Boom and Gloom

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Keywords: Investment cycles, booms, herding, competition

JEL Codes: G31, E32, E22, D83, R33
1 Introduction

How well do investments perform, if they were made during a boom? And if their performance is different, can strategic interactions between decision makers help explain the difference in performance? Given the exuberance that characterized many booms, these questions have received plenty of attention (see, e.g., Kindleberger (1978), Greenspan (1996), Akerlof and Shiller (2009), or Glaeser (2013)). However, the type of data needed to study these questions has been lacking.

So far, evidence has been available only in aggregate form. For example, IPOs and private equity and venture capital funds seem to perform less well if they raised funds during “hot” periods.\(^1\) Data aggregated at the firm or fund level, however, makes it infeasible to study whether the strategic interaction among projects in their relevant markets is related to investment booms and their performance. Data at the project level — in clearly delimited markets — is needed to explore whether imitation or competition between investments can help explain some of the booms we observe and the performance of investments made during such booms.

In this paper, we address these issues. We use a proprietary data set on the performance of hotels in the U.S. The data is available at the hotel level, and it contains detailed information about the economic and competitive environment in which each hotel operates.\(^2\) It includes the year of construction for virtually all hotels built in the U.S., and their location, allowing us to identify how aggregate (nationwide) and market-level (in this case, a county) investment booms affect their operating performance. Importantly, investments in the hotel industry are long-lived and irreversible, allowing us to study both the short and long-term impact of local and aggregate investment booms on performance. In addition, the hotel industry is particularly suitable to study the role of strategic interactions on investment booms, as agency problems among decision makers are not a major concern: Most hotels are owned and operated by individuals or partnerships.\(^3\)

We find that investments made during a boom perform significantly less well. Consistent with earlier papers on “cohort effects” for IPOs and PE or VC fund investments (cited above),

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\(^1\) See Ritter (1991); Gompers and Lerner (2000); Gompers et al. (2008); Kaplan and Schoar (2005); or Robinson and Sensoy (2011).

\(^2\) Our data is very detailed. It contains information on hotels’ brands, quality segment, type of location, relevant competitors, hotels’ characteristics, etc. See Section 3 for details.

\(^3\) Institutional details about the hotel industry are described in Section 2.
we find that investments made during aggregate (nationwide) booms perform poorly for a few years. More importantly, we find that after controlling for aggregate booms, investments made during local booms perform significantly less well for a long time: The effects are significant even 30 years after a hotel was built. This underperformance is economically significant. A one-standard deviation increase in the number of hotels built in the same county-year reduces a hotel’s performance by 3-5%. Interestingly, we find that the underperformance of a hotel built during a local boom is driven by the number of hotels from different quality segments entering the same geographic market at the same time.

The underperformance of hotels built during local booms cannot be explained by changes in demand. If more hotels are built because market participants expect a surge in demand, hotels built during local investment booms should not perform worse than otherwise equivalent hotels. Unforeseen competition at the time of entry, which could translate into more within-vintage competition ex post, cannot explain the underperformance, either, for two reasons: First, the start of a construction project is easy to observe for other agents (i.e., entry is foreseeable in the hotel industry); and second, the underperformance we observe is related to the number of hotels that enter in a different quality segment, whereas hotels compete more strongly with hotels in the same quality segment. Although unforeseen competition at the time of entry cannot explain the underperformance we observe, competition is not irrelevant in our setting: We do observe that a hotel’s performance is reduced if it competes with a larger number of hotels in the same segment, irrespective of their vintage.

The literature on herding and informational cascades (starting with Bikhchandani, Hirshleifer and Welch, 1992; Banerjee, 1992; and Welch, 1992) can provide an explanation for the underperformance of hotels built during local booms. According to these models, agents operating in environments with significant uncertainty may base their decisions on the actions of other agents. In trying to infer the private signals of other agents from their observed actions, agents potentially ignore or go against their own privately observed information, resulting in inefficient aggregation of available information and poor investment decisions.

This is also consistent with a “real options” view of investments (for example, capital may be available at a low cost, inducing investors to exercise investment options early); see Grenadier (1996).

We use RevPAR, the standard measure of performance in the hotel industry. Details on this measure are described in Section 2. The underperformance we find reduces the NPV of a hotel project significantly. An example of NPV reduction is given in Section 5.3; details are provided in the Appendix.

There are 6 quality segments: Luxury/Upper-Upscale, Upscale, Midscale with food and beverage, Midscale without food and beverage, Economy and Independent. See sections 2 and 3 below for more details.

In the context of the hotel industry, a developer may decide to enter a particular market, either because demand is generally growing, or because the developer has identified a location that is particularly well-suited for a very specific type of hotel. Given the general uncertainty, a developer’s entry may be regarded as good news about the prospects of investing in a particular market, and a natural response is to enter into that market, but in a different quality segment (to avoid direct competition). This may have detrimental effects on performance if the first developer’s decision was based on the attractiveness of a particular quality segment or location, not on her assessment of the overall market. In particular, if the followers build hotels with quality attributes poorly matched to their chosen location, their investment’s performance will be disappointing.

Our evidence supports this herding interpretation: Hotels perform less well if a larger number of other hotels opened in the same market in the same year, but in a different quality segment. Arguably, the herding explanation is more convincing if the imitators observed the near-completion or opening of the earlier hotels, rather than hearing about plans or initial construction work. We therefore examine whether the number of hotels that entered a given market in the preceding year (but in a different segment) affects performance. We find that it further reduces a hotel’s performance, consistent with the herding interpretation.

We perform several tests to assess further the validity of a herding interpretation for the subpar performance of investments made during local booms. First, we specifically design a test which attempts to measure the relative performance of herders within a county. We classify hotels into 3 different “leader” categories according to whether they were built 3, 2, or 1 years before the peak year, and we classify hotels into 3 different “laggards” categories according to whether hotels were built 1, 2 or 3 years after the peak year. We find that hotels built during the peak of a local investment cycle and hotels built one year after the peak underperform their peers. Neither “leaders,” nor late “laggards” show any statistically significant difference in performance relative to the control group. This is consistent with our herding interpretation, as the “leaders,” by definition, do not take suboptimal decisions by following other’s actions, while late “laggards” have had more time to observe the early performance of “herders” and make a better-informed decision about entry.

Next, we look for evidence of herding behavior at the time of the investment decision, as opposed to inferring herding from the investments’ performance. Under a herding interpretation, massive entry into a market should be positively correlated with the number of entrants in the
preceding year, even after controlling for common market signals. This effect, in turn, should be more pronounced when the common market signals are noisier, as relying on others’ decisions is then more tempting. Consistent with herding, we find that the likelihood of multiple hotel entry increases with the number of entrants in the preceding year, even after controlling for a county’s economic conditions and the stock of hotels in the county. We also find that this effect is stronger in counties experiencing more volatile economic growth.

Overall, the evidence we present suggests that herding behavior is an important factor in explaining investment booms, and that herding can explain why investments made during booms perform less well.

We contribute to the literature by being the first to study the performance of investments made at different points of an investment cycle using disaggregated data. We can distinguish aggregate investment cycles from investment cycles at the local market level. We show that hotels built during investment booms underperform others, but the impact of aggregate investment booms on performance is only short-lived, while the effect of local investment booms is much more long-lasting. Moreover, we can explore the sources of the underperformance of assets created during an investment boom. We show that direct competition at the time of entry is not the key driver of the underperformance of hotels built during investment booms. Hotel underperformance is related to the entry decision of hotels of different quality segments, suggesting that blind imitation — which leads to herding and ultimately to informational cascades — is the most likely driver for the underperformance. Overall, we show that the use of disaggregated data is critical to the understanding of the performance of investments made at different points of an investment cycle.

Our results also contribute to the empirical literature on herding and informational cascades. This literature is quite small, given the challenges in finding detailed data to test for herding behavior. Moreover, most of this literature focuses on settings where career concerns are an important driver of imitation (see, e.g., Welch 2000 for an analysis of herding behavior by security analysts; and Kennedy 2002 for an analysis of TV network programming choices). Our data allow us to focus on information transmission (imitation) and on competition, as in our setting career concerns are not likely to play a role (see Section 2 for details). Our results show that herding leads to poorer outcomes, on average. These results are consistent with those of Welch (2000) and Kennedy (2002), thus providing further evidence that herding behavior leads to poor information aggregation.
The rest of the paper is organized as follows. In Section 2, we describe some key features of the hotel industry. In Section 3, we describe the data. In Section 4, we present our empirical strategy. In Section 5, we describe our results. Section 6 concludes.

2 Investments, Operations and Performance in the Hotel Industry

2.1 Investments in the Hotel Industry

Branded hotels dominate the hotel market in the U.S., but surprisingly few hotels are actually owned by the company that owns the brand (e.g., Marriott International, Starwood Hotels & Resorts, Hilton Worldwide, Hyatt, etc.). Instead, hotels are typically owned by individuals, partnerships or LLCs (limited liability companies), who either operate the hotels themselves or hire management companies. Specifically, around 85% of hotels are owned by individuals, partnerships or LLCs, while only around 10% are owned by large corporations (see Corgel, Mandelbaum and Woodworth 2011). The typical investor who builds a hotel is a real estate developer, who selects a location, negotiates the financing and chooses the organizational form and brand (see below for details) while planning the project.

The hotel industry is thus characterized by a decentralized ownership structure, with very small units making investments and start-up decisions. As only a small fraction of the assets are owned by large corporations, there are no major concerns about bureaucracy or agency problems — including careers concerns — that complicate the analysis in other contexts. In particular, at the planning and investment stage of a hotel, the developer holds equity in the project and thus has a strong incentive to make value-maximizing decisions.

The decision to build a hotel is based on a developer’s assessment of future demand in a particular market. This requires forecasts about the volume of demand for hotel services, but also forecasts about the type of traveler that is expected (business, leisure, etc.). A developer must choose a promising market, a promising site in that market, and identify the most promising quality segment (for branded hotels, the quality segment depends on the chosen brand). Not surprisingly, these decisions are made under uncertainty, and hotels are planned (and construction starts) well before the expected increase in demand materializes.

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8 Investments/ownerships by hotel REITs (real estate investment funds) account only less than 2% of hotels, while other institutional investors (e.g. pension funds or financial institutions) represent usually less than 1% of investors.

9 For example, the recently begun construction of an upscale hotel in the “NoMa” neighborhood of Washington, D.C., is the first investment in a large mixed-use commercial development; see "JBG launches Capitol Square with
Investments in the hotel industry are long-term and irreversible. Developers invest large amounts, financed partly with bank loans (mortgages). Once completed, hotels are long-lived: With occasional renovations, a hotel can be operated for several decades. It is rare for hotels to be closed permanently: According to practitioner comments, conversions (say, into offices, apartments or retirement homes) are extremely rare, and only ½-1% of the existing stock is demolished per year. Sales and bankruptcies do not change the supply of hotel rooms in a given market: They merely change the ownership of a hotel, and maybe the choice of brand under which it operates. Not surprisingly, given the low exit rate, the entry rate in the industry is low, too: On average, the entry rate was 2.9% per year between 1993 and 2006, while the entry rate for other industries was about 10% for the same period (see Freedman and Kosová 2012).

The time needed to plan and construct a hotel varies, depending on the chosen quality segment and (related to that choice) the amenities the hotel will offer (e.g., restaurant, conference facilities). Economy hotels without food or beverage service can be built in one year, but more upscale hotels (with more facilities) can require two to three years. News about a planned new hotel becomes public during the planning stage (e.g., when permits are requested) or once the site clearance and construction work begins. This implies that the decision to build a hotel can incorporate prior decisions to build by others although the construction of these projects might not be finished.

2.2 Operations in the Hotel Industry

The hotel developer can choose to operate the hotel independently or under a nationally/globally recognized brand name (e.g., Courtyard by Marriott, Hilton Garden Inns, etc.), belonging to a large corporation (e.g., Marriott International, Hilton Worldwide, etc.). The choice of brand is also related to the organizational form under which the hotel will operate: Some brands are offered to developers only through franchise agreements (e.g., Microtel, Travelodge) or only through management contracts (e.g., Fairmont, Four Seasons); other brands make no such restrictions (e.g., Courtyard by Marriott).

Under a franchise agreement, the corporation owning the brand (the franchisor, e.g., Hilton Worldwide), grants to the owner/developer of a hotel (the franchisee) the right to use its brand name (Waldorf Astoria, Hilton, DoubleTree, Hampton Inn, etc., in the case of Hilton

new hotel site," Washington Business Journal, Thursday, October 18, 2012. The investment was started based on expectations that demand will materialize once the development is complete.
Worldwide) and to operate the hotel under this brand name. The franchisor does not manage the hotel property, but rather leaves most day-to-day management decisions to the franchisee.

Under a management contract, on the other hand, the corporation owning the chosen brand is hired by the hotel owner/developer to manage the hotel. Thus, the corporation owning the chosen brand handles day-to-day operations and all the management decisions at the given hotel. (Usually, the hotel’s owner cannot interfere with the operator’s management of the property).

Both franchise agreements and management contracts tend to have long time horizons — usually 20 years, with renewal options — but can be terminated before the contract expires under certain circumstances (see Kosová and Sertsios 2012). A consumer normally cannot tell whether a branded hotel is operated under a franchise agreement or a management contract. Each brand targets a particular quality segment defined by the brand requirements, in terms of service and amenities offered.

2.3 Performance Measurement in the Hotel Industry

The hotel industry is characterized by high up-front investments. The cost of a hotel development ranges from US$5 million for an Economy hotel to well above US$100 million for a Luxury hotel. The most important component of a hotel investment is the construction cost, which amounts to approximately 86% of the total investment. The land costs, on the other hand, represents only about 14% of the total development cost.10

The operating costs are also mostly fixed. Thus, hotels of the same brand (with similar construction costs, space needs and operational costs) operating in the same location type (e.g., urban area, near an airport, etc.), in markets with similar economic characteristics (in terms of touristic attractiveness, income, population, etc.), with the same number of room, amenities, age, and other characteristics, are expected to have comparable performance in terms of revenue. This is why the industry’s key performance measure is Revenue Per Available Room (“RevPAR”), which is defined as the revenue earned from all rooms on a given day divided by the number of room-nights available on that day.11 Actually, the data that we use (described below) is provided voluntarily by hotels to Smith Travel Research (STR), so that hotels can later purchase reports from STR that allow them to benchmark themselves against similar hotels, in terms of RevPAR.

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10 These numbers were obtained from HVS Global Hospitality Service, Hotel Development Cost Survey 2011.
Therefore, once controlling for the characteristics of hotels and their markets, hotels that have lower RevPAR are identified as underperforming hotels. Given that most of the costs are fixed, and given the strong competition in this industry, small reductions in RevPAR can significantly reduce the NPV of a hotel project. (An example of this is given in Section 5.3; details are provided in the Appendix.)

3 Data and Aggregate Data Patterns

3.1 Data Sources

We utilize a unique (proprietary) dataset on the hotel industry. This dataset combines hotel Census data compiled by Smith Travel Research (STR) with hotel revenue data also from STR.\(^2\) The STR Census data covers around 98% of the hotel properties in the US — about 52,000 hotels in 2009 — and represents one of the most comprehensive sources on the hotel industry available. The data provides information about the state and county where the hotel is located; each hotel’s organizational form (company-managed, franchised, or independent); a description of the hotel’s location (urban, small town, suburban, etc.) and other property characteristics including the number of rooms, the quality segment and the year in which the property was built (i.e., the year in which construction ended and the hotel was first opened for operations). In addition, we were also able to obtain the brand under which each hotel operates (coded numerically to preserve anonymity).

The revenue database contains a decade of performance information from 2000 to 2009, mainly on branded hotels. We use the key performance metric used in the hotel industry: monthly RevPAR (revenue per available room). It is defined as a hotel’s monthly revenues divided by the number of hotel room-nights available that month. Since in our analysis we use the average monthly RevPAR \textit{per year}, we restrict our final sample to those hotel-years for which we have monthly RevPAR for all 12 months in a given year. Using annual averages of RevPAR helps us to smooth out outliers and avoid biases in performance measurement due to monthly seasonality.

Our analysis focuses on hotel properties that were built in 1940 or later, as during earlier years hotel construction patterns were sparse. Our final sample consists of 219,849 hotel-year

\(^2\) STR is an independent research company that collects information about hotel properties in the U.S. and internationally. We obtained access to all STR data under a strict confidentiality agreement.
observations across 30,283 unique hotel properties, distributed across 2,216 counties. Among these, about 89.4% of the annual RevPAR observations correspond to branded hotels that belong to 221 unique brands. The remaining 10.6% of observations correspond to independent hotels. Notice that although we restrict our sample only to those hotels for which we have performance data, we use all hotels in the Census data to construct some of our variables (the number of hotels built in the same year as a given hotel, and the number of competing hotels operating in a given county-year).

We complement the hotel data with data from the Census Bureau and the Bureau of Labor Statistics (BLS), which provide annual information on county demographics and employment. These include population (from the Census Bureau’s annual population estimates), unemployment rate (from the BLS), median household income (from the Census Bureau), and the number of establishments in accommodation industry and two related industries — arts, recreation & entertainment, and food & beverage (all from the Census Bureau’s County Business Patterns data). In our analysis, we rely on market characteristics at the county-level for two reasons. First, counties represent the best available approximation to the relevant geographic area in which hotels interact with each other, and which consumers typically consider when looking for alternative lodging options around their target destination (see Freedman and Kosová, 2012 for a discussion). Second, county-level data represent the lowest level of aggregation at which time-varying market characteristics are regularly reported for each year.

3.2 Aggregate Investment Cycles — The Cohort Effect

Based on STR Census data (i.e., including all hotels in the Census, not only the ones for which we have performance data), Figure 1 shows the number of hotels built each year between 1940 and 2009. The figure clearly shows the patterns of cyclical aggregate activity (i.e., an aggregate cohort effect), with hotel construction sometimes above and sometimes below the long-term trend. We define the cohort effect in any year $h$ as the standardized residual from the time trend of the total number of hotels built nationwide in year $h$. We use $h$ to denote the year of a hotel’s construction, in order to later differentiate that year from the years of operation (indexed by $t$) during which we measure RevPAR and other control variables.

Specifically, to construct our measure of the aggregate cohort effect, we regress the total number of hotels built in the United States in year $h$, $\text{TotalHotels}_h$, on a time trend as follows:
Using the estimated residuals from this regression we measure the cohort effect as:

\[ \text{Cohort Effect}_h = \frac{\hat{e}_h}{\sigma} \]

where \( \sigma \) is the sample standard deviation of \( \hat{e}_h \). The main advantage of this cohort effect measure is that it not only captures the annual deviations in the hotel entry from the common trend, but it standardizes such annual deviations by the overall variation in our sample.

Although our main measure of the aggregate cohort effect is detrended, we also provide an alternative measure without detrending, which we use to assess the robustness of our results:

\[ \text{Cohort Effect (levels)}_h = \text{Total Hotels}_h \]

Since our analysis uses disaggregated hotel-level data, we measure the aggregate cohort effect (both detrended and levels) for each hotel \( i \), based on the year \( h \) in which hotel \( i \) was built.

As Figure 1 shows, the mid-1980s and late 1990s experienced the largest spikes in hotel construction when compared with the time trend (i.e., a positive estimated residual and a large standardized error), while the early 1990s and mid-2000s experienced slow investment (i.e., a negative estimated residual and a large standardized error). The Cohort Effect reached its maximum in 1998, when the total number of hotels built was 2.7 standard deviations above the long-term trend, and its minimum in 2004, when the number of hotels built was 2.1 standard deviations below the long-term trend.

### 3.3 Local Investment Cycles — The County Entry Effect

Since we have detailed data on hotel entry at the county-year level, we can distinguish the impact of aggregate hotel entry (i.e., the aggregate cohort effect) from the local market/county entry effect. To identify the local investment cycles that each hotel \( i \) faces in its county \( c \) at the year of construction \( h \), we define \( \text{Entrants}_{i,c,h} \) as the number of hotels that were built in county \( c \) during the same year \( h \) as hotel \( i \), including hotel \( i \) itself. If hotel \( i \) is the only hotel built in county \( c \) in year \( h \), the value of \( \text{Entrants}_{i,c,h} \) equals 1. The highest value of this variable (47 hotels) appears in our sample in Maricopa County, Arizona, in 1998. Thus, all hotels that were built in Maricopa County in 1998 will have their value of \( \text{Entrants}_{i,c,h} \) set to 47.

Figure 2 shows the county entry patterns for 2 counties. Panel A show the entry patterns for the county that experienced the largest spike in terms of the number of entrants in a single year,
Maricopa County in Arizona. Panel B show the entry patterns a county for which the extent of entry was much smaller: Middlesex County in New Jersey. The figures indicate that although entry patterns within counties tend to follow the aggregate investment cycles, there is substantial variation across counties in terms of the timing and the magnitude of entry. For example, the upsurge in construction from the mid-1980s was relatively more pronounced for Middlesex while the upsurge in construction from the late 1990s was relatively more pronounced in Maricopa. In addition, the distribution of hotel openings in Middlesex is much more “lumpy” compared with Maricopa (Middlesex had no hotel construction for over a 30 year period after 1940).

3.4 Summary Statistics

Table 1, Panel A, shows the summary statistics of our data. The panel itself is divided into 3 parts, showing descriptive statistics on: Hotel Characteristics, County (Market) Characteristics, and Year of Construction Characteristics.

Table 1

On average, a hotel in our sample has 123 rooms, generates $53 per room-night available (RevPAR) and total revenues of nearly $3 million per year (in 2009 US dollars). Hotel performance is measured from 2000 to 2009. Thus, hotels built before the year 2000 have 10 years of performance data, while newer hotels have fewer performance year observations. Hotel age is defined as the difference between the year of operation during our sample period (2000-2009) and the year of the hotel’s construction, plus one. The average age of hotels in our sample is 18 years. Seventy-one percent of the hotel-year observations represent operations of franchisees, 18% of the hotel-year observations represent operations of company managed properties, and the remainder represents operations of independent hotels.

Regarding market characteristics, on average a hotel in our sample operates in a county with a median annual household income of $52,200, an unemployment rate of 5.5% and a population of 797,000. The average number of hotels in a county in a year of hotel operation \( t \) is 108 during our sample period, while the average number of more broadly defined accommodation establishments (including hotels, hostels, motels, etc.) in a county is 129. A hotel in our sample operates in a county with on average 394 Art, Recreation and Entertainment Establishments and 1,487 Food and Beverage Establishments. Counties with more establishments in these hotel-
related industries are likely to be more attractive tourist/business destinations and have thus higher demand for hotels as well.

Finally, at the bottom of Panel A, we present the characteristics of hotels by year of construction, as defined in Sections 3.2 and 3.3: Cohort Effect, Cohort Effect (level), and Entrants. In this panel, and in all subsequent tables, we show these variables with subscripts, to remind the reader that they have different levels of aggregation, and that both Entrants and Cohort Effect are measured in the year of a hotel’s construction, h, not in the year when we measure a hotel’s performance, t. For simplicity, we do not include the subscripts of the other variables in the tables, as they are all measured at year t, although different variables have different levels of aggregation (i.e., county/hotel level). As Panel A shows, the detrended measure Cohort Effect is positive on average, as more hotels were built during years of high investment activity than during years of low investment activity. The mean for the variable Entrants is 4, indicating that on average a hotel in our sample was built with 3 other hotels in the same county-year.

Panel B shows a more detailed description of the variable Entrants, which captures county investment cycles. Specifically, 37% of the hotels (35% of our sample observations) represent hotels that were the only entrants in their year of construction in their county; while 20% of the hotels (20% of the observations) were built together with one other hotel in the same county and the same year. Hotel-year observations with 3, 4 and 5 hotels built at the same time represent 11%, 8% and 5% of our data, respectively. Interestingly, more than 20% of the observations represent properties that were built in the same county-year with 5 or more other hotels.

Panel C shows the annual frequency of hotel performance observations (RevPAR) in our sample. Overall, the distribution of hotel-year observations is relatively similar across the years with gradual increases over time due to new hotel construction. Panel D shows the distribution of hotels in our sample across different location types (i.e., urban, suburban, small town, resort, near a highway, or near an airport). Finally, Panel E shows the distribution of observations by quality segment. As expected, a small fraction of the hotel-year observations operate in the Luxury/Upper-Upscale (6.6%) and Upscale (10.3%) segments, while more than 40% operate in the Midscale segments (with and without food and beverage) and the Economy segment (32%). Independent hotels have no explicit quality benchmark and in our sample represent less than 11% of the observations.
4 Empirical Methodology

To analyze the impact of the aggregate investment cycles (aggregate cohort effect) and local/county-level investment cycles (county entry effect) on asset performance, we estimate several variations of the following baseline empirical model:

\[ y_{igt} = \alpha + \beta \cdot \text{Cohort Effect}_{ith} + \gamma \cdot \text{Entrants}_{ich} + Q'\Omega_{ct} + Z'T_i + M'\Psi_{igt} + \mu_t + \delta_g + \epsilon_{igt} \]

The subscript \( i \) indexes hotels, \( t \) indexes the year of a hotel’s operation during our sample period 2000-2009, \( c \) indexes the county, \( h \) indexes the year of a hotel’s construction, and \( g \) indexes a hotel’s brand. The dependent variable \( y_{igt} \) represents our asset performance measure — the average monthly RevPAR in a given year \( t \).

Differences in market size and economic conditions across counties and over time could affect hotel performance and at the same time be correlated with variables our of interest, thus biasing our estimates. To control for that, we include a set of market characteristics at the county-level, \( \Omega_{ct} \), namely: the median household income, the population of the county, and the county unemployment rate. In addition, we control for the total number of hotels that operate in a given county-year using the STR Hotel Census database. To control for the attractiveness of a market as a business or tourist destination, we control for the number of establishments in two related industries: Arts, Entertainment and Recreation and Food and Beverage, as well as the number of establishments in the broadly defined accommodation/lodging industry (not just hotels). Counties with more establishments in these industries are likely to be more attractive travel destinations and have higher demand for hotels as well.

Another set of important controls, \( \Gamma_i \), captures hotel-specific characteristics. These include the number of rooms or hotel capacity, and dummy variables for six hotel location types: urban, suburban, small town, resort, near a highway, or near an airport. We also include a set of time-varying hotel specific controls, \( \Psi_{igt} \), that include a hotel’s age (we include both a linear and a quadratic term) and dummy variables for a hotel’s operation/organizational form — franchised, company-managed, or independent. As Kosová et al. (2012) discuss, these organizational form dummies are likely endogeneous in our performance estimations, and thus their impact cannot be interpreted as a casual effect in our analysis (so we do not discuss them in the results section). However, including them as controls in our type of analysis is very helpful as they capture (to us) unobserved changes in ownership and hotel organizational structure that could potentially bias the coefficients of interest (i.e., aggregate cohort and county entry effects). See Stock (2010) for details.
variation over time in our sample; on average, the yearly rate of change in organizational form is 1.7%. We also control for year fixed effects, $\mu_t$, to capture unobserved macroeconomic shocks or changes in regulation that could affect hotel performance. Finally, we control for hotel brand fixed effects, $\gamma_g$, to control for unobserved differences across brands, such as different levels of popularity and quality segments (quality segments are subsumed within brands so we cannot include segment dummies together with brand dummies). The default category is thus independent hotels.

Key to our identification of the aggregate cohort effect and county-level entry effect is that our performance and control variables are measured at time $t$ (post-entry years of hotel operation), while Cohort Effect and Entrants are measured at time $h$ (year of hotel entry). In our data we have only 360 hotels/observations for which we measure their 12-month performance during their first year of operations (i.e., $t=h$), and all our results hold if we drop these observations from our sample.

Using our baseline empirical specification (equation 3) we explore the impact of the aggregate cohort effect and county-level entry effect on hotel performance for the overall sample, as well as for different subsamples based on the hotels’ age. We then repeat the analysis for subgroups of branded (i.e, Upscale, Economy, etc.) and independent hotels, as well as for subgroups of hotels in different location types (i.e., Urban, Resort, etc.), to explore whether the county-level entry effect ascribes to a particular subgroup of hotels. Next, we extend our baseline empirical specification by splitting the impact of local entry into the impact from the “same” and “other” segments, to explore what type of hotel entry correlates with a hotel’s performance. This can shed light on whether product market competition or informational concerns are more likely to explain the local entry effect and its role in a hotel’s performance.

The aforementioned specifications exploit both within-county and between-county variation to explain hotel performance. To verify that between-county variation and thus differences in business conditions or location attractiveness across counties are not biasing our results, we also exploit within-county variation through various specifications that include county fixed effects. We describe these additional specifications after discussing the baseline results.

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$^{14}$ For the same reason, we do not include parent fixed effects, as parent dummies are subsumed within brands. For example, the parent company Marriott includes the brands JW Marriott, Courtyard by Marriott, etc.
5 Results

5.1 Determinants of Hotel Performance

We show the results of our baseline regressions (equation 3) in Table 2. In all regressions, we adjust standard errors for heteroscedasticity and county-level clusters. Since many of our explanatory variables are at the county level of aggregation, un-clustered standard errors may be underestimated (see Moulton, 1990).

Table 2

In the first column, we only include Cohort Effect as a variable of interest; in the second column, we only include Entrants; and in the third column, we include both variables together. We find that when studying the impact of aggregate and local investment cycles separately, both have a negative and statistically significant impact on hotels’ long-term performance. However, when we include both variables together, only Entrants, capturing local investment cycles, has a negative and statistically significant impact on hotel performance. Once we control investment activity at the local level, the negative aggregate cohort effect tends to disappear (as we discuss later, the cohort effect remains significant during the first years of a hotel’s operation when we split the sample by hotel age).

The results from column III do not depend on the definition of the cohort effect. To show this, in column IV we replicate column III using our second definition of the cohort effect; namely, Cohort Effect (levels), again finding similar results. As our main results do not vary according the definition of the cohort effect, in the remainder of the paper we provide only the results that utilize our detrended measure (i.e., Cohort Effect). Overall, we find that local investment booms, measured as the number of entrants in a county-year, have a negative and strong impact on long-term performance, even after controlling for a comprehensive set of hotel and market characteristics.

5.2 Determinants of Hotel Performance by Hotel Age

To better understand the drivers of the negative impact of local investment cycles on performance, we run equation (3) for different subsamples according to the hotels’ age. We present these results in Table 3. Column I shows the performance of hotels in the first 5 full years of operation; column II considers hotels in their 6th to 10th year of operation; column III
considers hotels in their 11th to 20th year of operation; column IV considers hotels in their 21st to 30th year of operation; and column V considers hotels in operation for more than 30 years.

**Table 3**

We find that both *Cohort Effect* and *Entrants* have a negative and statistically significant impact on the hotels’ performance during their first 5 years of operations. However, for older hotels the cohort effect completely vanishes, while the effect of *Entrants* only decreases moderately through time, remaining statistically significant for all hotel ages, except for those in the last category (ages 31 and above).

The fact that the *Cohort Effect* is only short-lived (up to 5 years) suggests that aggregate markets do not remain oversupplied for long. Thus, while capital inflows experienced by an industry may affect its willingness to fund low-NPV projects (Gompers and Lerner 2000; Kaplan and Schoar 2005), that does not seem to affect performance in the hotel industry, except in the short run. This result is also consistent with a real options view of investments (see Grenadier 1996), as hotels may have taken advantage of better financing terms and were constructed “earlier” than they would have been under normal financing conditions. If this is the case, hotels might have been built when market demand was not yet high enough, and this is why they appear to perform worse than their peers in the short-run.

The fact that *Entrants* has a negative and pervasive effect on hotels’ performance is intriguing. We thus turn to disaggregate the results from Table 3 by different hotel categories in the next subsection, with the aim of shedding more light into what might be causing this result.

**5.3 Determinants of Hotel Performance by Quality Segments**

In Table 4, we repeat the analysis from Table 3 for subgroups of branded hotels and independent hotels. The first subgroup of branded hotels contains hotels belonging to Economy brands, the most frequent segment in our sample (see Table 1, Panel E). The second subgroup contains hotels belonging to Midscale brands (with and without food and beverage); and the third subgroup contains branded hotels from the 2 highest quality segments: Upscale and Luxury/Upper Upscale.

**Table 4**

When estimating equation (3) separately for branded of different quality segments and independent hotels, we would like to know the organizational form and brand under which hotels
started their operations. However, we only have information about their organizational form, brand and quality segment at the time of performance measurement and not at the time they were built. This distinction is unlikely to be of particular relevance when making our group classifications, for two reasons. First, as mentioned in Section 2, management contracts and franchise agreements are usually long-term (about 20 years), with a high renewal rate. Second, our data shows that the actual variation among these categories is low. For example, in our 10 years of performance data, the yearly rate of independent hotels turning into branded hotels was only 0.34%, and the yearly rate of branded hotels turning into independent hotels was similarly low: 0.42%.

By replicating our baseline specification for different quality segment subgroups, we can test alternative explanations for our findings. For example, agency problems could explain why a larger number of entrants in the same county-year reduces a hotel’s performance. If so, we would expect the effect to be more pronounced for branded hotels, compared with independent hotels. However, we find that *Entrants* has a pervasive negative effect on hotel performance, *both* in the branded and independent hotels subgroups, ruling out an agency explanation.

Alternatively, the underperformance of hotels built during local booms could be due to those hotels being built in cheaper and less attractive sites, and thus lower operational performance was expected. If that was the case, then the underperformance should be more pronounced for the highest quality segment hotels (Luxury/Upper Upscale and Upscale) hotels than for Economy hotels, as most Economy hotels are built in very homogenous sites (e.g., near a highway). We find, however, that the results for Economy hotels are actually slightly stronger than those of higher quality segment hotels, making the “cheaper location” hypothesis less viable.

In addition, our results are economically too large to be driven by hotels choosing “cheaper locations” during boom times. In the overall sample, a one-standard deviation increase in *Entrants* (6 additional hotels built in a county-year) decreases average RevPAR by about 4.8%. To get a better assessment of what this performance reduction means in terms of NPV, we asked STR to provide us with general information about how hotel revenue translates into yearly cash flows. They provided us aggregated information for all Economy hotels. Using this information and hotel development cost information available from HVS Global Hospitality Service, Hotel Development Cost Survey 2011, we estimate the NPV for the average Economy hotel in our sample and later ask how this NPV would change after a one standard deviation increase in the
number of Entrants (details are in the Appendix). We find that the NPV for the average Economy hotel development in our sample is about US$569,000 (the total development cost is US$5.284 million). A one standard deviation increase in the variable Entrants reduces present value of revenues by 3.9% (on average), reducing the NPV to $237,000. In other words, the NPV was reduced by nearly 60%. Given that the average cost of land for the average economy hotel in our sample is about US$735,000, the underperformance we find can only be explained if hotels built during boom times use locations that are 45% cheaper (within a given location type), and do not experience any increase in their building costs. This scenario is unlikely as both land costs and building costs are highly procyclical.

5.4 Determinants of Hotel Performance by Location Type

We now study whether investments made during booms underperform because later participants in a boom have a less attractive set of possible sites from which they can choose. For example, a resort hotel may have been built on a beachfront site before the investment boom, and later resort hotels may be limited to sites that are not beachfront sites; an airport hotel may have direct access to the terminal, while other hotels can only be built near the terminal, such that guests need transportation to the terminal; or an urban hotel may have been built facing a park or other landmark, but no other such sites are available later. In contrast, for suburban or small town hotels, or for hotels near interstates, the supply of suitable sites should be much less constrained.

To explore this possibility, in Table 5 we repeat the analysis from Table 3 for subgroups of hotels according to their type of location (urban areas, near an airport, in resorts, small towns, suburban areas, near interstates). If the underperformance of hotels built during local booms is due to those hotels being built in less attractive sites — and lower operational performance was expected — the underperformance should be more pronounced for hotels located in the type of locations where site selection is more relevant.

Our results show similar results for both groups. The coefficient of the variable Entrants is smaller (in absolute value) for the subgroup of hotels located in areas where site selection is a priori more relevant (Panel A) than for the subgroup of hotels located in areas where site selection is a priori less relevant (Panel B), for the first 10 years of operations. This coefficient
shows the opposite pattern for older hotels. Overall, the “cheaper location during boom times” hypothesis is not supported by the data.15

Table 5

5.5 Explaining the Underperformance of Hotels Built During Local Booms

What can explain the underperformance of hotels built during local booms? Anticipated increases in local demand may explain some of the local booms, but they cannot explain the underperformance that we find. If more hotels are built because the market is projected to have a surge in demand, hotels built during local investment booms should not perform worse than otherwise equivalent hotels.16

The underperformance of hotels built during local booms could, in principle, be explained by unforeseen competition at the time of entry (see Hoberg and Phillips 2010; Greenwood and Hanson 2013). If market participants cannot foresee the number of competitors entering a market, a large number of competitors entering the market at the same time could have a long-lasting effect on the entrants’ long-term performance, even after controlling for the current state of competition and local market conditions. This can occur if hotels compete more strongly with others of a similar vintage (built in the same or contiguous years). In that case, a sudden and large increase in supply in a local market might affect hotels that were part of that large supply increase for several years.

In the hotel industry, most investment decisions are common knowledge, so competition is generally foreseen by market participants, diminishing the likelihood of such an explanation. However, to further assess its validity, we divide our proxy for local booms (number of entrants in a county-year) into two mutually exclusive categories: number of hotels built in the same quality segment as hotel \( i \), and number of hotels built in other segments. If within-vintage unforeseen competition was to explain the underperformance of hotels built during local investment booms, then we should see that Entrants (same segment) have a much more negative impact on a hotel’s

15 See Section 5.7 for further evidence on this. There we show that latecomers to a county investment boom perform better than hotels built at the boom peak. This is inconsistent with the hypothesis that latecomers choose less attractive sites.

16 A survivorship bias explanation cannot explain our results either, for two reasons. First, as pointed out in Section 2.1, hotels are rarely demolished or converted into apartments or retirement homes. Thus, survivorship bias is not an important concern. Second, if poorly performing hotels are among the few that cease operations then our estimates should be biased against finding any indication of long-run underperformance.
performance than Entrants (other segment). Intuitively, hotels compete more directly with other hotels of the same quality segment. For consistency, we also split our competition variable in the same way: number of hotels operating in the same county and year (in which performance is measured) as hotel \( i \), either in the same quality segment or in other segments.

Table 6 presents the results for the specifications that use both within-segment and between-segment Entrants and competition (Hotels in County). Column I shows the results for the overall sample, and columns II-VI show the results for subsamples of hotels of different ages.

**Table 6**

Regarding the impact of current between-segment competition, we find evidence consistent with an “agglomeration” effect (Freedman and Kosová 2012, Canina et al. 2005): A hotel’s performance is better if it has more competitors operating in different quality segments, due to an agglomeration externality. However, a hotel’s performance is worse if there are more competitors operating in the same market segment (within-segment competition). These results highlight that contemporaneous competition and agglomeration are indeed very important in explaining the performance of hotels in a given year.

The number of entrants in the same county-year (year \( h \)) and the same segment as hotel \( i \) does not seem to have an important impact on hotels’ long-term performance. The number of entrants in the same county-year but in other segments as hotel \( i \), on the other hand, shows a negative and significant impact on a given hotel’s long-term performance. Clearly, unforeseen within-vintage competition cannot explain this pattern, as hotels compete more strongly with hotels of the same quality segment.

Another possible explanation for the underperformance of hotels built during local booms comes from the herding literature (starting with Bikhchandani, Hirshleifer and Welch, 1992; Banerjee, 1992; and Welch, 1992). Investment decisions are inherently difficult because of uncertainty about their prospects, and decision makers can then try to infer information about the fundamentals of a market when observing that other agents decided to invest. This strategic interaction (information transmission) can lead to poor investment decisions, in which the information available collectively is not used (so-called informational cascades).

In the situation at hand, a developer considering the construction of a hotel faces substantial uncertainty regarding both the future local demand and whether a specific site is attractive and what quality segment would be optimal for it. If work on another hotel has just started, the
developer may infer that demand must be expected to increase and decide to build as well; presumably, to reduce direct competition, the planned hotel would serve a different quality segment. However, the other developer may have started construction on the first hotel because she had identified a particularly attractive site that was profitable when matched with a specific quality segment — for example, an anchor hotel at a convention center, or an easily accessible site at a high-traffic highway exit — and not because she expected demand to generally increase in that market. If so, the follower's hotel will underperform other comparable hotels.\(^\text{17}\)

The result that hotels’ performance is negatively correlated with the number of entrants in the same county-year but in other segments is consistent with the above interpretation of herding. However, a cleaner test of this herding interpretation is possible if we focus on delayed imitation: Hotels that entered a market after having observed the near-completion or opening of other hotels, instead of just observing the entry plans of others. To that end, we look whether a hotel's performance is additionally reduced by the number of hotels that entered the same market in a different quality segment in the preceding year. In Table 7 we extend the specification used in Table 6 by including Entrants (same segment) and Entrants (other segment) in the year prior to the entry of a hotel (year h-1). We find that it is indeed the case that Entrants (other segment) in the preceding year additionally reduces a hotel’s performance, consistent with underperformance being explained by herding.

**Table 7**

### 5.6 Explaining the Underperformance of Hotels of Different Quality Segments

Under the herding interpretation some hotels “call the market wrong” during an investment boom. That is, they infer by the entry (or entry plans) of other hotels that market conditions are generally good (e.g., demand is growing) whereas the market may be suitable for a particular quality segment. Thus, they may enter the market with attributes that are poorly matched to the

\(^{\text{17}}\) The brand owners may advise developers or have set policies regarding the choice of hotel location, size and market or quality segment. Thus, one could argue that hotels operating under certain brands should be more/less likely to choose their location and quality segment poorly. This is not a concern in our estimations, however, as we control for brand fixed-effects in our regressions. Moreover, in estimations not shown for space reasons, we find that the underperformance of hotels built during boom times is unrelated to the popularity of their brand — measured as the number of franchised and company managed hotels operated in the US under the same brand. Hotels operating under more popular/experienced brands tend to underperform as much as hotels that operate under less popular/experienced brands if they are built during local booms.
market needs. To shed more light on this interpretation we further decompose the variable *Entrants* into entrants on each quality segment and run regressions for subsample of hotels belonging to each of these segments. In this way, we can study, for each quality segment, which type of entrants are driving the negative correlation with performance. The results are presented in Table 8.

**Table 8**

The Table shows some interesting patterns. Economy and Midscale hotels without food and beverage tend to underperform when a large number of Upscale hotels were built on the same county-year; Midscale hotels with food and beverage tend to underperform when a large number of Economy hotels were built in the same county-year; Upscale hotels tend to underperform when a large number of Midscale hotels (with and without F&B) were built in the same county-year; and Luxury/Upper Upscale hotels tend to underperform when a large number of Economy and Upscale hotels were built in the same county-year. As expected, the performance of branded hotels is not negatively correlated with the entry of independent hotels, as independent hotels do not have an explicit quality benchmark (i.e., they are heterogeneous in the segments they are serving). These results show that the phenomenon that we document cannot be ascribed to hotels of a single quality segment. Our herding interpretation, in which imitation can lead market participants to “call the market wrong,” seems to attain hotels of all types.

Our herding interpretation gives a plausible explanation to why hotels built during local booms underperform their peers for long periods—up to 30 years. Interestingly, we do not find evidence that hotels built during local booms more than 30 years ago perform worse than similarly old hotels built during non-boom times (see Tables 3-7). This may be due to that until the 1970s, hotel development followed a different model than the one that has been prevalent up to date. In earlier days, parent companies also built hotels, which they later sold after finishing the developments. As development decisions were taken by big corporations in earlier days, it was less likely that information was not aggregated correctly. Thus it seems possible that developers were less prone to “call the market wrong” during an investment boom.18

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18 Parent companies stop developing properties themselves to focus their business in managing and operating hotel properties.
5.7 Within-County Herding

As herding seems to be the most plausible explanation for the long-term underperformance of hotels built during high local investment cycles, we specifically design a test to measure the relative performance of herders within a county. To this end, we restrict our sample to those counties for which there was meaningful investment cyclicality. Specifically, we restrict our sample to counties in which five or more hotels were built in a single year at least once. There are 160 counties that satisfy that criterion. Then, we classify hotels that were probably part of a herd according to two different criteria. For our first criterion, we create dummy variables that classify each hotel entry by deciles of same-year entry within a county, i.e., whether the year of entry is within the first decile of years of higher activity, the second decile of years of higher activity, etc. If “herd” investments were poorly planned or executed, or if they were otherwise disadvantaged, we should expect hotels built during cycle peaks to perform the worst. We show the results in Table 9, Panel A. We include all the control variables from our empirical model (equation 3) in these regressions, but we do not report them in the table for space reasons.

Table 9

The patterns are striking. Hotels built during highest decile years of construction activity (10th decile) underperform peer hotels within the same county by almost 6%. This coefficient is substantially larger than all other entry decile coefficients, and it is the only statistically significant one. This result is consistent with massive herding behavior (where informational cascades are likely to occur) being responsible for the underperformance of hotels built during local market booms. Moreover, given that these regressions control for county-fixed effects, this result confirms that the underperformance is not driven by unobserved market characteristics.

One potential disadvantage of measuring herding using deciles of construction activity within a county is that we cannot distinguish between years of high investment activity that precede the peak year from those years that came after. Thus, for our second classification of “herders,” we first define peak years and then define “herders” using those years. We also define “leaders” and “laggards” relative to those years.

We define peak years as years in which at least 5 hotels were built, which were preceded by non-negative growth in hotel construction and which were followed by a decline in hotel construction. Using this criterion, we were able to classify 332 peak years in 159 counties.\(^{19}\)

\(^{19}\) For one county there was no year that could be classified as a peak using this criterion.
Then, we classify hotels as “herders” (dummy variable) if they were built during a peak year in a county. We classify hotels into 3 different “leader” categories according to whether they were built 3, 2, or 1 years before the peak year, and we classify hotels into 3 different “laggards” categories according to whether hotels were built 1, 2 or 3 years after the peak year. Table 9, Panel B, show the performance of these hotels relative to their county peers (neither leaders, laggards nor herders). We find that hotels built during the peak of the local investment cycle and hotels built one year after the peak underperform their peers. Neither “leaders,” nor late “laggards” show any statistically significant difference in performance relative to the control group. This is consistent with our herding interpretation, as the “leaders,” by definition, do not take suboptimal decisions by following others’ actions, while late “laggards” have had more time to observe the early performance of “herders” and make a better-informed decision about entry.

The results on “leaders,” “herders” and “laggards” also suggest that the timing of entry is unlikely to be related with site attractiveness in such a way that can explain the underperformance results we find. If developers agree on the economically most attractive sites, then the “leaders” should choose the best sites, and the “laggards” the worst sites, as the better sites have been taken. We would thus expect that the later a hotel enters a given market, measured against when other boom participants entered, the lower its performance. However, we find that late “laggards” show no significant underperformance, while the “herders” (who have access to a larger choice of sites) perform worse.\footnote{Similarly, one cannot argue that late entrants are somehow less skilled, even though they seem to react to market signals more slowly than “leaders”.

5.8 Does Herding Drive Local Investment Cycles?

Our results show that hotels that enter the market as part of a herd tend to underperform their peers. The most likely explanation for this is that “herders” put significant weight on others’ entry decisions when assessing the attractiveness of a county, and that this strategy did not pay off, on average. To provide further evidence that herding behavior is the most plausible cause for the underperformance pattern that we find, we now look for evidence of herding behavior at the time of construction. In particular, we study whether the likelihood of other hotels entering the market in a given year is affected by entry patterns in the preceding year, even after controlling for common market signals. In addition, we would like to test whether entry decisions are more likely to be dependent on previous market participants’ decisions when the common market signals are more volatile, as predicted by herding models.
To address these issues, we estimate an empirical specification different from equation (3), in which the unit of observation is a county-year of hotel construction \((c,h)\). The dependent variable \(E_{ch}\) is a discrete measure of the “hotel entry intensity” in a given county-year, which takes a value of 0 if no hotel is built in a county-year (no entry), 1 if just one hotel is built (single entry), 2 if 2-5 hotels are built (moderate entry), and 3 if 6 or more hotels are built in a county-year (massive entry). We then estimate a multinomial logit model (equation 4, below) in order to better understand whether different levels of entry intensity (massive, moderate, single and no entry) in a county-year respond differently to common economic signals and prior actions (hotel construction) of market participants.

\[
E_{ch} = \alpha + \sum_{c} X_{ch} + \mu_h + \varepsilon_{ch}
\]

The county-level explanatory variables, \(X_{ch}\), are lagged one year, since the decision to build a hotel is likely based on information available when construction started (recall that the year \(h\) is the year in which a hotel was opened). In this category, we include County GDP in year \(h-1\) (in logs); average county GDP growth from year \(h-4\) to \(h-1\) (both from the Bureau of Economic Analysis); the normalized standard deviation of county GDP growth from year \(h-4\) to \(h-1\) (to capture the volatility of the common economic signals); the stock of *existing* hotels in county \(c\) in year \(h-1\); the number of hotels built in county \(c\) in year \(h-1\); and various interaction terms (described below). 21

To understand the role of herding behavior, the number of hotels built in a county in the preceding year is of particular importance. In the absence of herding considerations, that number should be irrelevant for the entry decision of other participants, once the common signals about economic conditions of the county are taken into account. If herding considerations play a role in the building decision, however, we should expect that the likelihood of multiple hotels being built in a county in year \(h\) is positively affected by the number of hotels built in that same county in year \(h-1\). In addition, if herding indeed plays a role in the decision to build in a county-year, this decision should be more heavily influenced by other hotels being built the preceding year when common county signals are less precise. To test this intuition, we include an interaction term between the number of hotels built in a county in the preceding year and the normalized standard deviation of county GDP growth. We expect this coefficient to be positive.

21 For parsimony, we use total income rather than income per capita and population. All the results we present are robust to including these demographics separately.
We also include an interaction term between the number of hotels built in the prior year and county GDP growth. This term helps us test whether herding is more likely when the market is bullish, as documented by Welch (2000) for the case of analysts’ ratings.

Finally, we control for unobserved macro factors using time fixed effects, $\mu_h$. Relatedly, we include the interaction between the spread of Aaa Bonds to Fed rates (obtained from the Saint Louis Fed) with county GDP growth. This interaction term helps us control for the effect that favorable financing conditions conjoint with favorable real economic conditions may have on hotel construction. In our estimation, we do not include the bond spread itself (not interacted), as the spread is perfectly collinear with time-fixed effects.

The data we use to conduct our logit analysis covers around 3,100 counties each year from 1973-2009. The data starts in 1973 because the BEA started compiling annual data on county demographics in 1969, and we use four lags for county GDP growth and its standard deviation. Our final sample consists of 114,908 county-year observations. Among those, 95,261 (82.9%) county-years register no hotels built; 13,160 (11.4%) register 1 hotel built; 5,733 (5%) register 2-5 hotels built; and 754 (0.7%) register 6 or more hotels built.

We present the results from the multinomial logit estimation in Table 10. All the control variables show expected results: high county GDP increases the likelihood of single and multiple hotel entries (relative to no hotel entry), and higher county GDP growth also increases that likelihood. The effect of higher county GDP growth is weakened when the costs of financing (yield spreads) are high, especially for multiple hotel constructions in a given county-year. We also find that higher county growth volatility decreases hotel construction, consistent with standard investment evaluation arguments (lower NPV) and real options arguments (benefits from delaying entry).

Table 10

The number of hotels built in a county in the previous year does not have a significant impact on single-hotel construction (relative to no hotel construction). That is, entry, by itself, is not driven by previous participants’ actions. Moderate and massive intensity of entry (columns II-III), however, are significantly affected by the number of hotels built in the previous year. This is consistent with the idea that current entrants are inferring “something” about the market by observing the behavior of previous entrants. This result is indicative of herding, but it can also be merely due to an omitted variable bias generating positive autocorrelation between entry decisions in current and previous years. What is also indicative of herding, and not subject to
this criticism, is that when the volatility of county GDP growth is high, the positive effect of previous market entry increases (i.e., the coefficient of the interaction between Hotels built in County_{ch-1} and Normalized Standard Deviation of the County GDP_{h-4 to h-1} is positive). This increase is particularly pronounced for multiple entry.

Of additional interest is the result that previous market entry encourages current market entry when the market is more bullish (county GDP growth is higher). This is consistent with Welch’s (2000) finding that herding by analysts is more likely when markets are bullish.

Overall, the results in Table 10 suggest that entry in a given county-year is indeed affected by the behavior of earlier market participants. This reinforces the notion that herding is the most plausible explanation for our previous findings.

6 Conclusions

In this paper, we use a proprietary dataset from the U.S. hotel industry to study investment cycles and the impact of the timing of an investment over a cycle on that investment’s performance. The evidence we have presented in this paper is intriguing. Why are hotels built in cycles at the local level? And why do hotels built during booms underperform others for decades? Our interpretation of the evidence is that there is herding: The decision to build a hotel is made under great uncertainty about future demand, and relying on information inferred from other market participants’ actions is therefore tempting.

There is a large body of theoretical work on herding. In comparison, the empirical literature on herding is small. The main reason are difficulties in obtaining data that allow for rigorous tests of hypotheses drawn from herding models. Specifically, measuring the performance of an investment is hard if performance data is reported at the corporate level, not at the level of a particular investment. Furthermore, there can be many different reasons for imitative behavior, and identifying such reasons is challenging. Herding can arise if decisions must be made based on very unreliable information, but it can also be caused by career concerns (so the destruction of information is the goal). Imitation can also be spurious, simply caused by information that is available to the market participants but not to researchers.

Our data allow us to overcome many of these difficulties. Unobserved positive information cannot be driving our findings, since investments made during the peak of a cycle underperform others. Career concerns in connection with investment decisions are not an issue either, since the vast majority of investments into hotel developments is made by individuals, partnerships or
LLCs. Moreover, our performance measure is not aggregated over several investments, since we measure performance at the hotel level rather than at a more aggregate company level. Additionally, our data include important hotel and market characteristics that typically also affect performance, allowing us to control for factors that might confound with local and aggregate investment cycles.

A theory vacuum remains, however. Traditional herding models assume that all participants in a “herd” earn identical payoffs. The literature has made progress in relaxing assumptions and showing that herding and informational cascades are a robust feature in models of decision-making under uncertainty.\textsuperscript{22} Our findings suggest that models can be made more realistic by abandoning the assumption that all payoffs are identical. We suggest one possibility: Building a hotel may be a good idea either because a local market (in our case a county) is promising overall, or because a particular site (within that county) is promising. If other participants cannot exactly identify why a hotel was just built, they may (wrongly) infer that the overall market is promising.\textsuperscript{23}

Clearly, there is still much to be learned about herding — in particular, given our results, why herders may underperform others. It would also be interesting to study whether herding leads to underperformance in different settings (i.e., whether underperformance of herders is industry-specific or an empirical regularity). An alternative way to look at this phenomenon is to empirically study how information is transmitted during herding/non-herding periods. Perhaps a better understanding of how information is transmitted during herding periods will allow for better predictions in terms of market performance.

\textsuperscript{22} Relaxed assumptions include heterogeneously informed agents, costs of acquiring information, and endogenous entry; see Chamley and Gale, 1994; Zhang, 1997; Grenadier, 1999; Chari and Kehoe, 2004.

\textsuperscript{23} The literature on herding in the investment management industry allows for payoff externalities, but they are positive. Positive payoff externalities are also analyzed in Choi (1997). Negative externalities within an optimal stopping game are analyzed in Frisell (2003). Negative externalities are also analyzed in Ridley (2008), who studies when an uninformed firm imitates a better-informed competitor’s market entry decision (creating negative payoff externalities from competition), and how the competitor anticipates that and adapts her own entry decision.
References


Figure 1

The figure shows the number of hotels built each year between 1940 and 2009 using STR Census data. The fitted value line shows the predicted values from the regression: \( Total\ Hotels_h = \alpha + \delta \cdot \text{Trend}_h + e_h. \)

![Graph showing hotels opened per year](image1)

Figure 2

Panels A and B show the entry patterns in two counties in terms of the number of entrants in a single year: Maricopa County in Arizona and Middlesex County in New Jersey.

Panel A: Maricopa County

![Graph showing hotel opening entries in Maricopa County](image2)

Panel B: Middlesex County

![Graph showing hotel opening entries in Middlesex County](image3)
Panel A shows descriptive statistics for the variables in our sample — split into Hotel Characteristics, County (Market) Characteristics, and Year of Construction Characteristics — across 219,849 hotel-year observations in our sample for 30,283 hotels during 2000-2009. Panel B shows the distribution of observations (as well as hotels) in our sample with different numbers of Entrants, i.e., hotels entering in the same county-year as a given hotel. The remaining panels show the distribution of hotels and RevPAR observations per year (Panel C); the distribution across different location types (Panel D); and the distribution across different quality segments (Panel E).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Pctl 10</th>
<th>Pctl 50</th>
<th>Pctl 90</th>
<th>sd</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hotel Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RevPAR</td>
<td>53</td>
<td>22.9</td>
<td>45.7</td>
<td>89.7</td>
<td>35</td>
<td>219,849</td>
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<tr>
<td>Rooms</td>
<td>123</td>
<td>50</td>
<td>97</td>
<td>216</td>
<td>117</td>
<td>219,849</td>
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<tr>
<td>Yearly Revenues (000)</td>
<td>2,937.1</td>
<td>537.9</td>
<td>1,468.9</td>
<td>5,787.2</td>
<td>5,826.7</td>
<td>219,849</td>
</tr>
<tr>
<td>Year</td>
<td>2005</td>
<td>2001</td>
<td>2005</td>
<td>2009</td>
<td>3</td>
<td>219,849</td>
</tr>
<tr>
<td>Age</td>
<td>18</td>
<td>4</td>
<td>15</td>
<td>36</td>
<td>12</td>
<td>219,849</td>
</tr>
<tr>
<td>Franchise</td>
<td>0.71</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.45</td>
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<tr>
<td>Company Managed</td>
<td>0.18</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.39</td>
<td>219,849</td>
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<tr>
<td><strong>County (Market) Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (000)</td>
<td>52.2</td>
<td>38.5</td>
<td>49.7</td>
<td>69.8</td>
<td>12.8</td>
<td>219,849</td>
</tr>
<tr>
<td>Unemployment Rate (%)</td>
<td>5.5</td>
<td>3.3</td>
<td>5.0</td>
<td>8.2</td>
<td>2.1</td>
<td>219,849</td>
</tr>
<tr>
<td>Population(000)</td>
<td>797</td>
<td>37.5</td>
<td>295</td>
<td>1,804</td>
<td>1,458</td>
<td>219,849</td>
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<tr>
<td>Hotels in County</td>
<td>108</td>
<td>9</td>
<td>54</td>
<td>273</td>
<td>152</td>
<td>219,849</td>
</tr>
<tr>
<td>Art, Recreation and Entertainment Establishments</td>
<td>394</td>
<td>13</td>
<td>116</td>
<td>682</td>
<td>1,288</td>
<td>219,849</td>
</tr>
<tr>
<td>Food and Beverage Establishments</td>
<td>1,487</td>
<td>63</td>
<td>578</td>
<td>3,598</td>
<td>2,595</td>
<td>219,849</td>
</tr>
<tr>
<td>Accommodation Establishments</td>
<td>129</td>
<td>11</td>
<td>65</td>
<td>341</td>
<td>186</td>
<td>219,849</td>
</tr>
<tr>
<td><strong>Year of Construction (h) Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort Effect_h</td>
<td>0.66</td>
<td>-1.10</td>
<td>0.66</td>
<td>2.43</td>
<td>1.27</td>
<td>219,849</td>
</tr>
<tr>
<td>Cohort Effect_h (levels)</td>
<td>1,079</td>
<td>489</td>
<td>1,095</td>
<td>1,715</td>
<td>431</td>
<td>219,849</td>
</tr>
<tr>
<td>Entrants_h</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>6</td>
<td>219,849</td>
</tr>
</tbody>
</table>
Panel B: Distribution of Observations and Hotels by Number of Entrants in the Same County-year

<table>
<thead>
<tr>
<th>Entrants&lt;sub&gt;ch&lt;/sub&gt;</th>
<th>Obs</th>
<th>Hotels</th>
<th>% of Obs</th>
<th>% of Hotels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>77,780</td>
<td>11,083</td>
<td>35.4%</td>
<td>36.6%</td>
</tr>
<tr>
<td>2</td>
<td>43,463</td>
<td>6,075</td>
<td>19.8%</td>
<td>20.1%</td>
</tr>
<tr>
<td>3</td>
<td>23,746</td>
<td>3,331</td>
<td>10.8%</td>
<td>11.0%</td>
</tr>
<tr>
<td>4</td>
<td>16,889</td>
<td>2,230</td>
<td>7.7%</td>
<td>7.4%</td>
</tr>
<tr>
<td>5</td>
<td>11,379</td>
<td>1,570</td>
<td>5.2%</td>
<td>5.2%</td>
</tr>
<tr>
<td>&gt;5</td>
<td>46,592</td>
<td>5,994</td>
<td>21.2%</td>
<td>19.8%</td>
</tr>
<tr>
<td>Total</td>
<td>219,849</td>
<td>30,283</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Panel C: Distribution of Observations by Year of Operations

<table>
<thead>
<tr>
<th>Year</th>
<th>Obs</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>18,778</td>
<td>8.5%</td>
</tr>
<tr>
<td>2001</td>
<td>19,654</td>
<td>8.9%</td>
</tr>
<tr>
<td>2002</td>
<td>20,670</td>
<td>9.4%</td>
</tr>
<tr>
<td>2003</td>
<td>21,382</td>
<td>9.7%</td>
</tr>
<tr>
<td>2004</td>
<td>21,668</td>
<td>9.9%</td>
</tr>
<tr>
<td>2005</td>
<td>21,720</td>
<td>9.9%</td>
</tr>
<tr>
<td>2006</td>
<td>22,235</td>
<td>10.1%</td>
</tr>
<tr>
<td>2007</td>
<td>23,216</td>
<td>10.6%</td>
</tr>
<tr>
<td>2008</td>
<td>24,514</td>
<td>11.2%</td>
</tr>
<tr>
<td>2009</td>
<td>26,012</td>
<td>11.8%</td>
</tr>
<tr>
<td>Total</td>
<td>219,849</td>
<td>100%</td>
</tr>
</tbody>
</table>
### Panel D: Distribution of Observations and Hotels by Location Type

<table>
<thead>
<tr>
<th>Location</th>
<th>Obs</th>
<th>Hotels</th>
<th>% of Obs</th>
<th>% of Hotels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>20,564</td>
<td>2,786</td>
<td>9.4%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Suburban</td>
<td>93,756</td>
<td>12,350</td>
<td>44.3%</td>
<td>40.8%</td>
</tr>
<tr>
<td>Airport</td>
<td>14,071</td>
<td>1,817</td>
<td>6.4%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Interstate</td>
<td>34,657</td>
<td>4,896</td>
<td>16.5%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Resort</td>
<td>13,511</td>
<td>1,931</td>
<td>2.3%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Small Town</td>
<td>43,290</td>
<td>6,503</td>
<td>23.6%</td>
<td>21.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>219,849</td>
<td>30,283</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Panel E: Distribution of Observations by Segment

<table>
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<tr>
<th>Location</th>
<th>Obs</th>
<th>% of Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luxury/ Upper Upscale</td>
<td>14,274</td>
<td>6.5%</td>
</tr>
<tr>
<td>Upscale</td>
<td>22,702</td>
<td>10.3%</td>
</tr>
<tr>
<td>Midscale with F&amp;B</td>
<td>21,831</td>
<td>9.9%</td>
</tr>
<tr>
<td>Midscale without F&amp;B</td>
<td>66,587</td>
<td>30.3%</td>
</tr>
<tr>
<td>Economy</td>
<td>70,839</td>
<td>32.2%</td>
</tr>
<tr>
<td>Independent</td>
<td>23,616</td>
<td>10.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>219,849</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 2: Cohort Effect and County-Level Entry

The table shows the results from our baseline empirical equation (3). The dependent variable in all columns is hotel performance log(RevPAR) in a given year \( t \) during 2000-2009. The variables of interest are: Cohort Effect to capture the impact of the aggregate investment cycles and Entrants to capture the impact of local/county-level investment cycles. Entrants is measured as the number of all hotels that entered the same county \( c \) in the same year \( h \) as a given hotel \( i \). Cohort Effect in columns I and III is our detrended measure (i.e., the standardized residual from the time trend of the total number of hotels built in the US in year \( h \), see Section 3.2). Cohort Effect (levels) in column IV is the total number of hotels that built in US in the same year \( h \) as a given hotel \( i \). In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

<table>
<thead>
<tr>
<th>Variable</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort Effect(_{ih})</td>
<td>-0.0055***</td>
<td>0.0018</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0017)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrants(_{ich})</td>
<td>-0.0080***</td>
<td>-0.0081***</td>
<td>-0.0081***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
<td>(0.0014)</td>
<td>(0.0014)</td>
<td></td>
</tr>
<tr>
<td>Cohort Effect(_{ih}) (levels)</td>
<td>0.0067</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0063)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(Income)</td>
<td>0.2138***</td>
<td>0.2132***</td>
<td>0.2130***</td>
<td>0.2129***</td>
</tr>
<tr>
<td></td>
<td>(0.0428)</td>
<td>(0.0415)</td>
<td>(0.0416)</td>
<td>(0.0416)</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.012***</td>
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<td>-0.0134***</td>
<td>-0.0134***</td>
</tr>
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<td></td>
<td>(0.0040)</td>
<td>(0.0039)</td>
<td>(0.0039)</td>
<td>(0.0039)</td>
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<tr>
<td>Log(Popul.)</td>
<td>-0.1128***</td>
<td>-0.1079***</td>
<td>-0.1079***</td>
<td>-0.1079***</td>
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<tr>
<td></td>
<td>(0.0362)</td>
<td>(0.0356)</td>
<td>(0.0356)</td>
<td>(0.0356)</td>
</tr>
<tr>
<td>Hotels in County</td>
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<td>0.0002*</td>
<td>0.0002*</td>
<td>0.0002*</td>
</tr>
<tr>
<td></td>
<td>(0.0001)</td>
<td>(0.0001)</td>
<td>(0.0001)</td>
<td>(0.0001)</td>
</tr>
<tr>
<td>Log(AE&amp;R estab.)</td>
<td>0.0619*</td>
<td>0.0517</td>
<td>0.0515</td>
<td>0.0515</td>
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<tr>
<td></td>
<td>(0.0355)</td>
<td>(0.0340)</td>
<td>(0.0340)</td>
<td>(0.0340)</td>
</tr>
<tr>
<td>Log(F&amp;B estab.)</td>
<td>0.0920**</td>
<td>0.0957**</td>
<td>0.0959**</td>
<td>0.0959**</td>
</tr>
<tr>
<td></td>
<td>(0.0382)</td>
<td>(0.0373)</td>
<td>(0.0373)</td>
<td>(0.0373)</td>
</tr>
<tr>
<td>Log(Acc. estab.)</td>
<td>0.0161</td>
<td>0.0226</td>
<td>0.0228</td>
<td>0.0228</td>
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<tr>
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<td>(0.0168)</td>
<td>(0.0168)</td>
<td>(0.0168)</td>
</tr>
<tr>
<td>Log(Rooms)</td>
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<td>-0.0568***</td>
<td>-0.0568***</td>
<td>-0.0568***</td>
</tr>
<tr>
<td></td>
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<td>(0.0117)</td>
<td>(0.0117)</td>
<td>(0.0117)</td>
</tr>
<tr>
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<td>-0.0133***</td>
<td>-0.0137***</td>
<td>-0.0137***</td>
<td>-0.0136***</td>
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<tr>
<td></td>
<td>(0.0011)</td>
<td>(0.0011)</td>
<td>(0.0011)</td>
<td>(0.0011)</td>
</tr>
<tr>
<td>Age*2</td>
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<td>0.0002***</td>
<td>0.0002***</td>
<td>0.0002***</td>
</tr>
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<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
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<tr>
<td>Location Type Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Org. Form Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Brand Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year-Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>County Cluster</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.644</td>
<td>0.647</td>
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<td>0.6472</td>
</tr>
<tr>
<td>N</td>
<td>219,849</td>
<td>219,849</td>
<td>219,849</td>
<td>219,849</td>
</tr>
</tbody>
</table>
Table 3: Cohort Effect and County-Level Entry by Hotel Age

The table shows the results from our baseline empirical equation (3) for different subsamples based on hotels’ age. The dependent variable in all columns is hotel performance log(RevPAR) in a given year $t$ during 2000-2009. The variables of interest are: Cohort Effect to capture the impact of the aggregate investment cycles and Entrants to capture the impact of local/county-level investment cycles. Entrants is measured as the number of all hotels that entered the same county $c$ in the same year $h$ as a given hotel $i$. Cohort Effect in all columns is our detrended measure (i.e., the standardized residual from the time trend of the total number of hotels built in the US in year $h$, see Section 3.2). In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

<table>
<thead>
<tr>
<th>Hotel Age</th>
<th>Variable</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
<th>log(RevPAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cohort Effect$_{ih}$</td>
<td>-0.0118***</td>
<td>-0.0009</td>
<td>0.0006</td>
<td>0.0003</td>
<td>-0.0038</td>
</tr>
<tr>
<td></td>
<td>(0.0027)</td>
<td>(0.0024)</td>
<td>(0.0028)</td>
<td>(0.0045)</td>
<td>(0.0079)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entrants$_{ih}$</td>
<td>-0.0095***</td>
<td>-0.0094***</td>
<td>-0.0057***</td>
<td>-0.0059**</td>
<td>0.0055</td>
</tr>
<tr>
<td></td>
<td>(0.0016)</td>
<td>(0.0025)</td>
<td>(0.0021)</td>
<td>(0.0023)</td>
<td>(0.0060)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log(Income)</td>
<td>0.0818**</td>
<td>0.0641*</td>
<td>0.1993***</td>
<td>0.2900***</td>
<td>0.3815***</td>
</tr>
<tr>
<td></td>
<td>(0.0349)</td>
<td>(0.0353)</td>
<td>(0.0407)</td>
<td>(0.0528)</td>
<td>(0.0640)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployment</td>
<td>-0.0161***</td>
<td>-0.0221***</td>
<td>-0.0141***</td>
<td>-0.0099**</td>
<td>-0.0083</td>
</tr>
<tr>
<td></td>
<td>(0.0044)</td>
<td>(0.0039)</td>
<td>(0.0036)</td>
<td>(0.0050)</td>
<td>(0.0055)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log(Popul.)</td>
<td>-0.0218</td>
<td>-0.0361</td>
<td>-0.0932***</td>
<td>-0.1710***</td>
<td>-0.1973***</td>
</tr>
<tr>
<td></td>
<td>(0.0400)</td>
<td>(0.0357)</td>
<td>(0.0316)</td>
<td>(0.0392)</td>
<td>(0.0457)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hotels in County</td>
<td>-0.0000</td>
<td>0.0002**</td>
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<td>Log(Acc. estab.)</td>
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<td>Age$^2$</td>
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<td>Brand Fixed Effects</td>
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<td>Yes</td>
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<tr>
<td>R-squared</td>
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<td>0.6706</td>
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Table 4: Cohort Effect and County-Level Entry by Hotel Age and Quality Segment

The table shows the results from our baseline empirical equation (3) for different subsamples based on hotels’ age. The dependent variable in all columns is hotel performance log(RevPAR) in a given year \( t \) during 2000-2009. Panel A uses performance data of hotels affiliated to a nationwide recognized brand in the Economy segment. Panel B uses performance data of hotels affiliated to a nationwide recognized brand in the Midscale segments (with and without food and beverage). Panel C uses performance data of hotels affiliated to a nationwide recognized brand in any of the following segments: Upscale, Upper Upscale and Luxury. Panel D uses performance data of independent hotels (i.e., not affiliated to a nationwide recognized brand). The variables of interest are: Cohort Effect to capture the impact of the aggregate investment cycles and Entrants to capture the impact of local/county-level investment cycles. Entrants is measured as the number of all hotels that entered the same county \( c \) in the same year \( h \) as a given hotel \( i \). Cohort Effect in all columns is our detrended measure (i.e., the standardized residual from the time trend of the total number of hotels built in the US in year \( h \), see Section 3.2). The control variables are log(Income), Unemployment, log(Population), Hotels in County, log (AE&R estab.), log (F&B estab.), log (rooms), Age and Age squared. In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

Panel A: Cohort Effect and County-Level Entry by Hotel Age for Economy Hotels

<table>
<thead>
<tr>
<th>Hotel Age</th>
<th>&quot;1-5&quot;</th>
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<th>&quot;21-30&quot;</th>
<th>&quot;&gt;30&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
</tr>
<tr>
<td>Cohort Effect(_{ih})</td>
<td>-0.0075</td>
<td>-0.0012</td>
<td>0.0101**</td>
<td>0.0053</td>
<td>-0.0146</td>
</tr>
<tr>
<td>Entrants(_{ich})</td>
<td>-0.0105***</td>
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<td>-0.0047*</td>
<td>-0.0107***</td>
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<td>Controls</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Location Dummies</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Org. Form Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>R-squared</td>
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Panel B: Cohort Effect and County-Level Entry by Hotel Age for Midscale Hotels (with and without Food and Beverage)

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<th>&quot;21-30&quot;</th>
<th>&quot;&gt;30&quot;</th>
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<tbody>
<tr>
<td>Variable</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
</tr>
<tr>
<td>Cohort Effect(_{ih})</td>
<td>-0.0151***</td>
<td>-0.0024</td>
<td>-0.0027</td>
<td>-0.0070</td>
<td>-0.0085</td>
</tr>
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<td>Entrants(_{ich})</td>
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<td>-0.0077***</td>
<td>-0.0045**</td>
<td>-0.0027</td>
<td>0.0175**</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>R-squared</td>
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Panel C: Cohort Effect and County-Level Entry by Hotel Age for Upscale and Luxury/Upper Upscale Hotels

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<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
</tr>
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<td><strong>Cohort Effect</strong>&lt;sub&gt;ih&lt;/sub&gt;</td>
<td>-0.0101**</td>
<td>-0.0010</td>
<td>-0.0019</td>
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<td>(0.0049)</td>
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<td>(0.0088)</td>
<td>(0.0196)</td>
</tr>
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<td><strong>Entrants</strong>&lt;sub&gt;ich&lt;/sub&gt;</td>
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<td>-0.0066***</td>
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<td>Yes</td>
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<td>Yes</td>
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<td>Org. Form Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>R-squared</td>
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Panel D: Cohort Effect and County-Level Entry by Hotel Age for Independent Hotels

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<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
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<td><strong>Cohort Effect</strong>&lt;sub&gt;ih&lt;/sub&gt;</td>
<td>-0.0172</td>
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<td>(0.0152)</td>
<td>(0.0186)</td>
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<td><strong>Entrants</strong>&lt;sub&gt;ich&lt;/sub&gt;</td>
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<td>-0.0123*</td>
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<td>Yes</td>
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Table 5: Cohort Effect and County-Level Entry by Hotel Age and Location type

The table shows the results from our baseline empirical equation (3) for different subsamples based on hotels’ age. The dependent variable in all columns is hotel performance log(RevPAR) in a given year $t$ during 2000-2009. Panel A uses performance data of hotels located in urban areas, near airports and in resort areas. Panel B uses performance data of hotels located in suburban areas, near an interstate and in small towns. The variables of interest are: Cohort Effect to capture the impact of the aggregate investment cycles and Entrants to capture the impact of local/county-level investment cycles. Entrants is measured as the number of all hotels that entered the same county $c$ in the same year $h$ as a given hotel $i$. Cohort Effect in all columns is our detrended measure (i.e. the standardized residual from the time trend of the total number of hotels built in the US in year $h$, see Section 3.2). The control variables are log(Income), Unemployment, log(Population), Hotels in County, log (AE&R estab.), log (F&B estab.), log (rooms), Age and Age squared. In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

Panel A: Cohort Effect and County-Level Entry by Hotel Age for Hotels located in Urban areas, near Airports and in Resorts

Hotel Age

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<th>&quot;21-30&quot;</th>
<th>&quot;&gt;30&quot;</th>
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<tr>
<td>Cohort Effect$_{ih}$</td>
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<td>(0.0074)</td>
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<td>(0.0083)</td>
<td>(0.0098)</td>
<td>(0.0164)</td>
</tr>
<tr>
<td>Entrants$_{ich}$</td>
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<td>Yes</td>
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Panel B: Cohort Effect and County-Level Entry by Hotel Age for Hotels located in Suburban areas, near an Interstate, and in Small Towns

Hotel Age

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<th>&quot;21-30&quot;</th>
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<tr>
<td>R-squared</td>
<td>0.5981</td>
<td>0.6352</td>
<td>0.6242</td>
<td>0.6046</td>
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<td>27934</td>
<td>36519</td>
<td>53422</td>
<td>28478</td>
<td>25350</td>
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</table>
The table shows the results from our empirical equation (3), when we split the variable of interest \textit{Entrants} (and the control variable for competition during RevPAR years, \textit{Hotels in County} at time \(t\)) between same and other segments as a given hotel \(i\). The dependent variable in all columns is hotel performance \(\log(\text{RevPAR})\) in a given year \(t\) during 2000-2009. \textit{Entrants (same segment)} is the number of all hotels in the same segment as a given hotel \(i\) that entered the same county \(c\) in the same year \(h\). \textit{Entrants (other segments)} is the number of hotels in other segments than a given hotel \(i\) that entered the same county \(c\) in the same year \(h\). Column I shows the results for the full sample. Columns II-VI show the results for different hotel age cohorts. The control variables are \(\log(\text{Income}), \text{Unemployment}, \log(\text{Population}), \log(\text{AE&R estab.}), \log(\text{F&B estab.}), \log(\text{rooms}), \text{Age and Age squared.}\) In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

### Hotel Age

<table>
<thead>
<tr>
<th>Variable</th>
<th>Full Sample</th>
<th>&quot;1-5&quot;</th>
<th>&quot;6-10&quot;</th>
<th>&quot;11-20&quot;</th>
<th>&quot;21-30&quot;</th>
<th>&quot;&gt;30&quot;</th>
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<tbody>
<tr>
<td>Cohort Effect(h_i)</td>
<td>0.0000</td>
<td>-0.0142***</td>
<td>-0.0034</td>
<td>-0.0004</td>
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<tr>
<td>Entrants(h_i) (same segment)</td>
<td>(0.0017)</td>
<td>(0.0027)</td>
<td>(0.0023)</td>
<td>(0.0029)</td>
<td>(0.0045)</td>
<td>(0.0078)</td>
</tr>
<tr>
<td>Entrants(h_i) (other segments)</td>
<td>-0.0000</td>
<td>-0.0004</td>
<td>0.0016</td>
<td>0.0002</td>
<td>-0.0056</td>
<td>0.0108*</td>
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<tr>
<td>Hotels in County (same segment)</td>
<td>(0.0027)</td>
<td>(0.0027)</td>
<td>(0.0038)</td>
<td>(0.0038)</td>
<td>(0.0047)</td>
<td>(0.0065)</td>
</tr>
<tr>
<td>Hotels in County (other segments)</td>
<td>-0.0070***</td>
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<td>-0.0053**</td>
<td>-0.0060***</td>
<td>0.0050</td>
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<tr>
<td></td>
<td>(0.0013)</td>
<td>(0.0012)</td>
<td>(0.0021)</td>
<td>(0.0021)</td>
<td>(0.0021)</td>
<td>(0.0059)</td>
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<td>-0.0044***</td>
<td>-0.0044***</td>
<td>-0.0044***</td>
<td>-0.0044***</td>
<td>-0.0041***</td>
<td>-0.0047***</td>
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<tr>
<td></td>
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<td>(0.0012)</td>
<td>(0.0009)</td>
<td>(0.0009)</td>
<td>(0.0011)</td>
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<td>Yes</td>
<td>Yes</td>
</tr>
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<td>Org. Form Fixed Effects</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Year-Fixed Effects</td>
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<td>County Cluster</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.6514</td>
<td>0.642</td>
<td>0.6761</td>
<td>0.6761</td>
<td>0.6701</td>
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</table>
The table shows the results from our empirical equation (3), when we split the variable of interest \textit{Entrants} (and the control variable for competition during RevPAR years, \textit{Hotels in County} at time $t$) between same and other segments as a given hotel $i$. The dependent variable in all columns is hotel performance log(RevPAR) in a given year $t$ during 2000-2009. \textit{Entrants}_{ih} (same segment) is the number of all hotels in the same segment as a given hotel $i$ that entered the same county $c$ in the same year $h$. \textit{Entrants}_{ich} (other segments) is the number of hotels in other segments than a given hotel $i$ that entered the same county $c$ in the same year $h$. \textit{Entrants}_{ih-1} (same segment) and \textit{Entrants}_{ich-1} (other segments) are the number of all hotels in the same (other) segment as a given hotel $i$ that entered the same county $c$ in the year before ($h-1$). Column I shows the results for the full sample. Columns II-VI show the results for different hotel age cohorts. The control variables are log(Income), Unemployment, log(Population), Hotels in County (same segment), Hotels in County (other segments), log (AE&R estab.), log (F&B estab.), log (rooms), Age and Age squared. In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

<table>
<thead>
<tr>
<th>Hotel Age</th>
<th>Full Sample</th>
<th>&quot;1-5&quot;</th>
<th>&quot;6-10&quot;</th>
<th>&quot;11-20&quot;</th>
<th>&quot;21-30&quot;</th>
<th>&quot;&gt;30&quot;</th>
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<tbody>
<tr>
<td>Variable</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
<td>log(RevPAR)</td>
</tr>
<tr>
<td>Cohort Effect$_{ih}$</td>
<td>0.0001</td>
<td>-0.0140***</td>
<td>-0.0033</td>
<td>-0.0002</td>
<td>0.0003</td>
<td>-0.0039</td>
</tr>
<tr>
<td>(0.0017)</td>
<td>(0.0026)</td>
<td>(0.0024)</td>
<td>(0.0029)</td>
<td>(0.0045)</td>
<td>(0.0078)</td>
<td></td>
</tr>
<tr>
<td>Entrants$_{ih}$ (same segment)</td>
<td>0.0004</td>
<td>0.0008</td>
<td>0.0016</td>
<td>0.0005</td>
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</tr>
<tr>
<td>(0.0024)</td>
<td>(0.0022)</td>
<td>(0.0034)</td>
<td>(0.0035)</td>
<td>(0.0041)</td>
<td>(0.0066)</td>
<td></td>
</tr>
<tr>
<td>Entrants$_{ich}$ (other segments)</td>
<td>-0.0048***</td>
<td>-0.0034***</td>
<td>-0.0064***</td>
<td>-0.0041**</td>
<td>-0.0041**</td>
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<tr>
<td>(0.0012)</td>
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<td>(0.0018)</td>
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<td>Entrants$_{ih-1}$ (same segment)</td>
<td>0.0016</td>
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<td>(0.0028)</td>
<td>(0.0029)</td>
<td>(0.0029)</td>
<td>(0.0054)</td>
<td>(0.0057)</td>
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<td>-0.0063***</td>
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<td>Year-Fixed Effects</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<td>R-squared</td>
<td>0.6517</td>
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<td>0.611</td>
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<td>34253</td>
<td>44118</td>
<td>66100</td>
<td>38411</td>
<td>36967</td>
</tr>
</tbody>
</table>
Table 8: Entry per Segment

The table shows the results from our empirical equation (3), when we split the variable of interest *Entrants* per segment. The dependent variable in all columns is hotel performance log(RevPAR) in a given year $t$ during 2000-2009. Column I shows the results for Economy hotels, Column II shows the results for Midscale hotels without Food and Beverage, Column III shows the result for Midscale hotels with Food and Beverage, Column IV shows the results for Upscale hotels, and Column V shows the results for Luxury/Upper Upscale hotels. The control variables are log(Income), Unemployment, log(Population), Hotels in County (same segment), Hotels in County (other segments), log (AE&R estab.), log (F&B estab.), log (rooms), Age and Age squared. In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Economy</th>
<th>Midscale without F&amp;B</th>
<th>Midscale with F&amp;B</th>
<th>Upscale</th>
<th>Luxury/ Upper Upscale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort Effect $t_{ah}$</td>
<td>0.0012</td>
<td>-0.0036**</td>
<td>0.0143**</td>
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<td>0.0058</td>
</tr>
<tr>
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<td>(0.0029)</td>
<td>(0.0018)</td>
<td>(0.0056)</td>
<td>(0.0032)</td>
<td>(0.0063)</td>
</tr>
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<td>Entrants $t_{ah}$ (Economy)</td>
<td>0.0013</td>
<td>-0.0011</td>
<td>-0.0300***</td>
<td>-0.0013</td>
<td>-0.0089*</td>
</tr>
<tr>
<td></td>
<td>(0.0039)</td>
<td>(0.0025)</td>
<td>(0.0074)</td>
<td>(0.0028)</td>
<td>(0.0046)</td>
</tr>
<tr>
<td>Entrants $t_{ah}$ (Midscale w/o F&amp;B)</td>
<td>-0.0051</td>
<td>0.0076***</td>
<td>-0.0137*</td>
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</tr>
<tr>
<td></td>
<td>(0.0058)</td>
<td>(0.0025)</td>
<td>(0.0083)</td>
<td>(0.0028)</td>
<td>(0.0080)</td>
</tr>
<tr>
<td>Entrants $t_{ah}$ (Midscale w F&amp;B)</td>
<td>-0.0033</td>
<td>-0.0077</td>
<td>0.0614***</td>
<td>-0.0146**</td>
<td>-0.0033</td>
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<tr>
<td></td>
<td>(0.0088)</td>
<td>(0.0072)</td>
<td>(0.0082)</td>
<td>(0.0061)</td>
<td>(0.0094)</td>
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<td>Entrants $t_{ah}$ (Upscale)</td>
<td>-0.0180***</td>
<td>-0.0096*</td>
<td>-0.0013</td>
<td>0.0043</td>
<td>-0.0203***</td>
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<tr>
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<td>(0.0087)</td>
<td>(0.0058)</td>
<td>(0.0107)</td>
<td>(0.0045)</td>
<td>(0.0070)</td>
</tr>
<tr>
<td>Entrants $t_{ah}$ (Luxury/Upper Upscale)</td>
<td>-0.0102</td>
<td>-0.0134</td>
<td>-0.0115</td>
<td>-0.0047</td>
<td>0.0170***</td>
</tr>
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<td>(0.0149)</td>
<td>(0.0065)</td>
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<td>Entrants $t_{ah}$ (Independent)</td>
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<td>(0.0136)</td>
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<td>(0.0120)</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Org. Form Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Brand Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Year-Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>County Cluster</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>R-squared</td>
<td>0.3082</td>
<td>0.4469</td>
<td>0.4771</td>
<td>0.4857</td>
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<td>N</td>
<td>70839</td>
<td>66587</td>
<td>21831</td>
<td>22702</td>
<td>14274</td>
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</table>
Table 9: Within-County Herders’ Performance

The table shows the results for 160 counties in which 5 or more hotels built in a single year at least once. The dependent variable in all columns is hotel performance log(RevPAR) in a given year \( t \) during 2000-2009. Focusing on within-county variation, the regressions control for county-fixed effects and include the same controls as our empirical equation (3) together with our detrended measure of Cohort Effect. In Panel A, instead of including the variable Entries (as in equation (3)), we use dummies to indicate into which County Entry Decile a given hotel \( i \) belongs in its year of entry \( h \) (based on overall level of entry in that county). In Panel B, instead of using dummies for entry deciles, we use dummies to indicate whether a given hotel \( i \) belongs to Herders (i.e., hotels built during peak years for a given county) or Laggards/Leaders (i.e., hotels built 3, 2 or 1 years after/before the peak year), based on its year of construction \( h \) and county \( c \). The control variables are log(Income), Unemployment, log(Population), Hotels in County, log (AE&R estab.), log (F&B estab.), log (rooms), Age and Age squared. In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

### Panel A: Hotel’s County Entry Deciles

<table>
<thead>
<tr>
<th>Variable</th>
<th>log(RevPAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort Effect(_h)</td>
<td>0.0027 (0.0025)</td>
</tr>
<tr>
<td>County Entry Decile 2</td>
<td>0.0097 (0.0093)</td>
</tr>
<tr>
<td>County Entry Decile 3</td>
<td>0.0111 (0.0113)</td>
</tr>
<tr>
<td>County Entry Decile 4</td>
<td>-0.0007 (0.0102)</td>
</tr>
<tr>
<td>County Entry Decile 5</td>
<td>-0.0076 (0.0108)</td>
</tr>
<tr>
<td>County Entry Decile 6</td>
<td>-0.0010 (0.0123)</td>
</tr>
<tr>
<td>County Entry Decile 7</td>
<td>-0.0076 (0.0107)</td>
</tr>
<tr>
<td>County Entry Decile 8</td>
<td>-0.0065 (0.0128)</td>
</tr>
<tr>
<td>County Entry Decile 9</td>
<td>-0.0063 (0.0124)</td>
</tr>
<tr>
<td>County Entry Decile 10</td>
<td>-0.0592** (0.0244)</td>
</tr>
</tbody>
</table>

Controls | Yes
Location Dummies | Yes
Org. Form Fixed Effects | Yes
Brand Fixed Effects | Yes
Year-Fixed Effects | Yes
County Fixed Effects | Yes
County Cluster | Yes
R-squared | 0.7591
N | 102.133
### Panel B: County Herders, Leaders and Laggards

<table>
<thead>
<tr>
<th>Variable</th>
<th>log(RevPAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort Effect$_{ih}$</td>
<td>0.0022</td>
</tr>
<tr>
<td></td>
<td>(0.0023)</td>
</tr>
<tr>
<td>Leaders$_{ich-3}$ (3 years before peak)</td>
<td>-0.0051</td>
</tr>
<tr>
<td></td>
<td>(0.0074)</td>
</tr>
<tr>
<td>Leaders$_{ich-2}$ (2 years before peak)</td>
<td>-0.0075</td>
</tr>
<tr>
<td></td>
<td>(0.0073)</td>
</tr>
<tr>
<td>Leaders$_{ich-1}$ (1 year before peak)</td>
<td>-0.0079</td>
</tr>
<tr>
<td></td>
<td>(0.0066)</td>
</tr>
<tr>
<td>Herders$_{ich}$ (peak year)</td>
<td>-0.0152**</td>
</tr>
<tr>
<td></td>
<td>(0.0076)</td>
</tr>
<tr>
<td>Laggards$_{ich+1}$ (1 year after peak)</td>
<td>-0.0135*</td>
</tr>
<tr>
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<td>(0.0079)</td>
</tr>
<tr>
<td>Laggards$_{ich+2}$ (2 year after peak)</td>
<td>-0.0134</td>
</tr>
<tr>
<td></td>
<td>(0.0114)</td>
</tr>
<tr>
<td>Laggards$_{ich+3}$ (3 year after peak)</td>
<td>-0.0011</td>
</tr>
<tr>
<td></td>
<td>(0.0081)</td>
</tr>
</tbody>
</table>

- Controls: Yes
- Location Dummies: Yes
- Org. Form Fixed Effects: Yes
- Brand Fixed Effects: Yes
- Year-Fixed Effects: Yes
- County Fixed Effects: Yes
- County Cluster: Yes
- R-squared: 0.7607
- N: 100,714
Table 10: When is Herding More Likely? (Sample 1973-2008)

The table shows the results from a multinomial logit (equation (4)) across 3,100 US counties during 1973-2008. The dependent variable $E_{ch}$ takes a value of 0 if no hotels are built in a county-year, 1 if a single hotel is built, 2 if 2-5 hotels are built, and 3 if 6 or more hotels are built. As controls we include county-level economic, demographic and financing cost variables available for each year since 1973. In all regressions, robust standard errors are adjusted for heteroscedasticity and county-level clusters. Significant at: *10%, **5%, ***1%.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entrants$_{ch}$</th>
<th>1 vs 0</th>
<th>2-5 vs 0</th>
<th>5+ vs 0</th>
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</thead>
<tbody>
<tr>
<td>Hotels in County$_{ch-1}$</td>
<td></td>
<td>0.0162***</td>
<td>0.0249***</td>
<td>0.0307***</td>
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<tr>
<td></td>
<td></td>
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<td>(0.0027)</td>
<td>(0.0034)</td>
</tr>
<tr>
<td>Hotels Opened in County$_{ch-1}$</td>
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<td>-0.0012</td>
<td>0.1567***</td>
<td>0.3711***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0403)</td>
<td>(0.0498)</td>
<td>(0.0665)</td>
</tr>
<tr>
<td>Log(County GDP)$_{ch-1}$</td>
<td></td>
<td>0.5495***</td>
<td>0.9064***</td>
<td>1.4492***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0174)</td>
<td>(0.0303)</td>
<td>(0.0986)</td>
</tr>
<tr>
<td>Mean Tot. County GDP Growth$_{ch-1}$ from h-4 to h-1</td>
<td></td>
<td>4.5990***</td>
<td>10.7898***</td>
<td>18.3985***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.4756)</td>
<td>(0.7651)</td>
<td>(1.8663)</td>
</tr>
<tr>
<td>(Mean Tot. County GDP Growth$_{ch-1}$ from h-4 to h-1)$^*$</td>
<td>-0.1298</td>
<td>-0.7202***</td>
<td>-1.0857*</td>
<td></td>
</tr>
<tr>
<td>(Spread Aaa Bonds to Fed rates h-1)</td>
<td></td>
<td>(0.1593)</td>
<td>(0.2405)</td>
<td>(0.6306)</td>
</tr>
<tr>
<td>Normalized Standard Dev. County GDP Growth h-4 to h-1</td>
<td></td>
<td>-0.1290***</td>
<td>-0.5234***</td>
<td>-1.5003***</td>
</tr>
<tr>
<td>(Normalizated Standard Dev. County GDP Growth h-4 to h-1)</td>
<td></td>
<td>(0.0219)</td>
<td>(0.0930)</td>
<td>(0.3639)</td>
</tr>
<tr>
<td>(Hotels Opened in County$_{ch-1}$)$^*$</td>
<td></td>
<td>1.6969***</td>
<td>2.2125**</td>
<td>5.5152***</td>
</tr>
<tr>
<td>(Mean Tot. County GDP Growth from h-4 to h-1)</td>
<td></td>
<td>(0.7082)</td>
<td>(1.0024)</td>
<td>(1.5320)</td>
</tr>
<tr>
<td>(Hotels Opened in County$_{ch-1}$)$^*$</td>
<td></td>
<td>2.2051***</td>
<td>3.5075***</td>
<td>4.1421***</td>
</tr>
<tr>
<td>(Mean Tot. County GDP Growth from h-4 to h-1)</td>
<td></td>
<td>(0.4647)</td>
<td>(0.5602)</td>
<td>(0.7345)</td>
</tr>
</tbody>
</table>

Year-Fixed Effects: Yes
County Cluster: Yes
"R-squared": 0.26
N: 114908
Appendix: NPV of an Economy hotel

In this Appendix, we describe the data used to compute the NPV of an average Economy hotel, as discussed in Section 5.3.

The average Economy hotel in our sample has 82 rooms and generates yearly room revenues of US$928,000. According to STR, 98% of the total revenues of Economy hotels come from room revenues, and the variable operating expenses represent 19.3% of the total revenue. In addition, the estimated yearly fixed cost for the average hotel in our sample is US$300,000.

The average development cost of an Economy hotel of 82 rooms is US$5.25 million according to HVS Global Hospitality Service, Hotel Development Cost Survey 2011. We deflate this to 2009 US dollars, as the performance is measured in 2009 US dollars. The average yearly inflation rate for this period was 2.4%. Additionally, franchised hotels need to pay an initial franchise fee. For an Economy hotel, this fee is typically US$35,000.

Following standard industry practices, we allow 40 years of depreciation for the initial construction cost. We assume a corporate tax rate of 35% and that property taxes can be deducted from taxable income. Using the revenue, cost and depreciation information, the unlevered free cash flow for the first 40 years is US$342,000.

The typical hotel development is financed using 40% of equity and 60% of debt. To compute the WACC (discount rate), we use the discount rates suggested by deRoos and Rushmore (2003): 8% for debt and 13% for equity. Assuming that the hotel operates perpetually (although depreciation tax shields only last for 40 years), and that cash flows grow at the rate of inflation, we obtain an NPV of US$569,000.

Next, we use the parameters from Table 4, Panel C, to compute the revenue reduction for Economy hotels built during market booms. A one standard deviation increase in the number of Entrants (6 hotels) in the same county-year reduces a hotel’s RevPAR by 6.3% in the first 5 years of operations; by 4% in the years 5-10; by 2.8% in the years 10-20 and by 6.4% in the years 20-30. Using the weight each period represents in the total present value of revenues a hotel produces, this is equivalent to a reduction in the present value of revenues of 3.9%. Applying the same assumptions we used above to compute the NPV of the hotel, a hotel opened during a market boom has an NPV of US$237,000. That is, a reduction of US$332,000 in NPV.