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The Impact of Hygiene Factors on Online Hotel Consumption in China during the COVID-19 Pandemic

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Abstract: The COVID-19 pandemic, with its risk of repeated fluctuations, has shifted the basis for decisions on tourism spending. Thus, it is crucial for the hospitality industry to understand the factors that influence accommodation consumption. Grounded in signaling theory, our empirical analysis is based on analyzing data from eLong on 7209 Chinese hotels using binary logistic regression and the ordinary least squares method (OLS). The main findings are as follows: (1) completeness of information, online hygiene rating and hygiene recommendation tags have a significant impact on hotel consumption; (2) online hygiene rating has a positively significant moderating effect on the relationship between information completeness and hotel sales; and (3) there is variability in the factors that influence the generation and growth of hotel sales. In addition, we discuss the role of online travel agencies (OTAs) and provide relevant advice for practitioners.

Keywords: COVID-19 pandemic; signaling theory; online travel agency; hotel consumption; pandemic tourism



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1. Introduction

Since 2020, the public health emergency caused by COVID-19 has caused massive losses in the global tourism industry. China is one of countries to be affected by the pandemic, which led to the tourism industry suffering severely. According to the Ministry of Culture and Tourism of the People's Republic of China, the number of domestic tourists in 2022 fell 22.1% to 2.53 billion compared to the numbers from the previous year, and the country's tourism consumption of CNY 2.04 trillion was down 30% in 2022 [1]. As the hotel operation relies heavily on interpersonal interaction, the hospitality industry faced a huge challenge caused by the restrictions on human mobility as a result of COVID-19 [2–4]. In this context, achieving sustainable development in tourism requires further exploration of market trends.

Previous research has indicated that coronavirus susceptibility has significantly influenced the basis on which consumers choose hotels, emphasizing the importance of psychological safety and social distance [5,6]. The exact impact was manifested during the COVID-19 pandemic [7–9], drawing focus to both subjective shifts in tourists' psychological perceptions and the influences of objective factors on their consumption behavior. In terms of subjective perceptions, the cognition degree of the pandemic and voluntary precautions could change the level of perceived risk, thus affecting the predetermined intention [10,11]. In terms of objective factors, the impact of hotels' external anti-pandemic initiatives on operation is of concern. Measures such as clean tech innovations, artificial intelligence technologies, and crisis management could decrease psychological uncertainty and increase purchase intention to some extent [12–15]. It is obvious that the pandemic has prompted changes in consumer behavior from the inside out.

Moreover, the mainstream travel consumption pattern has changed. Instead of traditional travel service intermediaries, consumers now prefer the online booking model [16,17]. Online travel agencies (OTAs) integrate hotel information with the intuitive and convenient service favored by consumers [18–20]. A high-quality OTA reduces problems such

as adverse selection, which can occur when consumers lack sufficient information about hotels [21]. This means that the lack of access to diverse information sources may result in cognitive imbalances and perceived uncertainty [22,23], even in poor purchasing decisions [24].

Most existing studies have demonstrated the relationship between OTA information and consumption behavior. For example, Mohd-Any et al. (2014) proposed six dimensions of e-value on satisfaction in regard to online travel service [25]. K. Park et al. (2017) identified the effects of these factors: scarcity information, popularity, and ratings on the online booking process [26]. Hu and Yang (2020) found that OTAs' online pricing strategies and electronic word-of-mouth could affect hotel-booking intention [27]. However, these studies are only applicable to general consumption situations. Recent studies have further explored the role of OTAs during the pandemic. Guo et al. (2021) found the correlation between OTA information and hotel consumption behavior in the COVID-19 period [28]. While these studies examine OTAs from a variety of perspectives, a quantitative approach is essential to examine how specific attributes affect consumption behavior to use OTA services [29,30], further demonstrating the need for this study.

During this pandemic, health concerns have become more prominent than ever before; therefore, it is pertinent to clarify the relationship between hygiene information on OTAs and hotel consumption. Then, we suggest effective countermeasures for enterprises in the hospitality industry. In sum, this article aims to answer the following two questions:

- (1) During the COVID-19 pandemic, do hygiene factors have an impact on online hotel sales?
- (2) Are there differences in the factors influencing the generation and growth of hotel sales?

The remainder of the paper is organized as follows: Section 2 reviews the relevant literature and presents the hypotheses. Section 3 describes the methodology and data collection in the study. The results of the research are presented in Section 4. This is followed by Section 5 with discussion and conclusions. Section 6 presents implications. Finally, the limitations of the research are shown in Section 7.

2. Theoretical Foundation and Hypothesis Development

2.1. Theoretical Background

Signaling theory stems from the study of markets in which information between buyers and sellers is asymmetric. Spence suggests that the party with superior information in the market needs to pass it on to the weaker party; in other words, an exchange of information of a realistic level and quality can increase the efficiency of the transaction between the two parties [31].

Signaling theory represents a useful interpretation to understand consumer behavior and it accentuates quality as a distinguishing characteristic [32,33]. In spite of the fact that quality signals are associated with premium prices and impulse purchases [34], they still act as an incentive for consumers to pay a premium price [35–37]. To some extent, quality signals may fail depending on different approval standards [38]. This suggests that economic benefits should be achieved with convincing quality signals. In e-commerce, Mavlanova et al. (2016) differentiated signals into internally generated (e.g., website policies) and externally obtained (e.g., third-party verification, word-of-mouth) signals, and found that external signals play a more salient role for buyers [39].

Research on quality signals in hospitality was examined in relation to a global lodging industry's development [40]. Quality signals in hospitality research are concentrated in the following three categories: hotel service attributes [41–43], location attributes [44,45], and reputation-related signals [46,47]. Using quality signals, the hotel is able to distinguish itself from its competitors to help build trust with the consumer [48]. Therefore, signal theory provides a favorable theoretical basis for exploring the effects of OTA signals.

2.2. Hypothesis Development

2.2.1. Information Completeness

Information completeness can be defined as being relevant to the actual situation and exhibiting characteristics such as completeness and clarity [49]. Completeness is one of the quality factors of web technology [50,51], which helps consumers better perceive the value of a product or service [52]. The ease of use of a platform needs to be examined in terms of the information it sends to consumers [53], facilitating conversion into actual purchase behavior [54].

In the context of tourism and electronic commerce, Bonsón Ponte et al. noted that the higher the quality of information on a website, the more consumers will trust it and the more likely they are to complete purchases online [55]. Regarding hospitality practice, the completeness of information plays an equally vital role in online hotel services. Since the heterogeneity, intangibility, and perishability of hotel services increase the difficulty that potential consumers will have in understanding the product [56], this suggests the need for hoteliers to clarify the characteristics of the product in order to shape consumer brand loyalty [57].

Based on a voluntary disclosure principle of signal theory, voluntary disclosure plays a signaling role, and companies with a high level of disclosure are more likely to win the favor of stakeholders and achieve high-quality sustainable development [22,58]. Thus, we propose the first hypothesis:

Hypothesis 1 (H1). *Information completeness positively affects hotel consumption.*

2.2.2. Online Hotel Ratings

Online ratings (ORT) are a format of online consumer reviews (OCR) [59,60]. Relying on the opinions of others about products, consumers are influenced in their decisions by historical consumers' numerical ratings and descriptive opinions [61,62]. Varkaris and Neuhofer stressed that OCR can provide a reference of the hotel information to help consumers drive the decision-making process, and consumers are more likely to gather as many reviews as possible to verify the correctness of the decision [63].

Signaling theory could account for the relationship between ORT and hospitality performance. Previous research confirms that signaling has a non-negligible impact on stimulating potential tourism consumption. As a typical quality signaling factor [45], investigators have, respectively, demonstrated the non-negligible effects of ORT from the consumer and hotelier perspectives. From the consumers' point of view, ORT can bridge the information inequity inherent before checking in the hotel, thus influencing customers' purchase intention [62,64]. For example, Ye et al., as well as Verma et al., found that ORT have a significant impact on customers' willingness to book hotels [65,66]. Casalo et al. further found that the availability of ratings varies according to OTAs, which means that consumers tend to choose hotels that are recognized by the well-known travel community [67].

With OTAs, online hotel ratings are diversified and essentially include value, location, sleep quality, rooms, cleanliness, and service [68]. The hypothetical development of specific hotel characteristics for overall ratings and sub-ratings is similar [69,70]. In particular, we chose hygiene rating to consider the impact of hygiene signals on hotel sales. Formally, we propose these hypotheses:

Hypothesis 2a (H2a). *Hygiene rating positively affects hotel consumption.*

Hypothesis 2b (H2b). *Hygiene rating positively moderates the relationship between information completeness and the growth of hotel consumption, and that information completeness positively influences the growth of hotel consumption more strongly when the hygiene rating is higher.*

2.2.3. OTA Recommended Tags

Recommended tags, an indicator of competitiveness, are generated based on customer feedback, reflecting the reliability and trustworthiness of a brand [71]. In order to promote hotels and drive consumption, OTAs generate recommended tags on the detail page based on hotel features. To precisely match users' needs, different online platforms offer various quality certification signals, which are measured using different semantic features, sentiments, ratings, and usability aspects [72].

The role of recommended tags has been studied in various fields. In the field of social media, recommended tags are considered important in helping users choose from the vast amount of data available by cataloging user experience [73,74]. In the online shopping process, tags play a cueing role as textual features of product characteristics. Accurate recommendations are performed by predicting user preferences, thus influencing consumers' purchasing behaviors [75]. The recommended tags on OTAs act as signals to convey the quality of the hotel, thus inspiring consumer interest in searching for and comparing these visual symbols, attracting their attention, giving them visual access to information, and increasing their purchase intent [76,77].

Based on the above discussion, it is reasonable to assume that tags recommended by OTAs influence users' purchase behaviors. Formally, we propose:

Hypothesis 3 (H3). *OTA-recommended tags positively affect hotel consumption.*

Figure 1 shows the research framework.

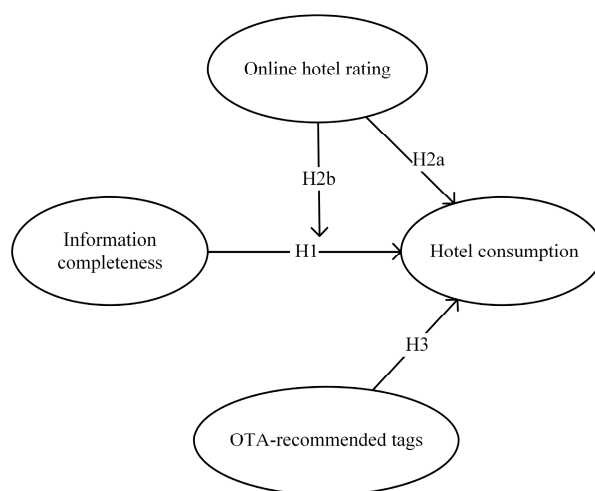


Figure 1. Research framework.

3. Method

3.1. Data Collection

The data for this paper were obtained from eLong and crawled through Python to two time points: February 2021 and March 2021. The reasons for collecting data from this OTA were as follows. First, eLong is one of the largest online travel service providers in China, and with the restructuring of the Tongcheng travel matrix, its paid Chinese users have been hitting new highs and gradually expanding in size with widespread approval. Second, eLong took the lead in announcing that it could refund its entire product line in China without damage and implement initiatives to protect users' rights during the COVID-19 pandemic, which shows that the OTA has strong coordination capabilities. In addition, eLong has added tags related to pandemic prevention on the hotel details page, making it easy for users to quickly understand the dynamics of hotel pandemic prevention. Based on the above, the eLong's characteristics are a good fit for our study. Figure 2 shows the introduction page of hotel on eLong.

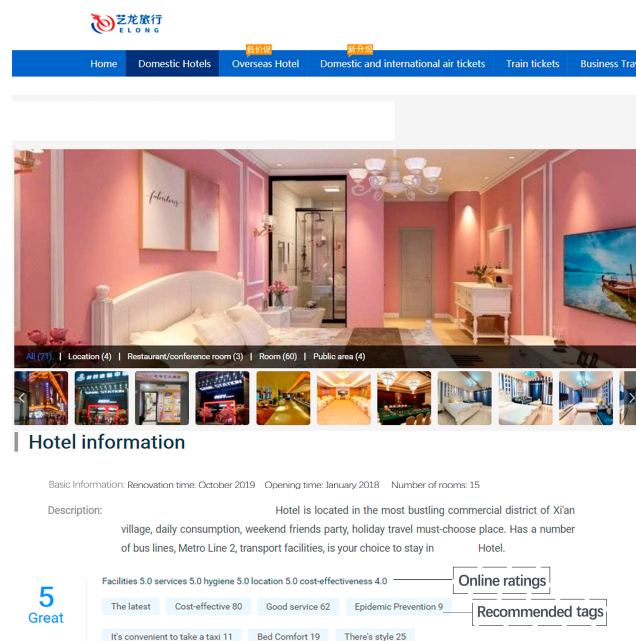


Figure 2. Hotel on eLong.

This paper eliminated interfering data with missing information and duplicated fields, i.e., it eliminated hotel data with review counts or ratings of 0, various information with missing fields, and all information with duplicated fields, obtaining a total of 10,619 pieces of data. In data screening, as the number of rooms has usually represented the hotel size in previous literature [78], too much variation in size may lead to a skewed distribution of the data; therefore, this study first standardized the number of rooms. The processed variables were used as the basis. Samples within the range of median values added or reduced one standard deviation (67.89% of the total sample), i.e., those with a room number range of 13–72 were selected as the study subjects, and a valid dataset of 7209 hotels was finally obtained. The sample data come from 31 provinces and municipalities in mainland China, which are representative to a certain extent. The location and number of hotels distributed are presented in Appendix A, Table A1.

3.2. Variables

3.2.1. Dependent Variable

The dependent variable of the study was hotel sales. Because sales could not be obtained directly from eLong, our approach was consistent with previous research. In the study of Ctrip.com, Ye et al. proved that the number of online reviews is a linear function of hotel sales [65]. Since eLong had the same review-posting mechanism as Ctrip.com [79], only users who have booked with eLong and successfully stayed at the hotel can post indicative reviews. Thus, we used the number of new reviews as a proxy variable to replace actual hotel sales.

3.2.2. Independent Variables

Hygiene rating comprised numerical reviews of historical consumers' satisfaction with the cleanliness of a hotel. One to five stars indicated the lowest to the highest level of satisfaction with hygiene.

Hotel descriptions were provided by the hotel parties to help consumers understand the hotel in detail. The length of hotel textual description was used as a proxy for information completeness.

Furthermore, recommended tags received a more detailed division, being divided into four main categories related to hygiene, location, service, and value for money. To fit the

context of the pandemic period, the tags “have disinfection measures” and “temperature testing available” were considered hygiene-related tags.

3.2.3. Control Variables

In our empirical study, we used two control variables that may affect hotel consumption. These control variables included hotel size and hotel age, and the number of rooms serves as the proxy for hotel size [80].

There is empirical evidence showing that hotel size and age have a significant impact on hotel pricing strategies as well as profitability [78,81,82]. According to Ben Aissa and Goaid, although size had a negative impact on hotel profitability, large hotels mean high occupancy and high sales revenue; in addition, there was an optimal age for profitability of hotels [83]. Similar insights are found from studies on COVID-19: Lin and Chen analyzed the impact of COVID-19 on the performance of hotels with different characteristics, which showed that hotel size was positively related to room revenue [84]. Conversely, if hotel rooms were in short supply, the scarcity cues signal of hotel rooms negatively impacted tourists’ booking intention [85]. Thus, we included these variables as control variables.

It should be noted that since the number of hotel rooms, length of hotel textual description, and hotel age were skewed, we took the natural logarithm of these variables. As some hotels had only one room, taking logarithms results in invalid data. Therefore, this variable type needed to be added to the natural logarithm by adding 1 to prevent missing data. Table 1 shows a list of the meanings and treatments of the variables.

Table 1. The meaning and handling of variables.

Variable Category	Variable Name	Variable Definitions	Variable Handling Methods
Dependent variables	Sales ₁	Hotel with or without sales	Categorical variable. Use time node T ₁ number of reviews—T ₀ number of reviews, add the number of reviews as sales, and filter by code, coding data with sales as 1 and data without sales as 0.
	Sales ₂	Actual sales of hotels with volume	Continuous variable. Based on data from sales ₁ , retain data coded as 1 in the sales ₁ variable.
	Review	Number of historical reviews	Proxy variable for sales.
Independent variables	Hygiene	Reviewer’s online hygiene rating posted for a hotel	Continuous variable crawled on the hotel details page.
	Descr_len	Length of hotel textual description	Continuous variable, taking the natural logarithm on top of the original.
	Hyg_tag	The recommended tags contain tags related to hygiene (e.g., “Have disinfection measures in place”, “Have temperature testing”, etc.)	Categorical variable with a value of “1” and without a value of “0”.
	Loca_tag	The recommended tags contain tags related to the location (e.g., “Excellent location”, “Easy to get around”, etc.)	Categorical variable with a value of “1” and without a value of “0”.
	Ser_tag	The recommended tags contain tags related to service (e.g., “Excellent service”, “Enthusiastic receptionist”, etc.)	Categorical variable with a value of “1” and without a value of “0”.
	Cost_tag	The recommended tags contain tags related to cost effectiveness (e.g., “Value for money”)	Categorical variable with a value of “1” and without a value of “0”.
Control variables	H_Size	Hotel size, number of hotel rooms	Add 1 to the original and take the natural logarithm.
	H_Age	Hotel age, time of hotel operation	Refers to the number of months elapsed since opening, taking the natural logarithm of the original base.

3.3. Model

To discover the differences in the factors that influence the generation and growth of hotel sales, this study divided the sample into two cases, coding the sample with sales as 1 and the sample without sales as 0 using a binary logistic selection model for analysis. P is the probability of the dependent variable coded as 1, i.e., the probability of hotel sales generation, while $1 - P$ is the probability of no hotel sales. α is the intercept term and β_i is the regression coefficient of the respective variable, indicating the degree of change in the log-incidence ratio resulting from a change in the independent variable. ε represents the random perturbation term. See Model (1).

The research also screened out the data (i.e., data coded as 1) collected from the hotel sales for the various factors that influence the growth of hotel sales using the OLS model, where γ is the intercept term, β_j is the regression coefficient of the respective variable, and κ_j is the regression coefficient of the interaction between hygiene rating and the length of hotel textual description. ε_1 and ε_2 represent the random disturbance term. See Models (2) and (3).

$$\text{Sales}_{01} = \ln\left(\frac{P}{1-P}\right) = \alpha_0 + \beta_{11}\text{Hygiene} + \beta_{12}\ln(\text{Descr_len}) + \beta_{13}\text{Hyg_tag} + \beta_{14}\text{Loca_tag} + \beta_{15}\text{Ser_tag} + \beta_{16}\text{Cost_tag} + \beta_{17}\ln(\text{H_Size} + 1) + \beta_{18}\ln(\text{H_Age}) + \varepsilon \quad (1)$$

$$\text{Sales}_{02} = \gamma_0 + \beta_{j1}\text{Hygiene} + \beta_{j2}\ln(\text{Descr_len}) + \beta_{j3}\text{Hyg_tag} + \beta_{j4}\text{Loca_tag} + \beta_{j5}\text{Ser_tag} + \beta_{j6}\text{Cost_tag} + \beta_{j7}\ln(\text{H_Size} + 1) + \beta_{j8}\ln(\text{H_Age}) + \varepsilon_1 \quad (2)$$

$$\text{Sales}_{03} = \gamma_{00} + \beta_{j01}\text{Hygiene} + \beta_{j02}\ln(\text{Descr_len}) + \beta_{j03}\text{Hyg_tag} + \beta_{j04}\text{Loca_tag} + \beta_{j05}\text{Ser_tag} + \beta_{j06}\text{Cost_tag} + \beta_{j07}\ln(\text{H_Size} + 1) + \beta_{j08}\ln(\text{H_Age}) + \kappa_{j01}\text{Hygiene} \times \ln(\text{Descr_len}) + \varepsilon_2 \quad (3)$$

4. Data Analysis and Results

4.1. Descriptive Statistics and Correlation Analysis

The descriptive statistics of the processed data were analyzed using SPSS 26.0. Table 2 demonstrates the results of the descriptive statistics for continuous variables in the overall sample, and Table 3 shows the results of the descriptive statistics for the categorical variables.

Table 2. Descriptive statistical analysis of continuous variables for the overall sample.

Variable Name	Min	Max	Mean	Std. Dev.	25% Digit	Median	75% Digit
Review	1	7055	184.8	364.2	15	55	193
Descr_len	3.932	7.076	5.171	0.55	4.727	5.17	5.595
Hygiene	1	5	4.325	0.64	4.1	4.5	4.8
H_Size	2.639	4.29	3.429	0.442	3.045	3.434	3.784
H_Age	0.693	7.249	3.835	0.658	3.367	3.784	4.304

Table 3. Descriptive statistical analysis of continuous variables for the overall sample.

Categorical Variables	Tags Related to Hygiene	Tags Related to Excellent Location	Tags Related to Excellent Service	Tags Related to Cost-Effectiveness
Yes (Coding 1)	224 (3.1%)	2573 (35.7%)	3515 (48.8%)	1170 (16.2%)
No (Coding 0)	6985 (96.9%)	4636 (64.3%)	3694 (51.2%)	6039 (83.8%)

4.2. Binary Logit Regression Analysis

This study used Stata 16.0 software to conduct regression analysis regarding the significance of variables for hotel sales. We used the Pearson correlation analysis to test for correlation between variables. Multi-collinearity was checked by examining the variance inflation factor (VIF), with a value greater than 10 indicating a serious covariance problem in the data [86].

Table 4 presents the results of the model 1 and Pearson correlations. This suggests that the coefficients for information completeness ($\beta = 0.437, p < 0.01$), hygiene rating ($\beta = 0.433, p < 0.01$), hygiene recommendation tags ($\beta = 1.944, p < 0.01$), location recommendation tags ($\beta = 0.707, p < 0.01$), service recommendation tags ($\beta = 0.743, p < 0.01$), cost-effectiveness recommendation tags ($\beta = 0.533, p < 0.01$) and hotel size ($\beta = 1.250, p < 0.01$) were positive and significant. The coefficient of hotel age was negative and significant ($\beta = -0.252, p < 0.01$). The degree of fit of the model needs to be illustrated. The model had a Nagelkerke R square of 0.312 and a Cox–Snell R square value of 0.233, which showed that the selected independent variables were moderately associated with hotel consumption. In addition, the Hosmer–Lemeshow test value was 0.083, indicating a good model fit.

Table 4. Results of binary logit regression.

Variable Name	Results	Wald	Exp(B)	VIF
Descr_len	0.437 *** (0.000)	66.672	1.548	1.2
Hygiene	0.433 *** (0.000)	74.376	1.541	1.27
Hyg_tag	1.944 *** (0.000)	40.831	6.987	1.05
Loca_tag	0.707 *** (0.000)	141.626	2.028	1.13
Ser_tag	0.743 *** (0.000)	176.292	2.102	1.14
Cost_tag	0.533 *** (0.000)	48.478	1.704	1.04
H_Size	1.250 *** (0.000)	351.582	3.489	1.19
H_Age	−0.252 *** (0.000)	33.315	0.777	1.11
_cons	−7.883 *** (0.000)	326.834	0	—
−2 Log likelihood	7977.181		Nagelkerke R square	0.312
Cox–Snell R square	0.233		Hosmer–Lemeshow test	0.083

Note: *** $p < 0.01$. p -value of each variable is reported in parentheses.

4.3. OLS Regression Analysis Results

The results of model 2 and model 3 are shown in Table 5. In model 2, information completeness ($\beta = 3.013, p < 0.01$), hygiene rating ($\beta = 6.175, p < 0.01$), hygiene recommendation tags ($\beta = 17.070, p < 0.01$), service recommendation tags ($\beta = 1.682, p < 0.01$), and hotel size ($\beta = 7.216, p < 0.01$) significantly and positively affected sales growth. However, location recommendation tags had no significant impact on sales growth ($\beta = 0.937, p > 0.1$), and cost-effectiveness recommendation tags ($\beta = -3.085, p < 0.01$) and hotel age ($\beta = -1.252, p < 0.05$) significantly and negatively affected sales growth.

Table 5. OLS model prediction results.

Variable Name	Model 2		Model 3	
	Results	VIF	Results	VIF
Descr_len	3.013 *** (0.000)	1.18	2.696 *** (0.000)	1.18
Hygiene	6.175 *** (0.000)	1.3	8.486 *** (0.000)	1.62
Hyg_tag	17.070 *** (0.000)	1.05	16.173 *** (0.000)	1.06
Loca_tag	0.937 (0.129)	1.04	1.148 * (0.062)	1.04
Ser_tag	1.682 *** (0.008)	1.06	1.790 *** (0.005)	1.06
Cost_tag	−3.085 *** (0.000)	1.03	−2.717 *** (0.000)	1.04
Hygiene × Descr_len			8.374 *** (0.000)	1.29
H_Size	7.216 *** (0.000)	1.07	7.099 *** (0.000)	1.07
H_Age	−1.252 ** (0.012)	1.15	−0.999 ** (0.044)	1.16
_cons	−56.343 *** (0.000)		−66.393 *** (0.000)	
R-squared	0.135		0.143	

Note: ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. *p*-value of each variable is reported in parentheses.

In model 3, the results showed that the coefficient for information completeness ($\beta = 2.696$, $p < 0.01$), hygiene rating ($\beta = 8.486$, $p < 0.01$), hygiene recommendation tags ($\beta = 16.173$, $p < 0.01$), service recommendation tags ($\beta = 1.790$, $p < 0.01$) and hotel size ($\beta = 7.099$, $p < 0.01$) were positive and significant, and cost-effectiveness recommendation tags ($\beta = -2.717$, $p < 0.01$) and hotel age ($\beta = -0.999$, $p < 0.05$) significantly and negatively affected sales growth. Hygiene rating positively moderated the effect of information completeness on sales growth ($\beta = 8.374$, $p < 0.01$). In contrast to model 2, the location recommendation tags were significant at the 10% level ($\beta = 1.148$, $p < 0.1$). The empirical results provided support for hypothesis 1, hypothesis 2a, as well as hypothesis 2b. Yet, hypothesis 3 is not fully supported.

Figure 3 shows the moderation of hygiene rating on the link between information completeness and hotel consumption growth. A high hygiene rating had a positive moderating effect on the relationship between information completeness and hotel sales. However, a low hygiene rating weakened the impact of information completeness on hotel sales.

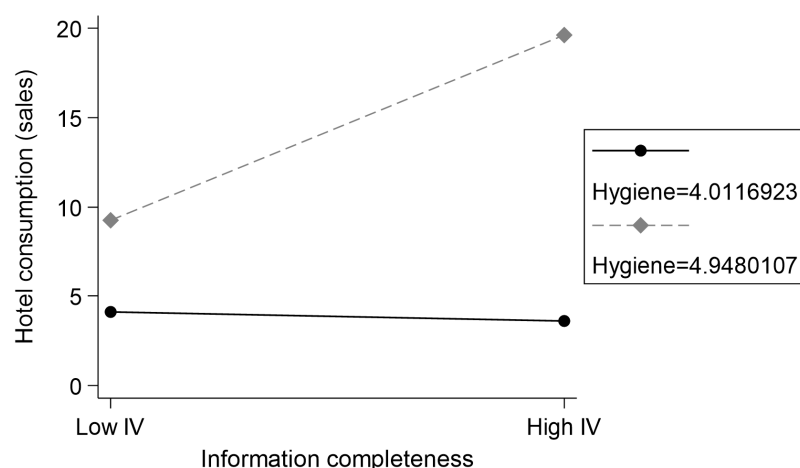


Figure 3. Moderating effect of hygiene rating.

5. Discussion and Conclusions

5.1. Discussion

Our study was motivated by the prominent presence of hygiene factors in the context of a pandemic, and the critical fact that multiple types of signals were constituents of OTA. This study explored the effects of three subject signals on consumption behavior across different characteristics while examining the moderating effect of hygiene signals. The study was built on two research models. The first model aimed to explore the influences that affect the generation of OTA sales, while the second model narrowed the scope of subjects to explore the linear relationship between OTA signals and consumption changes. The former result was largely consistent with previous research findings that quality signals can significantly influence hotel sales' generation. However, in the latter question, we found more complex factors affecting sales growth.

A thorough literature review based on signaling theory was conducted to develop the hypotheses of the study; our data suggested that consumers are more likely to choose hotels with more disclosure of descriptive information. This finding also resonated with the cue theory, which categorizes cues into internal and external cues [87,88]. Due to information asymmetry, consumers tend to rely on product-related cues to determine product features and make purchase decisions [89,90]. This result was partially consistent with those of Xu et al. and M. Kim et al., who confirmed the influence of information and ratings on users' purchasing behavior [76,91].

A high hygiene rating, as expected, contributed positively to the generation and sustainable growth of consumption. Moreover, a low hygiene rating continued to weaken consumption, even when information completeness was high. This result supported those of previous studies [92–94]. That is, consumers care more about negative evaluations.

Based on previous studies, signals could convey quality information. However, the role of excellent location signals on sales performance growth was not fully supported in the study sample; prior to a pandemic, well-located hotels tended to imply easy access and high traffic, while during an epidemic period, social distance was the focus of prevention and control [95–97]. In addition, the impact of cost-effective signals on sales generation and growth was in the opposite direction, which may be due to the nature of OTAs, where cost-effective signals were primarily based on room price but low prices usually imply that the hotel has quality issues. It is presumable that some of the quality tags did not work under the pandemic period.

5.2. Conclusions

This study addressed the impact of OTA quality signals on consumer behavior during the pandemic, specifically regarding the influence and moderating effect of hygiene signals. The study sample included data from 7209 online hotels in 31 mainland China regions.

Through a review of the relevant literature to identify the developmental path of quality signals and consumer behavior during the pandemic, our study extends the literature on signaling theory in the hospitality industry and provides advice to hotel managers.

6. Implications

6.1. Theoretical Implications

There are several theoretical implications in this study. In terms of variables, as hygiene and cleanliness have become the subject of current research attention [98], this study contributed to developing signal theory by adding hygiene factors of OTA to quality signals. In terms of framework, the current study sets out to determine the understanding of signals in the hospitality industry during the pandemic period; our study framework expands the variables of symbolic signals by combining information, hygiene rating, and OTA's certification. The empirical results clearly showed a significant positive effect of the hygiene signal.

Overall, this study further explored the role of hygiene factors in the pandemic and the use of signal theory in the hospitality industry.

6.2. Managerial Implications

First, this research provides practical advice for hotel practitioners to improve marketing. Managers can integrate unused room resources and branding to expand their hotel businesses. They can also enrich the online information about their accommodation brands so that users can learn about the hotels through multiple channels, reducing the cost of customer acquisition. Updating equipment in a timely manner ensures the quality of hotels. Although the duration of a hotel's operation has a relatively small effect on sales, longer years of operation have a negative effect on visitor spending, which is consistent with previous research [28]. A newly opened hotel may mean new room facilities and a new accommodation experience for consumers. Hotels must focus on the routine maintenance of guestroom facilities and adopt proven management practices to create an accommodation environment that meets the current needs. Hotels need to pay close attention to their own crisis management during the outbreak, which could, in turn, help reduce consumer uncertainty and restore user confidence [99,100].

Second, our empirical results suggest that hotels need to build reputations for their accommodations in three areas: accommodation products, online operations, and evaluation management. With the intrinsic quality of hotels as support, managers can develop reasonable operating plans based on the local pandemic situation, set up special funds to promote the implementation of plans, and highlight their ability to fulfill their health and safety commitments. With online marketing as an opportunity, the hotel can then take the initiative to invite key consumers for an accommodation experience, enhance hotel awareness through exposure, and attract potential consumers. Hotel operators should focus on the review trends on the platform, create standard operating procedures, proactively respond to customer feedback online, and extract potential needs from user feedback as a basis for product improvement.

Third, the regression results show that all recommendation tags can positively influence generation of hotel sales, but the factors influencing sales growth appear to be different. This requires managers to focus on the sustainability of the hotel: as Ben Aissa and Goaied mentioned, a better revenue capacity may not mean higher profitability [83]. Hotel managers need to pay extra attention to the safety consciousness of their staff and guide their stress in the face of uncertainty to facilitate the improvement of their service capabilities. Value for money does not simply mean low prices but rather the provision of services that exceed expectations at the same price level; it still requires hotels to improve quality and develop reasonable pricing strategies.

7. Limitations and Future Research

Our paper has limitations that could point to potential directions for further research. The data were primarily collected from eLong, China, and due to the variability in the operating models of OTAs, it would be prudent to generalize the results to other markets as well as OTAs. Subsequent studies could consider expanding the study model in other contexts, including concerns about the overall safety of the hotel environment and sustainability in the post-pandemic period [101]. In addition, the pandemic landscape is changing, and another potential direction for future research could be to explore the effects of variation in hygiene factors on travelers' hotel consumption behavior as the Chinese tourism market is liberalized.

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Appendix A

Table A1. The location and number of hotels distributed.

Province/ City with Provincial Status	Hotel Number
Shanxi	1
Shenzhen	1
Guangdong	2
Xinjiang	2
Jilin	3
Tibet	4
Inner Mongolia	4
Harbin	4
Qinghai	4
Ningxia	5
Beijing	5
Sichuan	5
Gansu	5
Hubei	6
Shaanxi	7
Jiangsu	7
Heilongjiang	117
Guangxi	150

Table A1. Cont.

Province/ City with Provincial Status	Hotel Number
Zhejiang	167
Hainan	204
Fujian	246
Liaoning	294
Jiangxi	386
Tianjin	400
Hebei	425
Guizhou	503
Yunnan	658
Hunan	778
Shanghai	791
Henan	970
Chongqing	1055
Total number	7209

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