Industry Structure, Segmentation and Competition in the U.S. Hotel Industry

R. Andrew Butters[1]
Thomas N. Hubbard[2],
November 12, 2019 -- DRAFT

This paper provides evidence on the relationship between quality competition and industry structure in the U.S. hotel industry during the past half century. We document that starting in the early 1980s, quality competition came more in the form of costs that vary with hotel size, and less in the form of costs that remain fixed with hotel size, particularly for business travelers. We then show that, consistent with Sutton (1991), industry structure has evolved differently since then in areas that are business travel versus personal travel destinations. Demand increases have been associated with more, but smaller, hotels in business travel destinations. In contrast, the growth in the number of hotels is much smaller, and the growth in average hotel size is much greater, in personal travel destinations. We provide evidence that this change reflects the emergence of two new classes of hotels – limited service and all suites hotels – that did not exist before the early 1980s. These entrants – many of which had high quality rooms but which had limited out-of-room amenities – had a narrower competitive impact on other hotels than the entrants of the 1960s and 1970s, which competed more on out-of-the-room amenities, did, and this led the industry structure to evolve differently. Our results illustrate how increases in concentration can be interrupted or reversed by changes in how firms compete on quality.

[1]Kelley School of Business, Indiana University
[2]Kellogg School of Management, Northwestern University and NBER

1. Introduction

A central implication of Sutton (1991) is that industry structure should be shaped by the form of quality competition – in particular, by whether quality competition comes in the form of investments in fixed costs or variable costs. When quality competition comes in the form of fixed costs, industries tend to be concentrated. Fragmented outcomes are not possible in part because high quality firms' marginal costs are the same as low quality firms' marginal costs. As a consequence, high quality firms can price low enough to attract not only customers who are quality-sensitive, but also those who are not quality-sensitive, and also operate at a high enough scale to make such a pricing strategy optimal. In contrast, when quality competition comes in the form of variable costs, less concentrated configurations are possible. In such cases, quality competition is not scale-intensive. Unlike when quality is produced through fixed cost investments, a high-quality firm's marginal costs increase with its quality, and it is not optimal for the firm to price low enough to attract less quality-sensitive customers. A more fragmented industry structure with many smaller firms, supplying different quality levels, is feasible. Changes in the form of quality competition therefore can lead to changes in industry structure. In particular, a shift from competing on quality through fixed costs to competing on quality supplied through variable costs can lead the industry to consist of more, but smaller firms.

We examine this phenomenon in the context of the US hotel industry by looking at the evolution of its structure during the past fifty years, especially the period between the early 1980s and recently. Figure 1 shows some broad patterns from the US Bureau of the Census' County Business Patterns. The top panel shows the number of hotels; the bottom panel shows the average employment size of hotels. The left part of these charts show a central fact from Hubbard and Mazzeo (2019): the US hotel industry experienced a shake-out between the 1960s and early 1980s, despite the fact that demand for hotels increased substantially during this time. The industry had fewer, but much larger hotels in the early 1980s than the mid-1960s. This previous work tested whether shake-outs were associated with quality competition in the form of fixed cost investments – primarily, swimming pools – and found evidence consistent with this proposition. The right part of these charts show, however, that these trends did not continue past the early 1980s, at least at the national level. Unlike in the earlier period, the number of hotels has increased steadily since the early 1980s, and the average employment size of hotels has only marginally increased, and in fact is nearly constant since around 1990. This paper examines what changed starting in the early 1980s, and how changes in quality competition have shaped the evolution of industry structure since then.

We first provide documentary evidence that this change was catalyzed by a form of a supply shock: the realization by firms that many business travelers did not value out-of-room amenities such as

full-service restaurants, lobbies, or meeting space as much as firms believed, and valued in-room amenities such as larger and better-appointed rooms more than they thought. In the case of Marriott, this insight is well-documented, and was the result of new market research and methods that not only identified that Marriott's and its competitors' offerings were not satisfying these travelers' needs – they were competing on the wrong dimensions for these travelers – but also indicated what amenities these travelers valued. Following this insight, the form of quality competition changed for business travelers, and shifted away from out-of-room amenities to in-room amenities (including larger rooms). One manifestation of this change is that, while a medium-to-high quality hotel without a restaurant was very uncommon in the early 1980s, it has become increasingly common ever since, and is the format used by several of the largest US hotel chains.[1]

Offering either out-of-room amenities or in-room amenities are both forms of quality competition, but the economic implications of competing along these different lines differ. The cost of supplying out-of-room amenities such as swimming pools, restaurants, and meeting rooms, if not entirely fixed, has a significant fixed component in the sense that it does not increase proportionately with the number of rooms in a hotel. In contrast, the cost of supplying in-room amenities such as higher quality chairs or desks, better appointed rooms, or simply larger rooms, varies directly with the number of rooms. Following Sutton (1991), shifting from competing on the basis of the former to the latter can affect industry structure, and lead the industry to consist of more, but smaller, hotels.

We test for this effect by contrasting the evolution of industry structure in different local markets, comparing counties that tend to be destinations for business travel to those which tend to be destinations for personal travel (for example, counties in Georgia versus Florida). We find that industry structure evolved similarly in these areas before the early 1980s, but very differently ever since the early 1980s. In "personal travel" destinations, demand increases were associated primarily with larger hotels, as opposed to more hotels. Looking at changes in hotels' size distribution, we find that this increase in average size reflected, in part, increases in the number of very large hotels. Non-price competition in the form of fixed investments continued in these areas, and quality competition continued to be scale-oriented. However, in "business travel" destinations, the industry evolved very differently. Here, the average size of hotels decreased substantially, and there were many more hotels. Unlike in personal travel destinations, the expansion in the number of hotels was exclusively in small to medium sized hotels, not in very large hotels. These patterns are consistent with the proposition that changes in quality competition – which

---

[1] Today's "limited service" chains include Holiday Inn Express, Hampton Inn, and Fairfield Inn, among others. None of these chains existed in the early 1980s.

shifted for firms competing for business travelers but not personal travelers – led industry structure to evolve differently in these different segments.

We then provide evidence on quality differentiation and segmentation in this industry recently. Our analysis of these data shows different patterns than an analogous study of the industry in 1982, and illustrates how changes in quality competition have led industry structure to be different. Among other things, the relationship between a hotel's price and its size is weaker now than then, and it is now not unusual for a medium-to-high quality hotel to not have a restaurant. Areas that tend to be business travel destinations are no longer more likely to be served by hotels with restaurants; instead they are more likely to be served by all-suites hotels, which tend to be relatively small and compete mainly on the attributes of their rooms rather than amenities that are outside of the room. All of these patterns are consistent with Sutton's broad hypothesis that the way that firms compete on quality shapes industry structure, along with the narrower hypothesis that when firms compete on quality on variable rather than fixed costs, this will tend to lead to more fragmented industry structures.

This paper builds from previous research on quality competition and industry structure that was initiated by Sutton's (1991) seminal work, which combined theory, cross-industry evidence, and industry case studies. Along with several other papers (e.g., Mazzeo (2002a, 2002b), Ellickson (2007), George (2009)), this especially includes Berry and Waldfogel (2010), which contrasts the newspaper and restaurant industries to illustrate how industry structure varies with whether quality competition comes in the form of fixed costs (newspapers) versus variable costs (restaurants). It is also closely related to Hubbard and Mazzeo (2019), which examines the impact of local demand shocks in the form highway openings on local market structure, and how this impact differs depending on the returns to investments in outdoor amenities such as swimming pools.[2] It differs from this previous paper in several ways. First, it looks at the evolution of the industry in much more recent periods, close to the present day. Second, it examines the entire US hotel industry, rather than a relatively small number of local hotel markets that primarily served customers who were passing through the area, rather than those for whom the area was their destination. Third, it focuses the effect on industry structure of a form of a supply shock – insights into customer preferences – that had the potential to affect the structure of many local markets, rather than the effect of local demand shocks that impacted different local markets at different times. Combined, this previous work and our current results illustrate how and why industries can consolidate or fragment with the interaction of demand increases and the form of quality competition. Among other things, it

---

[2] Like Berry and Waldfogel (2010), Hubbard and Mazzeo (2019) also provide cross-industry evidence to illustrate the relationship between quality competition and industry structure: highway openings were only associated with shake-outs in the hotel industry, and not in gas retailing or restaurants, where quality competition is either less important or comes in the form of variable costs.

illustrates how a trend toward increases in concentration – such as that which is worrying policy-makers today -- can be interrupted or reversed by changes in how firms compete on quality.

The rest of the paper is organized as follows. Section 2 briefly summarizes our theoretical framework, which relates quality competition to industry structure. Section 3 provides an overview of the US hotel industry at the beginning of the 1980s and analyzes how hotel amenities varied with whether areas are business or personal travel destinations. We then describe how and why quality competition for business travelers began to change during this period, and relate this to Marriott's well-documented and novel (to the industry) use of segmentation analysis. Our main empirical propositions, which connect these events to changes in industry structure, follow. Section 4 investigates the evolution of industry structure before and after the early 1980s in light of these empirical propositions. Section 5 investigates current patterns in the industry, and shows how the relationship between hotel size and amenities differs greatly from the early 1980s, reflecting in part the development of new business formats – limited service and all-suites hotels where quality is less dependent on scale. Section 6 concludes.

2. Quality Competition and Industry Structure

Our analytical starting point is Sutton (1991), which presents theory and evidence on the determinants of industry structure. Sutton distinguishes between two types of industries: those where sunk costs are exogenous, and those where sunk costs are endogenous. In the former, firms decide whether to enter, and entering firms then compete on price. Entering firms incur an exogenous fixed cost, which one might interpret as a "ticket to admission" to the industry, or as the fixed cost of operating a technologically efficient plant. Firms must incur this fixed cost to enter, but have no incentive to incur any additional such costs. Sutton shows that fragmented outcomes are possible in such an industry. If the size of the market is large relative to this fixed cost, and price competition is not strong, such a market can consist of many firms.

Sutton then models industry structure where sunk costs are endogenous. In this model, entering firms not only incur an exogenous fixed cost, but can also choose to make fixed-cost investments that increase the real or perceived quality of their offerings. Sutton shows that, in contrast to the case where sunk costs are exogenous, fragmented outcomes are not possible, even if the size of the market is large and price competition is weak. The logic behind this result is that if the market is large and price competition is weak – conditions that would lead an exogenous sunk cost industry to be able to support many firms – this is exactly when a firm's incentive to make fixed-cost, quality-increasing investments are high: an investment that attracts a certain proportion of a market's customers implies more customers

4

the larger the market, and each of these customers brings with them more incremental profits when price competition is weak. However, firms' strong incentives to make such investments mean that their fixed costs – including both the exogenous sunk costs and these endogenous investments – will necessarily be high, and this limits the number of firms that can be viable in a free-entry equilibrium, even when market size is arbitrarily large.

Sutton's analysis illustrates how quality competition can shape industry structure: when quality competition comes in the form of fixed-cost investments – that is, investments that can be scaled across customers – quality competition will lead industries to be concentrated. Firms making these investments not only attract quality-sensitive customers, but also those who are less quality-sensitive, because these firms' marginal costs remain low and they can operate at a high enough volume to be viable at prices that attract less-quality sensitive customers. Sutton's analysis also shows how quality competition can affect how industry structure adjusts to market size increases. It indicates that when such competition comes in the form of fixed-cost investments, increases in market size will lead firms to increase these investments, and this more intense quality competition will lead the adjustment to industry structure to come more in the form of larger firms, and less in more firms, than it otherwise would.

As Sutton emphasizes, the connection between quality competition and industry structure is different in industries where quality is generated through higher variable costs rather than fixed costs.[3] The reason for this is that investments in quality are not scalable when quality is produced through higher variable costs. Firms producing higher quality products have higher marginal costs. Their offerings attract quality-sensitive customers, but it is not optimal for them to price at levels that would also attract less quality-sensitive customers. Similar to the "exogenous sunk costs" case discussed above, such industries can be fragmented, consisting of many small firms that produce at different quality levels.

Sutton's analysis therefore implies that a shift in the nature of quality competition should affect industry structure. In particular, if quality competition shifts from coming in the form of fixed costs to variable costs, this should lead the industry to consist of more, but smaller firms. Furthermore, it should affect the relationship between industry structure and market size, leading increases in market size to be met more by increases in the number of firms, and less by increases in the size of firms, than it had been.

3. Hotels and Changes in Quality Competition in the Early 1980s

---

[3] See also the discussions in Berry and Waldfogel (2010) and Hubbard and Mazzeo (2019), who test how relationships between market size and market structure differ between industries where quality is produced with fixed versus variable costs.

By the early 1980s, the US hotel industry had largely adjusted to one important transportation-related change in the US economy. The Interstate Highway System was built mostly in the 1960s and early 1970s, and had been almost entirely completed by the mid-1970s. Hotels had entered and exited the industry as these new highways were completed.[4] It was beginning to adjust to a more recent change that would ultimately spur travel: the deregulation of the airline industry. While deregulation promised to increase demand at hotels in the long run, the industry was not growing during this period because of an economic recession: hotel employment was close to flat between 1980 and 1982.

Many hotels were part of chains, and some of the largest were Holiday Inn, Best Western, Quality Inn, and Sheraton. By 1982, 35% of industry revenues were accounted for by hotels that were part of chains.[5] Hotels within chains tended to be operated by franchisees. Most, with Best Western a prominent exception, applied a consistent though not uniform format across their properties. For example, nearly all Holiday Inns had pools and restaurants, but Holiday Inns differed in their architecture and size, among other things. Unlike today, few companies operated multiple chains, or had brand extensions. The most prominent instance of a company operating multiple chains was Quality Inn, which first established its Comfort Inn hotels in 1981.

To provide a sense of competitive conditions in the industry during this time, we collected data from 1983 AAA TourBooks (which likely reflect data collected in 1982). Our sample includes all hotels in the continental US listed in these books, except in the states of Alabama, Louisiana, and Mississippi.[6] In all, our sample includes data on 12,360 hotels, which have 1.36 million guestrooms; comparing these to 1982 Economic Census reports, these account for 35% of US hotels, and 58% of US guestrooms. For each hotel, we collected data on their location (e.g., city and county), the list price of a room with one bed and two persons, amenities (e.g., a restaurant, a pool), and AAA's rating of the hotel in "diamonds." This rating ranges from one to five and represents "a combination of the overall quality, range of facilities, and level of hospitality offered by a property."[7]

Figure 2 shows the average price and size distribution of hotels within chains with more than 10 hotels in our AAA sample, and among hotels in this sample that are not affiliated with a chain.   The grey bar in the number of rooms distribution depicts the 10th and 90th percentiles; the blue bar depicts the 25th and 75th percentile; the dark line depicts the 50th percentile. The average price across hotels in each chain is shown in parentheses. This figure shows several patterns. First, there is a strong relationship between

---

[4] Hubbard and Mazzeo's (2019) estimates indicate that about 90% of the long-run adjustment to highway openings takes place within 8 years after highways open.
[5] 1982 Census of Service Industries, SC82-I-3, Hotels, Motels and Other Lodging Places. Table 4.
[6] We have not yet acquired a TourBook for these states.
[7] See "Approval Requirements and Diamond Rating Guidelines." http://aaa.biz/approved/assets/ diamond_rating_guidelines_lodging.pdf

price and hotel size. Hotels in higher-priced chains tend to be larger than hotels in lower-priced chains, especially when looking across chains with an average price above $45.00. There is considerable variation in hotel size within the higher priced chains, but the relationship between price and size shows up not only in the median, but also at the 10th and 25th percentiles as well. Second, even mid-price, medium-quality (with an average rating of about 2.5) chains tended to consist of fairly large hotels. The median size of Holiday Inns and Ramada Inns in our sample is about 150 rooms. Howard Johnson's are smaller, but the average size in our sample is still 100 rooms.[8] Finally, as noted above there is only one "brand extension" chain in the figure: Comfort Inn, which had only 25 hotels listed in AAA guides in 1983.

Figure 3 plots the share of hotels in major chains with a restaurant and pool, and reports the average AAA rating (number of "diamonds") among hotels in the chain that are listed in AAA TourBooks. This figure shows that most medium and high quality chains (those with an average AAA rating of at least 2.5) had hotels with both pools and restaurants. The three largest medium-quality chains – Holiday Inn, Ramada Inn, and Howard Johnson's – consisted almost entirely of hotels with both restaurants and pools. Chain hotels without restaurants tended to be low-quality hotels. There were two exceptions to this -- Drury and La Quinta -- which had 22 and 100 hotels listed in the AAA guides. From the size distribution figure, hotels in these chains were somewhat smaller and had more uniform sizes than their larger competitors.

We then examine geographic patterns in amenities among hotels in our AAA sample, assessing the extent to which the likelihood hotels have pools or restaurants varies with local climate and the extent to which the hotel is located in an area that tends to be a destination for business travel (as opposed to personal travel). We obtain data on temperatures by county from the North America Land Data Assimilation System (NLDAS), and construct average temperatures by taking the mean of the average high and low daily temperatures. Average temperatures range from about 40 to 75 degrees across our sample, and the mean is about 55 degrees. We construct a measure of the share of travel to counties that is business travel using data from the 1995 American Travel Survey, which surveyed 80,000 households on the origin, destination, and purpose of trips of 100 miles or more, and programs supplied by Severin Borenstein.[9] A full description of how we construct this measure is in the Appendix. This share varies

_____

[8] Best Western hotels and motels tend to be smaller; the size distribution and average price of Best Westerns are similar to the hotels in our sample that are not affiliated with chains. This likely reflects that, unlike other chains, Best Westerns were not required to have a consistent format.

[9] See Borenstein (2010); we thank Severin for his help with respect to these data. Using survey data from 1995 is not ideal for our purposes, either here or later in the paper. However, to our knowledge, this is the only year for which an extensive survey of intercity travel exists. These data were collected in the middle of the period we

predictably across states; for example, the "business travel share" tends to be low in Florida and Colorado counties, and high in Georgia and Texas counties.[10] Most counties' business travel share is between 15%-35%. Counties with large cities, and which tend to receive a high *volume* of business travel tend to be in the upper half of the distribution, but not at the very top because they also are important personal travel destinations. For example, the business travel share of New York, NY (i.e., Manhattan) is 36%. See Figure A1 in the Appendix for a map depicting the business travel share of each county in our sample.

Table 1 summarizes the results of our analysis. In the left panel, the dependent variable is a dummy variable that indicates whether the hotel has a swimming pool. In the first column, we regress this against the average temperature in the hotel's county. As expected, the probability that a hotel in our sample has a swimming pool is higher, the warmer the temperature is. Moving from 45 to 65 degrees is associated with a 30 percentage point increase in the probability that a hotel listed in our 1983 AAA guides has a pool. The second column also includes the business travel share as an independent variable. The coefficient on this variable is small and not statistically significant. The third and fourth columns report results that include only hotels in chains, and include chain fixed effects. These thus indicate the extent to which, within chains, the temperature and business travel share of the area is associated with whether individual hotels have pools. Like in the first two columns, hotels in warmer places are more likely to have pools, but whether hotels have pools is not associated with whether the business travel share is high. This suggests that, at this point in time, whether hotels had pools was related to the local climate, but not whether they were in areas that were business or personal travel destinations.

The right panel reports results from analogous regressions where the dependent variable is a dummy that indicates whether the hotel has a restaurant. The first two columns indicate that hotels are more likely to have a restaurant in warmer places, though this relationship is weaker than the relationship between temperature and pools.[11] The second column indicates that hotels in business travel destinations were more likely to have a restaurant than those in personal travel destinations; increasing the business travel share from 15% to 35% is associated with a 10 percentage point increase in the likelihood a hotel has a restaurant. However, both of these relationships disappear when looking only at chains and including chain fixed effects. Within chains, whether a hotel has a restaurant is independent of both the

---

study in this paper; we assume that the measures that we construct are highly correlated with the measures that we would obtain from years earlier and later in the period that we study.

[10] The county with the highest share of business travel in our sample is El Paso, TX (69%); the county with the lowest is Volusia, FL (5%). See Figure 10 for a map that provides a summary of the business travel share across all the counties in our sample.

[11] A 20 degree temperature difference is only associated 10 percentage point greater likelihood of having a restaurant.

local temperature and whether it is primarily a business travel destination. Thus, the relationship between whether a hotel has a restaurant and the business travel share reflects that chains whose format included a restaurant were more prevalent in business travel destinations than personal travel destinations.

These patterns thus suggest that in the early 1980s non-price competition in the form of pools and restaurants – amenities that are outside of the room and involve fixed costs – tended to be greater in warmer places (especially for pools) and areas that were disproportionately business travel destinations (for restaurants). Much of the rest of our analysis concerns how this evolved over time.

Customer Insight and Changes in Quality Competition For Business Travelers

The patterns in the previous subsection indicate that quality competition tended to be scale-intensive, including competition for business travelers, and included competition in the form of out-of-room amenities. But while it was rare for hotels to compete for business travelers primarily on the quality of their rooms (but, instead on out-of-room amenities) in the early 1980s, some hotels did so. As noted earlier, La Quinta was one of the rare mid-quality chain operators whose hotels did not have restaurants. This was part of the way that its hotels competed for business travelers. One account reports that:

> "La Quinta's unique recipe for attracting travelers to its hotels allowed the chain to prosper during the 1970s and 1980s. La Quinta Inns were designed for male business travelers, especially those employed in sales jobs. Rather than striving to entertain guests, as [CEO] Sam Barshop believed many of his competitors were trying to do, La Quinta simply provided its patrons with clean, comfortable rooms at low prices. Visitors enjoyed comparatively large rooms with large beds and ample space to work. The Barshops were able to undercut competing hoteliers, such as Holiday Inn and Rodeway, by eschewing such amenities as swimming pools, elaborate lounges, and restaurants that were of negligible interest to bustling businessmen."[12]

Competition along these lines increased greatly, however, after other hotel operators, including especially Marriott, began to realize that they were competing on inefficient dimensions for many business travelers.

Early in the 1980s, Marriott operated a chain of large, higher-end full-service hotels that typically had 300-500 rooms. It was concerned, however, that its hotels were not attractive to some segments of travelers, including business travelers seeking medium-quality hotels, and considered developing a new chain that could better serve these customers.[13] Its executives became aware of how segmentation

---

[12] International Directory of Company Histories, Vol. 11. St. James Press, 1995. Also available on http://www.fundinguniverse.com/company-histories/la-quinta-inns-inc-history/.

[13] Much of this and the following paragraphs are based on Wind, et al. (1989), which provides an account of Marriott's early use of conjoint analysis to develop Courtyard by Marriott. We thank Jerry Wind and Lee

analysis being developed in academic research in marketing was beginning to be applied in various consumer product contexts, and hired two prominent marketing professors (Jerry Wind and Paul Green from Wharton) to conduct customer surveys and apply such an analysis toward informing the features and pricing of hotels in this new chain.

The results of this analysis were a surprise to Marriott executives, who thought that hotels in the new chain would simply be smaller versions of existing Marriott hotels.[14] The results indicated that some out-of-room amenities that many hotels offered were not valued by business travelers and as a result certain features, which were "often provided based on traditional hotel management beliefs were not retained [in the new chain], for example, an 'action' lounge, a more upscale restaurant and room service, and more meeting space."[15] Based on this survey, Marriott also decided that the new chain would not offer several typical out-of-room services such as bellmen or concierges.[16] Instead, hotels in the new chain (Courtyard by Marriott) emphasized features of the room itself. The rooms were somewhat larger than standard rooms, with room for a large desk and sofa, and had nicer décor and larger bathtubs than mid-range competitors' rooms had. These hotels did have pools and restaurants, but the pools were mainly functional and did not have slides or diving boards, and the restaurants were small and offered only a limited menu – in part because Marriott's customer survey indicated that the business travelers they were targeting valued having a good restaurant nearby, but not necessarily in the hotel itself.

Wind, et al. report that hotels in the new chain were not only successful, but their innovative format was imitated by competitors: "The success of the effort has caused a restructuring of the midprice level of the lodging industry…[a]t least five new *Courtyard by Marriott* clone chains have been initiated by other hotel groups. They all offer a high-end hotel room at a midlevel price."[17] Changes in how Marriott competed on quality thus led to changes in how other hotel operators did as well. Along with La Quinta and Marriott's followers, these changes led to the "limited services" segment of the hotel industry.[18]

We treat Marriott's insight as an innovation: a form of a supply shock. This innovation was highly visible and changed how hotel operators competed, orienting them toward competing more for

---

Pillsbury, an executive at Marriott who helped catalyze this analysis and Courtyard's launch, for several valuable discussions. See also Goldberg, et. al. (1984), which describes and publishes results from this conjoint analysis.

[14] Wind, et al, p. 39.

[15] Wind, et al, p. 39.

[16] They also offered customers the ability to check out without stopping at the front desk, by issuing a bill under the customer's door.

[17] Wind, et al, p. 40.

[18] Later, this in turn led to the emergence of an all-suites segment, where even fewer amenities were "out-of-the-room" and quality competition was almost exclusively on the rooms themselves.

business travelers on in-the-room amenities and away from competing on out-of-the-room amenities.[19] In terms of the economics, it changed the form of quality-enhancing investments. The cost of supplying out-of-the-room amenities such as restaurants and pools has an element that is fixed in the sense that it does not vary with the size of the hotel, and can be scaled across many customers at once. In contrast, the cost of supplying in-the-room amenities, including simply a larger room, varies directly with the number of rooms. Quality competition for business travelers thus increasingly came in the form of variable costs, and less in the form of fixed costs.

Applying Sutton's theory, one would expect such a change in the form of quality competition to affect industry structure. In the long run, it should lead to a more fragmented structure with more, but smaller, hotels. Furthermore, it should lead the industry to adjust to increases in demand more in the form of more hotels, and less in the form of larger hotels, after the form of quality competition shifted.

We test these propositions by examining how the evolution of industry structure differed in different areas in the U.S. starting in the early 1980s. We exploit the fact that travel to some areas of the country is disproportionately business travel, while travel to other areas of the country is disproportionately personal travel. If the propositions above are true, the industry should evolve differently in different areas: the "shock" should affect how firms compete more in areas where the "business travel share" is higher. Therefore, one should observe increases in demand to be met more in the form of more hotels, and less in the form of larger hotels, in areas where the business travel share is high than low.

4. The Evolution of Industry Structure

Our analysis of changes in the number and size of hotels over time, and how these vary across different regions, relies on the Bureau of the Census' County Business Patterns (CBP) data. Our sample years include 1974-2015.[20]   Our series come from SIC Code 7010 (Hotels and Motels) from 1974-1994, and then SIC Code 72110 (Hotels (Except Casino Hotels) and Motels) from 1995-2015.[21]

---

[19] For example, see By (1985), Wysocki (1989), Hotel & Motel Management (1995), Koss-Feder (1996a, 1996b).

[20] Starting in 1974, CBP reported the number of hotels in a county. Before then, it reported the number of firms operating hotels in a county, and thus a firm that operated two hotels was counted once rather than twice. Starting in 1974 provides us with a consistent measure.

[21] Casino hotels are only tracked separately after the movement to NAICS codes in 1995. We drop counties in Nevada, the Atlantic City-Cape May, NJ MSA, and the Shreveport-Bossier City, LA MSA, counties where casino hotels were prevalent before the mid-1990s, so that our sample does not include the vast majority of casino hotels throughout our time period.

CBP provides annual data on the number of hotels overall, and the number of hotels within various employment size categories (e.g., 1-4 employees, 5-9 employees, and so on). These data are available in all years for all counties. CBP also reports the number of employees in the industry – here, the number of employees at hotels – by county. However, when there are a small number of hotels in a county, the Census does not publish the total number of employees to prevent disclosure of individual hotel information. For these counties and years, we estimate the number of hotel employees in the county by multiplying the number of hotels in each employment size bin by its midpoint and taking the sum, and use this estimate in our analyses.[22] Our final sample includes 3087 counties for 42 years.[23]

We begin by showing the evolution of hotel employment, the number of hotels, and employees/hotel in the United States, and how this evolution has differed in business versus personal travel destinations, using annual data. The left panel of Figure 4 shows these variables between 1974 and 2015, the time period that is the focus of our analysis. The top chart shows that hotel employment increases steadily during this period. The bottom two charts, like Figure 1, show that the number of hotels decreased between the mid-1970s and the early 1980s, then has steadily increased ever since then; in contrast, the average employment size of hotels increased until around 1990 but has been roughly constant at 35 employees/hotel ever since. Thus, increases in hotel employment are accounted for by increases in average hotel size early in our sample period, but increases in the number of hotels later in our sample period.

In the right side of Figure 4, we show how these variables have evolved differently in areas that are business and personal travel destinations. In these charts, and those that follow, we define a "business travel county" as a county that has a business travel share that is in the highest quartile among United States counties, and a "personal travel county" as a county that has a business travel share that is in the lowest quartile among United States counties. In these charts, we normalize each quantity to their 1974 levels, so that we focus on changes over time. These charts show several important facts.

First, up until the early 1980s, all three of these variables evolved very similarly in business and personal travel counties. However, after the early 1980s, these series diverged. The top chart shows that hotel employment increased more in personal travel counties than in business travel counties.[24] By 2015, hotel employment was three times 1984 levels in personal travel counties, but only twice 1984 levels in business travel counties. The middle chart shows that even though hotel employment expanded by more

---

[22] For the largest employment size bin, hotels with 1000+ employees, we use 1000 employees.

[23] 89% of our county-years have positive number of hotels, and for 50% of our county-years there are at least five hotels.

[24] Although explaining this is not the focus of this paper, this suggests that decreases in transportation costs over the past forty years have increased long distance travel for personal trips more than for business trips.

in personal travel counties, the number of hotels did not: the increase in the number of hotels was greater in business travel counties, especially after 2000.

The bottom chart shows a striking pattern. After tracking each other closely through the early 1980s, the average employment size of hotels continued to increase in personal travel counties, but flattened out and then decreased in business travel counties. By 2015, the average employment size of hotels in business travel counties was about 25% smaller than it was at its 1990 peak. The fact that the average number of employees/hotel – as depicted in the left panel – has been roughly constant since 1990 masks very different trends in counties that are business and personal travel destinations.

These trends provide broad support for the hypotheses described above. On average, industry structure evolved differently after the early 1980s than before then. Furthermore, the evolution was different in business travel counties than personal travel counties. In the former, demand increases appear to have been met entirely by increases in the number of hotels and not increases in hotel size; in fact, average hotel size decreased in the long run. In the latter, demand increases were met primarily with increases in average hotel size, and not as much by increases in the number of hotels.

Figure 5 shows the evolution of the number of hotels in different employment size bins, and how this differed in business and personal travel counties. The left panel shows that, among these size bins, the increase in the number of hotels was greatest among those between 10-19 and 20-49 employees; for each of these bins, there were about 10,000 more hotels in 2015 than 1974. The right panel shows that changes in these numbers were greater in business travel counties than in personal travel counties. In contrast there were smaller increases in the number of larger and smaller hotels, and less of a difference in the changes between business and personal travel counties for these other size bins.[25]

A shortcoming of the County Business Patterns data is that it describes hotel size in terms of employment rather than the more natural measure of hotel size, the number of rooms. However, the Economic Census, which is conducted every five years, asks hotels their size in terms of number of rooms and publishes estimates of the distribution of hotels in the United States by room size categories. In the Appendix, we compare the size distributions in terms of employment (CBP) and room size (EC) for the United States in 2012 to get a sense of how the two correspond. We estimate that hotels with 10-19 employees tend to have 60-100 rooms, while hotels with 20-49 employees tend to have 100-250 rooms. Thus the expansion in the number of hotels in our sample period is largely accounted for by increases in these two room size categories.

Long Difference Regressions

---

[25] The main exception to this is the greater decrease in the number of hotels with 1-4 employees in personal travel counties after the mid-1990s.

The next part of our analysis uses long difference regressions to estimate changes in these variables and how these changes differed with the business travel share. These regressions provide further, more formal, statistical evidence that bears on our hypothesis that changes in the way hotels competed led to changes in the long run structure of the hotel industry in the United States.

Our first set of regressions analyzes changes between 1974 and 1982, the period before the customer insight "shock" we describe above. We present results from these regressions in Table 2. In each, the unit of observation is the county. We use the change in the (natural) log of hotel employment, the log of the number of hotels, and the log of employees per hotel between these two years as our dependent variables. Our independent variables are the county's business travel share and its average temperature. We include the latter as a control to account for the fact that the increase in demand for hotels was greater in warmer areas during this time; warmer areas grew faster than colder places in the United States throughout our sample period. We use de-meaned versions of our independent variables; thus, the constant in this and our other regressions represents changes in the dependent variable for a county with an average business travel share and temperature.

The results in the first column indicate that, on average, hotel employment grew during this period, but this growth was smaller in areas with a greater business travel share. The bottom part of the table shows our estimates of the change in ln(hotel employment) at different points in the distribution of the business travel share. These estimates decline from .333 for a county at the 10th percentile to .249 for a county at the 90th percentile which corresponds to a 40% increase in the former and a 28% increase in the latter.

The results in the second column show that, on average, the number of hotels declined during this same period, and there was no difference in this decline between counties with a high and low business travel share. Those in the third column indicate that on average, there was a large increase in hotel size, which was somewhat greater where the business travel share was lower. Together, these results provide evidence that increases in demand during this time were met entirely by increases in hotel size, not increases in the number of hotels, and that this was true irrespective of the county's business travel share.

Table 3 reports the results from a similar exercise, but where the long differences are taken between 1982 and 2015, after the customer insight "shock" that changed the way hotels competed. The coefficient estimates in the first column indicate that, like in the earlier period, hotel employment grew on average, and grew more in counties where the business travel share was low. Our estimates at the bottom of the table correspond to a 92% increase for a county at the 10th percentile but only a 57% increase for a county at the 90th percentile. However, the coefficient estimates in the rest of the table indicate very different patterns than in the 1974-1982 regressions. In the second column, the estimate on the constant is large and positive, not negative: on average, the number of hotels increased during this period.

Furthermore, the positive and significant estimate on the business travel share coefficient indicates that this increase was larger for counties with high business travel shares than those with low business travel shares. In the third column, the estimate of the business travel share coefficient is negative and significant, indicating that the significant increase in average hotel size (denoted by the positive and significant estimate of the constant) is smaller, the higher the county's business travel share. Moving to the bottom of the table, which evaluates the estimated changes in the dependent variables at different percentiles of the business travel share distribution, our estimates imply that no change in average hotel size in a county at the 75th percentile, and an a statistically significant decrease in a county at the 90th percentile.

Table 4 summarizes by depicting our estimates of the change in the log of hotel employment, and how these changes are accounted for by changes in the number and size of hotels, in these two periods. In the early period, the increase in employment varied moderately across counties with their business travel share, and the increase is (more than) accounted for entirely by increases in hotel size. In contrast, after 1982, the increase in employment is primarily accounted for by increases in the number of establishments – even in counties that tend not to be business destinations – but the extent to which it is accounted for by increases in the number of establishments is much greater, the greater the county's business travel share.

These regressions provide more formal, statistical evidence consistent with the hypothesis that changes in how hotels competed in the early 1980s led to changes in industry structure along the lines that Sutton's (1991) framework predicts. Once hotels began to compete more on the basis of what is inside rooms rather than what is outside rooms, industry structure changed, especially in areas where hotels served business travelers rather than personal travelers. In contrast to the preceding period, increases in demand were met by more, smaller hotels, rather than by larger hotels, and this occurred especially in areas that were business travel destinations.

We next turn to long difference estimates of changes in the number of hotels in different size bins. This allows us to examine changes in terms of hotel size distributions, and later to connect them to other evidence on the current characteristics of different sized hotels.

Table 5 reports the results from long difference regressions from our later period where the dependent variable is the change in the number of hotels in the employment size bins reported in the CBP data. The positive and significant estimates of all of the constants indicate that, for the average county, the number of hotels in each of these size bins increased.[26] The increase was greatest for 10-19 and 20-49 employee hotels (which correspond roughly to 60-100 and 100-250 room hotels, as noted above). The

---

[26] Note that our regressions weight observations by hotel employment in the county. Thus, the average county is defined by where the average employee works. Here, the average county, weighted by employment, is approximately the size of Marion County, IN, the county containing the city of Indianapolis, IN.

coefficient on business travel share is positive and significant for several of the regressions examining size categories with fewer than 100 employees, and is negative and significant for the two categories with 500 or more employees. In counties where the business travel share is higher, there was a greater increase in the number of smaller hotels, but a smaller increase in the number of very large hotels.

Figure 6 depicts these results in two charts. The top one shows average increases (i.e., the coefficients on the constants); the bottom one shows our estimates for counties with business travel shares 10 percentage points above and below the average. This shows that while the number of hotels with 10-19 and 20-49 employees (or, roughly 60-100 and 100-250 rooms) increased in both business and personal travel destinations, the increase was greater in business travel destinations.

Figure 7 presents analogous results, but where we weight our estimates by the midpoint of the employment size categories (using 1000 employees for our top category). This figure thus depicts our results in terms of changes in the distribution of hotel employment – which is likely to be closely connected to hotel capacity – across employment size bins rather than changes in the distribution of hotels across these bins. Doing so allows one to see more clearly the effect of the estimated increases in the number of large hotels and how they differ with the business travel share. In particular, the estimates imply large increases in the number of employees working at large hotels in personal travel destinations, but not business travel destinations. In contrast, the opposite is true when looking at smaller hotels. Combined, this indicates that changes in the size distribution of hotels between 1982-2015 took place at different points in the distribution, depending on the extent to which hotels tended to serve business versus personal travelers.

5. Hotels and Quality Competition in the 2010s

We close our analysis by considering hotel-level data from late in our sample period, and conducting analyses similar to our analyses of the 1982 AAA data. This analysis shows the consequences of changes in how hotels have competed. First, the relationship between a hotel's price (or quality) and size is not as sharp as it was forty-odd years ago; today, there are far more medium-to-high quality hotels that do not have hundreds of rooms than there were then. Second, it is common for a medium-to-high quality hotel to not have a restaurant; La Quinta was an exception four decades ago but this is no longer the case. Third, it is no longer the case that hotels are more likely to have restaurants in areas where the business travel share is higher. Fourth, there is a strong, positive relationship between the business travel share in an area and the probability that a hotel in the area is an "all-suites" hotel – a format which, with one notable exception (Embassy Suites), rarely has an accompanying restaurant.

Our data in this section come from the 2014 Smith Travel Research (STR) U.S. Hotel Census database.[27] This database contains information on hotels' location, room size, and some amenities (e.g., whether it has a restaurant, whether it is an all-suites hotel) for a very high percentage of hotels in the U.S.[28] The data also include the upper and lower price range for a daily rate for a double bed room; we use the midpoint as the hotel's price. Finally, the STR classifies hotel chains into six bins according to their quality, from Luxury to Economy. We assign a rating to each of these classifications (e.g., Luxury=5, Upper Upscale=4.5, Upscale=4, Upper Midscale=3, Midscale=2, and Economy=1). For consistency with the rest of our analysis, we include only hotels in the continental United States, and drop all hotels with casinos. Our final sample includes 52,167 hotels; for comparison, the 2012 Economic Census reports there were 49,543 non-casino hotels in the United States.

Figure 8 shows the average price and size distribution within chains with more than 99 hotels in our STR sample, and among hotels in this sample that were categorized by STR as independent. This figure is analogous to Figure 2 above. This figure reveals several differences from what we observed in this earlier Figure's summary of 1982 data. First, while there remains strong association between price and hotel size, it is weaker now than it was then. Hotels in low-price chains tend to be small, but it is not unusual for hotels in medium-high priced chains to be smaller than lower-priced competitors. For example, Homewood Suites (a Hilton brand extension), Springhill Suites (a Marriott brand extension), Staybridge Suites (an Intercontinental Hotels Group brand), Residence Inn (a Marriott brand extension), and Hyatt House (a Hyatt brand extension) all consist of all-suites hotels that are substantially smaller than Radissons, Crowne Plazas, DoubleTrees, or even Holiday Inns. The figure also shows Holiday Inn Express, Fairfield Inn, Hampton Inn, and other large limited service hotel chains that did not exist in the early 1980s, all of which typically consist of hotels with fewer than 100 rooms.

Figure 9 depicts major chains according to the share of their hotels that have a restaurant and the share that are all-suites. We label the largest of these chains, and include their STR rating in parentheses. Unlike in 1982, it is now common for a medium-high quality hotel not to have a restaurant. Several of these are the all-suites hotels in the lower right part of the chart, but others in the lower left of the chart, including Hampton Inn and Holiday Inn Express, are limited services hotels that, like all-suites hotels, also compete primarily on what is inside the room rather than what is outside of the room. All of the limited service and all-suites chains that are highlighted in this figure consist of more than 500 hotels.

We also note in passing Embassy Suites, which in some ways is the exception that proves the rule. Unlike all of the other all-suites chains, Embassy Suites hotels almost always have a restaurant.

---

[27] The timing of these data means that our analysis examines the industry at a point where it was unlikely that AirBnB was having any important economic impact as the industry's "competitive fringe."

[28] The STR data do not have an indicator for whether the hotel has a pool.

They are also far larger than any of the other all-suites chains: the median Embassy Suites has nearly 240 rooms, which is more than double that of nearly all of the other all-suites chains in our data. This suggests that it is not the all-suites format *per se* that is leading industry structure to be more fragmented, but rather the fact that hotels with all suites tend not to also compete on scale-intensive, outside-of-the-room amenities. If more business travelers placed a significant premium on both outside-of-the-room amenities and suites, industry structure likely would have evolved differently.[29] [30]

Table 6 provides additional evidence, depicting the share of hotels with a restaurant, by quality rating, in our 1982 AAA sample and our 2014 STR data. This table shows that this share is similar at the top and bottom of the quality distribution. Few low-quality hotels (one-diamond AAA hotels and "Economy" STR hotels) had restaurants in both years, and most high-quality (four- or five-diamond AAA hotels and "Upper Upscale" or "Luxury" STR hotels) had restaurants in both years. There is a large difference, however, in the middle of the quality distribution. Hotels in the other two STR categories were about half as likely to have restaurants in 2014 as hotels in the other two AAA categories did in 1982, consistent with the form of quality competition shifting away from out-of-the-room amenities for medium to medium-high quality hotels during this time.

Finally, Table 7 reports results from hotel-level regressions that relate whether a hotel has a restaurant or has all suites to the local climate and the business travel share. In the left panel, the dependent variable is a dummy variable that indicates whether the hotel has a restaurant. In the first specification, we regress this indicator on average county level temperature. The regression coefficient of -0.002 is not only statistically significant, but the opposite sign from that in our earlier analysis of 1982 data. Then, it was more common for a hotel in a warmer place to have a restaurant; now, it is less common. Moving from 45 to 65 degrees is associated with a 4 percentage point decline (off an average of 22 percent) in the likelihood a hotel has a restaurant. The second column also includes the business travel share as an independent variable. The coefficient on this variable is small and not statistically significant. The point estimate is about one-sixth as large as the positive and significant coefficient we estimated using 1982 data. In 1982, hotels were more likely to have a restaurant if they were located in a county where the business travel share was high. In 2014, this was no longer true.

The right panel reports results from a similar set of regressions where the dependent variable is a dummy that indicates whether the hotel is an "all-suite" format hotel. The first two columns indicate that

---

[29] Embassy Suites hotels are considered to be particularly popular with female business travelers in part because their design, and perhaps the fact that they have an in-house restaurant which provides for additional security (e.g., Shifflet & Bhatia (1998), Gooch (1997)).

[30] Business travelers who value both, of course, are well-served by hotels that have suites as well as standard rooms, along with out-of-the-room amenities – hotels such as Marriotts and Westins that are in the upper left of this figure.

hotels are more likely to be an all-suite format in warmer places, though this effect is still weak compared to the effects we found for temperature and pools in the 1980s. A 20 degree temperature difference is associated with a 4 percentage point increase in the likelihood a hotel is an all-suite format. The second specification of this panel indicates that hotels in business travel destinations were much more likely to adopt the all-suites format. In particular, increasing the business travel share from 15% to 35% is associated with just over a 3 percentage point increase (or 24%, off an average of 13 percent) in the likelihood a hotel is an all-suite format. We view this effect as economically large given the relative frequency of this format nationally; it is also statistically significant. Both of these relationships disappear when looking at chains and including chain fixed effects—indicating that the patterns found in the previous two specifications occur at the chain/brand extension level. The estimates in the fourth column indicate that within chains, whether a hotel is an all-suite format is virtually independent of both the local temperature and whether it is primarily a business travel destination. This is unsurprising, given that chains generally either consist of hotels that are all-suites or not. The results indicate that all-suites chains are more likely to operate in warmer places where a higher share of demand is business travelers.

Together with our earlier results, these patterns are consistent with the hypothesis that changes in the nature of quality competition have affected industry structure in the way that Sutton (1991) predicts. In the 1980s quality competition in the form of pools and restaurants—amenities that are outside of the room and involve largely fixed costs—tended to be greater in warmer places and areas that were disproportionately business travel destinations (for restaurants). By the mid-2010s this pattern had reversed or strongly weakened. In particular, hotels in high business travel share areas are no longer significantly more likely to have restaurants, and instead are much more likely to have an all-suites format. This all-suites format, as described above, involves competing on the basis of amenities that tend to be inside the room—including more square footage, desks, sofas and kitchenettes. Increasing the quality of these features involve costs that vary considerably – probably close to proportionately – with the number of rooms. Unlike in areas that are predominantly personal travel destinations, while increases in demand in these areas may have led to quality competition, it has not led to larger hotels.

To close this section, we note that comparing the segment of the industry that we have to here excluded from our analysis – casino hotels – with the rest of the industry reinforces the point that the form of quality competition shapes industry structure. As of 2014, twenty-nine of the thirty-four largest hotels, including the seventeen largest hotels, in the US were casino hotels, most of which were located in Las Vegas.[31] These extremely large hotels have an amenity (a casino) where quality competition comes in

---

[31] The other five of the top thirty-four are large hotels connected to a resort. The largest non-casino, non-resort hotel in the US in 2014 was the Hyatt Regency in Chicago, with just over 2000 rooms.

the form of fixed costs. Competition in this segment, especially in Las Vegas, has led to an outcome where hotels are far larger than in the rest of the industry, and increases in demand have been met significantly by larger hotels.

6. Conclusion

Changes in market structures and concentration levels have led to a renewed concern among economists and policy makers that competition has decreased broadly across many industries.[32] However, the welfare implications of such changes, and the appropriate policy response to them, depend critically on whether increases in concentration are the consequences of competition or manifestations of a lack of competition.

Sutton (1991) illustrated that changes in either the strength or form of quality competition can lead to changes in industry structure, including in industries where firms have no meaningful market power.[33] The main part of his analysis showed that when firms compete on quality through fixed cost investments, then increases in demand are met by larger, but not necessarily more, firms. However, a second implication of his model is that changes in the form of quality competition should affect industry structure: if firms begin to compete on quality through variable costs rather than fixed costs, then, increases in demand should be less likely to be met by larger firms, and more likely to be met by increases in the number of firms—a situation that could lead to more fragmented market structures.

Our empirical analysis examines the connections between the nature of competition and industry structure in the hotel industry over the last 40 years. The extended period of our sample is crucial to providing the appropriate lens for the medium- to long-run mechanisms under study. Our results, together with Hubbard and Mazzeo (2019), also show that the link between competition and market structure in an industry might not be stable over time—nor be constant across different segments of the industry even at the same period of time.

By examining the amenity decisions of hoteliers and how the market structure has evolved over the last 40 years, we provide evidence that not only has the form of quality competition changed dramatically but that this change has had differential impact on industry structure across different segments of the market. In contrast to the quality competition between the 1960s and early 1980s documented by Hubbard and Mazzeo (2019), which centered on fixed cost investments like pools, that affect quality outside of the room, hoteliers since the 1980s have begun to compete on quality much more

---

[32] See the discussions in Berry, et al. (2019) and Shapiro (2018, 2019).
[33] In Sutton's framework, firms are symmetric and there are no barriers to entry and thus no firm makes positive profits. The fact that these firms' prices exceed their marginal costs does not imply that they have any meaningful market power.

on amenities within the room. Firms have increasingly competed on quality in the form of variable costs, and this change in the form of competition can be traced to innovations in the hotel industry in the 1980s, most prominently with the introduction of Courtyard by Marriott, and then the consequent development of the "limited service" and "all-suites" hotel formats—formats that simply did not exist previously. Unlike the local demand expansions driven by interstate highway additions that served as the catalyst for shakeouts documented by Hubbard and Mazzeo (2019), the shift in competition during the 1980s flowed from innovations on the supply-side of the market, innovations that resulted from investments in market research and extensive study on the preferences of different segments of customers, particularly business travelers.

Since the 1980s, the nature of competition for business travelers has evolved to emphasize the amenities within the room, while often eschewing other amenities of little value to many business travelers (e.g., an attached restaurant, concierge, large lobby, etc.). This shift in quality competition for business travelers has very different implications for market structure than the form of competition in the prior decades—and the type of competition that has largely continued in predominantly personal travel destinations. In particular, because the form of quality differentiation for the business travel segment centers on in-room amenities as opposed to out-of-room amenities, the advantages of scale are diminished and the tendency for increases in demand to lead to higher levels of concentration are also muted.

Our empirical results reflect this shift in competition by identifying a divergence in the both the change in employment per hotel and the number of hotels serving high business travel share areas relative to high personal travel share areas. Hotels are now less likely to have an attached restaurant, but more likely to have an all-suite format in high business travel share areas. In contrast, 30 years prior, the hotels in these areas were more likely to have an attached restaurant, and the all-suite format was non-existent. Taken together, the results indicate the form of competition for different segments of hotel customers has evolved on dimensions sufficiently different enough on their cost implications of scale to lead to different market structures in different areas of the country. We suspect that the recent trend of massive "micro-hotels," which have extremely small rooms but large, engaging public spaces also reflects the distinct forms of competition across different segments of customers (Karmin, 2015).

Our results indicate that caution should be exercised when drawing conclusions about changes in concentration levels before the forces driving those changes are characterized.[34] In particular, our results underscore the importance of understanding how quality competition shares industry structure, and whether changes in the latter reflect changes in the former. Our results also highlight the possibility that trends in concentration even within an industry might evolve differently across different segments. To the

---

[34] Berry, et al.'s (2019) recent perspectives piece recommends this as well.

extent that these segments are competing to provide quality on different dimensions, and in particular on dimensions that represent different parts of the cost structure, one would expect industry structure to evolve differently.

7. Appendix

Room Size and Employment Size Distributions

In table A1, we compare the room size distribution and employment size distribution for US hotels in 2012; the former comes from the Economic Census while the latter comes from County Business Patterns.

The bottom row reports our estimates of "equivalent room size" intervals for seven employment size bins. We derive these estimates by summing the share of hotels in successive room size bins until the cumulative share of hotels in the number of employees distribution for that size bin is matched. For example, to obtain the room size interval that is equivalent to the 33.2% share of hotels with 1-4 employees, we first bring in the 23.4% of hotels with 1-24 rooms. This leaves a deficit of 9.8% (33.2%-23.4%) in that cell. This, in turn is 51.5% (9.8%/19.0%) of the share of hotels with 25-49 rooms. Assuming that the room size distribution is uniform within this interval, we estimate that hotels with 25-37 rooms (37=25+51.5%*(49-25)) account for 51.5% of hotels with 25-49 rooms, and thus hotels with 1-37 rooms account for the same share of hotels as hotels with 1-4 employees. We then apply the same procedure to estimate equivalent room size intervals for the remaining employee size categories. While inexact, this provides a rough sense of the correspondence between the two distributions.

Construction of a Business Travel Index for Hotels

This section provides more of the details on our construction of the business travel index for hotels that we built using the responses from the American Travel Survey (ATS) from 1995. The ATS was a survey that collected the travel history of individuals at 80,000 U.S. addresses regarding all of their trips above 100 miles taken in 1995.

The business travel indices we built from this survey are intended to be reflective of the share of trips, conditional on involving a hotel stay to a particular MSA (and then linked to the underlying counties) that were reported to be for a business trip. In constructing this index, we largely adopted the approach of Borenstein (2010) with minor revisions to reflect the accommodation focus (instead of air-travel) of our index.

Our business travel index is ultimately the person-weighted share of trip-nights at a hotel in that particular MSA that were reported to be for business purposes. In constructing the number of business trips we constructed a weighted sum of the number of trips which were reported with a purpose of: (i) business (reason code 01), and (ii) combined business/pleasure (reason code 02), where we scaled the

combined business/pleasure trips so that only a half of the person-nights associated with that trip were counted as for business, as in Borenstein (2010). Each of these were one of the 16 possible reasons that could have been given for the reason for the trip (see Table A2). As a robustness check, we also constructed an alternative business travel index in which the trips associated with a "convention, conference, and seminar" (reason code 03) were also included as a business trip, although we view the role of the hotel in these instances as serving an alternative function that is likely to be unrelated to the non-price competition we are focusing on in this paper.

To further ensure the robustness of our result, we also experimented with alternative weighting schemes in constructing the aggregate business trip share for each MSA. As was mentioned above, the baseline weights each person-trip by the household weight and the number of individuals in the travel party. The alternative weighting scheme was also used by weighting each trip by the household weight of the individuals in the travel party and the number of nights stayed away from home. This index weights trips that involve longer nights away from home (and in a hotel) more heavily than the trips of shorter duration.

All the shares constructed, are best interpreted as the share of person-trips to a particular state/MSA at the destination that were reported as being for business or convention related business. These MSA level business indices are then mapped to each of the respective counties that make up the MSA, according to their inclusion in the original ATS survey (BTS, 1995). Consequently, our measures should facilitate county-level analysis, much like Borenstein's (2010) construction of airport specific business travel indices.

An important aspect to be aware of in regards to our constructed indices, relative to the Business Travel Indices of Borenstein (2010) is the role of conditioning on air-travel or staying at a hotel on the distribution of types of trips. For example, trips involving air-travel and trips involving staying at a hotel are much more likely to be for business reasons, than the distribution of all trips in the ATS. Table A2 reports the unconditional, and conditional distributions of all trips in the ATS. While business trips make up about a quarter of all trips in the ATS survey, they make up over 40 percent of trips conditional on air travel or conditional on staying at a hotel.

To provide a general sense as to the areas with high rates of business travel driving hotel demand, tables A3 and A4 report the business travel indices for both the top 10 states (table A3) and the top 10 MSAs (table A4) conditional on the index being constructed on more than 100 trip observations. Together, the tables indicate that hotel demand in the states of Illinois, Georgia, and Texas are likely driven more by business travel as well as select MSAs in the Midwestern part of the country, such as Wichita, KS and Battlecreek-Kalamazoo, MI.

References

Berry, Steven, Martin Gaynor and Fiona Scott Morton (2019), "Do Increasing Markups Matter? Lessons from Empirical Industrial Organization," *Journal of Economic Perspectives* 33(3), 44-68.

Berry, Steven and Joel Waldfogel (2010), "Quality and Market Size," *Journal of Industrial Economics*, 58, 1-31.

Borenstein, Severin (2010), "An Index of Inter-City Business Travel for Use in Domestic Airline Competition Analysis." Accessible at: https://remote3.nber.org/data/bti.html.

Bureau of Transportation Statistics (BTS), U.S. Department of Transportation (1995). "American Travel Survey Technical Documentation."

By, S. S. (1985), "Basic Bedrooms: How Marriott Changes Hotel Design to Tap Midpriced Market --- Company's Courtyard Chain Cuts Room Size, Service; Holiday Inns Fight Back --- Doing Things by the Book," *Wall Street Journal*, Eastern edition edn, New York, N.Y.

County Business Patterns (CBP), 1974-2015. US Census Bureau. Accessible at: https://www.census.gov/programs-surveys/cbp/data.html.

Ellickson, Paul (2007), "Does Sutton Apply to Supermarkets?" *Rand Journal of Economics*, 38, 43-59.

Karmin, C. (2015), "Marriott Hopes Small Rooms are a Big Draw," *Wall Street Journal*, Eastern edition edn, New York, N.Y. Accessible at: https://www.wsj.com/articles/marriott-hopes-small-rooms-are-big-draw-1421780131

Koss-Feder, Laura. 1996a. "Marriott Joins Parade of New Hotel Brands." *Hotel & Motel Management,* 211 (5): 1.

Koss-Feder, Laura. 1996b. "Marriott Rolls out Fairfield Suites Product." *Hotel & Motel Management,* 211 (6): 1.

George, Lisa M. (2009), "National Television and the Market for Local Products: The Case of Beer," *Journal of Industrial Economics*, 57, 85-111.

Goldberg, Stephen M., Paul E. Green, and Yoram Wind (1984), "Conjoint Analysis of Price Premiums for Hotel Amenities," *Journal of Business*, 57, S111-S132.

Gooch, Heather. 1997. "Chains Beef up Security for Safety Sake." Hotel & Motel Management 212 (15): 46.

"High-Rise Courtyard Planned for Atlanta." 1995. *Hotel & Motel Management,* 210 (19): 86.

Hubbard, Thomas N. and Michael J. Mazzeo (2019), "When Demand Increases Cause Shakeouts," *American Economic Journal: Microeconomics*, 11(4), 216-249.

Mazzeo, Michael J. (2002a), "Product Choice and Oligopoly Market Structure," *Rand Journal of Economics*, 33, 221-242.

Mazzeo, Michael J. (2002b), "Competitive Outcomes in a Product-Differentiated Oligopoly," *Review of Economics and Statistics*, 84, 716-728.

Shapiro, Carl. 2018. "Antitrust in a Time of Populism," *International Journal of Industrial Organization*, 61: 714-748.

Shapiro, Carl. 2019. "Protecting Competition in the American Economy: Merger Control, Tech Titans, Labor Markets," *Journal of Economic Perspectives*, 33(3): 69-93.

Shifflet, D.K., and Pawan Bhatia. 1998. "Hotels Must Change to Meet Needs of Female Travelers." *Hotel & Motel Management,* 213 (16): 32.

Smith Travel Research (STR), 2014. "US Census Database, May 2014". Accessible at: https://str.com/data-solutions/census-database.

Sutton, John (1991), *Sunk Costs and Industry Structure*, MIT Press, Cambridge.

Wind, Jerry, Paul E. Green, Douglas Shifflet, and Marsha Scarbrough (1989), "'Courtyard by Marriott': Designing a Hotel Facility with Consumer-Based Marketing Models," *Interfaces*, 19, 25-47.

Wysocki, B. (1989), "The New Boom Towns," *Wall Street Journal*, Eastern edition edn, New York, N.Y.
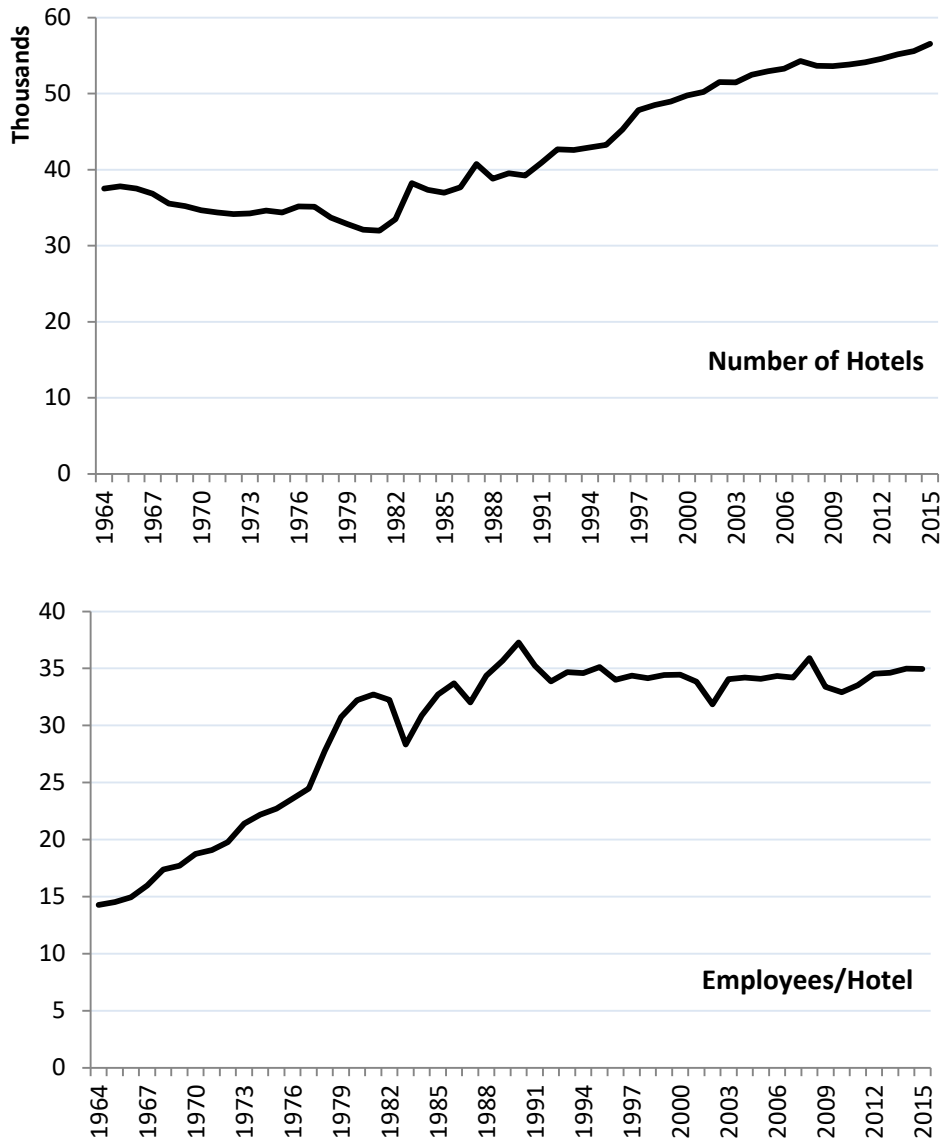
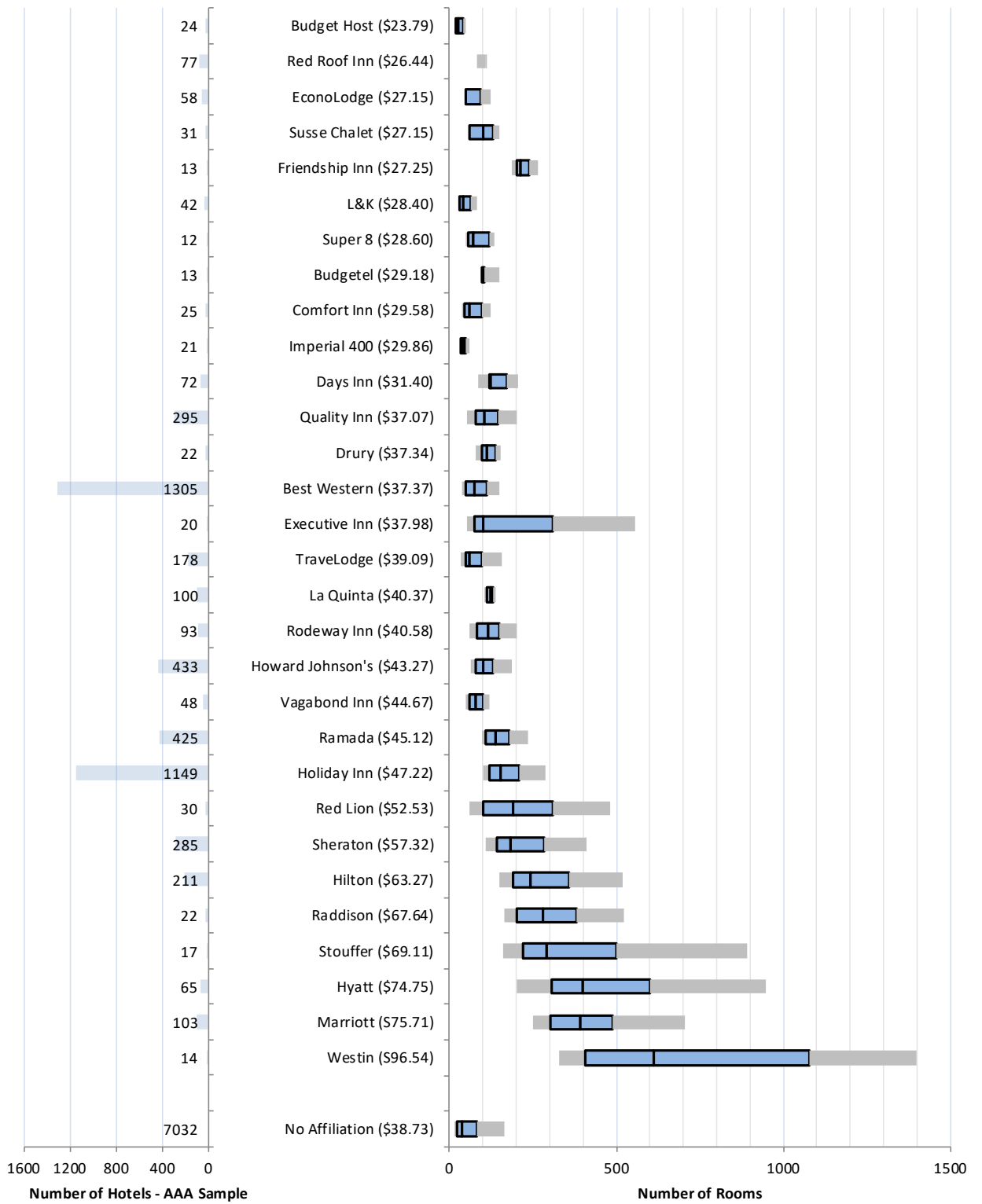**Figure 1. Number of Hotels, Employees/Hotel, United States, 1964-2015.**

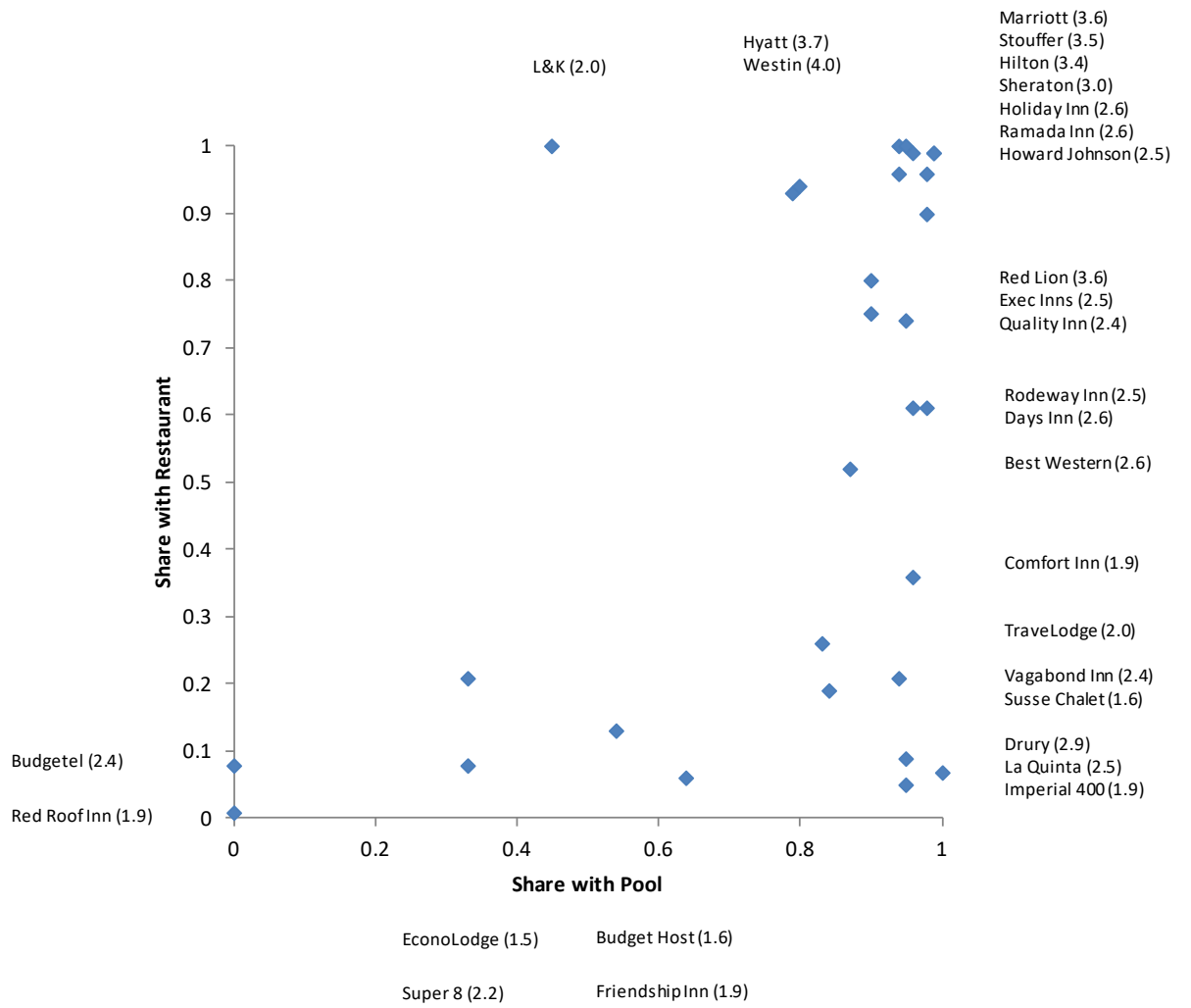**Figure 2. Average Price and Size Distribution of Hotels in Major Chains, 1982.**

Figure 3. Amenities and Average AAA Rating of Hotels in Major Chains, 1982.

Dependent Variable	Hotel Has Pool				Hotel Has Restaurant			
Temperature	**0.015**	**0.015**	**0.005**	**0.005**	**0.006**	**0.005**	0.001	0.001
	(0.001)	**(0.001)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.001)**	(0.001)	(0.001)
Bus Travel Share		0.050		-0.052		**0.508**		0.033
		(0.061)		(0.034)		**(0.089)**		(0.053)
Chains Only?			Y	Y			Y	Y
Chain Fixed Effect			Y	Y			Y	Y
N	12301	12119	5303	5262	12301	12119	5303	5262

Standard errors are clustered by county.

Table 1. Estimates of Relationships Between Hotels' Amenities, Temperature, and Business Travel Share. 1982 AAA Sample
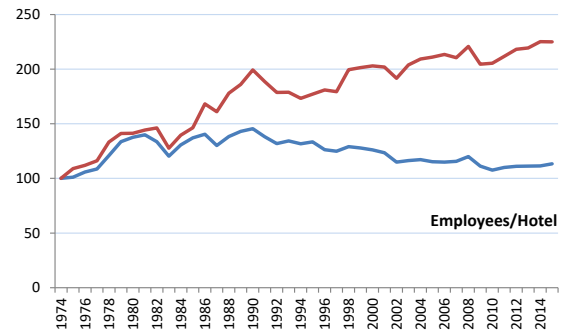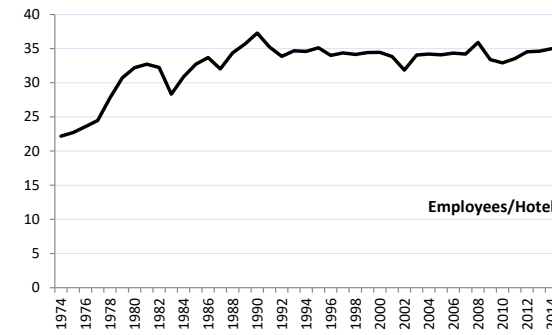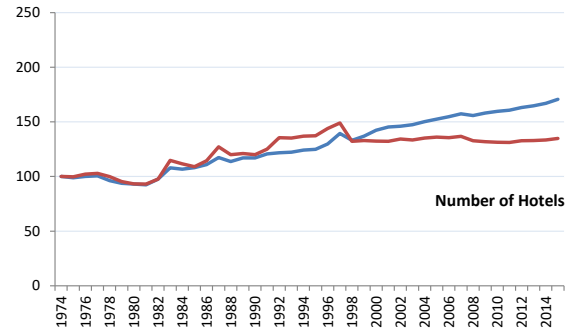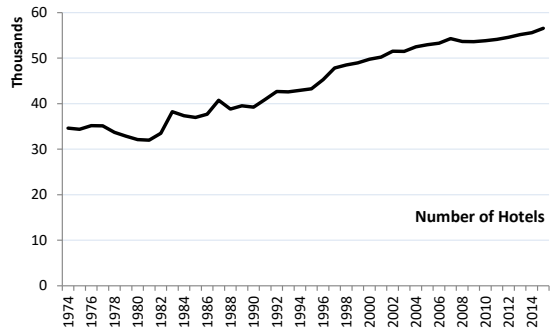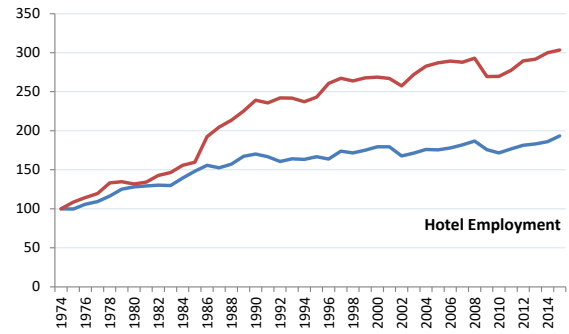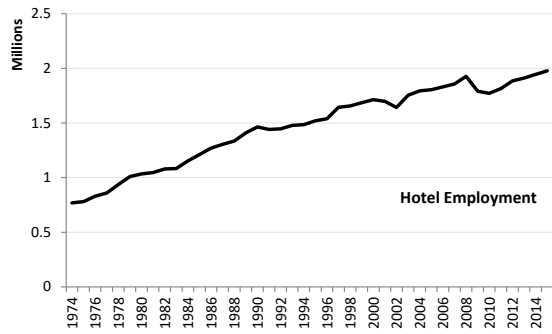
**Figure 4. Hotel Employment, Number of Hotels, Employees/Hotel, United States (black);
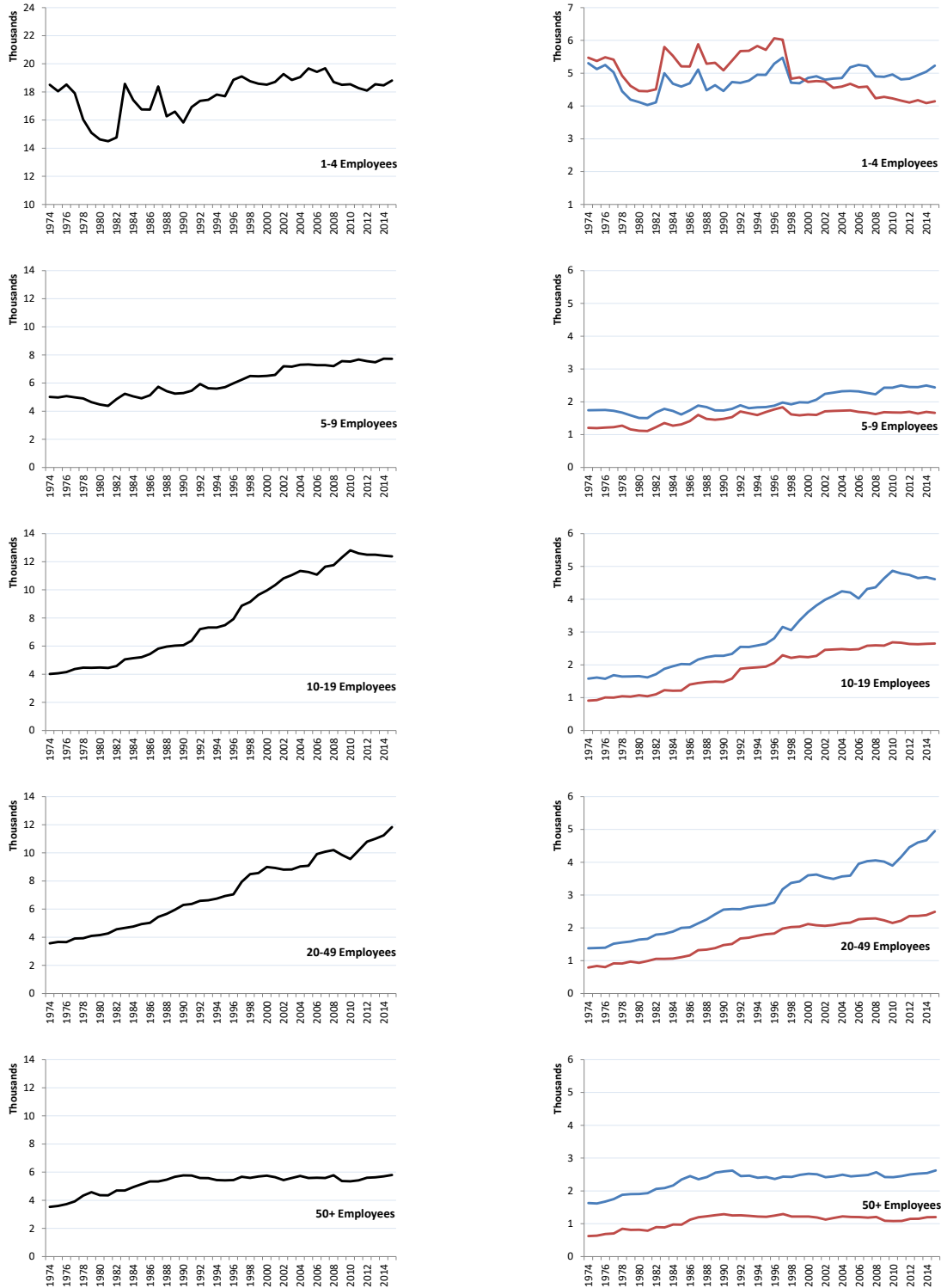Business (blue) and Personal (red) Travel Counties (1974=100).**

**Figure 5. Number of Hotels by Employment Size Category, United States, 1974-2015.
All counties (black), and business (blue) and personal (red) travel counties.**

Coefficient Estimates

	dln(emp)	dln(estab)	ln(emp/estab)
Bus. Travel Share	**-0.364**	-0.018	**-0.346**
	(0.080)	(0.043)	**(0.070)**
Temperature	**0.003**	**0.001**	**0.002**
	(0.001)	**(0.001)**	**(0.001)**
C	**0.289**	**-0.025**	**0.315**
	(0.009)	**(0.005)**	**(0.009)**

Business travel share and temperature variables are deviations from means. Observations weighted by hotel employment in 1978. N=2517

Predicted Changes, Evaluated at Percentiles of Business Travel Share

	dln(emp)	dln(estab)	ln(emp/estab)
10th	**0.333**	**-0.023**	**0.356**
(BTS=15.6%)	**(0.016)**	**(0.008)**	**(0.014)**
25th	**0.309**	**-0.024**	**0.334**
(BTS=22.1%)	**(0.012)**	**(0.006)**	**(0.010)**
50th	**0.290**	**-0.025**	**0.315**
(BTS=27.6%)	**(0.010)**	**(0.005)**	**(0.009)**
75th	0.274	-0.026	0.301
(BTS=31.6%)	(0.009)	(0.005)	(0.008)
90th	**0.249**	**-0.027**	**0.277**
(BTS=38.7%)	**(0.011)**	**(0.006)**	**(0.010)**

Table 2. Long Difference Estimates 1974-1982. Employment, Establishments, Employees per Establishment.

Coefficient Estimates

	dln(emp)	dln(estab)	ln(emp/estab)
Bus. Travel Share	**-0.870**	**0.540**	**-1.411**
	(0.119)	**(0.079)**	**(0.103)**
Temperature	**0.008**	**0.009**	-0.001
	(0.001)	**(0.001)**	(0.001)
C	**0.545**	**0.480**	**0.065**
	(0.015)	**(0.009)**	**(0.013)**

Business travel share and temperature variables are deviations from means.
Observations weighted by hotel employment in 1999. N=2472

Predicted Changes, Evaluated at Percentiles of Business Travel Share

	dln(emp)	dln(estab)	ln(emp/estab)
10th	**0.650**	**0.415**	**0.235**
(BTS=15.6%)	**(0.023)**	**(0.015)**	**(0.020)**
25th	**0.593**	**0.450**	**0.142**
(BTS=22.1%)	**(0.017)**	**(0.011)**	**(0.015)**
50th	**0.545**	**0.480**	**0.066**
(BTS=27.6%)	**(0.015)**	**(0.010)**	**(0.013)**
75th	**0.510**	**0.502**	0.008
(BTS=31.6%)	**(0.014)**	**(0.009)**	(0.012)
90th	**0.449**	**0.540**	**-0.091**
(BTS=38.7%)	**(0.016)**	**(0.011)**	**(0.015)**

Table 3. Long Difference Estimates 1982-2015. Employment, Establishments, Employees per Establishment.

| | | Percent of estimated change in dln(emp) accounted for by estimated change in… | |
Business Travel Share	Estimated change in dln(emp)	dln(estab)	dln(emp/estab)
1974-1982 Estimates			
15.6% (10th percentile)	0.333	-7%	107%
22.1% (25th percentile)	0.309	-8%	108%
27.6% (50th percentile)	0.290	-9%	109%
31.6% (75th percentile)	0.274	-9%	109%
38.7% (90th percentile)	0.249	-11%	111%
1982-2015 Estimates			
15.6% (10th percentile)	0.650	64%	36%
22.1% (25th percentile)	0.593	76%	24%
27.6% (50th percentile)	0.545	88%	12%
31.6% (75th percentile)	0.510	98%	2%
38.7% (90th percentile)	0.449	120%	-20%

Table 4. Estimated Change in Hotel Employment, Decomposition of Change. 1974-1982, 1982-2015.

	Change in Number of Hotels….									
	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000+	Total
Bus. Travel Share	**44.718**	0.259	**31.425**	**40.661**	**11.129**	1.544	1.969	**-5.971**	**-5.755**	**119.981**
	(4.371)	(2.623)	**(3.750)**	**(4.048)**	**(2.101)**	(1.814)	(0.766)	**(0.491)**	**(0.370)**	**(14.800)**
Temperature	**0.414**	**0.354**	**0.837**	**1.166**	**0.070**	0.014	0.076	0.112	0.078	**3.121**
	(0.051)	**(0.031)**	**(0.044)**	**(0.047)**	**(0.024)**	(0.021)	(0.009)	(0.006)	(0.004)	**(0.174)**
C	**3.820**	**3.620**	**15.178**	**20.914**	**5.409**	**5.098**	**1.572**	**1.241**	**0.378**	**57.232**
	(0.532)	**(0.319)**	**(0.457)**	**(0.493)**	**(0.256)**	**(0.221)**	**(0.093)**	**(0.059)**	**(0.044)**	**(1.802)**

Business travel share and temperature variables are deviations from means.
Observations weighted by hotel employment in 1999. N=2741.

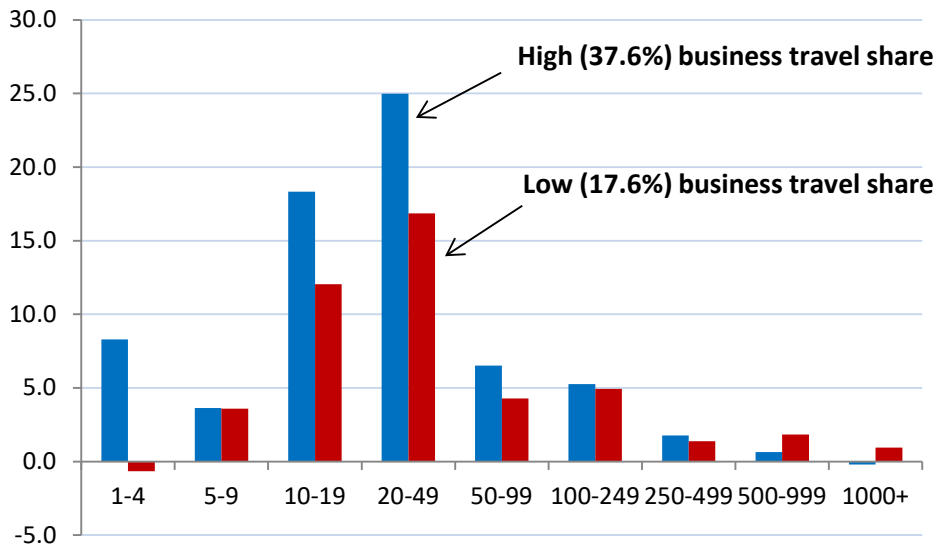**Table 5. Long Difference Estimates 1982-2015. Number of Hotels in Different Employment Size Categories.**
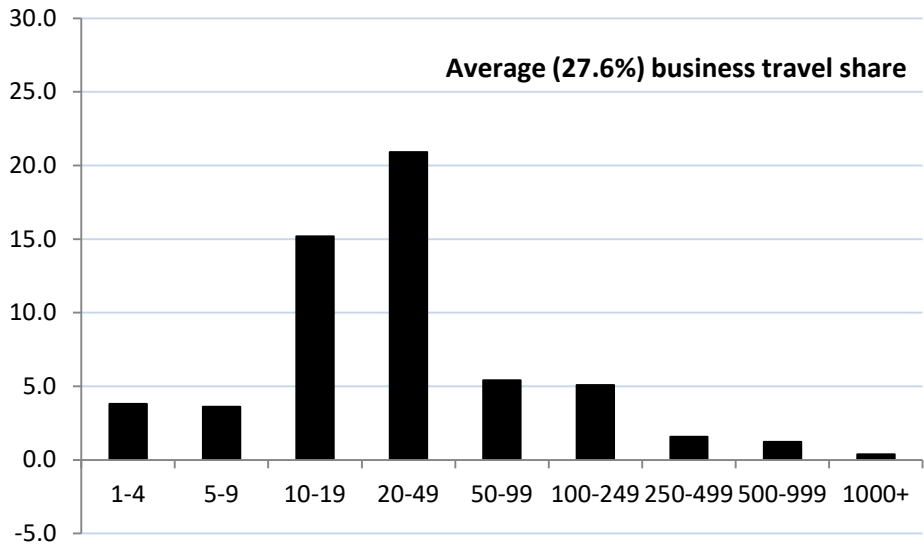
Figure 6. Estimated Change in Number of Hotels in County, 1982-2015, by Employment Size Category.
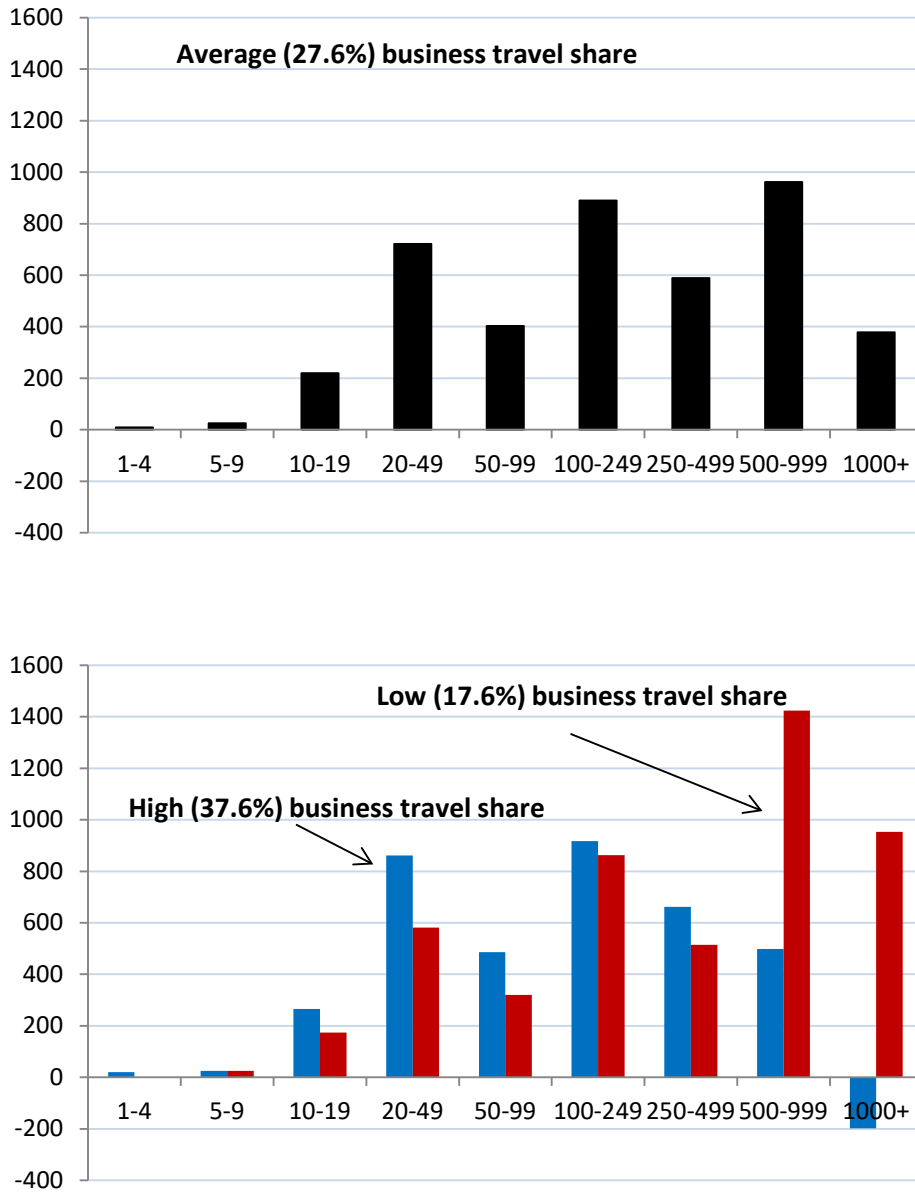
Figure 7. Estimated Change in Hotel Employment in County, 1982-2015, by Employment Size Category.
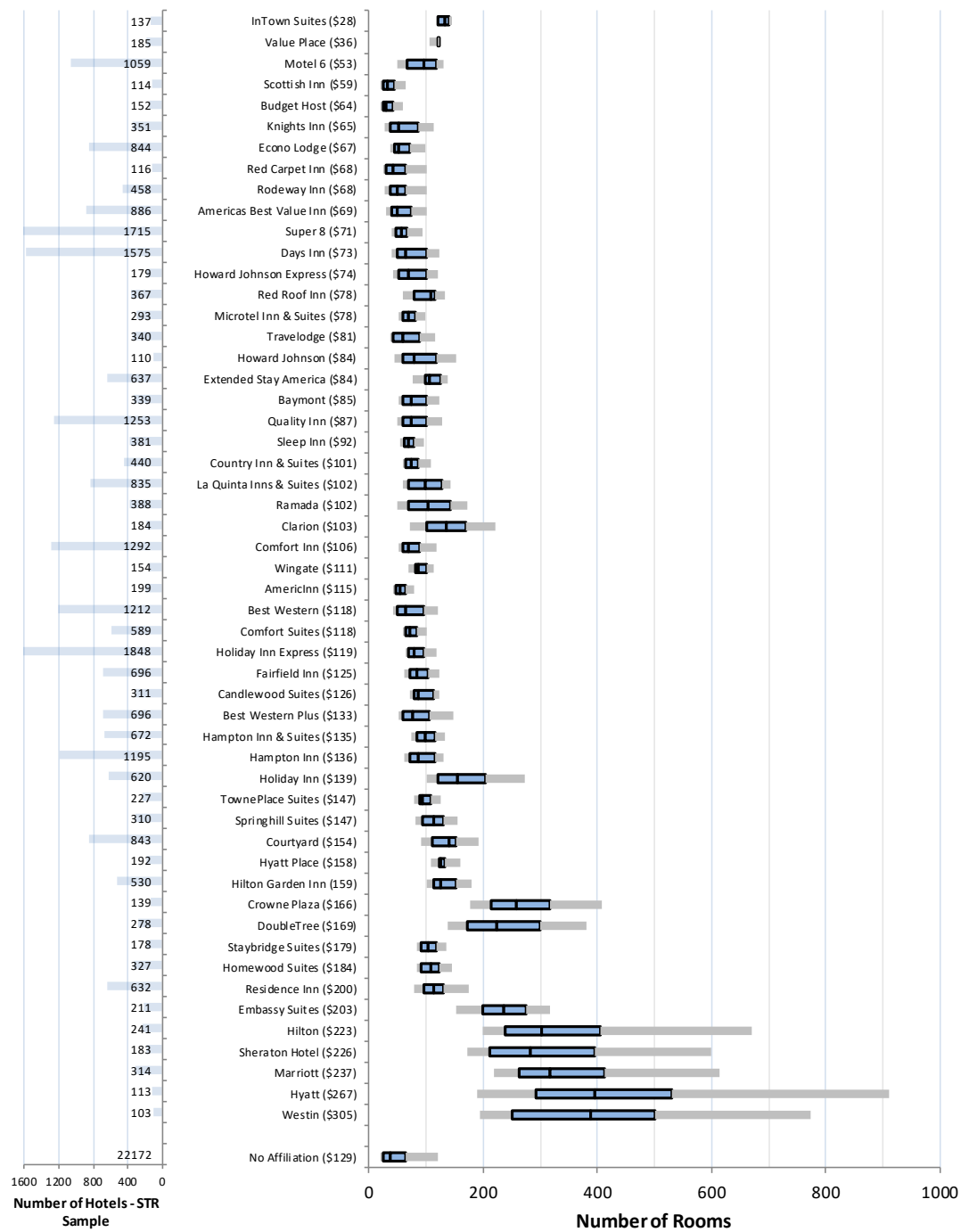
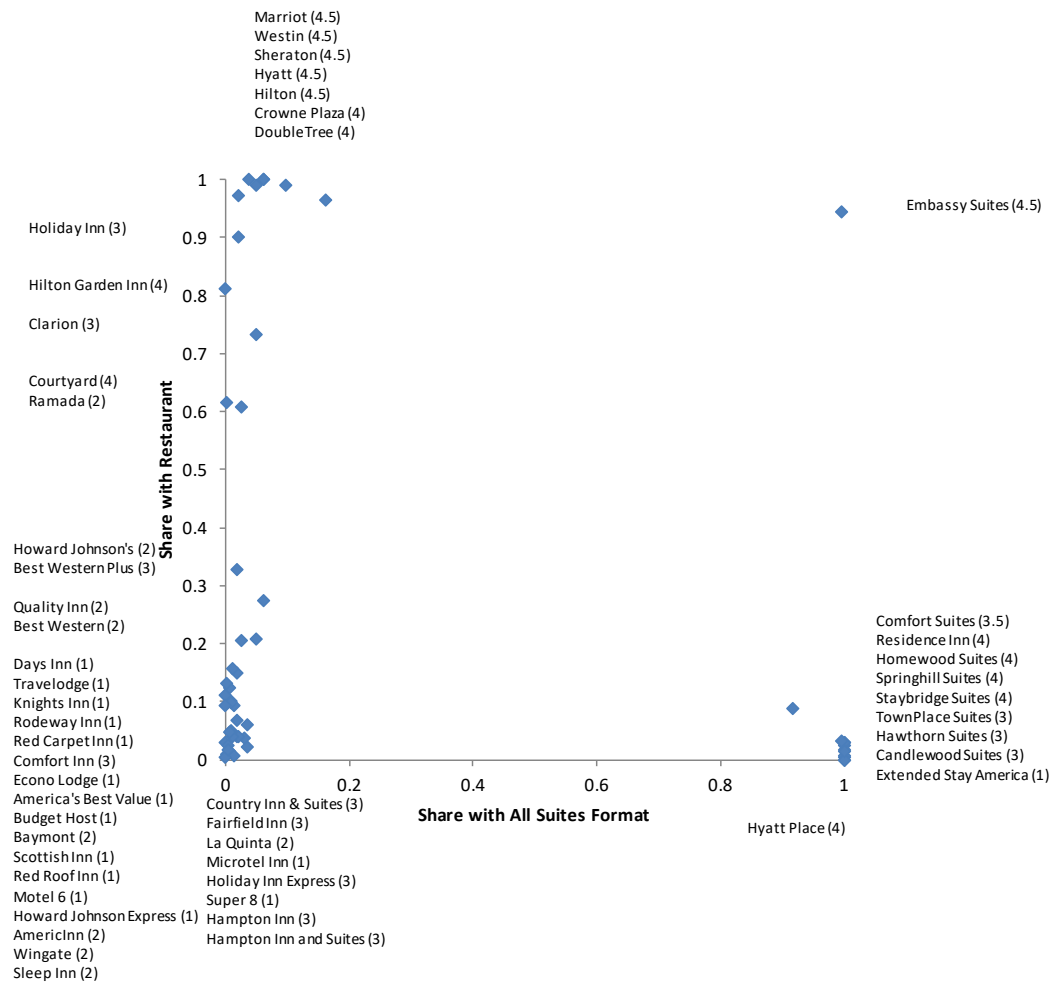**Figure 8.   Size Distribution of Hotels in Major Chains, 2014.**

Figure 9. Amenities and Average STR Rating of Hotels in Major Chains, 2014.

Rating	Share With Restaurant	Representative Chain
AAA Sample, 1982		
1 diamond	0.19	EconoLodge
2 diamond	0.41	Quality Inn, TraveLodge
3 diamond	0.65	Holiday Inn, Best Western (nicer ones)
4 diamond	0.86	Marriott, Hyatt
5 diamond	0.94	Fairmont
STR Sample, 2014		
Economy	0.11	EconoLodge, Motel 6, Super 8
Midscale	0.23	Quality Inn, Ramada
Upper Midscale, Upscale	0.29	Holiday Inn Express, Hilton Garden Inn, Homewood Suites
Upper Upscale	0.80	Marriott, Hyatt
Luxury	0.74	Four Seasons, Park Hyatt, Peninsula

Table 6. Share of Hotels with Restaurant by Quality Rating. 1982 AAA Sample, 2014 STR Sample.

Dependent Variable	Hotel Has Restaurant				Hotel is All Suites Format			
Avg Daily Max Air Temperature (F)	**-0.002**	**-0.002**	**-0.001**	**-0.001**	**0.002**	**0.002**	**0.001**	**0.001**
	(0.001)	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Business Travel Index (travel party weights)		0.081		-0.013		**0.155**		0.019
		(0.061)		(0.022)		**(0.034)**		(0.013)
Chains Only?			Y	Y			Y	Y
Chain Fixed Effect			Y	Y			Y	Y
Observations	52167	52167	30301	30301	52167	52167	30301	30301

Standard errors are clustered by county.

Table 7. Estimates of Relationships Between Hotels' Amenities, Temperature, and Business Travel Share. 2014 STR Sample
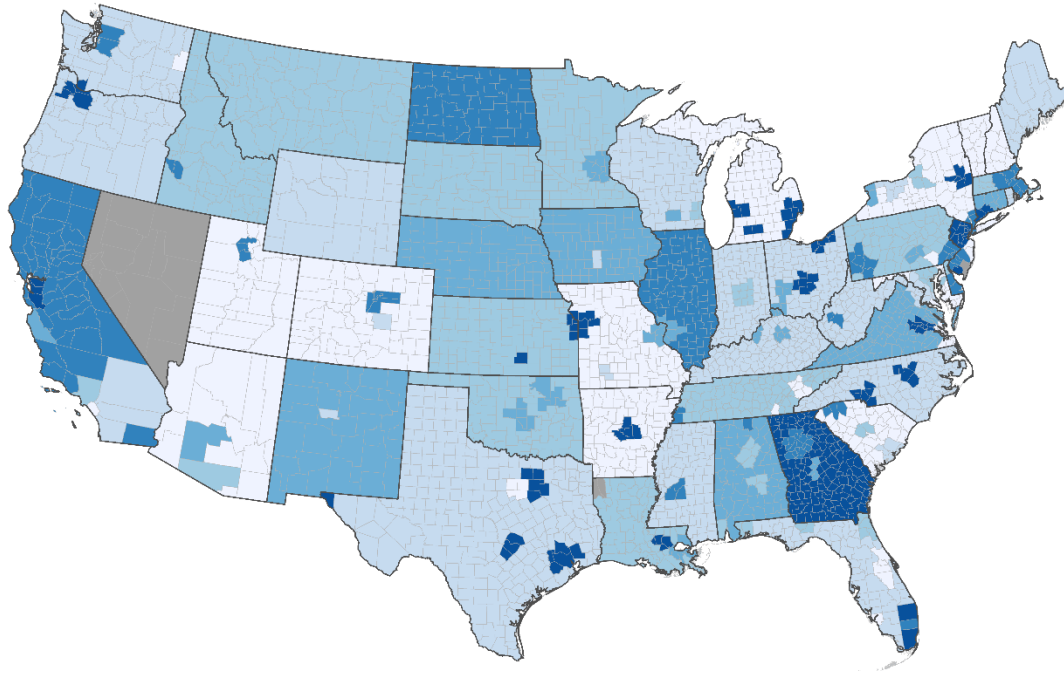
Figure A1. Business Travel Share by County, 1995.

This map depicts the share of travel to each county that is for business. Darker blue denote areas with higher business travel share. Counties that have been dropped from our sample are displayed in gray.

	Number of Rooms						
	1-10	10-24	25-49	50-99	100-299	300-499	500+
Number of Hotels	3805	7072	8816	12970	11654	1407	745
Share of Hotels	8.2%	15.2%	19.0%	27.9%	25.1%	3.0%	1.6%
Cumulative Share of Hotels	8.2%	23.4%	42.4%	70.3%	95.4%	98.4%	100.0%

	Number of Employees						
	1-4	5-9	10-19	20-49	50-99	100-249	250+
Number of Hotels	18102	7561	12502	10795	2482	2009	1108
Share of Hotels	33.2%	13.9%	22.9%	19.8%	4.5%	3.7%	2.0%
Cumulative Share of Hotels	33.2%	47.0%	70.0%	89.7%	94.3%	98.0%	100.0%
Equivalent Room Size Interval	1-37	38-58	59-98	99-254	255-290	291-470	471+

Table A1. Room Size and Employment Size Distribution of Hotels in the United States, 2012.

Reason	All Trips	Trips on Airplane	Trips with a Hotel Stay
Business	26.4	42.4	42.8
Combined business/pleasure	2.3	3.3	3.1
Convention, conference, or seminar	1.6	2.5	3.4
School related activity	3.1	1.8	3
Visit relatives or friends	27.5	22.2	7.4
Rest or relaxation	9.1	8.6	10.4
Sightseeing, or to visit a historic/scenic attraction	3.9	4.5	6.7
Outdoor recreation	6.5	2.7	5.4
Entertainment	5.3	3.9	8.5
Shopping	2.4	0.3	1.5
Personal, family, or medical	11.9	7.9	7.9
Num. Observations	337,520	65,096	101,878

Table A2. American Travel Survey (1995) Reasons for Trip Across Trips with Airline and Hotel Stay.

State	Business Index
IL	0.41
GA	0.39
OH	0.38
KS	0.38
CT	0.37
MA	0.37
ND	0.36
TX	0.36
DE	0.35
OR	0.34

Table A3. Top 10 States for Share of Trips with Hotel Stay Made for Business Travel.

MSAs	Business Index
El Paso, TX	0.69
Worcester, MA	0.68
Wichita, KS	0.64
Newark, NJ	0.61
Stamford-Norwalk, CT	0.60
Baton Rouge, LA	0.59
Albany-Schenectady-Troy, NY	0.57
Miami, FL	0.56
Hartford, CT	0.55
Kalamazoo-Battle Creek, MI	0.55

Table A4. Top 10 MSAs for Share of Trips with Hotel Stay Made for Business Travel.