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The resilience of the lodging industry during the pandemic: Hotels vs. Airbnb

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\textbf{ABSTRACT}

The adverse impact of the recent pandemic on the lodging industry has largely been based on anecdotal evidence. The extent to which different parts of this broad industry were individually affected by the COVID-19 pandemic also remains unclear. The purpose of this study is to investigate the effects of the COVID-19 pandemic in the various sectors of the lodging industry to identify patterns that may not be consistent with the idea that the entire hospitality industry was negatively affected by the pandemic. The results show that while the COVID-19 pandemic did have a generally negative effect on lodging demand, hotel room and peer-to-peer accommodation property bookings were not affected equally. Importantly, it appears that these variations were attributable, at least in part, to state-level variations in policy that made travel and hospitality services relatively more (or less) difficult for consumers to obtain. Theoretical and managerial implications are extensively discussed.

1. Introduction

Anecdotal evidence abounds regarding the negative effect of the COVID-19 pandemic on the lodging industry. Headlines such as “North American inbound tourism spend declined by 74.1% in 2020” (Johnson, 2021) and “Coronavirus Pandemic Sets Hotel Industry Back 10 Years, Report Finds” (Lardieri, 2021) have led to both an academic and a practical understanding that, in a general sense, the COVID-19 pandemic negatively affected consumers’ booking overnight accommodations. However, the accommodations industry is quite complex.

For example, the lodging industry comprises both traditional hotels and resorts as well as individuals’ home properties listed through companies such as Airbnb, Vrbo, HomeAway, etc. (peer-to-peer accommodations). Additionally, there are lodging sub-types within this stratification. Within the traditional hotel sector, there are six distinct lodging classes ranging from economy to luxury (STR, 2021). Likewise, amongst the peer-to-peer accommodation listings by companies such as Airbnb, available property types include entire homes, private rooms within an owner-occupied home, and shared-rooms with other guests. Thus, while the accommodations industry is often considered in aggregate when it comes to reporting purchasing decline from COVID-19, it is possible that not all of the various operating sectors were affected equally.

Many different factors exist that could have caused variation between (and within) bookings in the hotel and the peer-to-peer accommodation sectors. On one hand, consumer sentiment about safety could have potentially shifted demand away from hotels and toward the peer-to-peer accommodations due to the perception that private accommodations are more conducive to social distancing than hotels. On the other hand, consumers may have been willing to forego the relative isolation inherent to private or even shared homes in favor of hotels that typically provide a standardized and more professional approach to health and sanitation (Verleye et al., 2021). In addition, it is possible that factors outside of consumer sentiment, such as state-level policy, travel restrictions, and limitations on hospitality operations, could have caused differential effects on various booking patterns throughout the lodging industry. While many states implemented relatively strict mandates in an effort to mitigate spread of COVID-19 (e.g., stay at home orders, curfews, limited business operating hours, business closures, visitor restrictions, etc.) other states imposed relatively few restrictions (McCann, 2021). As such, it is likely that inter-state disparities in COVID-19-based restrictions contributed, at least in part, to variations in demand effects between and within the various operating sectors of the lodging industry.

Overall, it is evident that occupancy rates were disrupted at the...
industry level during the COVID-19 pandemic. However, it remains unclear how various sectors of the broad industry were affected. Accordingly, the purpose of this study is to investigate the effects of the COVID-19 pandemic in the various sectors of the lodging industry to identify patterns that may not be consistent with the idea that the entire hospitality industry was negatively affected by the pandemic. Additionally, this research seeks to identify the effects of state-level policy on the demand across various operating sectors of the lodging industry. The results from this study are expected to shed light on several issues ranging from the resilience from pandemic-related demand shocks to the effect of public-health regulations on guest booking hotel rooms and peer-to-peer accommodations.

2. Literature review

2.1. The impact of COVID-19

With the onset of the COVID-19 pandemic, travel restrictions and consumer concerns have had a significant impact on all facets of the travel and tourism industry. In an effort to quantify these effects, understand their precursors, and develop mitigating strategies, researchers have conducted a number of studies in various contexts, beginning very shortly after the onset of the pandemic. For example, Ugir & Akbijik (2020) analyzed data from a large travel forum and found that prior to the worldwide proliferation of the virus, even while the pandemic was still localized, travelers were changing, adjusting, and canceling travel plans. Likewise, Li et al., (2020) found that as the pandemic began to spread globally, travelers were delaying travel plans and booking shorter stays than originally planned. Indeed, in 2020, a flurry of papers were published, analyzing the impact of the pandemic on various aspects of the tourism industry, such as trip type (Wen et al., 2020), travel likelihood (Yang et al., 2020), tourism consumer behavior (Zenker & Kock, 2020; Sues et al., 2022), and homesharing (Dolnicar and Zare, 2020). Research into the impact of the pandemic on the generalized hospitality and tourism industry continued during the following two years, demonstrating the adverse effects on tourism asset management (Crespi-Cladera et al., 2021), tourism company valuations (Kocak et al., 2022), and various subsectors of the tourism and hospitality industry. Cepni et al. (2022) found that the hotel subsector of the tourism industry was hit particularly hard by the pandemic.

Several studies have been conducted over the past two years investigating the impact of COVID-19 on the hotel industry. For example, Guillett & Chu (2021) conducted a qualitative study, speaking with revenue managers at hotels in Asia, and found that hotel demand was down, regardless of revenue management strategies. Likewise, Ozdemir et al. (2021) found that demand was down across the entire hotel industry, although economy-scale hotels were more resilient than other segments. Ozdemir et al. (2022) found that demand was weaker in states where travel and gathering restrictions were the most stringent, and that this was not uniform across all hotel segments, with economy hotels being more resistant than luxury segment hotels. These studies would suggest that there is much to be learned about the ways in which the COVID-19 pandemic impacts various types of hotels differentially. To fill this gap, the present study aims to investigate how the pandemic impacted the various hotel classes, as well as comparing these results to homesharing platforms.

2.2. The effect of COVID-19 on the hotel industry

There is no doubt that COVID-19 has significantly impacted the lodging industry. In the face of the pandemic, visiting friends and family has been canceled, business trips have shifted into online videoconferencing, and leisure and vacation travel have been severely restricted. These changes have been a major disruptor, seriously affecting the traditional hotel business models (Schulz, 2021). However, as the course of the pandemic has ebbed and flowed, it is difficult to discern exactly how the hotel industry has been affected. Impacts to hotel occupancy have been relatively fluid, with some phases of the pandemic producing drastic drops in travel and associated room bookings during times of high-risk and peak infection rates, followed by months of recovery fueled by demand from those pent-up in their residences, seeking to travel (Eggleston and Lee, 2021). Consumer perceptions of safety, the ability and willingness to travel, and anxiety about the pandemic have all resulted in demand-side fluctuations in hotel reservations. In addition, government mandated closures and stay-at-home orders have had a profound effect. Given the number and the complexity of factors affecting hotel reservations, it is difficult to discern how COVID-19 has affected overall hotel occupancy. Thus, the following is proposed:

Research Question 1:

RQ1. To what extent does the COVID-19 pandemic affect hotel occupancy?

To further illuminate the ways in which COVID-19 has impacted the hotel industry, it is important to examine whether the effects of the pandemic on hotel occupancy vary across hotel classes. For classification and comparison purposes, hotels are often divided into categories (i.e., economy, midscale, upper midscale, upscale, upper upscale, and luxury) (STR Chain Scales, 2019). While there are many ways to classify hotels, these categories are widely accepted due to their use by Smith Travel Research and the STAR report, thus creating a taxonomy that is commonly understood by hoteliers and researchers alike (Miller, 2016). Ozdemir et al. (2021) have suggested that the pandemic has affected various hotel classes differently, but aside from this study, there is little understanding of how each class of hotel has been specifically impacted. Thus, research question 2 is proposed as follows:

RQ2. To what extent does the COVID-19 pandemic affect the occupancy levels of various hotel classes (i.e., economy, midscale, upper midscale, upscale, upper upscale, and luxury)?

2.3. The effect of COVID-19 on Airbnb occupancy

In addition to affecting hotel occupancy, it is possible that the restrictions on travel have affected the peer-to-peer accommodations sector as well. While there are many home-sharing platforms, for the purposes of this study, the effects of the pandemic on Airbnb property occupancy levels is most germane. Airbnb is the largest among the peer-to-peer accommodation platforms, and a primary competitor to the hotel industry, providing travelers with the opportunity to book a stay in an individual’s private home, either with or without them occupying it as a host. Moreover, data on the properties listed on Airbnb’s occupancy levels is readily available. While COVID-19 restrictions, lockdowns, and canceled travel plans have certainly affected occupancy among Airbnb properties, research has suggested that the impact has not been entirely negative (Dolnicar and Zare, 2020). As safety-conscious travelers opt out of staying in hotels where they must share space such as elevators, lobbies, and restaurants with other patrons, they have looked toward renting the private properties listed on Airbnb as an alternative, where they will not encounter other guests and extensive staff, thus decreasing the risk of catching the virus (Carville and Bloomberg, 2021). Additionally, the shift at many companies to working at home has given rise to a new group of customers who choose to rent a property through Airbnb on a long-term basis so that they can live in and explore new and different cities and countries while working remotely (Hines, 2021). Such digital nomads have generated demand for peer-to-peer accommodations in a way that could not be foreseen prior to the pandemic (Rodriguez, 2020). Given that travel restrictions and health concerns significantly decreased travel overall during the pandemic, yet health-conscious guests and digital nomads generated new demand, it remains unclear how COVID-19 has impacted occupancy of Airbnb listings overall. Thus, research question 3 is proposed:

RQ3. To what extent does the COVID-19 pandemic affect Airbnb occupancy?
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when infection rates were very low, and vaccination was prevalent enforced the strictest measures, maintaining them throughout periods number and type of restrictions each state has imposed during the 2021). However, there has been vast deviation with regards to the gatherings -in some cases any gathering over six people (Multistate, operation, number of patrons allowed in any given business, and private social-distancing and ordered restrictions on business openings, hours of level restrictions on hospitality businesses also had a significant impact on occupancy. Both of these factors are important in determining the impact of state COVID-19 restrictions on demand for Airbnb properties. First, because listings on Airbnb do not typically include property types that are dependent on large group business (as opposed to hotels), state restrictions regarding group size, for the most part, would not impact bookings on Airbnb. Second, because properties listed are mostly individual-owned private homes, as opposed to businesses, state mandates to close did not apply to the properties. Third, while state restrictions and social distancing reduced the number of guests permitted on hotel premises and amenity operations, these mandates, in general, did not apply to properties listed on Airbnb or significantly impact host occupancy. Both of these factors are important in determining the impact of state COVID-19 restrictions on demand for Airbnb properties. First, because listings on Airbnb do not typically include property types that are dependent on large group business (as opposed to hotels), state restrictions regarding group size, for the most part, would not impact bookings on Airbnb. Second, because properties listed are mostly individual-owned private homes, as opposed to businesses, state mandates to close did not apply to the properties. Third, while state restrictions and social distancing reduced the number of guests permitted on hotel premises and amenity operations, these mandates, in general, did not apply to properties listed on Airbnb or significantly impact host operations for guests in their homes. Namely, almost none of the state restrictions on gatherings applied to entire-home listings, often booked by individuals or family and small groups. In light of the differential social distancing standards among hotels and peer-to-peer accommodations, it is important to investigate Research Question 6:

RQ6. How has the level of state restrictions regarding COVID-19 impacted Airbnb property occupancy levels?

As mentioned above, peer-to-peer accommodations listed on Airbnb differ from traditional hotels in terms of their guest capacity and host occupancy. Both of these factors are important in determining the impact of state COVID-19 restrictions on demand for Airbnb properties. First, because listings on Airbnb do not typically include property types that are dependent on large group business (as opposed to hotels), state restrictions regarding group size, for the most part, would not impact bookings on Airbnb. Second, because properties listed are mostly individual-owned private homes, as opposed to businesses, state mandates to close did not apply to the properties. Third, while state restrictions and social distancing reduced the number of guests permitted on hotel premises and amenity operations, these mandates, in general, did not apply to properties listed on Airbnb or significantly impact host operations for guests in their homes. Namely, almost none of the state restrictions on gatherings applied to entire-home listings, often booked by individuals or family and small groups. In light of the differential social distancing standards among hotels and peer-to-peer accommodations, it is important to investigate Research Question 6:

RQ5. How has the level of state restrictions regarding COVID-19 impacted hotel occupancy levels?

As mentioned above, peer-to-peer accommodations listed on Airbnb differ from traditional hotels in terms of their guest capacity and host occupancy. Both of these factors are important in determining the impact of state COVID-19 restrictions on demand for Airbnb properties. First, because listings on Airbnb do not typically include property types that are dependent on large group business (as opposed to hotels), state restrictions regarding group size, for the most part, would not impact bookings on Airbnb. Second, because properties listed are mostly individual-owned private homes, as opposed to businesses, state mandates to close did not apply to the properties. Third, while state restrictions and social distancing reduced the number of guests permitted on hotel premises and amenity operations, these mandates, in general, did not apply to properties listed on Airbnb or significantly impact host operations for guests in their homes. Namely, almost none of the state restrictions on gatherings applied to entire-home listings, often booked by individuals or family and small groups. In light of the differential social distancing standards among hotels and peer-to-peer accommodations, it is important to investigate Research Question 6:

RQ6. How has the level of state restrictions regarding COVID-19 impacted Airbnb property occupancy levels?
3. Methodology

3.1. Sample and data

The sample of this study comprises 49 out of the 50 U.S. states and the District of Columbia for the period between October 2014 and December 2020. The study covers the time period from the first availability of Airbnb property data (e.g., occupancy, supply, demand, etc.) to its latest availability (December 2020). Delaware was omitted from the study sample because there was no data available on this state. Accordingly, the study’s sample contains 3850 state-month observations.

The study’s dependent variable is the monthly occupancy rate, which is the most commonly accepted industry-metric reported on a monthly basis for both hotels and Airbnb peer-to-peer accommodation listings. Specifically, hotel room occupancy rates and Airbnb properties occupancy rates were specified as the main dependent variables of the study to examine the effects of COVID-19 pandemic on hotels and Airbnb property demand. The hotel occupancy data were provided by Smith Travel Research (STR), while data on Airbnb property occupancy were obtained from AirDNA, a well-recognized research company that collects detailed data on Airbnb listings through web crawling. Furthermore, monthly hotel occupancy rate for hotel categories, including economy class, midscale class, upper midscale class, upscale class, upper upscale class, and luxury class hotels were used to analyze the extent to which the effect of COVID-19 pandemic on hotels varies based on diverse hotel categories. Likewise, listings on Airbnb include entire-home, private-room, and shared-room property types. Therefore, monthly Airbnb occupancy rates for entire homes, private rooms, and shared room Airbnb properties were specified as additional dependent variables to investigate the effect of COVID-19 pandemic across alternative Airbnb property types. Fig. 1 presents the occupancy levels of the accommodations during the study period. The dramatic fall in occupancy levels across different accommodation properties is evident during the pandemic period.

The total monthly number of confirmed COVID-19 cases was specified as the main independent variable of the study, to investigate the effect of COVID-19 pandemic on the US accommodation sector. In addition, the total monthly number of confirmed COVID-19 deaths, monthly new-confirmed COVID-19 cases, and monthly new-confirmed COVID-19 deaths as alternative measures. The COVID-19 new-confirmed cases and death data were obtained from the Centers for Disease Control and Prevention (CDC). Fig. 2 presents the severity of the total COVID-19 cases across the US states during the study period in the form of heat maps.

A number of control variables were included to account for macroeconomic factors and travel demand that might affect hotel and Airbnb property occupancy rates regardless of the COVID-19 pandemic. Based on extant studies analyzing hotel supply and demand dynamics (e.g., Canina & Carvell, 2005; Dogru et al., 2020; Lee & Jang; 2012; Lei & Lam, 2015; Tsai, Kang, Yeh, & Suh, 2006), five control variables were included in the models to account for the effects of macroeconomic factors and travel demand on the accommodation sector. Specifically, airport passenger arrivals, hotel room supply, Airbnb property supply, income, and unemployment rate were controlled for. The first control variable in the empirical models, which accounts for general tourism and travel demand dynamics, was the number of airport passenger arrivals to all state airports. Airport passenger arrivals data were obtained from the Bureau of Transportation Statistics. Because a change in hotel room supply and Airbnb properties supply is likely to have an effect on the occupancy rates (Dogru et al., 2020), the effect of hotel room supply and Airbnb properties supply was also controlled for. Furthermore, the coincident index, a variable developed by the Federal Reserve Bank of Philadelphia to measure the monthly gross domestic product (GDP) for each state, was included in the empirical models to account for the effects of general macroeconomic dynamics on hotel and Airbnb property

Fig. 2. Total Number of COVID-19 Cases in the US.
The effect of COVID-19 on hotel occupancy. Readers are directed to the following reference: WalletHub (2020). The pandemic on the supply of hotel rooms and Airbnb properties is used to account for these potential differences, the data were sorted into two less restrictive groups, depending on the degree of regulations as measured by the WalletHub index of "Disease Control and Prevention agency, and the post-COVID period between October 2014 and December 2019, where total number of COVID-19 cases take the value of zero based on the Centers for Disease Control and Prevention agency, and the post-COVID period between January 2020 and December 2020, where total number of COVID-19 cases take the value of the number of cumulative COVID-19 cases recorded every month in each state. This empirical approach better captures the effect of COVID-19 pandemic on the US accommodation sectors because the COVID-19 pandemic is treated as a variable intervention in time against the hotel room occupancy and Airbnb properties occupancy rates in 50 states. The empirical models are specified as follows:

\[
\text{HotelRoomOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it} \\
\text{EconomyClassHotelRoomOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it} \\
\text{MidscaleClassHotelRoomOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it} \\
\text{UpperMidscaleClassHotelRoomOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it} \\
\text{UpscaleClassHotelRoomOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it} \\
\text{UpperUpscaleClassHotelRoomOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it} \\
\text{AirbnbPropertiesOCC}_i = \alpha + \beta_1 \log \text{COVID}_i + \sum \beta_k X_{it} + \epsilon_{it}
\]

Table 1

| Study Variables | Mean | Median | Std. Dev. | Min. | Max. |
|----------------|------|--------|-----------|------|------|
| Occupancy      |      |        |           |      |      |
| All Hotels     | 0.58 | 0.60   | 0.13      | 0.08 | 0.89 |
| Economy Class  | 0.52 | 0.53   | 0.15      | 0.00 | 0.89 |
| Midscale Class | 0.54 | 0.55   | 0.14      | 0.00 | 0.94 |
| Upper Midscale Class | 0.61 | 0.63   | 0.14      | 0.14 | 0.91 |
| Upscale Class  | 0.64 | 0.67   | 0.15      | 0.06 | 0.92 |
| Upper Upscale Class | 0.60 | 0.66   | 0.20      | 0.00 | 0.94 |
| Luxury Class   | 0.60 | 0.65   | 0.18      | 0.03 | 0.96 |
| All Airbnb     | 0.33 | 0.32   | 0.12      | 0.02 | 0.76 |
| Entire Home Airbnb | 0.34 | 0.33   | 0.13      | 0.01 | 0.79 |
| Private Room Airbnb | 0.32 | 0.32   | 0.12      | 0.01 | 0.72 |
| Shared Room Airbnb | 0.22 | 0.21   | 0.12      | 0.00 | 1.00 |
| Log Total COVID-19 Cases | 1.69 | 0.00   | 4.01      | 0.00 | 15.07 |
| Log Airport Arrivals | 12.66 | 12.56   | 1.68      | 6.09 | 15.80 |
| Log Hotel Supply | 14.57 | 14.64   | 0.86      | 12.56 | 16.64 |
| Log Airbnb Supply | 11.49 | 11.55   | 1.36      | 6.51 | 15.19 |
| Log Coincident Index (Income) | 4.81 | 4.81    | 0.09      | 3.93 | 5.03 |
| Unemployment   | 0.05 | 0.04   | 0.02      | 0.02 | 0.29 |

Table 2

| Study Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|----------------|-----|-----|-----|-----|-----|-----|-----|
|                | All Hotels | Economy Class | Midscale Class | Upper Midscale Class | Upscale Class | Upper Upscale Class | Luxury Class |
| Log Total COVID-19 Cases | -0.007 ^a | -0.004 ^c | 0.001 | -0.005 ^a | -0.010 ^a | -0.018 ^a | -0.017 ^a |
| Log Airport Arrivals | 0.093 ^b | 0.058 ^a | 0.089 ^b | 0.113 ^a | 0.125 ^b | 0.164 ^a | 0.171 ^a |
| Log Hotel Supply | 0.460 ^a | 0.166 ^b | 0.415 ^a | 0.336 ^b | 0.279 ^b | 0.365 ^b | 0.484 ^a |
| Log Airbnb Supply | -0.025 ^b | -0.039 ^b | 0.006 | -0.035 ^a | -0.029 ^a | -0.023 ^b | -0.060 ^a |
| Log Coincident Index (Income) | -0.104 | -0.001 | 0.017 | -0.087 | -0.223 ^b | -0.284 ^b | -0.482 |
| Unemployment | -0.055 | 0.184 | 0.067 | -0.141 | -0.439 | 0.298 | 0.391 |
| Constant | -6.646 ^a | -2.364 | -6.670 ^a | -5.051 ^a | -3.726 ^a | -5.304 ^b | -6.001 ^a |
| R-Squared Within groups | 0.83 | 0.57 | 0.64 | 0.85 | 0.86 | 0.85 | 0.78 |
| Between groups | 0.28 | 0.13 | 0.21 | 0.20 | 0.19 | 0.19 | 0.17 |
| Overall | 0.14 | 0.20 | 0.10 | 0.14 | 0.16 | 0.20 | 0.11 |
| F-Test | 309.21 ^a | 224.85 ^a | 332.62 ^a | 417.73 ^a | 396.94 ^a | 173.44 ^a | 146.26 ^a |
| Number of Observations | 3750 | 3750 | 3750 | 3750 | 3750 | 3750 | 1710 |
| Number of Groups (States) | 50 | 50 | 50 | 50 | 50 | 50 | 39 |

Notes: Occupancy rate is the dependent variable. Robust t-statistics are in parentheses. a, b, and c denote 1%, 5%, and 10% statistical significance levels, respectively.
Table 3
The Effect of COVID-19 on Airbnb Occupancy.

| Study Variables | All Airbnb | Entire Home Airbnb | Private Room Airbnb | Shared Room Airbnb |
|-----------------|-------------|---------------------|---------------------|-------------------|
| Log Total COVID-19 Cases | 0.001* | 0.002 | -0.011* | -0.012* |
| Log Airport Arrivals | 0.045* | 0.047* | 0.026* | 0.016 |
| Log Hotel Supply | 0.443 | 0.422* | 0.765* | 0.330* |
| Log Airbnb Supply | -0.062* | -0.069* | -0.039* | -0.024 |
| Log Coincident Index (Income) | (-3.45) | (-3.59) | -2.74 | -1.45 |
| (Time) | (-3.15) | (-3.15) | -0.07 | -0.06 |
| Unemployment | -0.134 | -0.159 | -0.008 | -0.066 |
| (States) | (-0.99) | (-1.15) | (-0.07) | (-0.46) |
| Constant | -5.670* | -5.228* | -8.087* | -4.415* |
| (8.46) | (7.16) | (10.69) | (4.64) |
| R-Squared | 0.586 | 0.505 | 0.935* | 0.660 |
| Within groups | (1.50) | (1.23) | (2.80) | (1.60) |
| Between groups | -5.670* | -5.228* | -8.087* | -4.415* |
| Constant | (-6.27) | (-5.34) | (-8.36) | (-4.21) |

Notes: Occupancy rate is the dependent variable. Robust t-statistics are in parentheses. a, b, and c denote 1%, 5%, and 10% statistical significance levels, respectively.

4. Empirical results

4.1. The effect of COVID-19 pandemic on hotels

This section presents the results from the investigation of the effect of COVID-19 pandemic on the US hotel industry. The analyses are carried out utilizing the panel data fixed effect regression analysis. Table 2 presents the results from the analysis of the effects of COVID-19 pandemic on all hotels and for each hotel class separately (i.e., economy, midscale, upper midscale, upscale, upper upscale, and luxury) controlling for macroeconomic factors, such as income and hotel industry specific factors, such as hotel room supply.

The results show that hotel room occupancy is adversely affected by the COVID-19 pandemic. Specifically, a 1% increase in total number of COVID-19 cases decreases hotel occupancy rate by almost 0.01%. This result is both economically and statistically significant (β = −0.007, p < 0.01). While the COVID-19 pandemic is expected to have an adverse impact on the hotel industry, the magnitude of this impact was not clear. Furthermore, the effect of the COVID-19 pandemic may not be uniform across demand associated with different hotel categories. Therefore, a further analysis was conducted on the effect of the COVID-19 pandemic including all hotel class categories.

The results showed that demand for all hotel classes was adversely affected by the COVID-19 pandemic at varying degrees with the exception of the midscale class hotels. The effect of the COVID-19 pandemic on midscale class hotels was not statistically significant at conventional statistical significance levels. The magnitude of the effect of the COVID-19 pandemic was larger in higher class hotels. Specifically, a 1% increase in total number of COVID-19 cases decreases hotel occupancy rate by between 0.01% and 0.02% in upscale class hotels (β = −0.01, p < 0.01), upper upscale class hotels (β = −0.018, p < 0.01) and luxury class hotels (β = −0.017, p < 0.01). The results further show that economy class hotels and upper midscale class hotels showed higher resilience against the COVID-19 pandemic. That is, a 1% increase in total number of COVID-19 cases decreases hotel occupancy rate by about 0.005% in economy class hotels (β = −0.004, p < 0.10) and upper midscale class hotels (β = −0.005, p < 0.01). These outcomes collectively suggest that the COVID-19 pandemic has had a significantly negative effect on demand in the hotel sector, in general. However, the magnitude of the effect is not uniform across hotel class categories and that the midscale class hotels are the most resilient against the COVID-19 pandemic, followed by economy scale and upper midscale hotels, while the highest impact was observed in the upper upscale and luxury class hotels. The results further showed that the differences in magnitude were also statistically significant for all hotel classes except for upscale hotels compared to all hotels, as the COVID-19 pandemic has had a similar effect on upscale hotels compared to all hotels. The significance difference tests of the coefficients are presented as follows: all hotels vs. economy hotels (t = 2.54, p < 0.05); all hotels vs. midscale hotels (t = 2.75, p < 0.01); all hotels vs. upper midscale hotels (t = 1.90, p < 0.10); all hotels vs. upscale hotels (t = 1.62, n.s.); all hotels vs. upper upscale hotels (t = 7.28, p < 0.01); and all hotels vs. luxury hotels (t = 4.15, p < 0.01).

4.2. The effect of the COVID-19 pandemic on Airbnb

Although results of the analyses showed that the COVID-19 pandemic had an adverse impact on the hotel industry’s demand, and that the magnitude of this impact varies across hotel class categories, the accommodation sector is not limited to hotels only. Peer-to-peer accommodations listed through the company Airbnb have become a major player in the lodging industry, and the effect of the COVID-19 pandemic on booking demand for properties listed by Airbnb might not be similar.
Table 4
The Effect of COVID-19 on Hotels and Airbnb Occupancy: The Role of State Restrictions.

| Study Variables          | Panel A | Panel B |
|--------------------------|---------|---------|
|                          | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|                          | Hotel   | Airbnb | Hotel   | Airbnb |
| Log Total COVID-19 Cases | -0.011  | -0.005  | -0.003  | -0.001  |       |
|                          | (−6.97) | (−3.13) | (−1.38) | (−0.13) |       |
| Log Airport Arrivals     | 0.083   | 0.095   | 0.031   | 0.046   |       |
|                          | (6.03)  | (6.02)  | (1.96)  | (4.58)  |       |
| Log Hotel Supply         | 0.443   | 0.455   | 0.428   | 0.439   | 0.001  |
|                          | (5.57)  | (3.21)  | (7.47)  | (4.58)  | 0.01   |
| Log Airbnb Supply       | -0.040  | -0.028  | -0.102  | -0.084  |       |
|                          | (−3.06) | (−1.89) | (−4.17) | (−3.39) |       |
| Log Coincident Index (Income) | −0.27  | −0.171  | −0.027  | −0.252  |       |
|                          | (−1.39) | (−0.12) | (−2.01) |       |       |
| Unemployment             | 0.147   | 0.283   | 0.827   | 0.388   | 0.01   |
|                          | (0.28)  | (−0.71) | (1.12)  | (0.97)  | 0.01   |
| Constant                | −6.503  | −6.136  | −5.400  | −4.885  |       |
|                          | (−5.13) | (−3.45) | (−4.42) | (−3.44) |       |
| R-Squared                |         |         |         |         | 0.01   |
| Within groups            | 0.87    | 0.80    | 0.74    | 0.80    |       |
| Between groups           | 0.10    | 0.42    | 0.09    | 0.27    |       |
| Overall                  | 0.12    | 0.15    | 0.11    | 0.16    |       |
| F-Test                   | 1083.55 | 694.42  | 423.96  | 484.18  |       |
| Number of Observations   | 1875   | 1875    | 1875    | 1875    |       |
| Number of Groups (States)| 25      | 25      | 25      | 25      |       |

Notes: Occupation rate is the dependent variable. Robust t-statistics are in parentheses. a, b, and c denote 1%, 5% and 10% statistical significance levels, respectively.

Table 5
The Effect of Lagged COVID-19 on Hotels and Airbnb Occupancy.

| Study Variables          | Panel A | Panel B |
|--------------------------|---------|---------|
|                          | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|                          | Hotel   | Airbnb | Hotel   | Airbnb |
| 1.1. Log Total COVID-19 Cases | -0.003  | -0.004  | 0.001   | 0.001   |       |
|                          | (−2.61) | (−4.22) | (0.93)  | (0.02)  |       |
| 1.2. Log Total COVID-19 Cases | -0.004  | -0.004  | 0.001   | 0.001   |       |
|                          | (−2.61) | (−4.22) | (0.93)  | (0.02)  |       |
| 1.3. Log Total COVID-19 Cases | -0.004  | -0.004  | 0.001   | 0.001   |       |
|                          | (−4.14) | (−4.14) | (0.02)  | (0.02)  |       |
| Log Airport Arrivals     | 0.104   | 0.108   | 0.110   | 0.047   | 0.045  |
|                          | (10.36) | (11.22) | (11.49) | (4.54)  | (4.74) |
| Log Hotel Supply         | 0.442   | 0.442   | 0.444   | 0.440   | 0.446  |
|                          | (6.27)  | (6.28)  | (6.46)  | (8.81)  | (8.81) |
| Log Airbnb Supply       | −0.021  | −0.024  | −0.025  | −0.062  | −0.062 |
|                          | (−2.16) | (−2.46) | (−2.47) | (−3.46) | (−3.45) |
| Log Coincident Index (Income) | -0.104 | -0.122 | -0.124 | -0.135 | -0.134 |
|                          | (−1.43) | (−1.61) | (−1.60) | (−1.02) | (−1.02) |
| Unemployment             | -0.047  | -0.070  | -0.107  | 0.556   | 0.562  |
|                          | (−0.16) | (−0.23) | (−0.35) | (1.44)  | (1.47) |
| Constant                | −6.559  | −6.489  | −6.505  | −5.667  | −5.637  |
|                          | (−6.74) | (−6.68) | (−6.83) | (−6.40) | (−6.34) |
| R-Squared                |         |         |         |         | −0.50  |
| Within groups            | 0.83    | 0.83    | 0.83    | 0.74    | 0.74   |
| Between groups           | 0.30    | 0.30    | 0.30    | 0.21    | 0.20   |
| Overall                  | 0.15    | 0.15    | 0.15    | 0.14    | 0.14   |
| F-Test                   | 356.16  | 341.04  | 215.52  | 168.49  | 179.12 |
| Number of Observations   | 3700   | 3650    | 3600    | 3700    | 3650   |
| Number of Groups (States) | 50      | 50      | 50      | 50      | 50     |

Notes: Occupation rate is the dependent variable. Robust t-statistics are in parentheses. a, b, and c denote 1%, 5% and 10% statistical significance levels, respectively.
The Effect of COVID-19 on Hotels and Airbnb Occupancy: Alternative COVID-19 Measures.

| Study Variables | Panel A | Panel B |
|-----------------|---------|---------|
|                 | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
| Log Total COVID-19 Death | -0.008* (-4.65) | -0.001 (-0.16) | -0.001 (-0.29) |
| Log New COVID-19 Cases | -0.008* (-6.41) | -0.008* (-3.71) | -0.008* (-3.62) |
| Log New COVID-19 Death | -0.008* (-6.41) | -0.008* (-3.71) | -0.008* (-3.62) |
| Log Airport Arrivals | 0.096* (9.50) | 0.096* (9.11) | 0.044* (4.12) |
| Log Hotel Supply | 0.452* (6.14) | 0.445* (8.37) | 0.443* (8.27) |
| Log Airbnb Supply | -0.024* (-2.53) | -0.026* (-2.34) | -0.068* (-3.61) |
| Log Coincident Index (Income) | -0.100 (-0.95) | -0.082 (-1.14) | -0.135 (-0.97) |
| Unemployment | -0.068 (-0.24) | -0.051 (1.50) | 0.586 (0.59) |
| Constant | -6.584* (-6.64) | -6.741* (-6.67) | -5.675* (-6.26) |
| R-Squared | Overall 0.471 (3.62) | 0.096 (0.42) | 0.105 (0.62) |
| Number of Observations | 3750 | 3750 | 3750 |
| Number of Groups (States) | 50 | 50 | 50 |

Notes: Occupation rate is the dependent variable. Robust t-statistics are in parentheses. a, b, and c denote 1%, 5%, and 10% statistical significance levels, respectively.

The Effect of COVID-19 on Hotels and Airbnb Occupancy: Testing for Structural Breaks.

| Study Variables | Panel A | Panel B |
|-----------------|---------|---------|
|                 | (1)     | (2)     | (3)     | (4)     |
| Log Total COVID-19 Cases | -0.013* (-8.44) | -0.001 (-7.63) |
| Log Airport Arrivals | 0.003 (0.42) | 0.004 (1.28) |
| Log Hotel Supply | 0.053* (1.28) | 0.026 (1.28) |
| Log Airbnb Supply | -0.048* (-3.36) | -0.0369* (-2.62) |
| Log Coincident Index (Income) | -0.021 (0.63) | 0.237 (1.51) |
| Unemployment | -1.877* (-4.97) | -0.502* (-1.51) |
| Constant | 0.471* (5.18) | 0.105* (3.62) |
| R-Squared | Overall 0.465 (3.62) | 0.096 (0.42) |
| Number of Observations | 3750 | 3750 | 3750 |
| Number of Groups (States) | 50 | 50 | 50 |

Notes: Occupation rate is the dependent variable. Robust t-statistics are in parentheses. a, b, and c denote 1%, 5%, and 10% statistical significance levels, respectively.
4.3. The effect of COVID-19 pandemic on Hotels vs. Airbnb: the role of Restrictions

Main analyses showed that the hotel room occupancy is adversely affected by the COVID-19 pandemic, while the effect of COVID-19 pandemic on Airbnb properties occupancy was not statistically significant. However, these analyses do not take into consideration the policy responses of the government authorities across the states regarding the COVID-19 pandemic. That is, during the pandemic, state authorities have reacted differently to COVID-19 pandemic. Some states have taken strict measures, such as stay-at-home orders, curfews, business closures, and travel restrictions to cope with spread of the COVID-19 infections, while some states did not impose any restrictions in this context. Accordingly, the effect of the COVID-19 pandemic is likely to be more prevalent in states with higher restrictions than in states with little or no restrictions in place. Therefore, we further examined the effect of COVID-19 pandemic on hotel and Airbnb occupancies based on the degree of restrictions in 50 US states. Specifically, we categorized each state into more restrictive and less restrictive state groups based on their degree of regulations as measured by the WalletHub index of “States with the Fewest COVID-19 Restrictions”. Table 4 presents these results.

The results from Columns 1 and 2 of Table 4 show that the COVID-19 pandemic has had a significantly adverse impact on hotel occupancies in states with both more restrictive and less restrictive regulations. Further, the magnitude of the results demonstrate that the COVID-19 pandemic has much higher impact on hotel occupancies in more restrictive states ($\beta = -0.011, p < 0.01$) than less restrictive states ($\beta = -0.005$, $p < 0.01$). The difference in the magnitude of the impact is statistically significant ($t = 4.24, p < 0.01$). These findings suggest that pandemic related restrictions have had a significantly higher adverse impact on the hotel industry.

The results from the examination of the effect of COVID-19 pandemic on Airbnb occupancy yields results similar to that of the main findings. That is, the results from Columns 3 and 4 of Table 4 show that the COVID-19 pandemic does not have any adverse effects on Airbnb property occupancies in more restrictive or less restrictive states.

These results suggest that Airbnb properties continued to operate regularly regardless of the restrictions imposed to contain the COVID-19 pandemic by more restrictive states. These findings may indicate that guests preferred to stay in Airbnb properties while traveling during COVID-19 pandemic. Alternatively, privately owned Airbnb properties may not have been held to the same restrictions imposed to commercially operated hotel business. Regardless, peer-to-peer accommodations, at least those listed on Airbnb, appear to be more resilient to the COVID-19 pandemic in both more restrictive and less restrictive states.

We further investigated the effect of the COVID-19 pandemic on hotels and Airbnb properties using alternative measures to test the robustness of our initial findings. More specifically, we analyzed one-month, two-month, and three-month lagged effects of the COVID-19 pandemic on the accommodation sector, because the effect of the COVID-19 pandemic might last for few months. These results collectively confirmed the initial findings that Airbnb properties are more resilient against the COVID-19 pandemic than hotels. Due space limitation, we present these findings in detail in the Appendix.

5. Discussion and conclusion

The COVID-19 pandemic has had major adverse impacts on the overall economy, and many, if not all, industries and businesses have experienced significant challenges resulting from social distancing and public health regulations. While the COVID-19 pandemic continues to be a challenge around the world, the adverse effect of the COVID-19 pandemic on the lodging industry has largely been based on anecdotal evidence. That is, the effect of the COVID-19 pandemic on the lodging industry has not yet been quantified. Furthermore, although the COVID-19 pandemic has had an impact on the overall economy and the lodging industry, its effect might not be uniform across various segments (e.g., economy-scale, midscale, luxury-scale). That is, some hotel segments could be more resilient than others to the external shock.

In this study, the effects of the COVID-19 pandemic on all hotels and for each hotel class separately (i.e., economy, midscale, upscale, upper upscale, and luxury) were analyzed. Specifically, the COVID-19 pandemic was specified as a variable intervention in time against hotel room occupancy, which allows for investigation of the before and after effect of the COVID-19 pandemic on hotel room occupancy in 50 states. The results show that the COVID-19 pandemic has had a significantly negative effect on the hotel sector in general. However, the magnitude of the effect is not uniform across hotel class categories, and the midscale class hotels are the most resilient against the COVID-19 pandemic, followed by economy scale and upper midscale hotels, while the highest impact was observed in the upper upscale and luxury class hotels. The resilience of the midscale hotel can be attributed to the pricing points of these properties compared to upper scale or luxury hotel properties (Ozdemir et al., 2021). During the pandemic, some people continued to travel; however, these travels were mostly business related and hence midscale hotels were preferred. Also, some midscale hotels were utilized by first responders and that provided a resilience in occupancy in this category of hotels. Furthermore, the quality of amenities compared to that of economy scale hotels may offer a better value for travelers and hence may have been preferred during the pandemic. Maintaining the cost of operation with low occupancy level can still be manageable in midscale and economy scale hotels because of the low level of employment needed compared to that of upper scale and luxury scale hotel properties (Dogru et al., 2020). Therefore, midscale hotels showed higher resilience followed by economy scale hotels, while upscale and luxury scale hotels are the most affected by the pandemic.

In addition to alternative hotel segments, the lodging sector consists of peer-to-peer accommodations property listing platforms, such as Airbnb. Therefore, we further examined the effects of COVID-19 pandemic on all Airbnb properties and for each Airbnb property type separately (i.e., entire home, private room, and shared room). The results showed that the COVID-19 pandemic did not have a statistically significant impact on Airbnb properties, in general. However, the effect of the COVID-19 pandemic is not uniform across Airbnb property types. While entire home Airbnb property bookings were not adversely affected by the COVID-19 pandemic, there were significant declines of private room and shared room Airbnb property bookings. These outcomes suggest that travelers do not feel comfortable staying in a private room or shared room Airbnb properties due to likely risk of infection and interaction with other guests, however Airbnb guests continued to book in entire home Airbnb properties during the pandemic which facilitated social distancing.

Moreover, while some states pursued a relatively strict approach to public health regulations in an effort to combat the spread of the COVID-19 virus, including stay-at-home orders, curfews, business closures, and travel restrictions, other states imposed little or no restrictions (McCann, 2021). Therefore, we investigated the effect of the COVID-19 pandemic on hotel and Airbnb property occupancies based on the degree of restrictions by state.

The results showed that the COVID-19 pandemic had a significantly adverse impact on hotel occupancies in both more restrictive and less restrictive states. However, the magnitude of these effects was not uniform. Specifically, the COVID-19 pandemic had a higher impact on hotel occupancies in more restrictive states than less restrictive states, which suggests that pandemic related restrictions further intensified the adverse impacts of the COVID-19 pandemic on the hotel industry’s demand. However, the COVID-19 pandemic did not have any adverse effects on Airbnb property occupancies, regardless of the degree of restrictions across states. These results suggest that peer-to-peer accommodation properties listed on Airbnb seem immune to the state-level COVID-19 policy and restrictions either because the pandemic-
related restrictions did not apply to privately-owned Airbnb properties, or because travelers preferred staying at Airbnb properties for social-distancing reasons.

5.1. Research implications

This study makes several key contributions to the limited empirical literature on the effects of the COVID-19 pandemic on the lodging industry. First, much of the extant studies in this context are descriptive in nature, and the impact of the COVID-19 pandemic on the lodging industry has largely been based on anecdotal evidence (Lardieri, 2021). In a recent study, Özdemir et al. (2021) showed that US hotels have experienced significant drops in demand during the early stages of the pandemic; however, the extent to which COVID-19 pandemic affects the lodging industry was not empirically investigated. In the present study, we examined and quantified the effect of the COVID-19 pandemic on the lodging industry across states. Second, while the COVID-19 pandemic might appear to have an adverse effect on the entire industry, the hotel industry is quite complex, with six distinct categories ranging from economy to luxury. As such, the COVID-19 pandemic might not have a uniform effect on these various hotel classes. However, the extent to which the COVID-19 pandemic affects the occupancy levels of various hotel classes has not been previously investigated. Thus, the effect of the COVID-19 pandemic on the economy, midscale, upper midscale, upper upscale, and luxury scale hotel classes was analyzed.

Next, the lodging industry comprises both traditional hotels and peer-to-peer accommodation properties listed for booking by companies such as Airbnb. It is possible that Airbnb property bookings were not equally affected by the COVID-19 pandemic. In a recent study, Dolnicar and Zare (2020) posed the question of whether COVID-19 has disrupted the disruptor (Airbnb). Following this, the extent to which the COVID-19 pandemic affected Airbnb property bookings, including all, entire home, private rooms, and shared room properties in the US was investigated. In so doing, this key question posed by Dolnicar and Zare (2020) was answered, in that results showed that Airbnb demand was not adversely impacted by the COVID-19 pandemic.

Finally, the COVID-19 pandemic is a major external shock to which policymakers in US states have responded differently in terms of regulations. Some states have ordered strict limitations on business openings, number of patrons allowed, hours of operation, large and even small gatherings, and social distancing (Multistate, 2021), while other states imposed almost no rules at all (Hunnicutt & Mason, 2021). This study examined the role of those different policy responses on the effect of the COVID-19 pandemic on the lodging industry. In so doing, analyses showed that while an external shock, such as the COVID-19 pandemic, might have adverse impacts on the lodging industry, policies and strategies implemented to deal with such external shocks have significant impacts on the economic actors of the society.

Accordingly, the present study contributes to the limited formative literature by analyzing and quantifying the impact of the COVID-19 pandemic on the lodging industry. Also, the current study further contributes to the extant literature through its temporal, inferential, and geographical scope. That is, the effect of the COVID-19 pandemic US hotel room and Airbnb property bookings was examined using available data during the most comprehensive timeframe. The research serves as contemporary empirical evidence of the implications of the COVID-19 pandemic on the lodging industry in the US. Results further showed a major external shock (i.e., COVID-19 pandemic) that appears to have adverse impacts to the economy, in general, and the lodging sectors, in particular, has an impact at varying degrees. While some sectors of the lodging industry are more resilient (e.g., peer-to-peer accommodation properties listed on Airbnb and midscale hotels), others are more vulnerable (e.g., upper upscale and luxury hotels). Furthermore, we showed that public health policies and regulations developed to mitigate the COVID-19 virus spread throughout the pandemic have had varying effects on its impacts. Therefore, such policy interventions should always be taken into consideration when analyzing the economic impact of external shocks, such as the COVID-19 pandemic.

5.2. Practical implications

The results of this study have significant managerial implications for the lodging industry and strategic implications for destinations and policymakers. First, although the COVID-19 pandemic is a major external shock that has had severe impacts to the overall economy and hospitality and tourism industry, the effect of the COVID-19 pandemic is not uniform across all platforms. Midscale hotels are the most resilient hotels against the COVID-19 pandemic, followed by economy-scale and upper midscale class hotels. Therefore, hotel corporations should increase midscale, economy-scale, and upper midscale class hotels in their portfolios, as they are the most resilient hotels against major external shocks.

Furthermore, the hotel industry has somewhat recognized that peer-to-peer accommodation networks are major competitors (Dogru et al., 2020), and some hotel chains have even incorporated the home sharing model into their businesses. However, advertising privately-owned properties for guests is often limited to individuals, and commercial hotel companies may not be able to operate within the peer-to-peer accommodation market, in this sense. Therefore, to the extent of the limitations, hotel companies should endeavor to innovate commercially owned properties, as travelers have shifted to staying in more private properties, where they do not interact with other guests and large staff.

In addition, hotels can provide stronger value propositions than peer-to-peer accommodation operations by integrating their large-scale knowledge base, professional cleaning, hygiene standards, and technological infrastructure that enables contactless check-in and entry (Jiang and Wen, 2020; Kaushal and Srivastava, 2021). As hotel corporations have started to acquire properties and operate peer-to-peer accommodations, expanding their business model could also increase their resiliency during major external shocks, such as a pandemic, and it may also provide an opportunity to capitalize on the rapidly growing market. Offering private home and residential style property rentals, such as those advertised by individual owners on the peer-to-peer accommodation networks, would be a winning strategy for hotels, because loyal customers of major hotel corporations might not feel the need to shift their booking preferences to the properties listed on Airbnb. While peer-to-peer accommodation and home sharing business models appear to be ideal for consumers who desire to travel during the pandemic while maintaining social distancing with other travelers, incorporating experiential value propositions, such as localness, serendipity, communities (Mody et al., 2017) and a sense of “feeling at home” (Song et al., 2021) through such properties would further strengthen the hotel businesses.

Furthermore, hotels could change their business models to decrease their reliance on group businesses, such as conferences, events, corporate meetings, and so on (Hao et al., 2020). Similar to Airbnb’s local travel initiative, Go Near (Jelski, 2020), hotels could attract customers from within or near the cities they operate. Consumer perceptions of safety, the ability and willingness to travel, and anxiety about the pandemic have all resulted in significant changes in consumer travel behavior (Suess et. al, 2021). The highest standards of cleanliness, hygiene, and safety should be in the center of hotels’ marketing strategies, coupled with flexible booking and free cancellation options, and promotions that could alleviate consumers’ anxiety and restore confidence about traveling during the pandemic (Shin et al., 2021). Also, the shift at many companies to working at home has given rise to a new group of customers who choose to rent Airbnb properties on a long-term basis so that they can explore new and different cities and countries while working remotely (Hines, 2021). These digital nomads have generated new demand for the lodging sector, which appears to be captured by Airbnb properties (Rodriguez, 2020). Hotels could offer extended stay options to these new groups of health-conscious digital nomads to create a new stream of revenues during the pandemic and thereafter.
Strict restrictions intensify the adverse impacts of the pandemic. Certainly, public health is of paramount importance during a pandemic. Specifically, mandatory business closures, limited hours of operation, curfews, stay-at-home orders, and other similar policies have had direct and significant effects on businesses. By imposing such strict policies, local and federal governments have lost significant sales, income, and other tax revenues that are essential to funding measures related to maintaining public health. While almost all US states implemented strict policy measures, some states, such as Florida and Texas, relaxed these restrictions significantly and allowed businesses to continue to operate as usual in early 2020. The benefits of these lenient policies have appeared in the results of the present study, showing that the impact of the COVID-19 pandemic to the lodging industry was lower in less-restrictive states. Policymakers in more-strictive states should reconsider their approaches to mitigating the effects of the ongoing pandemic by investigating the methods utilized in less-restrictive states to sustain their tax revenues and attract new investments in local communities from future hotel developers.

The results of the study showed that midscale hotels are the most resilient against the demand decreased related to the COVID-19 pandemic. Prior to the pandemic, Dogru et al. (2020) also showed that midscale hotels are the major hotel classes that contribute to the employment in local economies. Considering the impact that the midscale hotels have on local economies and their resilience to pandemic, local authorities should further incentivize midscale hotel development in their communities. Also, the resilience of the Airbnb peer-to-peer accommodation properties might appear to be a benefit for local communities as they bring in additional tax revenues for cities and local governments from visitor spending, especially during the COVID-19 pandemic. In fact, Airbnb properties, in general, were found to be resilient in both more-restrictive and less-restrictive states, suggesting that more restrictive states only imposed restrictions against traditional hotels or that hosts of Airbnb properties were not mandated by the same restrictions as hotels. Regardless, policymakers should consider regulating Airbnb properties in the same manner as the commercial accommodation counterparts to level the playing field. Otherwise, loose regulations and policies on privately operated properties might drive away major hotel investments to states or destinations that treat hotels and sharing economy properties similarly, where both are allowed to operate with little or no restrictions during a pandemic (Dogru et al., 2019). Also, state and federal governments could initiate tax-incentives to encourage travelers to book hotels and/or Airbnb properties during pandemic to accelerate the recovery (Ozdemir et al., 2021; Salem et al., 2021).

5.3. Limitations and recommendations for future research

Although the present study makes a significant contribution to the extant literature, it has some limitations. The current study examines the effect of the COVID-19 pandemic on various sectors of the lodging industry. However, its sample is limited to the hotel categories and Airbnb property types specifically in the US. It is not clear whether the COVID-19 pandemic affected the lodging industry in other parts of the world, similarly. Future research is necessary to examine the extent to which the COVID-19 pandemic affects the lodging industry in other countries. Also, the classification of hotels in the study is based on class categories (STR). However, hotels in each class might vary in their organizational structures, such as franchised or managed, and the implications of the COVID-19 pandemic might be different. Therefore, future studies are necessary to examine these issues and compare the structures. Similarly, Airbnb properties can be compared based on management by single-unit hosts or multi-unit hosts. The examination of the impact of COVID-19 pandemic to Airbnb properties in this structural context will well serve the extant literature. The present study examined the effect of the COVID-19 pandemic on the demand for hotel and peer-to-peer accommodation properties listed on Airbnb. Finally, the impact of the COVID-19 pandemic to other sectors of the hospitality and tourism industry is not clear. Future studies should investigate the implications of the COVID-19 pandemic on restaurants, museums, and other sectors of the hospitality and tourism industry.

Declarations of interest

None.

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Appendix 1

Robustness analysis

Our main analyses provide extensive evidence on the effects of the COVID-19 pandemic on hotels and the peer-to-peer accommodation properties listed on Airbnb. However, we further examined the effects using alternative measures of COVID-19 pandemic. While the COVID-19 pandemic might have immediate effect on the accommodation sectors, its effect could be lagged for several months. Therefore, a further examination of the lagged effects of the COVID-19 pandemic on hotels and Airbnb was warranted. Table 5 presents these findings.

The analyses yielded results similar to that of the main findings. That is, the results show that the effect the COVID-19 pandemic on hotels continues to be significant in one-month (β = −0.003, p < 0.05), two-month (β = −0.004, p < 0.01), and three-month (β = −0.004, p < 0.01) lagged total number of COVID-19 cases. While the magnitudes of the effect of the COVID-19 pandemic on hotels are slightly lower, the impact of the COVID-19 pandemic persists for at least three months. However, the effect of COVID-19 pandemic on Airbnb properties remains to be insignificant in a lagged examination of the effect of the COVID-19 pandemic. These results confirm our findings that Airbnb properties are more resilient against the COVID-19 pandemic than hotels.

In addition to the examination of the effect of lagged values of COVID-19 cases, we also analyzed the effect of COVID-19 pandemic on hotels and Airbnb properties utilizing alternative measures of COVID-19 pandemic. Specifically, we utilized total number of COVID-19 deaths, new number of COVID-19 cases, and new number of COVID-19 deaths to analyze the effect of COVID-19 pandemic on hotels and Airbnb. Table 6 presents these results.

The results from the Panel A of Table 6 validates our main findings that the COVID-19 pandemic has an adverse impact on hotel occupancy rates. The magnitudes of the effect are similar to that our initial findings, suggesting that the effect of the COVID-19 pandemic on hotels does not change based on the measure of the COVID-19 pandemic. That is, regardless of the COVID-19 pandemic variable, the effect of the COVID-19 pandemic on hotels remains negative and statistically significant with similar findings in magnitude when the total number of COVID-19 deaths, new number of COVID-19 cases, or new number of COVID-19 death measures (β = −0.008, p < 0.01) were utilized to examine the effect of COVID-19 pandemic on
hotels. These results further confirm the initial analysis findings of the effect that the COVID-19 pandemic has on peer-to-peer accommodation properties listed on Airbnb, which continues to be insignificant. That is, COVID-19 pandemic does not appear to have any adverse impacts on Airbnb properties when alternative measures of COVID-19 pandemic are utilized. These results suggest that our results are robust to alternative measures of the COVID-19 pandemic, and collectively validate our findings that Airbnb property bookings did not experience any adverse impacts from the COVID-19 pandemic and appear to be more resilient than hotels, although hotels experienced economically and statistically significant impacts due to the COVID-19 pandemic.

The anonymous reviewer suggested to examine the effect of COVID-19 pandemic on hotels and Airbnb occupancy by adjusting the total COVID-19 cases by respective state populations. These results are presented in Table 7.

The results from Panel A of Table 7 show that analyzing the pandemic period alone yields results similar to that of initial analysis. That is the effect of the COVID-19 pandemic on hotels and Airbnb occupancy remains similar regardless of the time period. Furthermore, the findings from the analysis presented in Panel B of Table 7 show coefficients similar to that of initial findings, suggesting that the state population does not have any significant impact on the effect of COVID-19 pandemic on hotels and Airbnb.

Furthermore, in a recent study Dey-Tortella et al. (2022) argued that COVID-19 pandemic has led to significant changes in tourist behavior and hence there might be structural shifts in this context. Considering the nature of this study’s data period containing the COVID-19 pandemic, we have further tested for the existence structural breaks in the data following the procedures in Ditzen et al. (2021). The results showed that the data contains five structural breaks. Therefore, we re-run the analysis on all hotels and all Airbnb samples considering the existence of the structural breaks following the methodology proposed by the study of Ditzen et al. (2021), Table 8 presents these findings.

The results yield estimates similar to that of the results from the main analysis. While the coefficient estimates changed slightly, the changes are not significant. Therefore, our estimates are valid and robust to alternative specifications. Overall, the results from the robustness tests suggest that our results are robust and collectively validate our findings.

Appendix 2

Correlation Matrix

| Occupancy | (1) All Hotels | (2) Economy Class | (3) Midscale Class | (4) Upper Midscale Class | (5) Upscale Class | (6) Upper Upscale | (7) Luxury Class | (8) All Airbnb | (9) Entire Home Airbnb | (10) Private Room Airbnb | (11) Shared Room Airbnb | (12) Log COVID19Cases | (13) LogAirport Arrivals | (14) Log Hotel Supply | (15) LogAirport Arrivals | (16) Log Income | (17) Un-employment |
|-----------|---------------|-----------------|-------------------|------------------------|----------------|-----------------|----------------|----------------|--------------------------|--------------------------|--------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| (1) All Hotels | .55 | .85 | .94 | .95 | .86 | .59 | .33 | .30 | .47 | .35 | -.55 | .47 | .18 | .12 | .15 |
| (2) Economy Class | 1 | .53 | .52 | .53 | .44 | .32 | .24 | .22 | .32 | .19 | .19 | .27 | .30 | .17 | .16 |
| (3) Midscale Class | .53 | 1 | .81 | .79 | .68 | .44 | .31 | .29 | .41 | .28 | .40 | .32 | .17 | .09 | .12 |
| (4) Upper Midscale Class | .52 | .81 | 1 | .94 | .84 | .49 | .22 | .20 | .34 | .22 | .60 | .40 | .13 | .01 | .18 |
| (5) Upscale Class | .53 | .79 | .94 | 1 | .86 | .53 | .18 | .15 | .33 | .24 | .67 | .39 | .09 | .01 | .14 |
| (6) Upper Upscale | .44 | .68 | .84 | .86 | 1 | .57 | .16 | .14 | .29 | .20 | .65 | .46 | .19 | .14 | .12 |
| (7) Luxury Class | .32 | .42 | .49 | .53 | .57 | 1 | .30 | .29 | .38 | .34 | .30 | .59 | .39 | .44 | .13 |
| (8) All Airbnb | .24 | .31 | .22 | .18 | .16 | .30 | 1 | .99 | .90 | .61 | .30 | .21 | .21 | .45 | .27 |
| (9) Entire Home Airbnb | .22 | .29 | .20 | .15 | .14 | .29 | .99 | 1 | .86 | .57 | .33 | .20 | .21 | .43 | .25 |
| (10) Private Room Airbnb | .32 | .41 | .34 | .33 | .29 | .38 | .90 | .86 | 1 | .68 | .08 | .28 | .26 | .48 | .33 |
| (11) Shared Room Airbnb | .19 | .28 | .22 | .24 | .30 | .34 | .61 | .57 | .08 | 1 | .02 | .02 | .34 | .22 | .42 | .20 |
| (12) Log COVID19Cases | -.19 | -.40 | -.60 | -.67 | -.65 | -.30 | .30 | .33 | .08 | .02 | .01 | 1 | -.22 | .04 | .16 | .05 |
| (13) LogAirport Arrivals | .27 | .32 | .40 | .39 | .46 | .59 | .21 | .20 | .28 | .34 | -.22 | 1 | .07 | .57 | .37 |
| (14) Log Hotel Supply | .30 | .17 | .13 | .09 | .19 | .39 | .21 | .21 | .20 | .22 | .04 | .07 | 1 | .63 | .28 |
| (15) LogAirport Arrivals | .17 | .05 | .01 | .00 | .11 | .14 | .44 | .45 | .43 | .42 | .16 | .57 | .63 | 1 | .43 |
| (16) Log Income | .16 | .12 | .18 | .14 | .12 | .13 | .27 | .25 | .33 | .20 | -.05 | .37 | .28 | .43 | .1 |
| (17) Un-employment | -.42 | -.21 | -.32 | -.52 | -.50 | -.50 | -.20 | .04 | .06 | .07 | -.01 | .53 | -.24 | -.02 | .46 |

Notes: b and c denote 5% and 10% statistical significance levels, respectively. ns indicates not significant. All other correlations results are significant at 1% statistical significance level.

References

Airbnb, n.d., Select your home type. Airbnb. (https://www.airbnb.com/help/article/317/select-your-home-type/).

Bresciani, S., Ferraris, A., Santoro, G., Premazzi, K., Quaglia, R., Yahiaoui, D., Viglia, G., 2021. The seven lives of Airbnb. The role of accommodation types. Ann. Tour. Res. 88, 103170.

Carville, O. & Bloomberg, 2021, February 25, Airbnb revenue beats estimates amid COVID surge. Fortune. (https://fortune.com/2021/02/25/airbnb-revenue-beats-estimates-amid-covid-surge/).

Dey-Tortella, B., Leoni, V., Ramos, V., 2022. COVID-led consumption displacement: A longitudinal analysis of hotel booking patterns. Int. J. Hosp. Manag. 107, 103343.

Ditzen, J., Karavias, Y., Ditzen, J., Karavias, Y., & Westerlund, J. (2021). Testing and estimating structural breaks in time series and panel data in stata. arXiv preprint arXiv:2110.14550.

Dogrul, S., Dolnicar, S., & Zare, S., 2020. COVID19 and Airbnb–Disrupting the disruptor. Ann. Tour. Res. 83, 102061.

Eggleston, K. & Lee, M., 2021, August 8, Hospitality industry moves into post-pandemic recovery mode. HotelManagement.net. (https://www.hotelmanagement.net/operate/hospitality-industry-moves-post-pandemic-recovery-mode/).

Gusroy, D., Chi, C.G., 2020. Effects of COVID-19 pandemic on hospitality industry: Review of the current situations and a research agenda. J. Hosp. Mark. Manag. 29, 5.

Hao, F., Xiao, Q., Chon, K., 2020. COVID-19 and China’s hotel industry: Impacts, a disaster management framework, and post-pandemic agenda. Int. J. Hosp. Manag. 90, 102366.

Hines, M., 2021, February 9, As work and school can be done from anywhere, Airbnb sees more monthly stays. USA Today. Retrieved from (https://www.usatoday.com/story/travel/hotels/2021/02/09/airbnb-rentals-monthly-stays-up-covid-travel-meets-virtual-life/4375982001/).

Hoechle, D., 2007. Robust standard errors for panel regressions with cross-sectional dependence. J. 7 (3), 281–312.

Jelski, C., 2020, Airbnb increases focus on local travel. Travel Weekly. Retrieved from (https://www.travelweekly.com/TravelNews/HotelNews/Airbnb-increases-focus-on-local-travel).
2021–01-27/coronavirus-pandemic-sets-hotel-industry-back-10-years-report-finds) Accessed Aug. 23, 2021.
McCann, A. (2021, April 6). States with the fewest Coronavirus restrictions. WalletHub. (https://wallethub.com/edu/states-coronavirus-restrictions/73818/).
Mody, M.A., Suess, C., Lehto, X., 2017. The accommodation experiencescape: a comparative assessment of hotels and Airbnb. Int. J. Contemp. Hosp. Manag.
Ozdemir, O., Dogru, T., Kilildag, M., Mody, M., Suess, C., 2021. Quantifying the economic impact of COVID-19 on the US hotel industry: Examination of hotel segments and operational structures. Tour. Manag. Perspect. 39, 100864.
Rodriguez, S., 2020, December 12, Airbnb nomads are ditching their apartments in pandemic-ridden cities and living wherever they want. (https://www.cnbc.com/2020/12/12/airbnb-nomads-ditch-apartments-during-covid.html).
Salem, I.E., Elbaz, A.M., Elkhwesky, Z., Ghazi, K.M., 2021. The COVID-19 pandemic: The mitigating role of government and hotel support of hotel employees in Egypt. Tour. Manag. 85, 104305.
Schulz, B., 2021, August 14, I just didn’t feel like it was responsible: Growing number of travelers cancel trips as COVID-19 cases surge. USA Today. (https://www.pointswithacrew.com/hotels-categorize-difference-upscale-upper-upscale/).
Shin, H., Sharma, A., Nicolau, J.L., Kang, J., 2021. The impact of hotel CSR for strategic philanthropy on booking behavior and hotel performance during the COVID-19 pandemic. Tour. Manag. 85, 104522.
Song, S., Suess, C., Mody, M.A., Dogru, T., 2021. Comparing the influence of substantive and communicative servicescape on healthcare traveler emotions: the moderating effect of accommodation type and interior design style. Int. J. Contemp. Hosp. Manag.
STR Chain Scales, 2019, October 29, STR. Retrieved August 19, 2021, from (https://str.com/sites/default/files/2019-10/STR-Chain%20-Scales-20191025_0.pdf).
Suess, C., Maddock, J., Dogru, T., Mody, M., Lee, S., 2021. Using the Health Belief Model to examine travelers’ willingness to vaccinate and support for vaccination requirements prior to travel. Tour. Manag. 88, 104405.
Suess, C., Maddock, J.E., Dogru, T., Mody, M., Lee, S., 2022. Using the Health Belief Model to examine travelers’ willingness to vaccinate and support for vaccination requirements prior to travel. Tour. Manag. 88, 104405.
Verleye, K., Leroi-Werelds, S., Line, N., Bove, L., 2021. Value proposition dynamics in response to external event triggers. J. Bus. Res.
Voltes-Dorta, A., Sánchez-Medina, A., 2020. Drivers of Airbnb prices according to property/room type, season and location: A regression approach. J. Hosp. Tour. Manag. 45, 266–275.