independents have smaller effects than high quality independents. Intuitively, both population and household income are positively correlated with revenue, although only income's effect is statistically significant.

Despite the consistency of the revenue results, concern may remain about the endogeneity of the market structure variables. If, for example, the market, firm, and hotel-level controls do not sufficiently take account of unobservable factors favoring market development by certain firms, then the coefficients would be biased.[22] To address such concerns, I re-estimated the models shown in Table 4 via instrumental variables using one period lags of the market structure variables as instruments. The F-stats for these models were much in excess of the threshold of 10 identified by Staiger and Stock (1997). As noted above, one might worry about serially correlated errors. Therefore, I experimented with higher lag-orders; the results were qualitatively unchanged using lag orders of up to two years (i.e. 8 periods). Details are available upon request. Because of the consistency of the results across the choice of lags, I present models using just one period lags in

[22]It is worth remembering, however, that the most obvious type of endogeneity would lead to upwardly-biased coefficients, making the baseline results particularly conservative estimates of the importance of cannibalization.

order to leverage as much data as possible. Table 5 shows the results of these IV models. Columns 1-6 represent the analogues to Columns 1-6 of Table 4.

Table 5: Revenue Cannibalization and Endogenous Market Structure

	IV-OLS b/se	IV-OLS b/se	IV-OLS b/se	IV-FE b/se	IV-FE b/se	IV-FE b/se
Same Brand		-0.076			-0.110*	
		0.05			0.06	
Diff. Brand, Same Firm		-0.115***			-0.108***	
		0.02			0.03	
Same Firm	-0.105***		-0.104***	-0.108***		-0.108***
	0.01		0.01	0.03		0.03
Different Firms	-0.041***	-0.045***	-0.042***	-0.054***	-0.054***	-0.054***
	0.01	0.01	0.01	0.01	0.01	0.01
Own Same Firm			0.046			0.028
			0.2			0.06
Own Different Firm			0.04			-0.021
			0.07			0.11
Premium Independent	-0.028*	-0.026*	-0.025	-0.011	-0.011	-0.005
	0.02	0.02	0.02	0.01	0.01	0.01
Budget Independent	0.003	-0.002	0.004	-0.015*	-0.015*	-0.013
	0.01	0.01	0.01	0.01	0.01	0.01
Own Independent			0.178			0.022
			0.18			0.1
Population ('000)	0	-0.001	0.001	0.005	0.005	0.005
	0.01	0.01	0.01	0.01	0.01	0.01
Income ('000)	0.021***	0.019**	0.020**	0.020***	0.020***	0.020***
	0.01	0.01	0.01	0	0	0
Firm Effects	Yes	No	Yes	No	No	No
Brand Effects	No	Yes	No	No	No	No
Market Effects	Yes	Yes	Yes	No	No	No
Hotel Effects	No	No	No	Yes	Yes	Yes
Quarter-Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8887	8887	8887	8872	8872	8872

* p<0.10, ** p<0.05, *** p<0.01 in two-sided tests. Standard errors clustered at market-level for OLS models and hotel level for FE models.

The models controlling for the possibility of endogenous market structure more directly through instrumental variables methods remain consistent with the baseline results. Only in the instance of Column 3 is there a marked divergence. In that case, the IV model shows a smaller effect of

hotels affiliated with the same brand than simply hotels sharing a firm affiliation. However, this anomalous result disappears when used in conjunction with fixed effects in Column 6. Ultimately, the consistency of the results between the two tables both in terms of signs and magnitudes supports the idea that there is little concern about endogeneity after including market and hotel-level controls for time-invariant heterogeneity.

Overall, I interpret the revenue model results as offering strong support for the idea that strong brand preferences exacerbate intra-firm cannibalization. Firms can reduce these effects via strategies such as brand-proliferation and/or the use of franchisees able to affiliate with multiple franchisors. All of these findings are consistent with the simple theoretical framework laid out above in Section 3. Moreover, they are highly robust. For example, I explored the impact of strengthening the assumption of independent markets by dropping all markets whose centrums were less than 20 miles apart as well as at least 50 miles from a major economic centers. As shown in Table A-3 in the Appendix, the results are qualitatively similar to those presented in Table 4. In addition, although not shown here, I explored the robustness of the results to non-linear reparameterizations of the market structure variables. In particular, including dummies for the number of affiliated and non-affiliated outlets led to highly similar results. Details are available upon request.

While the cannibalization results are in line with the predictions of the model, they do not speak directly to spatial preemption. In order to gain greater insight into this issue, I now turn to estimating econometric models relating market structure to the manner of market growth.

6 Changes to Market Structure

6.1 Econometric Approach and Identification

Eaton and Lipsey (1979) showed that when spatial preemption is credible the break-even point in time for introducing a new product for an incumbent occurs prior to when it occurs for a potential entrant. By contrast, the theoretical model presented above suggests that in markets

where consumers' preferences for different firms are important, growth is expected to occur via entry. I exploit these insights, and test as close an analogue to the theoretical model as I can, focusing on the nature of changes to market structure in growing markets.

I identify growing markets in the following manner. First, I reduce the sample to yearly observations on the grounds that it takes a year for a new hotel to be constructed and suitably staffed. Then, I look at how the numbers of hotels affiliated with each of the six major hotel firms in the data changed from year to year in each market in the data. (Thus, I include those firms who might not yet have had a presence in a given market.) In order to focus only on those markets experiencing growth, I then exclude all observations from markets in which any of the firms reduced their net stock of affiliated hotels. In addition to considering behavior in these "non-shrinking" markets, I create a smaller sample where I condition on growth having actually occurred.

As one would expect given the markets' small sizes and the significant fixed costs involved, the number of times that a firm chose to increase its stock by more than one was very rare in the sample. This can be seen explicitly in Table 6. In non-shrinking markets, firms increased their stock of hotels by more than one less than 0.1% of the time. In actively growing markets, it occurred just 1% of the time. Therefore, for simplicity's sake, I topcoded the size of a firm's change in stock to 1; however, the results were virtually unchanged when this assumption was relaxed. Details are available upon request.

I take a similar approach to identifying market structure's effect on the likelihood of accounting for market growth as I did to identifying the magnitude of cannibalization. Letting $\Delta N_{f,m,t+1}$ represent the increase in category f's stock of hotels in market m from time t, I estimate models of the following form:

$$\Delta N_{f,m,t+1} = \beta_0 1(N_{f,m,t} = 0) - \beta_1 N_{f,m,t} - \sum_{c \neq f} \beta_c N_{c,m,t} + X'_{m,t}\lambda + \mu_{f,m} + \epsilon_{f,m,t}. \quad (7)$$

As before, I assume that market structure can largely be captured by using linear associations of

Table 6: Magnitude of Changes to Firms' Stocks of Hotels

	Frequency	
Change in Stock of Hotels	Non-Shrinking Markets	Growing Markets
0	8,238	606
	98.14	*79.53*
1	150	150
	1.79	*19.69*
2	6	6
	0.07	*0.79*
Total	8,394	762
	100	*100*

Notes: Entries in *italics* represent percentages of observations within the column.

like and unlike hotels. To account for some possible non-linearity between incumbents – meaning categories already present in the local market – and entrants – those that are not, I supplement these variables with an indicator variable showing that f has no hotels in the market and is thus a potential entrant. As before, $X_{m,t}$ is a vector representing number of independent hotels, local population size and household income, and year fixed effects, while μ captures time-invariant unobservable factors related to the category and/or market. Finally, $\epsilon_{j,m,t}$ is the time-varying unobservable information.

The analytical approach to giving an observation to each market participant allows me to control for decision-maker heterogeneity, a factor that tests showed to be important in the revenue regressions and which also proved significant in exploratory models of market growth.[23] Unfortunately, it also means that the analytical approach can only be applied to examining the behavior of the national firms. This is because the unit of observation is the choice of each possible market participant, regardless of whether or not the participant is contemporaneously present in the market. This is feasible when looking at the behavior of the hotel firms insofar as there are only six of them. By contrast, there are far too many brands – to say nothing of property-owners – to implement this approach at that level. Thus, my results for hotel firms' behavior should be considered reduced

[23] Details are available upon request.

form estimates of the net impact of all factors, including firms' capacity for brand proliferation and sharing of franchisees, on hotel firms' expansion strategies.

The coefficients to focus upon in assessing whether spatial preemption is taking place are β_0 and β_1. A positive coefficient on β_0 would indicate that an entrant would be more likely to account for a new hotel in a market than an incumbent. This would be inconsistent with spatial preemption, but consistent with my model of market growth when consumers have strong preferences. Similarly, a negatively signed β_1 would indicate that the larger a firm's contemporaneous stock of hotels, the less likely it would be to account for any market expansion.

As in the analyses of cannibalization, I primarily address concerns about endogeneity through the inclusion of market and firm or market-firm level fixed effects.[24] However, as before, I also explore the results' robustness to instrumenting using lags of the potentially endogenous market structure variables. I estimate Equation (7) linearly without weighting. As noted in Angrist and Pischke (2009), weighting can lead to a more efficient estimator, but these benefits depend critically upon an accurate model of the conditional variance. Therefore, I prefer simple linear estimation, which will provide unbiased estimates designed to minimize the mean squared error. The marginal effects recovered through linear estimation in this case are highly similar to those numerically calculated after estimation via standard discrete choice methods. Details are available upon request.

6.2 Results

Table 7 shows descriptive statistics for the variables used in the analyses of firms' behavior. Panel a) shows results for the non-shrinking markets (i.e. no firm reduces its net stock of hotels, and growth may or may not occur), while Panel b) presents results for markets where growth definitely took place. Therefore, the mean value of a firm's change in its stock is necessarily substantially larger in the Panel b). While the samples are fairly similar, the Table shows that, on average, growing

[24] Insofar as I have 8 years of data for each market, I believe that the probability of incidental parameter bias due to the inclusion of the market-firm fixed effects is small. This assumption is supported by Collard-Wexler (2009), who finds evidence of only small bias in a pure panel with 12 observations per group.

markets were larger in both population and number of pre-existing hotels.

Table 7: Summary Statistics for Firm Behavior Models

a) Non-shrinking Markets

Variable	Obs	Mean	Std. Dev.	Min	Max
Change in Stock	8394	0.02	0.14	0.00	1.00
1(Entrant)	8394	0.86	0.35	0.00	1.00
Stock of Hotels	8394	0.20	0.59	0.00	7.00
Other Branded	8394	1.01	2.25	0.00	21.00
Premium Independent	8394	0.60	1.10	0.00	10.00
Budget Independent	8394	2.10	2.79	0.00	21.00
Population ('000)	8394	12.64	27.28	0.97	217.51
Income ('000)	8394	40.30	8.95	18.57	89.08

b) Growing Markets

Variable	Obs	Mean	Std. Dev.	Min	Max
Change in Stock	762	0.20	0.40	0.00	1.00
1(Entrant)	762	0.53	0.50	0.00	1.00
Stock of Hotels	762	0.82	1.16	0.00	7.00
Other Branded	762	4.11	4.54	0.00	21.00
Premium Independent	762	2.02	2.18	0.00	10.00
Budget Independent	762	5.64	5.57	0.00	21.00
Population ('000)	762	49.58	61.74	1.22	217.51
Income ('000)	762	44.05	9.02	24.85	71.70

Table 8 shows the results of models controlling for firm and market as well as firm-market heterogeneity. The latter are fixed effect models insofar as they control for within-market decision-maker specific heterogeneity. Columns 1 and 2 represent cross-sectional and fixed effect analyses of non-shrinking market-periods where no incumbent firms reduced their stock of hotels. Columns 3 and 4 are analogous but condition on growth having taken place.

Overall, the results of my analyses support the theoretical model's predictions about equilibrium strategic decision-making by firms in industries where consumers have well-developed, heterogeneous firm preferences. In all of the models, the coefficient on the entrant dummy is positive. This implies that – on average – it is more likely that firms not currently present in the market account for new hotels than any firm with an existing presence. Moreover, the coefficient on the

existing stock of hotels is negative, which means that the larger an incumbent's stock of hotels, the less likely they are to expand. Both results run counter to what would be observed if firms engaged in spatial preemption. Furthermore, in most of the models, both effects are statistically as well as economically significant. These results indicate that contrary to what initial intuition might suggest about oligopolistic behavior in individual differentiated product markets, growth in the branded hotel segment is more likely to occur on the extensive margin as new entrants build new hotels than on the intensive margin via expansion by incumbent.

The economic significance of the key explanatory variables is larger in Columns 3 and 4. This is intuitive as these regressions are conditional on growth having taken place. The fixed effects models return coefficients of significantly larger magnitude, which is consistent with their better accounting for unobserved market level factors favoring individual firms. Therefore, I believe those results are preferable. They indicate that an entrant is 30 percent more likely to account for market expansion in non-shrinking markets, and approximately 50 percent more likely to account for growth in growing markets.

The results for Texas hotel firms provide an interesting contrast to those of Bronnenberg et al. (2009), who document significant first-mover advantages in many consumer packaged goods industries. Bronnenberg et al. (2010) present evidence suggesting that this effect stems in large part from consumers' initial experiences. My different results for Texas hotel markets may reflect that the firms are mature with nation-wide presences. As a result, any given hotel's potential customers are likely randomly drawn from much of the country. Thus, while any individual consumers' preferences may be quite influenced by their initial hotel experiences, none of the major hotel firms in Texas are likely to benefit systematically. I hope to explore these ideas further in future research.

The coefficients on the other explanatory variables in the market growth models are broadly in line with intuition and past research. The coefficient on the stock of other branded firms is usually more positive (and in one case actually positive) than the coefficient on the stock of a firms' own hotels. This is consistent with the cannibalization results presented above. I find effects of

inconsistent sign and significance for the independent hotels variables. This could be due to the high degree of collinearity among the explanatory market structure variables and the comparatively small sample size. The findings for population are of small magnitude and inconsistently signed, which is consistent with the fact that the sample markets were selected because they grew.

Table 8: Analyses of Market Structure and Expansion

	OLS b/se	FE b/se	OLS b/se	FE b/se
1(Entrant)	0.035**	0.069	0.164***	0.180*
	0.02	0.06	0.06	0.11
Stock of Hotels	-0.037*	-0.238***	-0.047	-0.390***
	0.02	0.05	0.04	0.06
Other Branded	-0.043***	0.001	-0.012	0.057*
	0.01	0.01	0.03	0.03
Premium Independent	0.026**	0.026**	0.001	0.001
	0.01	0.01	0.03	0.05
Budget Independent	-0.006	-0.006	-0.021**	-0.022
	0	0.01	0.01	0.03
Population ('000)	0.013***	0.012***	-0.006	-0.006
	0	0	0.01	0.01
Income ('000)	0	0	0.006	0.006
	0	0	0	0.02
Firm Effects	Yes	No	Yes	No
Market Effects	Yes	No	Yes	No
Firm-Market Effects	No	Yes	No	Yes
Year Effects	Yes	Yes	Yes	Yes
Observations	8394	8394	762	762

* p<0.10, ** p<0.05, *** p<0.01 in two-sided tests. Standard errors clustered at market-level for OLS models and market-firm level for FE models.

Overall, I find that the results for market growth strongly support the theoretical model's predictions about the viability of spatial preemption in industries where consumers are highly affected by branding. Consistent with the model's predictions, I find that growth is much more likely to take place on the extensive margin via entry by new (albeit nationally recognized firms) rather than via expansion by incumbents. Moreover, like my findings for hotel revenues, these results are highly robust. For example, Table A-4 in the Appendix shows the results of models

when I impose stricter limits on the proximity between markets. In addition, the Table also shows the results of IV models of the larger non-shrinking markets sample. In both cases, the results are quite similar to those of my baseline models.

My results also are qualitatively robust to reparameterizing the representation of market structure in more non-linear fashion. Furthermore, although not shown, the results are qualitatively robust to different assumptions about the timing of market structure changes. In particular, I explored simply looking at one year changes in market structure for all quarters rather than simply one quarter per year. Intuitively, this did not lead to substantially different results. Finally, controlling for whether or not an incumbent is a monopolist does not fundamentally change the results. Details are available upon request.

7 Conclusion

In many settings where spatial preemption might be expected to produce tightly concentrated industry structures, firms share the market instead. I explore these issues in the context of the hotel industry, whose local markets resemble the stylized set-up of Eaton and Lipsey (1979), but also are characterized by strong brand preferences. I develop a strategic investment model that suggests that strongly varied consumer opinions about firms, such as might be created by the nationwide marketing campaigns common in the hotel industry, inhibit spatial preemption by exacerbating intra-firm cannibalization. Extensions to the model accommodate stylized facts in the hotel industry such as brand proliferation and multi-firm franchising arrangements, which relax intra- and inter-firm competition, respectively. I test the model's predictions using rich longitudinal data on Texas hotels. These data strongly support the model's predictions insofar as I find very large intra-firm revenue cannibalization effects, which can be mitigated via the use of different brands. Moreover, the intensity of inter-firm competition appears to be relaxed when two hotel firms both use the same local franchisee. Finally, I find that growth in the sample markets is much more likely to occur on the extensive margin through entry rather than on the intensive margin through incumbents'

expansion.

Overall, the paper contributes to an emerging literature focusing on how factors relating to a national firm's identity may impact local competitive interaction. My results suggest that when consumers are nationally drawn, being a local first-mover provides no long-term advantages. By contrast, the results in Bronnenberg et al. (2009, 2010) indicate that when consumers are drawn locally, advertising can help firms retain their dominant status. In future work, I hope to integrate greater consideration of the determination and preservation of brand preferences into an analysis of dynamic product market competition.

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Appendix A

Table A-1: Qualities of Nationally Branded and Unbranded Hotels

	Quality Tier		
	Low	High	Total
Accor	931	106	1,037
AmericInn International	0	24	24
America's Best Franchising	0	61	61
Budget Host	120	0	120
Candlewood Hotel Co.	0	3	3
Carlson Hotels Worldwide	0	104	104
Choice Hotels	0	2,340	2,340
Continent	0	1,685	1,685
Drury Hotels	0	9	9
Extended Stay Hotels	0	90	90
Hilton Hotels Corporation	0	827	827
Hyatt	0	125	125
La Quinta	0	828	828
Marriott International	0	638	638
Starwood	0	55	55
Vantage	0	343	343
Wyndham	0	3,505	3,505
Independent	13,730	3,488	17,218
Total	14,781	14,231	29,012

Table A-2: Brands Affiliated with each Firm

Firm	Chain	Observations
Choice Hotels	Clarion Inns & Suites	50
	Comfort Inn	721
	Comfort Suites	428
	Econo Lodge	591
	Quality Inns & Suites	383
	Rodeway Inn	83
	Sleep Inn	84
Continent Hotels	Candlewood Suites	27
	Crowne Plaza	2
	Holiday Inn	436
	Holiday Inn Express	1,211
	Staybridge Suites	9
Hilton Hotels	Embassy Suites Hotels	39
	Hampton Inn	671
	Hilton	36
	Hilton Garden Inn	5
	Homewood Suites by Hilton	76
La Quinta	La Quinta Inns	828
Marriott International	Courtyard	135
	Fairfield Inn	320
	Residence Inn	123
	Ritz-Carlton	15
	Springhill Suites	11
	Towneplace Suites	34
Wyndham	Baymont Inn & Suites	40
	Days Inn Worldwide	1,488
	Hawthorn Suites	7
	Howard Johnson International	243
	Knights Inn	1
	Microtel Inns & Suites	2
	Ramada	594
	Super 8 Motels	928
	Travelodge Hotels	170
	Wingate	32

Table A-3: Robustness Revenue Regressions: Markets at least 20 miles apart.

	OLS b/se	FE b/se	IV-FE b/se
Same Firm	-0.076	-0.187***	-0.248***
	0.06	0.06	0.06
Different Firms	-0.140***	-0.099***	-0.126***
	0.02	0.02	0.02
Premium Independent	-0.073	-0.063	-0.051
	0.05	0.04	0.04
Budget Independent	0.016	-0.009	-0.015
	0.02	0.02	0.01
Population ('000)	0.008*	0.009	0.016**
	0	0.01	0.01
Income ('000)	0.016	0.015	0.016*
	0.01	0.01	0.01
Firm Effects	Yes	No	No
Market Effects	Yes	No	No
Hotel Effects	No	Yes	Yes
Quarter-Year Effects	Yes	Yes	Yes
Observations	3263	3263	3096

* p<0.10, ** p<0.05, *** p<0.01 in two-sided tests. Standard errors clustered at market-level for OLS models and hotel level for FE models.

Table A-4: Robustness Entry Regressions

	IV		distance > 20		distance > 20	
	OLS	FE	OLS	FE	OLS	FE
	b/se	b/se	b/se	b/se	b/se	b/se
1(Entrant)	0.038**	0.134	0.004	-0.061	0.116	0.017
	0.02	0.12	0.04	0.08	0.12	0.19
Stock of Hotels	-0.019	-0.260***	-0.062**	-0.368***	-0.01	-0.458***
	0.03	0.1	0.03	0.06	0.05	0.09
Other Branded	-0.029	0.029	-0.051***	0	0.02	0.084
	0.02	0.02	0.01	0.01	0.03	0.05
Premium Independent	0.02	0.019	0.004	0.008	-0.090**	-0.067
	0.02	0.02	0.02	0.01	0.04	0.08
Budget Independent	-0.007	-0.008	-0.011***	-0.011*	-0.043**	-0.058
	0	0.01	0	0.01	0.02	0.04
Population ('000)	0.011	0.009	0.017***	0.020***	-0.01	-0.004
	0.01	0.01	0	0	0.01	0.02
Income ('000)	0.001	0.001	0	0	0.027	0.011
	0	0	0	0	0.02	0.03
Firm Effects	Yes	No	Yes	No	Yes	No
Market Effects	Yes	No	Yes	No	Yes	No
Firm-Market Effects	No	Yes	No	Yes	No	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7326	7326	7669	7669	529	529

* p<0.10, ** p<0.05, *** p<0.01 in two-sided tests. Standard errors clustered at market-level for OLS models and hotel level for FE models.

Appendix B

In this section, I provide the results of numerical solutions to the theoretical model. In these simulations, I assume that the μ are all drawn from normal distributions with mean 0 and standard deviation σ. I show the relationship between heterogeneous brand preferences and cannibalization by varying the parameters affecting the variance of consumers' heterogeneous brand preferences (σ) and the baseline benefit to staying in one of the hotels in the market (δ). Code for the simulations is written in Matlab 7.8 by the author and is available upon request.

Table B-1 shows the prices, revenues, and market shares for one hotel under different market structures for different parameter values. The first column of the Table indicates the behavior and payoffs for one hotel in a 2-hotel market where both hotels are affiliated with a single brand. Column two indicates the results for one hotel in a duopolistic market. Column 3 shows the results for one hotel affiliated with a 2-hotel incumbent in 3-hotel markets. Column 4 indicates the results for the entrant in such markets.

As described in the text above, the results show that as the magnitude of σ grows relative to δ, the returns to adding an additional hotel fall for brands. For example, when δ is fixed at 3, the tables show that as σ increases from 0 to 4, the difference between $R^I(2,1)$ and $R^I(1,1)$ falls from 0.28 to 0.19.

Analogous results for franchising markets or those where firms can assign hotels to different brands are available upon request.

Table B-1: Numerical Results of Theoretical Model for One Hotel Under Different Market Structures

		2 Hotels		3 Hotels	
		Monopoly	Competition	Incumbent	Entrant
$\sigma = 0$ & $\delta = 3$	Price	3.00	1.77	2.04	1.63
	Revenue	1.00	0.77	0.52	0.63
	Mkt Share	0.33	0.44	0.26	0.39
$\sigma = 1$ & $\delta = 3$	Price	3.26	2.16	2.44	2.05
	Revenue	0.94	0.86	0.56	0.75
	Mkt Share	0.29	0.40	0.23	0.37
$\sigma = 2$ & $\delta = 3$	Price	3.93	2.87	3.13	2.78
	Revenue	0.93	0.98	0.61	0.90
	Mkt Share	0.24	0.34	0.19	0.33
$\sigma = 3$ & $\delta = 3$	Price	4.81	3.68	3.92	3.60
	Revenue	0.97	1.12	0.67	1.05
	Mkt Share	0.20	0.30	0.17	0.29
$\sigma = 4$ & $\delta = 3$	Price	5.75	4.53	4.76	4.45
	Revenue	1.05	1.27	0.73	1.22
	Mkt Share	0.18	0.28	0.15	0.27
$\sigma = 5$ & $\delta = 3$	Price	6.73	5.37	5.60	5.33
	Revenue	1.14	1.42	0.80	1.38
	Mkt Share	0.17	0.26	0.14	0.26
$\sigma = 6$ & $\delta = 3$	Price	7.75	6.32	6.54	6.23
	Revenue	1.24	1.60	0.89	1.54
	Mkt Share	0.16	0.25	0.14	0.25
$\sigma = 1$ & $\delta = 2$	Price	2.73	1.95	2.19	1.86
	Revenue	0.67	0.66	0.45	0.58
	Mkt Share	0.25	0.34	0.21	0.31