COVID-19 pandemic and hotel property performance

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Abstract

Purpose – The purpose of this study is to test the local impact of COVID-19 pandemic on hotel performance at the individual property level, and further examine the roles of hotel attributes and business mix in potentially moderating or intensifying the impact of a crisis.

Design/methodology/approach – Using a sample of 5,090 hotel properties in Texas, USA from January 2020 to December 2021, this study estimates a monthly hotel performance model to evaluate how the pandemic affected hotels' operational performance based on revenue per available room.

Findings – Results show that a 10% increase in the monthly number of confirmed COVID-19 cases led to a 0.522% decrease in hotel performance. Also, a series of moderators were identified within the pandemic–performance relationship: the negative impact of the pandemic was more severe among higher-end hotels and newer hotels; urbanization and localization diseconomies prevailed during the pandemic; and there was a smaller negative effect of COVID-19 on high rated hotels in the category of economy hotels.

Originality/value – The moderators highlighted in this paper shed light on the heterogeneity of COVID-19's effects on hotel operations. Findings enrich the hospitality literature by considering business resilience in relation to the pandemic.

Keywords : COVID-19, Hotel performance, Urbanization diseconomies, Localization diseconomies, Online reputation

Paper type Research paper

1. Introduction

COVID-19 hit the world economy hard. The IMF managing director, Kristalina Georgieva, called it the worst economic crisis since the Great Depression, and IMF models for 2020 projected that "over 170 countries [out of 189] will experience negative per capita income growth" (Georgieva, 2020). Hotels were one of the first industries to be wounded by the pandemic and will likely be one of the last to recuperate (AHLA, 2021; Ghosh and Bhattacharya, 2022). Despite a cautious outlook that recognizes numerous negative impacts,

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an industry recovery is unquestionable owing to the rollout of vaccines worldwide and the economic importance of tourism in many countries and regions (Zhang *et al.*, 2021). As a result, various tourism sectors are working hard on post-COVID-19 recovery to live with uncertainty in the new normal. Yet, as stated by Colmekcioglu *et al.* (2022), a crisis such as COVID-19 also offers hoteliers an opportunity to rethink their strategies. A successful reset will require a strong understanding of how the industry has been affected. More specifically, was COVID-19's impact homogeneous across all hotel types, or were some hotel types influenced more than others?

That hotels have heterogeneous resources and capabilities, and that this heterogeneity affects performance both during times of business-as-usual and during disruptive times, is a perspective supported by a growing stream of research. For example, Assaf *et al.* (2010) showed that firm-specific parameters such as hotel size, ownership and service class affected efficiency. Similarly, other frontier-based studies of hotel efficiency have also identified firm-specific resources and capabilities as key performance drivers (Arbelo *et al.*, 2021). Performance recovery from a crisis, in this case, the Great Recession beginning in 2007, was also found to depend on firm-specific resources and capabilities, with price recovery taking more or less time depending on the characteristics of a particular hotel (Kim *et al.*, 2019). Results such as these lead us to anticipate that a hotel's performance during COVID-19 likely varies across variables that measure that hotel's resources and capabilities. Literature in business, management and marketing proposed the concept of business resilience to illustrate an entity's capacity to endure and recover from disasters; resilience, therefore, safeguards business performance and boosts the probability of survival (Brown *et al.*, 2017). Notably, research has also begun investigating the pandemic's impact on the hotel industry. An integrative multiple capital-based approach was proposed to understand exact elements of hotel business resilience (Brown *et al.*, 2018), which includes social, economic, human, physical, natural and cultural capital, with common predictors identified for each dimension. For example, the economic capital includes business age, financial strengthen and size of the hotel property, etc., which work interdependently toward building a resilient hotel business (Brown *et al.*, 2018). However, there lacks the empirical evidence of how these individual capitals relate to business resilience by contributing to business performance in difficult times.

To bridge the knowledge gap, this paper examines hotel performance, as measured by RevPAR, as a function of hotel characteristics and the extent of COVID-19 between January 2020 and December 2021. RevPAR has gained great popularity due to its ability to combine rates and occupancy. Specifically, by compiling the monthly hotel performance data from the local Comptroller of Public Accounts, hotel attributes from STR hotel census databases, hotel listing information from TripAdvisor and pandemic-related information from the Johns Hopkins Coronavirus Resource Center, this paper investigates the roles of different hotel attributes that describe its resources and capabilities, such as hotel class, location and business mix in potentially moderating or intensifying the impact of a crisis, and presents empirical evidence of Texas, USA.

2. Literature review and research hypotheses

2.1 Business resilience

Business resilience refers to the ability of a firm to withstand the impact of a crisis, reduce adverse reactions and the ability to learn and grow in the face of adversity (Williams *et al.*, 2017). Specifically, business resilience is a dynamic process that essentially entails three stages: precrisis prediction, in-crisis coping and postcrisis response. In particular, coping during a crisis refers to the firm's defensive capabilities to withstand the crisis and recover

at full speed. Notably, businesses with high resilience recognize and respond to early signs of crisis more quickly. The ability of firms to develop resilience and reflect on adaptations or transformations in the face of adverse events has become critical for organizational survival and future success (van der Vegt *et al.*, 2015).

Previous studies have generally investigated three aspects help to improve the business resilience: macro environment, organizational environment and individual factors. First, establishing strong relationships with external agents, such as the government and business partners, enhances the firm's access to resources that are critical and scarce in crisis, and accelerates the flow of information and technology for timely assistance, all of which are believed to strengthen the firm's resilience (Iftikhar *et al.*, 2021). Another significant component is proactive social engagement that aims to create ideal environments and conditions for business operations, such as fulfilling corporate social responsibility (Gürlek and Kılıç, 2021). Second, at the organizational level, two broad categories exist: hard and soft power. Hard power encompasses the resources, strategy and organizational structure that a company has, while soft power includes corporate culture, atmosphere and relationships within the organization. Specifically, adequate funding, facilities, talents and social capital are all important elements that help firms withstand crises (Linnenluecke, 2017; Brown *et al.*, 2018). Finally, at the individual level, employees and teams are intertwined, with employees actively feeding into and being influenced by the team (van der Vegt *et al.*, 2015). Employees' cognitive and emotional abilities, which include individual's intelligence, self-efficacy, emotional ability, cognitive ability and self-regulation, exert impacts on the resilience of the firm (Linnenluecke, 2017).

It is beneficial to understand what constitutes business resilience before proposing any strategies for businesses to maintain performance and develop resilience. Brown *et al.* (2018) proposed an innovative framework for hotel disaster resilience that explores economic, social, human, physical, natural and cultural capitals as integrative dimensions. In a departure from previous literature works, this paper thus enriches the hotel disaster resilience framework by extending the measurements of different capitals and providing empirical evidence of how such capitals contribute to business performance in COVID-19.

2.2 Local pandemic severity and hotel performance

The COVID-19 outbreak is the most recent crisis to permeate today's interconnected global system. Scholars have investigated how the hotel industry can effectively respond to these events. Researchers have also explored how catastrophes such as the 1999 Jiji earthquake in Taiwan, the September 11 attacks, and the SARS outbreak have compromised hotel performance, as evidenced by declining sales revenue and company stock performance (Kim *et al.*, 2019; Kubickova *et al.*, 2019). Previous studies have also presented empirical evidence of the impacts of such public health events on global tourism performance. For instance, over 82% of respondents to a survey of the 2003 SARS epidemic in Canada indicated that SARS had an extremely hard or very hard impact on their hotel's performance (Tew *et al.*, 2008). More recently, Yang *et al.* (2022) specifically suggested that COVID-19 cases negatively impacted tourism revenue and pricing in the USA, given the restrictions on human mobility and interactions. In this study, with a decline in the number of travelers and subsequently lowered room prices due to the local pandemic, hotels' revenue performance may be negatively affected during the COVID-19 crisis. Therefore, the first hypothesis to be tested is:

H1. Local pandemic severity has a negative influence on hotel performance measured by RevPAR.

2.3 The moderating role of hotel class

The pandemic could affect different types of hotels in distinct ways; that is, some hotels may be more resilient to its impact than others. High-end hotels, for example, were discovered to be more vulnerable to pandemic severity (Yang *et al.*, 2022). Hotel class is hence predicted to moderate hotel performance during a crisis. Similarly, Lin and Chen (2022) investigated factors that include hotel class and their moderating roles in the relationship between pandemic severity and hotel performance. Specifically, the result showed that international tourist hotels with a wide range of product offerings and five-star hotels lost more revenue than other types of hotels, whereas hotels affiliated to an international chain or located in scenic areas (i.e. as opposed to the metropolitan areas) were less affected. However, this study only provided a point of departure to investigate the hotel class's moderation role in the association between pandemic severity and hotel performance in that they only operationalized hotel class as a dummy variable (i.e. whether it is a five-star hotel or not). A more granular measurement and classification of hotels is thus needed. Amid COVID-19, the US GDP declined for two consecutive quarters in early 2020 (National Bureau of Economic Research, 2020), marking the end of the longest growth period on record. These factors imply that the pandemic will influence the performance of luxury and upscale hotels more than for lower-priced segments. This might be attributed to the reason that luxury hotels are less flexible in sources of income and highly dependent on certain customer groups, therefore less resilient in terms of the economic capital.

Furthermore, hotel revenue managers frequently offer room rate discounts in response to low demand. Hoteliers often consider these promotions an effective crisis-coping strategy (Kim *et al.*, 2019). Consumer demand for different hotel classes is further complicated by customer segments' disparate expectations and values around various hotel types (Qiu *et al.*, 2015). For example, unlike users of limited-service hotels who are driven primarily by price and value considerations, guests of luxury hotels are driven, in part, by social status or a desire to be seen engaging in conspicuous consumption (Jang and Moutinho, 2019). Therefore, price discounts may adversely affect the quality perceptions and brand image of luxury hotels (Jang and Moutinho, 2019). As such, with their limited use of pricing tools, luxury hotels could suffer more from pandemics. Therefore, the following hypothesis is proposed:

H2. Hotel class negatively moderates the impact of pandemic severity, such that the negative impact on hotel performance is greater for higher-class hotels.

2.4 The moderating role of hotel age

Business success during the crisis hinges on organizations' abilities to extract knowledge, disseminate information and drive communication throughout the organization and among stakeholders (Katare *et al.*, 2021). As the hospitality and tourism industry is deeply rooted in the local community, social networks underlie performance recovery after a crisis (Leung *et al.*, 2021). Hotels with more years of operating experience may have wider social networks and more loyal customers thanks to closer relationships and stronger emotional attachment within the community.

Social capital, which is defined as the resources that a company can access to acquire actual and potential support through its plot of social relationships (Nahapiet and Ghoshal, 1998), plays a crucial role in the creation of innovative actions at the call of market dynamics during a crisis (Visentin *et al.*, 2021). At the firm level, Sainaghi and Baggio (2014) asserted that social capital may positively affect hotel occupancy and appears to be a powerful lever for hotel management to manage operational issues, especially seasonality and location

problems. At the interfirm level, prior research indicates that commitment and trust are established along with repeated transactions among business partners (Nahapiet and Ghoshal, 1998); well-established firms that are perceived as trustworthy have more post-disaster adaptive resilience as they may receive support from the partners as mutually beneficial solutions during the unexpected disruptions (Chowdhury *et al.*, 2019). Such relationships, enhanced by cumulative effects of historical interactions, also promote open conversations for resource sharing and knowledge spillovers in the network, so that the hotels' management can borrow and adapt to cope with its own challenges (Visentin *et al.*, 2021). In addition, at the firm level, a resource-based view of firms asserts that knowledge is a core strategic resource that organizations can leverage to achieve a competitive advantage and to survive in a dynamic environment (Wernerfelt, 1984). An organization's knowledge is composed of the experience, values and beliefs of individuals within the organization and is embedded in their work routines. Therefore, hotel management's sense-making of a crisis is closely related to and revolved from its previous routines of problem-solving and established organizational knowledge (Visentin *et al.*, 2021; Brown *et al.*, 2018).

Considering that the external social networks and internal organizational knowledge can be gained, archived and circulated over time; as such, all else being equal, hotels that are well established in this environment (e.g. due to opening earlier) enjoy advantages in terms of accumulating knowledge resources and experience in knowledge management to better cope with pandemics. The following hypothesis is put forth accordingly:

H3. Hotel age positively moderates the impact of pandemic severity, such that the negative impact on hotel performance is smaller for hotels with longer operational histories (e.g. those that opened in an earlier year).

2.5 The moderating role of urbanization diseconomies

Urbanization economies refer to economies of scale external to industry, which are usually determined by city-wide economic activity, an urban area's size and the diversity of business activities (Glaeser *et al.*, 1992). Compared with rural areas, urban areas generate more intense and frequent interactions among individuals and industries (Davis and Dingel, 2020). Urbanization externalities include multispecialized labor agglomeration, input and output sharing, knowledge spillovers and general infrastructure availability (Davis and Dingel, 2020). According to Combes (2000), the positive effects of urbanization economies are significant in some service sectors, especially in hotels with high fixed costs. Studies have also identified the impact of urbanization on hospitality development. Notably, physical capital that include buildings and local infrastructures are considered important for hotel industry (Brown *et al.*, 2018), which include the roads and utilities that are shared among local businesses. A robust built infrastructure and environment is an essential component of physical capital that allows an hotel to remain operational, and is critical in determining hotel resilience (Brown *et al.*, 2018). The benefits of urbanization economies, including high population density, sound public infrastructure and higher demand and consumption from travelers, are important determinants of hotel location decisions as well; Accordingly, proximity to the city center is a key location premium for hotels (Yang *et al.*, 2012).

Industries are typically concentrated in densely populated areas where economic activities usually occur (Davis and Dingel, 2020). These regions also tend to be susceptible to and greatly affected by crises such as the pandemic. For example, large metropolitan areas in the USA, such as New York and Los Angeles, were hit earlier and harder by COVID-19 and suffered steeper job losses compared with places lower on the urban hierarchy. Many industries in big cities also faced unprecedented challenges during the pandemic; a large

proportion of businesses closed temporarily or even permanently. The hotel industry was severely disrupted given its susceptibility to the external environment and an inability to easily shift to remote production (Bartik *et al.*, 2020). Economic downturns and slowing productivity in urban areas have therefore adversely affected urban economies. Hotels in more urbanized areas may have experienced more severe business interruptions from COVID-19 compared with others, as postulated below:

H4. Urbanization diseconomies exist, such that the negative impact of the pandemic on hotel performance is greater for hotels in more urbanized areas.

2.6 The moderating role of localization diseconomies

The local tourism industry is complex, consisting of sectors such as food and beverage, accommodation, transportation, facilities, attractions and events (Mill and Morrison, 2002). Attractions, as a vital sub-element of the tourism system, have been regarded as the heart of the travel process and often motivate travelers to visit specific areas. These sites hence promote tourist inflows, activities and consumption (Richards, 2002). Localization economies bear the feature of being intra-industry; they are external to individual properties but internal to the industry (Graham, 2009). Localization economies in the tourism industry have led tourist attractions to share extensive externalities with other sectors, such as hotels and food and beverage establishments (Segarra-Oña *et al.*, 2012). The agglomeration of tourism products and sectors has, in turn, shaped various tourism clusters; externalities from these clusters generate benefits across sectors in the associated geographical area (Segarra-Oña *et al.*, 2012). Parts of the local tourism system are interrelated and shape travelers' perceptions of an area's attractiveness as a destination (Anuar *et al.*, 2012). During COVID-19, tourist inflows to attractions declined substantially; some attractions' operations were even suspended at the height of the pandemic (Lastoe, 2020). The pandemic's negative impact on tourist flows to attractions may also affect other sectors – including hotels in the immediate geographical area – resulting in localization diseconomies. Thus, we propose the following hypothesis:

H5. Localization diseconomies exist, such that the negative impact of the pandemic on hotel performance is greater for hotels in areas with more tourist attractions.

2.7 The moderating role of online ratings

Online reviews, a common form of electronic word of mouth, are a core source of hotel information and greatly affect travelers' decision-making and purchase behavior when booking hotels online (Zhang *et al.*, 2019). Research has shown the importance of online reviews and ratings (Li, Liu *et al.*, 2020; Li *et al.*, 2020), which can even help to forecast the tourism demand (Hu *et al.*, 2022; Li *et al.*, 2020). These information sources typically reflect a hotel's quality and online reputation, facilitating consumers' decision-making process. A general consensus exists regarding the positive impacts of online ratings on hotel room rates (Hu *et al.*, 2019): consumers perceive better quality and express stronger booking intentions toward hotels with higher online review ratings (Park and Lee, 2009), which is a proxy of trust among consumers. Trust in the community is another form of social capital that determines hotel disaster resilience (Brown *et al.*, 2018). Positive online reviews and ratings can be capitalized by hotels and are significantly and positively related to hotel performance, including RevPAR and financial profitability (Yang *et al*, 2018). Many travelers have experienced stronger insecurity and more concern about health risks during the pandemic. Hotels with more positive reviews and higher ratings as well as seemingly better safety and cleanliness, may attract more customers during

this time (Uzuner and Ghosh, 2020). Therefore, positive online reviews and ratings can enhance hotel performance and may impart greater advantages under crisis conditions. The following hypothesis is suggested thusly:

H6. Online ratings positively moderate the impact of pandemic severity, such that the negative impact on hotel performance is smaller for hotels with higher online ratings.

On this basis, the above research hypotheses are summarized in Figure 1.

3. Research methods

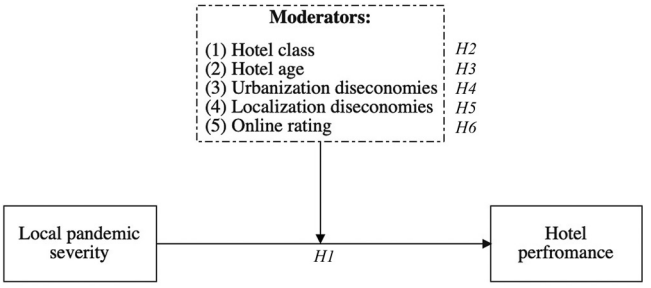
3.1 Data collection

We chose the hotel properties in Texas as the sample in this study. Texas has a strong and robust tourism economy, and in 2019, the state received a total of US$63bn in travel-generated earnings. Also, a remarkable within-state heterogeneity can be observed across the state in terms of urban-rural division, which gives rise to different lodging industry landscapes at different locations.

We collected monthly hotel performance data between January 2020 and December 2021 from the Texas Comptroller of Public Accounts. This database includes lodging tax data for all taxable units, including hotel properties. We then calculated hotels' monthly RevPAR based on total lodging revenue, the number of rooms in operation and the number of days eligible for tax (Hua and Yang, 2017). Texas lodging tax data also included a large number of nonhotel lodging units, such as short-term rentals and bed and breakfasts. Therefore, we merged these data with the STR hotel census database based on property addresses to retain hotel properties only. We merged dual-branded properties (i.e. two properties with the same address) manually. STR's hotel census data cover a range of hotel characteristics such as hotel class, opening date, brand affiliation history, operating mode, amenities and facilities and location. Our sample contained 5,090 hotel properties after merging both data sets. We also obtained hotel information from TripAdvisor. The TripAdvisor Web page for each hotel provides information on the property's online reputation (e.g. online rating and number of online reviews), accessibility (e.g. nearby attractions and restaurants), hotel services and room amenities. Finally, we identified local pandemic severity in each Texas county during each month of the study period from the Johns Hopkins Coronavirus Resource Center (https://coronavirus.jhu.edu/).

3.2 Empirical models and variable operationalization

We adopted the following panel data model with fixed effects to estimate the impact of local pandemic severity on hotel performance:



Source: Created by author

Figure 1.
Research framework

$$lnRevPAR_{it} = \rho \cdot lncases_{it} + \mathbf{X_{it}}\beta + \mu_i + \tau_t + \varepsilon_{it}$$

where i indicates each individual hotel, and t represents the month from January 2020 to December 2021. In this model, the dependent variable is RevPAR (in log of USD) of each individual hotel. The major variable of interest was *lncases*, the number of monthly new confirmed COVID-19 cases in a given county (in log), which we used to assess the severity of local pandemic conditions. Its estimated coefficient, ρ, was employed to test *H1*. We also applied *lndeaths*, the number of monthly COVID-19 deaths in a given county (in log), as an alternative measure in our empirical analysis. As both dependent and independent variables were log transformed, the estimated coefficient of ρ can be interpreted as elasticity of pandemic severity on hotel performance. $\mathbf{X}$ represents the set of control variables in the model; μ_i reflects hotel-specific effects that do not vary over time (e.g. location), and τ_t denotes year-month-specific effects that do not vary across hotels (e.g. nationwide/statewide pandemic policies). Our proposed two-way fixed-effects panel data models are adequate in this research context. By controlling for the hotel- and year-month-specific effects, the model is able to better capture the causality effect from a specification akin to a difference-in-differences estimator.

The following listed control variables are included in $\mathbf{X}$:

- *class*: hotel class based on room rate. Six classes were used in accordance with the STR hotel census database: economy (*class* = 1), midscale (*class* = 2), upper midscale (*class* = 3), upscale (*class* = 4), upper upscale (*class* = 5) and luxury (class = 6);
- *lnrooms*: number of hotel rooms (in log). Within the hotel management literature, both scale economies and diseconomies purportedly exist;
- *operation*: a hotel's operating mode. The STR hotel census database includes three modes of operation: chain operation (*operation* = 1), franchise (*operation* = 2) and independence (*operation* = 3). Empirical studies have shown that independent hotels exhibit lower performance than their branded counterparts due to a lack of resources associated with brand affiliation (Silva *et al.*, 2017);
- *mana_co*: indictor of a hotel operated by a third-party management company. Research indicates that management from these companies leads to higher operating performance (Yang and Mao, 2017);
- *lnage*: log of hotel age (in months); and
- *lncompetition*: number of hotels in a given zip code (in log). This variable measures the market competition level, with fierce competition compromising a hotel's performance (Tsang and Yip, 2009).

To test our other research hypotheses, we incorporated the following set of moderating variables into the model:

$$lnRevPAR_{it} = \rho \cdot lncases_{it} + \gamma \cdot lncases_{it} \cdot z_{it} + \mathbf{X_{it}}\beta + \mu_i + \tau_t + \varepsilon_{it}$$

where z represents a specific moderating variable. In our model, *class* and *lnage*, each represent a moderator (z) to test *H2* and *H3*, respectively. The following time-invariant variables were taken as moderators to test the remaining hypotheses because their main effects were not applicable to the fixed-effects model:

- *lnrestaurants*: number of restaurants within 0.30 miles (in log). In urban and regional economics, many empirical studies leveraged variables of urban-related

economic activities/businesses to measure urbanization economies, such as nightlife locations, bars and restaurants. In particular, nearby restaurant density has been used previously as a popular proxy to test urbanization economies (Luo and Yang, 2016); *lnrestaurants*lncases* was adopted to test *H4* in this study.

- *lnattractions*: number of attractions within 0.30 miles (in log); *lnattractions*lncases* was used to test *H5*.
- *lnrating*: public TripAdvisor overall rating (in log); *lnrating*lncases* was adopted to test *H6*.

3.3 Data characteristics

All variables' descriptive statistics were shown in Table 1. Note that our panel data is unbalanced for two reasons. First, there were hotel entries and exits during the research period. Second, hotels could temporarily close during the COVID-19 pandemic, making the revenue record unavailable. We also checked for potential multicollinearity issues based on the variance inflation factor (VIF). The VIFs of all variables were lower than 5, indicating no severe multicollinearity (Pearson, 2010). Detailed information on the correlation table can be found in the online supplementary material. Figure 2 displays a map of the chosen hotel properties. Our sample consisted of properties across the state of Texas, and most counties have at least one hotel property covered in the data set. Hotel locations were largely clustered in several major metropolitan areas, such as Houston, Dallas, Austin, San Antonio and Fort Worth. Figure 2 also shows the number of total COVID-19 cases per 1,000 population as of December 31, 2020, ranging from 5.92 to 202.36. The pandemic appeared more severe in southwestern Texas compared with other parts of the state at that time.

Continuous variables	Observations	Mean	SD	VIF
lnRevPAR	99,152	3.469	0.938	
lncases	99,152	11.815	4.531	1.00
lndeaths	99,152	8.064	3.675	
lnrooms	99,152	4.328	0.632	1.99
mana_co	99,152	0.340	0.474	1.92
lnage	99,152	5.266	1.018	1.32
lncompetition	99,152	2.326	0.800	1.08
lnrestaurants	44,788	3.681	0.696	
lnattractions	33,708	1.785	0.908	
lnrating	84,264	1.273	0.282	
Categorical variables	*Frequency*	%	*Cumulative* (%)	*VIF*
class (1)	41,342	41.70	41.7	2.07
class (2)	11,964	12.07	53.77	
class (3)	27,592	27.83	81.6	1.32
class (4)	12,672	12.78	94.38	1.45
class (5)	4,206	4.24	98.62	1.35
class (6)	1,376	1.39	100.00	1.14
operation (1)	6,786	6.84	6.84	
operation (2)	69,905	70.50	77.35	3.87
operation (3)	22,461	22.65	100.00	4.15

Source: Created by author

Table 1. Descriptive statistics of variables

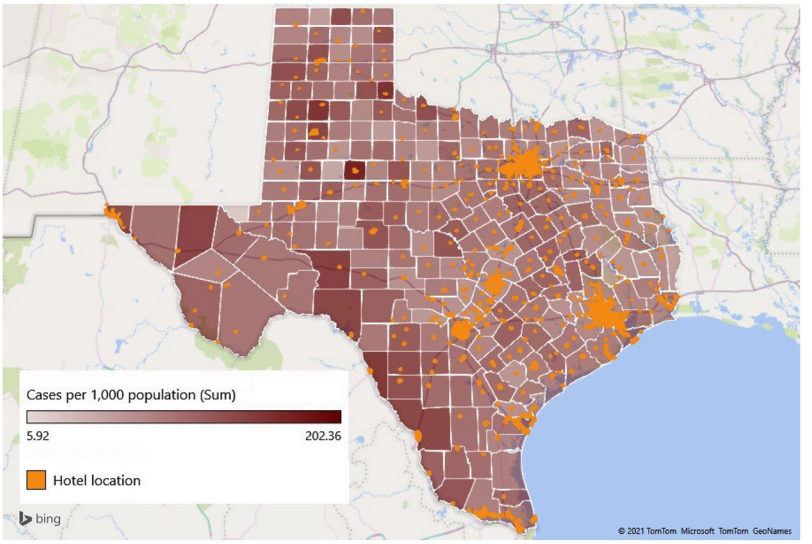


Figure 2.
Hotel sample location and the distribution of COVID-19 cases

Source: Created by author

4. Model estimation results

Table 2 provides basic models' estimation results. Model 1 included all 99,152 observations from 5,090 hotel properties. This model had an R^2 value of 0.737, indicating a reasonable level of explanatory power. The effect of the major variable of interest, *lncases*, was negatively significant. Specifically, a 10% increase in the monthly number of confirmed COVID-19 cases led to a 0.522% decline in hotel RevPAR. *H1* was thus empirically supported. Using a partial correlation coefficient, the effect size is −0.042. Among other control variables in the model, only *lnage* and *mana_co* were significant. The positive coefficient of *lnage* demonstrated that older hotels were associated with a higher performance level as indicated by RevPAR, whereas the positive coefficient of *mana_co* indicated that hotels managed by the third-part hotel management company are associated with a higher performance level.

In Model 2, a series of interaction terms between *lncases* and hotel class dummies were added. Compared with the benchmark group of midscale hotels (*class* = 2), economy hotels suffered the same level from the pandemic as denoted by the insignificant interaction coefficient of *lncases* * *class* = 1. The coefficients of other interaction terms were negative and significant, indicating a more substantial adverse effect from the pandemic on upper midscale (*class* = 3), upscale (*class* = 4), upper upscale (*class* = 5) and luxury (*class* = 6) hotels versus midscale hotels (*class* = 2). To better interpret the interaction terms' estimated coefficients, we plotted the marginal effects of *lncases* for different hotel classes as illustrated in Figure 3. The impact of COVID-19 cases, as reflected by the coefficient of *lncases*, was negatively significant across all six hotel classes. Overall, a higher-class hotel withstood a larger negative impact from the pandemic; the largest marginal effect was observed for upper upscale hotels, followed by upscale and luxury hotels. Our empirical results generally lent support to *H2*.

Models 3 and 4 estimated the model using *lndeaths*, an alternative measure of local pandemic severity. In Model 3, the coefficient of this variable was −0.0548 and significant at

Variable	Model 1	Model 2	Model 3	Model 4
lncases	−0.0522*** (0.004)	−0.0439*** (0.004)		
lndeaths			−0.0548*** (0.004)	−0.0490*** (0.004)
*lncases * class (1)*		−0.00153 (0.002)		
*lncases * class (3)*		−0.00405** (0.002)		
*lncases * class (4)*		−0.0140*** (0.002)		
*lncases * class (5)*		−0.0302*** (0.004)		
*lncases * class (6)*		−0.00810* (0.005)		
*lndeaths * class (1)*				−0.00420* (0.002)
*lndeaths * class (3)*				−0.00154 (0.002)
*lndeaths * class (4)*				−0.0116*** (0.003)
*lndeaths * class (5)*				−0.0304*** (0.005)
*lndeaths * class (6)*				−0.000747 (0.006)
class (1)	−0.0879 (0.126)	−0.0822 (0.130)	−0.101 (0.128)	−0.0754 (0.131)
class (3)	0.166 (0.207)	0.212 (0.208)	0.135 (0.207)	0.152 (0.210)
class (4)	0.320 (0.210)	0.477** (0.211)	0.297 (0.211)	0.401* (0.213)
class (5)	−0.181 (0.377)	0.272 (0.377)	−0.203 (0.374)	0.0999 (0.368)
class (6)	0.148 (0.213)	0.261 (0.226)	0.131 (0.214)	0.143 (0.226)
lnrooms	0.348 (0.595)	0.347 (0.589)	0.356 (0.608)	0.355 (0.606)
operation (2)	0.0867 (0.087)	0.112 (0.097)	0.0849 (0.087)	0.109 (0.095)
operation (3)	0.0439 (0.106)	0.0693 (0.115)	0.0419 (0.106)	0.0693 (0.113)
mana_co	0.147*** (0.046)	0.152*** (0.047)	0.146*** (0.046)	0.150*** (0.046)
lnage	0.391*** (0.028)	0.411*** (0.029)	0.387*** (0.028)	0.392*** (0.029)
lncompetition	−0.0181 (0.030)	−0.0325 (0.031)	−0.0194 (0.030)	−0.0317 (0.031)
constant	0.399 (2.554)	0.213 (2.528)	0.230 (2.611)	0.165 (2.600)
Hotel effect	Yes	Yes	Yes	Yes
Year-month effect	Yes	Yes	Yes	Yes
N	99,152	99,152	99,152	99,152
N(hotels)	5,090	5,090	5,090	5,090
R-sq	0.737	0.738	0.738	0.738

Notes: ***Significant at the 0.01 level; **significant at the 0.05 level; *significant at the 0.10 level. Values in parentheses are robust standard errors
Source: Created by author

Table 2.
Estimation results

the 0.01 level; a 10% increase in the monthly number of COVID-19-related deaths, therefore, led to a 0.548% decline in RevPAR. This estimated coefficient was quite similar to its counterpart in Model 1, which was −0.0522. In Model 4, upon introducing the interaction terms between *lndeaths* and class dummies, we found that higher-class hotels were, in general, more sensitive to the local COVID-19 pandemic situation than lower-class ones. This finding did not vary with how the impact of COVID-19 was operationalized. The variable *lncases* was applied in subsequent models to measure the pandemic's severity in each Texas county.

Results on the effects of other moderating variables were shown in Table 3. Model 5 included the interaction term between *lncases* and *lnage*, whose coefficient was found to be positively significant. This finding supports *H3*, indicating that older hotels' performance was less sensitive to the pandemic than that of other hotels. Figure 4 shows how the impact of COVID-19 cases on RevPAR changed with hotels' age: young hotels were particularly vulnerable to the pandemic and experienced the most substantial negative effect. For newly opened hotels with *lnage* = 0, the coefficient of *lncases* was −0.0765; this figure is significantly greater than that for a five-year-old hotel, whose coefficient was −0.0564.

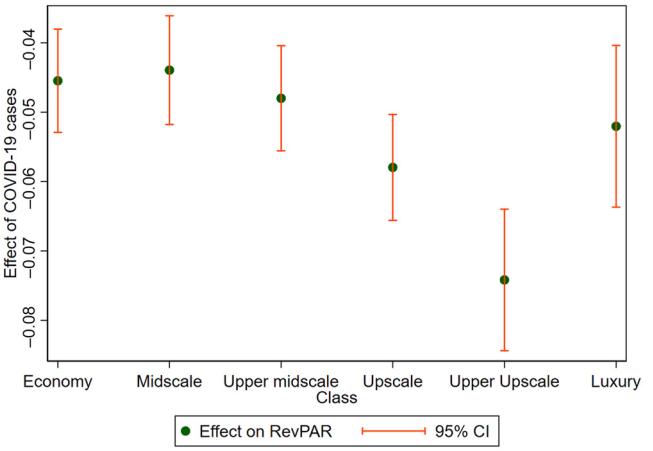


Figure 3.
Marginal effect of COVID-19 cases on hotel performance across hotel classes

Source: Created by author

Models 6 and 7 introduced the interaction terms to test urbanization and localization (dis) economies during the pandemic, respectively. Both *lncases* * *lnrestaurants* and *lncases* * *lnattractions* were estimated to be negative and significant. As such, urbanization and localization diseconomies prevailed, and hotels located close to restaurants and attractions were especially sensitive to the pandemic situation. Hence, *H4* and *H5* were supported. Figures 5 and 6 show how the impact of COVID-19 cases changed with hotels' urbanization economies level and localization economies level, respectively. The value range covers 99% of the value in the sample. As indicated in these two figures, hotels located with more nearby restaurants and attractions were particularly vulnerable to the pandemic and experienced the most substantial negative effect. In Model 8, the interaction term *lncases* * *lnrating* was created to test the moderating role of online ratings on hotels' pandemic–performance relationship. Interestingly, the estimated coefficient of the interaction was negative and insignificant, which did not lend support to *H6*. A possible reason is that hotels' online ratings are highly correlated with hotel class, such that higher-class hotels are more likely to receive higher online ratings. We therefore added a three-way interaction effect, *lncases* * *lnrating* * *class*, in Model 9 to test the moderating role of online ratings within each hotel class. Among the six three-way interaction terms, only *lncases* * *lnrating* * *class* = 1 was estimated to be significant. Higher online ratings hence lowered the negative impacts of the local pandemic on economy hotels. This model provided limited support for *H6* but implied that the impact of online ratings was specific to low-end hotels.

We then conducted a series of additional robustness checks (See Table 4). First, we introduced *l.lncases*, the lag of *lncases*, in Model 10 to measure the local pandemic by considering the lagged effect of COVID-19. Second, we added a hotel-specific linear time trend in Model 11 and a hotel-specific quadratic time trend in Model 12 to better capture changes in uncontrolled variables over time. The estimated coefficient of *lncases* (or *l.lncases*) ranged from −0.0483 to −0.0548 and was close to the estimate in Model 1 (−0.0522), confirming the robustness of our main results.

5. Conclusion and implications

5.1 Conclusions

This study postulated that hotel performance during the COVID-19 pandemic would be influenced by the hotel's competitive environment and by its resources and capabilities.

Table 3. Empirical results for models with interaction terms

Variable	Model 5	Model 6	Model 7	Model 8	Model 9†
lncases	−0.0765*** (0.005)	−0.0575*** (0.008)	−0.0877*** (0.007)	−0.0523*** (0.005)	
*lncases * lnage*	0.00488*** (0.001)				
*lncases * lnrestaurants*		−0.00634*** (0.001)			
*lncases * lnattractions*			−0.00494*** (0.001)		
*lncases * lnrating*				−0.00223 (0.002)	
*lncases * class (1)*					−0.0563*** (0.005)
*lncases * class (2)*					−0.0436*** (0.007)
*lncases * class (3)*					−0.0531*** (0.012)
*lncases * class (4)*					−0.0865*** (0.018)
*lncases * class (5)*					−0.0721* (0.039)
*lncases * class (6)*					−0.0156 (0.097)
*lncases * lnrating * class (1)*					0.00260** (0.001)
*lncases * lnrating * class (2)*					−0.000759 (0.002)
*lncases * lnrating * class (3)*					0.000612 (0.003)
*lncases * lnrating * class (4)*					0.00636 (0.004)
*lncases * lnrating * class (5)*					−0.00104 (0.010)
*lncases * lnrating * class (6)*					−0.00861 (0.021)
constant	0.197 (2.549)	3.637 (2.794)	3.945 (2.917)	3.437 (2.407)	2.087 (2.647)
Hotel effect	Yes	Yes	Yes	Yes	Yes
Year-month effect	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes
N	99,152	44,788	33,708	84,264	84,264
N(hotels)	5,090	2,075	1,570	3,893	3,893
R-sq	0.738	0.692	0.690	0.718	0.719

Notes: ***Significant at the 0.01 level; **significant at the 0.05 level; *significant at the 0.10 level. † indicates that the interaction terms between ln*rating* and *class* are not provided for brevity. Values in parentheses are robust standard errors
Source: Created by author

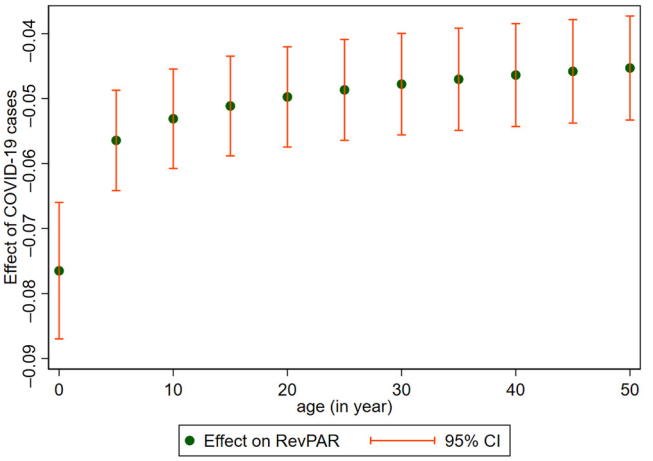


Figure 4.
Marginal effect of COVID-19 cases on hotel performance across hotel ages

Source: Created by author

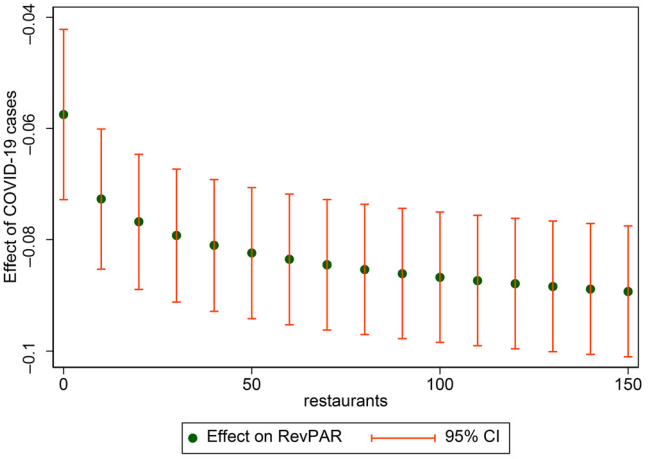
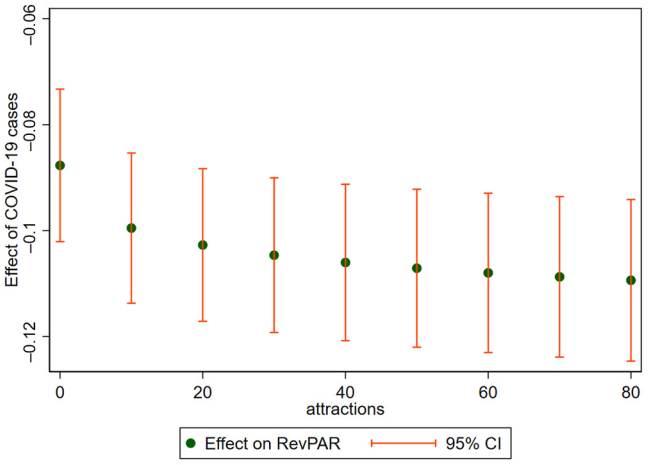


Figure 5.
Marginal effect of COVID-19 cases on hotel performance across different levels of urbanization economies (measured by number of nearby restaurants)

Source: Created by author

Specifically, we estimated a series of models to identify how the pandemic affected individual hotels. Results supported seven of the eight hypotheses and provided contingent support for the other. The severity of COVID-19 conditions directly impacted performance. Specifically, a 10% increase in the monthly number of confirmed COVID-19 cases led to a 0.522% decrease in hotel performance in terms of RevPAR. Note that in some months, the case increase can be substantial. For example, the average confirmed case number in our sample increased by 186.62% from June 2020 to July 2020, and this could lead to a 9.74% decrease in hotel performance.



Source: Created by author

Figure 6.
Marginal effect of COVID-19 cases on hotel performance across different levels of localization economies (measured by number of nearby attractions)

Our results further suggest that the pandemic affected all hotels but did not influence them equally. We incorporated several moderators, including hotel class, hotel age, urbanization and localization diseconomies and online reputation, into our models to address the heterogeneity of the pandemic–performance relationship. The empirical results showed that higher-end hotels and younger hotels were specifically found to be more vulnerable to the pandemic's local severity, which highlights the importance of economic and social capital in determining hotel resilience during hard times. In terms of the agglomeration, plummeting demand intensified the competition associated with spatial clustering. Moreover, online reputation has also been found to boost hotel performance in general (Yang *et al.*, 2018) – yet our overall results did not indicate any performance premium associated with having a better online reputation during the pandemic. However, our results did unveil a smaller negative effect of COVID-19 on high rated hotels in the category of economy hotels. This pattern suggests that online reputation helps protect low-end hotel properties in the early stage of pandemic; however, exactly how online reputation-related factors influence hotel recovery at later stages of the pandemic is unknown.

5.2 Theoretical implications

This study contributes to the literature in a few ways. First, this study contributes to the business resilience literature. Built upon a multiple capital-based framework, this study provided empirical evidence for developing hotel resilience during the pandemic from economic, social and physical capital perspectives. The findings facilitate the understanding of hotel disaster resilience capability by empirically testing the components of hotel resilience during the pandemic using monthly hotel property performance panel data. Specifically, this study highlights that when coping with the COVID-19 crisis, one size does not fit all. Characteristics of a hotel's location mattered; similarly, the resources and capabilities available to the hotel mattered, which expands the literature on hotel resilience and crisis management.

Second, this study contributes to the literature on the impact of geographic agglomeration during the pandemic and further disentangles it from urbanization and

Variable	Model 10	Model 11	Model 12
l.lncases	−0.0530*** (0.004)		
lncases		−0.0548*** (0.004)	−0.0483*** (0.004)
class = 1	−0.102 (0.134)	0.0384 (0.104)	−0.0315 (0.093)
class = 3	0.134 (0.212)	0.408*** (0.122)	0.364*** (0.113)
class = 4	0.265 (0.215)	0.645*** (0.149)	0.612*** (0.142)
class = 5	−0.208 (0.295)	−0.436 (0.588)	−0.780 (0.745)
class = 6	0.0657 (0.217)	0.207 (0.166)	−0.0421 (0.152)
lnrooms	0.440 (0.547)	0.322 (0.446)	0.324 (0.462)
operation = 2	0.0383 (0.066)	0.149 (0.113)	0.126 (0.118)
operation = 3	0.00163 (0.089)	0.260* (0.143)	0.255* (0.142)
mana_co	0.114*** (0.037)	0.121 (0.081)	0.0890 (0.064)
lnage	0.278*** (0.028)	0.721*** (0.099)	0.775*** (0.205)
lncompetition	−0.0271 (0.029)	0.0501 (0.036)	0.0116 (0.038)
constant	0.659 (2.352)	−1.595 (1.997)	−1.779 (2.279)
Hotel effect	Yes	Yes	Yes
Year-month effect	Yes	Yes	Yes
Hotel-specific linear trend	No	Yes	Yes
Hotel-specific quadratic trend	No	No	Yes
N	92,645	99,152	99,152
N(hotels)	5,079	5,090	5,090
R-sq	0.758	0.792	0.825

Table 4. Robustness check results

Notes: ***Significant at the 0.01 level; *significant at the 0.10 level. Values in parentheses are robust standard errors
Source: Created by author

localization effects. Although prior studies have described urbanization and localization economies, two aspects of agglomeration economies in the hotel industry (Luo and Yang, 2016), our results show that agglomeration diseconomies prevailed during COVID-19. This study confirms that agglomeration may act as a double-edged sword: despite the multiple advantages of agglomeration in typical times, disadvantages can outweigh these merits during crises. In particular, the findings extend the understanding of a hotel's physical capital and its contribution to business disaster resilience in the hospitality industry by specifying, quantifying and testing exact elements and constructs. Different from Lin and Chen (2022) that included location as a rough measurement of hotel's environmental externalities, this study captures the spillovers explicitly produced by industrial agglomeration and makes sense of their interdependent impacts on business performance. Moreover, compared to the previous effort that indicated local pandemic outbreaks by a dummy variable (Lin and Chen, 2022), this study alternatively regressed multiple factors on pandemic-related variables, namely, the number of monthly new confirmed COVID-19 cases in a given county, and the number of monthly COVID-19 deaths, which enhance the understanding of negative impacts of pandemic and its scale in a more concise manner.

Third, our study contributes to the crisis management literature by emphasizing the importance of location and hotel class decisions in understanding performance during the COVID-19 pandemic. By decomposing the determinants of business resilience into different and independent capitals, this study informs what hotel resilience means during the pandemic. It provides in-depth insights associated with each dimension to enrich the crisis management literature for the hotel sector. Utilizing the availability of the STR census database to acquire hotel brand-related information (i.e. economy, midscale, upper midscale,

upscale, upper upscale, luxury), this study advanced the understanding of how hotel class can moderate the impact of the pandemic on property performance. Empirical results from this study also emphasize the importance of strategic decisions made at the planning stage of hotel development. Choices about location and hotel class affect operational performance during times of business as usual. Recent research also shows that these choices are particularly critical during times of disrupted business conditions. Kim *et al.* (2019) showed that location and hotel class decisions were particularly important in understanding performance during the Great Recession that started in December 2007. Strategic choices about location and hotel class both affected performance during that recession and affected the time it took for hotel rates to recover to prerecession levels.

5.3 Practical implications

These findings also provide implications to industry stakeholders. First, with a better understanding of hotels' vulnerability to the COVID-19 pandemic, governments can more effectively allocate funding and other relief packages to the industry. Second, nongovernmental tourism organizations should promote interfirm and interindustry communications and knowledge exchange to ensure information transparency and pronounce the benefits of agglomeration. They should also urge the government to recognize the contemporary challenges faced by the tourism business by constantly assessing the tourism industry status quo and carefully evaluating the consequences of political provisions. Third, the multiple capital-based hotel resilience framework highlighted in our study clarifies the contribution of several concrete characteristics of a hotel to business performance during the pandemic and offers insight into ways to strategically strengthen their resilience as a routine crisis management practice. Fourth, the empirical results related to agglomeration effects can guide real estate analysis for hotel location selection: agglomeration diseconomies should be considered during economic downturns, such as pandemics, when appraising a location's value. Moreover, although our findings did not suggest overarching benefits associated with having a better online reputation during the pandemic, we should interpret the results with caution. As crisis communication represents one of the vital crisis management strategies, we still recommend that hotels should undertake online reputation management practices during the crisis. Last but not least, hotels should recognize the need to develop social capital by remaining relevant and maintaining a presence in the local community, even if not all of them can be converted into sales immediately. For example, hoteliers should actively engage in local activities and enhance their brand equity among local consumers through corporate social responsibility initiatives. The management team should also maintain full awareness of the movements of tourism stakeholders and stay tuned to learn from players successful in coping with the crisis in various industrial, business and political settings. A good understanding of the local environment, risks and resources for how the business can prepare for and continue to function after a crisis is part of building a resilient tourism business, which should begin by developing business continuity plans and proposing possible response strategies if there are any likeable hazard events in the foreseeable future. Communication and information should also be enabled to flow fluently among tourism stakeholders.

5.4 Limitations and future directions

Some limitations could constrain the generalizability of these empirical results. First, we did not specifically examine hotels' responses to the pandemic; individual hotel-level mitigation measures, as crisis management practices, may moderate COVID-19's negative impact. Second, due to data limitations, we could not investigate the pandemic's effects on other hotel

performance measures, such as profitability and online reputation. On this basis, future studies could gather more comprehensive data from other geographical regions across stages of the pandemic to further unravel the pandemic–performance relationship in the hotel industry.

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