

Spatial analytics with hospitality big data: Examining the impact of locational determinants on customer satisfaction in the U.S. hotel market

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Abstract

Although hotel location has been recognized as one of the important factors affecting hotel selection and guest satisfaction, relatively few studies have examined guest satisfaction with hotel location and its locational determinants at a macro level. This study aims to identify the locational determinants of hotel guest satisfaction through big data spatial analytics via a case study of 5,302 hotels in 151 cities in the U.S. Based on the framework of hotel location satisfaction, we classified all location-related factors into three categories: accessibility to points of interest, transport convenience, and surrounding environment. Our findings indicated that hotel property's proximity to city area, landmark, park, shopping center, and highway as well as, attraction-driven tourism industry specialization, and hotel industry agglomeration were significant determinants. Furthermore, the impacts of these factors were spatially heterogeneous. These findings can provide geographical insights that are critical for developing a customer service experience and satisfaction model.

Keywords: Hotel Location, Location Satisfaction, Determinants of Hotel Location Satisfaction, Hospitality Big Data, Spatial Analytics

1. Introduction

Guests' experience and enjoyment embedded in a hotel stay are highly dependent on hotel location (Yang, Mao, & Tang, 2018). Despite the importance of hotel location affecting guest satisfaction (Lee, Kim, Kim, & Lee, 2010; Shoal, McKercher, Ng, & Birenboim, 2011), relatively few studies have examined guest satisfaction with hotel location and its locational determinants. Prior studies considered location components typically as latent constructs and utilized subjective self-related items to evaluate location. However, with the emergence of advanced geospatial

analytical techniques such as geographic information system (GIS)-based spatial analysis, locational convenience and accessibility can be more objectively and easily evaluated (Govind, Chatterjee, & Mittal, 2018; Kim, Jang, Kang, & Kim, 2020; Mittal, Kamakura, & Govind, 2004). Furthermore, most service research has briefly demonstrated the importance of hotel location without systematically examining the locational determinants of guest satisfaction related to hotel location.

This study addresses these research gaps by exploring the locational determinants of hotel guest satisfaction related to hotel location. To achieve the purpose, we analyzed hospitality big data (i.e., online reviews) about hotel location to examine factors determining guest satisfaction. Advanced spatial analytical techniques using a GIS-based network analysis and geographically weighted regression (GWR) analysis via hospitality big data congaing a total of 443,857 reviews of 5,302 hotels in 151 cities in the U.S. Specifically, this study (1) explores the significant locational determinants of hotel guest satisfaction, and (2) demonstrates spatially heterogeneous effects of the significant locational determinants. The findings of this study can help information systems and marketing researchers and service industry practitioners better understand the spatially heterogeneous effects of locational determinants of hotel guest satisfaction, which are essential for facilitating the formulation of location-based customer service experience and satisfaction strategies with hotel locations.

The remainder of the paper is structured as follows. The next section synthesizes previous findings and determinants of hotel guest satisfaction and location and proposes the research hypotheses. Then, we present research methodology and findings. Finally, we summarize the study's key contributions, limitations, and future research directions.

2. Literature review

2.1. Importance of hotel location in customer satisfaction

A hotel's location refers to the physical site where the property is situated and has received considerable attention in various fields such as information systems, marketing, hospitality and tourism management, and geography (Yang et al., 2018). Hotel location is considered one of the most critical service attributes for customer satisfaction and business performance (Kim et al., 2022; Yang et al., 2018), hotel development (Xiang & Krawczyk, 2016), customer's hotel selection decision (Tanford, Raab, & Kim, 2012), and traveler's movements in a destination (Dredge, 1999).

In particular, customer satisfaction is essential to the firm's long-term business success (Fornell et al., 2016) and the leading criterion for determining service quality (Pizam, Shapoval, & Ellis, 2016). According to World Tourism Organization (1985), customer satisfaction is a psychological concept that involves the feeling of well-being and pleasure that results from obtaining what one hopes for and expects from an appealing product and/or service. While the key characteristics of services are intangible, inseparable, perishable, and inconsistent, location is the only hotel attribute that is relatively fixed (Yang et al., 2018).

Due to this unique aspect of hotel location in customer satisfaction studies, prior research attempts to empirically test the impact of location on customer satisfaction (e.g., Mittal, Kamakura, & Govind, 2004; Kim et al., 2022). Lee et al. (2020) demonstrate that customer evaluation toward hotel location positively influences customer satisfaction by analyzing hotel online reviews. In a similar vein, Kim et al. (2022) suggest that location or geographical information should be considered to better predict customer satisfaction. This finding is aligned with what recent location research (Kang et al., 2018; Lee, Pennington-Gray, & Kim, 2019) found. These studies highlight the importance of examining location and spatial information in a tourism destination.

Prior location research emphasizes the critical roles of location in some major areas including customer's hotel selection, travel planning, service evaluation and satisfaction, and tourist movements. For example, tourists want to stay in hotels near major attractions, leading to a better service experience (Arbel & Pizam, 1977). Other factors related to service location include perceived accessibility to city center and public transport (Carneiro & Costa, 2001; Gu & Ryan, 2008), transportation/parking convenience (Li, Ye, & Law, 2013; Poon & Low, 2005), and nearby facilities (Ren et al., 2016). However, there is a lack of studies examining

what antecedents or factors lead to customer's hotel location evaluation and satisfaction (Yang et al., 2018). Thus, there is an urgent need to have a more comprehensive understanding of diverse attributes affecting customer's satisfaction toward hotel location.

2.2. Determinants of hotel location satisfaction

Considering that customer satisfaction is strongly associated with hotel location (Mellinas, Nicolau, & Park, 2019; Sim, Mak, & Jones, 2006), much research has been conducted to identify the factors affecting customers' satisfaction with hotel location. Specifically, previous studies have used customers' subjective evaluation of location-related attributes. For example, Lee, Kim, Kim, and Lee (2010) measured frequent individual travelers' / foreign independent travelers' perceived importance of and satisfaction with hotel location. On the other hand, Zhou, Ye, Pearce, and Wu (2014) extracted hotel location evaluation attributes from online reviews. Similarly, Hu, Teichert, Liu, Li, and Gundyeva (2019) investigated the impact of hotel location using online review data.

However, according to Aksoy and Ozturk (2017), customers' post-experience evaluations, such as customer satisfaction with locations, can be associated with metric indicators. Thus, while previous studies offer critical insights to the hotel industry about the different location attributes affecting customers' satisfaction with hotel location, the inclusion of more objective attributes (e.g., accessibility, urban development, and tourist attractions) was essential to develop a comprehensive understanding of how different location attributes shape customer location satisfaction. Thus, some researchers have applied objective metric indicators to understand the impacts of different location-related attributes on customers' hotel location satisfaction. For example, Yang, Mao, and Tang (2018) examined the impacts of the distances to attractions, facilitating elements (e.g., airport, metro, freeway), and surrounding environment (e.g., local business, crime rate) on customers' satisfaction with hotel location.

However, previous studies identified a limited number of attributes that affect customers' satisfaction with a hotel's location. According to the gravity spatial allocation model (Werczberger & Berechman, 1988), there are three key determinants of an individual's location satisfaction: points of interest, transport convenience, and surrounding environments. In 2008, Chou, Hsu, and Chen proposed that hotel location is a hierarchical concept that includes geographical and traffic conditions. While Chou et al. (2008) proposed their model from developers' perspectives, the

hierarchical structure of hotel location would be relevant in customers' evaluation of hotel location.

Thus, to provide a comprehensive understanding of customers' hotel location satisfaction, this study extended the number of attributes shaping customers' hotel location satisfaction based on previous studies (Choe et al., 2008; Yang et al., 2018). Specifically, this study proposed a hierarchical model that consists of three key determinants: points of interest, transport convenience, and surrounding environments.

2.2.1. Accessibility to points of interest. Accessibility to points of interest indicates the distance or time required to reach the points of interest (Li, Guan, Han, Zhu, & Zhao, 2021). When customers make the decision about hotels, they consider whether they can easily access the points of interest (Weaver, 1993). While the point of interest might depend on the types/purposes of customers (e.g., business, leisure), the accessibility to the points of interest is critical since customers seek to minimize the time and cost spent to arrive at the points of interest (Yang et al., 2018). Accordingly, many researchers have identified the points of interest, including tourist attractions (Arbel & Pizam, 1977; Tsai, Yeung, & Yim, 2011; Yang, Wong, and Wang, 2012) and central business districts (Ferreira & Boshoff, 2014). Furthermore, studies found that a hotel's accessibility to points of interest positively influences customers' satisfaction with hotel location (Yang et al., 2018). For example, Lee et al. (2010) found the significant impact of a hotel's accessibility to tourist attractions on hotel location satisfaction. While past literature served as the basis for the potential points of interest, to offer an in-depth understanding of customers' hotel location satisfaction, a more comprehensive list of points of interest was developed, including city areas, landmarks, parks, shopping centers, golf courses, and water areas. Hence, based on the discussion above, the following hypothesis was developed.

H1: Customers' hotel location satisfaction is influenced by the accessibility to (a) city areas, (b) landmarks, (c) parks, (d) shopping centers, (e) golf courses, and (f) water areas.

2.2.2. Transport convenience. Transport convenience indicates how easily customers can use the local transportation systems, such as buses and highways. Studies on location satisfaction suggested that a person's residential satisfaction is strongly influenced by transport convenience, such as distance to the transportation system (e.g., bus) (Olfindo, 2021). Transport convenience might be relevant in the context of hotels since hotel customers would visit different

places (e.g., attractions) during their stay. When a hotel is located near local transportation systems, customers' expenses and time spent on transportation would be decreased (Canina, Enz, & Harrison, 2005), thereby increasing satisfaction. Accordingly, the importance of transport convenience has been much found in the previous literature (e.g., Darini & Khozaei, 2016; Ren, Zhang, & Ye, 2015). Thus, transport convenience has been recognized as an important determinant affecting hotel location satisfaction (Yang et al., 2018). In order to capture the aspects of transport convenience that are less relevant to residential location contexts, the two key transportations were selected in this study: airports and highway exits. Thus, the following hypothesis was developed.

H2: Customers' hotel location satisfaction is influenced by the distance to (a) airports and (b) highway exits.

2.2.3. Surrounding environment. Surrounding environments indicate the environmental aspects of a hotel, including public safety and security (e.g., crime), neighboring environment (e.g., air quality, land use), and public infrastructure and areas (e.g., restaurants and bars) (Masiero, Yang, & Qiu, 2019; Ren, Qiu, Wang, & Lin, 2016; Yang et al., 2018). In the context of a hotel, customers are likely to evaluate a hotel by considering its surrounding environments (Yang et al., 2018). Researchers have suggested that a hotel's surrounding environment has a great influence on customers' perceptions of a hotel (Fang, Li, & Li, 2019). Particularly, researchers found that the surrounding environments of a hotel have a significantly positive impact on customers' post-experience evaluation, as pleasant surrounding environments alleviate customers' discomfort and uneasiness with unfamiliar environments (Rigall-I-Torrent & Fluvià, 2007).

Recognizing the importance of the surrounding environments of a hotel on customers' location satisfaction, many researchers have identified the attributes of surrounding environments that affect customers' perceptions. For example, a hotel's neighborhood security, such as the crime rate, has been found to be a critical factor affecting customers' perception of a hotel's location (Lee et al., 2010; Valentin & O'Neill, 2019). While security attributes (e.g., crime rate) had a negative impact on customers' perception of hotel location, there have been also attributes that positively influenced customers' perception of hotel location. For example, the infrastructure for the hospitality and tourism industry and agglomeration had positive impacts on customers' hotel location satisfaction (Luo & Yang, 2016; Yang et al., 2012; Yang et al., 2018). Thus, based on the above discussion, the following hypothesis was developed.

H3: Customers' hotel location satisfaction is influenced by (a) crime rate, (b) employment for arts, entertainment, and recreation industry (LQ71), (c) employment for accommodation and food services industry (LQ72), and (d) agglomeration.

3. Methodology

3.1. Data collection and pre-processing

To collect hospitality big data and location information, business intelligence techniques such as data mining were employed. A total of 443,857 reviews of 5,302 hotels in the U.S. were collected by a self-developed web crawler on TripAdvisor.com. For each review, hotel property information (e.g., location, scale) and location evaluation were collected. A series of data pre-processing, including data cleaning and exploration was performed in R software (R 3.6.2). Then, GIS-based network analysis and geoprocessing tools such as Geocoding were performed to measure locational determinants. Finally, the review level dataset containing 423,151 reviews was aggregated at the property level for aspatial and spatial data analysis. The property level final dataset includes location information (e.g., latitude and longitude), locational factors, hotel class, and average location evaluation for 4,079 hotels in 148 U.S. cities.

3.2. Variables

Because this study aims to identify the determinants of guest satisfaction related to hotel location, guest satisfaction with hotel location was defined as the dependent variable. It was quantified on a 5-point scale from 1 (terrible) to 5 (excellent).

The independent variables represent locational factors that can influence hotel guest satisfaction. Based on the framework of hotel location satisfaction by Yang et al. (2018), we classified all location-related factors into three categories: accessibility to points of interest, transport convenience, and the surrounding environment. As a result, twelve locational factors were considered. Lastly, we controlled hotel class and population density based on previous studies. All variables and their operational definitions are presented in Appendix 1.

Location data for the city center, landmark, park, shopping center, golf course, water area, airport, both LQ index for NAICS 71 and 72, and crime and population density data for counties where hotel properties are located were collected from the U.S. Bureau of Labor Statistics, Crime Data Explorer, and

U.S. Census Bureau, respectively. Geographic data such as county boundary and the street network were collected from the Environmental Systems Research Institute.

3.3. Data analysis

To conduct this study, both aspatial and spatial regression analyses were employed. First of all, an OLS-based multiple regression analysis was performed to identify the significant locational determinants of hotel guest satisfaction. Next, the sample dependent and a set of independent and control variables from the OLS regression model were applied using GWR to explore spatially heterogeneous effects of locational determinants with regard to hotel guest satisfaction. Unlike aspatial OLS-based multiple regression analysis, GWR explores the spatial variation in the relationships between geo-referenced variables (Jang & Kim, 2022). GWR has been used as an explorative spatial analysis to detect spatial variability over the study area in tourism and hospitality research (Kim et al., 2020; Lee et al., 2019). The GWR model in this study is shown in Equation (1):

$$y_i = \beta_0(u_i, v_i) + \sum_{j=1}^k \beta_{ij}(u_i, v_i)x_{ij} + \varepsilon_i \quad (1)$$

where y_i is the dependent variable (i.e., guest satisfaction related to hotel location) at hotel $i \in \{1, 2, \dots, n\}$; x_j is the j th locational variable; $j \in \{1, 2, \dots, k\}$; β_j is the j th parameter estimate, and ε is the error term; (u_i, v_i) refers to the coordinate at each hotel property. While employing GWR models, the choice of bandwidth is essential for spatial weighting function. The Gaussian kernel with fixed bandwidth and bi-square kernel with adaptive bandwidth is commonly used in GWR. We used a bi-square kernel function based on previous hotel location studies (Kim et al., 2020). Furthermore, the GWR model fit was maximized when employing the bi-square kernel function compared to the Gaussian kernel function. We defined the optimal kernel size through an iterative optimization approach to minimize the corrected Akaike Information Criterion (AICc) (Lee, Kim, & Jang, 2021). Finally, we mapped local GWR coefficients for significant locational determinants and local R^2 to visualize spatially heterogeneous effects of the locational determinants and model performance. Various software programs, such as ArcGIS (version 10.7.1) and GWR (version 4.0) were employed for spatial data analysis.

4. Results

Appendix 2 presents the results of the OLS regression analysis. The value of R^2 (0.163) indicated a moderate model performance. Access to city area (0.021), landmark (-0.105), park (0.010), shopping center (-0.033), and highway (0.045) as well as attraction-driven tourism cluster (0.142) and agglomeration (-0.001) were significant locational determinants at the 0.05 level, supporting H1_a, H1_b, H1_c, H1_d, H2_b, H3_b, and H3_d. It means that hotel properties that are located with a higher level of attraction-driven tourism industry specialization and shorter distance to landmark and shopping center were related to higher guest satisfaction than is located with a lower level of hotel agglomeration and shorter distance to city areas and highway exhibited lower guest satisfaction with hotel location.

The results of the GWR analysis are also summarized in Appendix 2. The local R^2 ranged from 0.156 to 0.281 with a mean of 0.226. The local condition index ranged from 21.862 to 29.927, indicating the absence of local multicollinearity issues, among independent and control variables. The local coefficients of the significant locational determinants ranged from -0.041 to 0.036 with a mean of -0.004 (*access to city area*), -0.303 to 0.001 with a mean of -0.124 (*access to landmark*), -0.021 to 0.020 with a mean of -0.002 (*access to park*), -0.101 to 0.000 with a mean of -0.054 (*shopping center*), 0.000 to 0.105 with a mean of 0.059 (*access to highway*), -0.224 to 0.472 with a mean of 0.087 (*attraction-driven tourism cluster*), and -0.001 to 0.001 with a mean of 0.000 (*agglomeration*). Such variability of local coefficients suggests spatial non-stationarity, indicating spatially heterogeneous effects of the significant locational determinants with regard to guest satisfaction with hotel location.

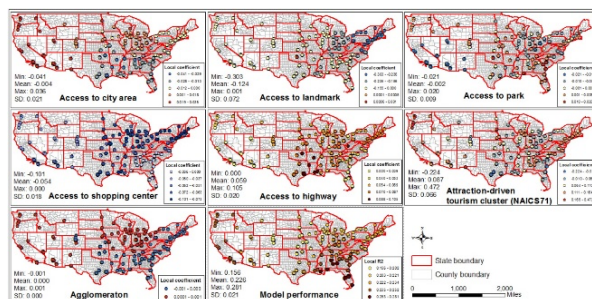


Figure 1. Spatial distribution of GWR-based local coefficients for significant locational determinants and local R^2

Figure 1 maps the distribution of local coefficients for the significant locational determinants and local R^2

in the GWR model. Specifically, although the OLS coefficient for the proximity to city area (access to city area) was 0.021, its local coefficients from the GWR analysis ranged from -0.041 to 0.036, representing spatial variability. Hotel properties with strong positive local coefficients for the proximity to city area were observed mainly in Western and Midwest regions, such as California, Oregon, Washington, Arizona, Nevada and Illinois, Indiana states, whereas hotel properties with negative local coefficients were mainly located in Southern regions, including Texas, Florida, Georgia, and Alabama states. Furthermore, different from the OLS model, the GWR model showed spatially heterogeneous values of the local R^2 ranging from 0.156 to 0.281. These findings represent that the model performance of the GWR-based local model was not stationary across the study area.

5. Implications and conclusion

Using the hotel customer review data from tripadvisor.com, this study identified the significant locational determinants of guest satisfaction related to hotel location. Using the framework of hotel location satisfaction by Yang et al. (2018), we used big data spatial analytics via a case study of 5,302 hotels in 151 cities in the U.S. Our findings showed that hotel property's geographic proximity to attractions such as city area (e.g., downtown), landmark, and shopping center were key determinants for customer satisfaction. Furthermore, hotel property's surrounding environment, including attraction-driven tourism industry specialization could affect guests' locational satisfaction. Lastly, these effects are spatially heterogeneous.

5.1. Theoretical implications

This study offers several theoretical contributions. First, while the location of a hotel has been much studied in hospitality research, most studies have focused on the importance of location from business perspective (Kim et al., 2020; Yang et al., 2012). Thus, the current understanding of the impact of location attributes on customer satisfaction has been limited. Although a few studies examined the importance of location attributes on customers' hotel location satisfaction (Yang et al., 2018), the studies used customers' subjective evaluation of a hotel's location, rather than the objective metrics. Thus, a more comprehensive understanding of how different location attributes influence customers' hotel location satisfaction was essential. Therefore, by using GIS-based objective measures, such as geographical proximity (e.g., distance), this study further strengthened the findings of previous studies that

suggested the importance of location attributes in creating customer satisfaction.

Second, this study further deepens the current understanding of customer hotel location satisfaction by considering a variety of location attributes. Specifically, rather than relying on a single attribute for location satisfaction determinants (i.e., points of interest, transport convenience, and surrounding environments), the present study incorporated diverse attributes for determinants. Particularly, this study extends the study by Yang et al. (2018) by dividing points of interest into several location attributes: city areas, landmarks, parks, shopping centers, golf courses, and water areas. Last, but not least, by conducting GWR, this study demonstrated the spatial heterogeneity in customers' hotel location satisfaction.

5.2. Practical implications

This study also provides practical insights into the hotel industry. The findings of this study indicated that hotels' location should be considered when planning potential hotel development, as customers' location satisfaction is significantly influenced by various locational attributes. The results demonstrated that a hotel's accessibility to points of interest, transport convenience, and surrounding environments were critical determinants of customers' hotel location satisfaction. Particularly, among various attributes of points of interest, the distance to city areas, landmarks, and shopping centers were found to be significant factors affecting customers' satisfaction with hotel location. While it might vary by region, hotel developers might consider the distance to the abovementioned points. The findings also recommended potential ways to increase customers' hotel location satisfaction. Specifically, given the importance of surrounding environments in creating hotel location satisfaction, hotels might develop marketing strategies to convey messages that emphasize their hotels' proximity to landmarks and shopping centers. In addition, the findings showed that the distance to highway exits is critical, whereas the distance to airports might not be important. Therefore, those hotels, other than positioning themselves as 'airport hotels', need to consider the distance to highway exits. Furthermore, hotel developers are encouraged to carefully consider the crime rate, arts, entertainment, and recreation industry development, and agglomeration of the neighborhood to maximize customers' hotel location satisfaction.

5.3. Limitations and future studies

The present study has some limitations. First of all, the sample in this study is limited to branded hotels in the US. Thus, the generalizability of this study would be limited to branded US hotels and there might be different patterns in different cultures or nations. Thus, future study can analyze the data collected from other international destinations to enhance its generalizability and also compare geographical patterns across different cultures or nations. Second, the data set included online review data in 2015. Thus, the findings did not cover the longitudinal effects, such as changing surrounding environments. Hence, researchers may consider a longitudinal approach to understand customers' hotel location satisfaction. Lastly, while this study incorporated various attributes of hotel location, there might be some other attributes that might affect customers' hotel location satisfaction. Thus, future studies are encouraged to consider more attributes to provide a deeper understanding of customers' hotel location satisfaction.

6. References

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APPENDIX

Appendix 1. Variable definition

Variable	Operational definition
<i>Accessibility to points of interests</i>	
Access to city area	Shortest road network distance from each hotel to the nearest city downtown (in miles)
Access to landmark	Shortest road network distance from each hotel to the nearest landmark (in miles)
Access to park	Shortest road network distance from each hotel to the nearest park (in miles)
Access to shopping center	Shortest road network distance from each hotel to the nearest shopping center (in miles)
Access to golf course	Shortest road network distance from each hotel to the nearest golf course (in miles)
Access to water area	Shortest road network distance from each hotel to the water body (in miles)
<i>Transportation convenience</i>	
Access to airport	Shortest road network distance from each hotel to the nearest airport (in miles)
Access to highway	Shortest road network distance from each hotel to the nearest highway entrance (in miles)
<i>Surrounding environment</i>	
Crime rate	Total crime index of county where hotel properties are located
Attraction-driven tourism cluster	Location quotient of leisure industries (NACIS 71: Arts, Entertainment, and Recreation) of county where hotel properties are located
Service-driven tourism cluster	Location quotient of hospitality industries (NACIS 72: Accommodation and food services) of county where hotel properties are located
Agglomeration	Number of hotel properties of county where hotel properties are located
Hotel scale	STR hotel scale (1: economy; 2: midscale; 3: upper midscale; 4: upscale; 5: upper upscale; 6: luxury)
Population density	Number of population per square miles of county where hotel properties are located

Appendix 2. Results of aspatial and spatial regression analyses

Variable	OLS	GWR coefficients (β)			Range	Hypothesis Testing
	coefficients	Min.	Mean	Max.		
	β					
Intercept	3.901**	3.744	4.023	4.455	0.711	
<i>Accessibility to points of interests</i>						
Access to city area (H1 _a)	0.021**	-0.041	-0.004	0.036	0.077	Sig.
Access to landmark (H1 _b)	-0.105**	-0.303	-0.124	0.001	0.304	Sig.
Access to park (H1 _c)	0.010**	-0.021	-0.002	0.020	0.041	Sig.
Access to shopping center (H1 _d)	-0.033**	-0.101	-0.054	0.000	0.101	Sig.
Access to golf course (H1 _e)	-0.001	-0.009	-0.001	0.008	0.017	N.S.
Access to water area (H1 _f)	-0.026	-0.034	-0.021	-0.015	0.019	N.S.
<i>Transportation convenience</i>						
Access to airport (H2 _a)	-0.001	-0.013	-0.002	0.021	0.034	N.S.
Access to highway (H2 _b)	0.045**	0.000	0.059	0.105	0.105	Sig.
<i>Surrounding environment</i>						
Crime (H3 _b)	0.001	-0.001	0.002	0.004	0.005	N.S.
Attraction-driven tourism cluster (H3 _b)	0.142**	-0.224	0.087	0.472	0.696	Sig.
Service-driven tourism cluster (H3 _c)	0.072	-0.378	0.054	0.325	0.703	N.S.
Agglomeration (H3 _d)	-0.001**	-0.001	0.000	0.001	0.002	Sig.
Hotel scale	0.452	0.185	0.439	0.518	0.333	
Population density	-0.0005	-0.0011	-0.0004	0.0001	0.0006	
R ²	0.163	0.156	0.226	0.281	0.125	
Condition index		21.862	24.715	29.927	8.065	

Note. β (Beta): Regression coefficient; AIC_c: Corrected Akaike's information criterion; Sig.: Significant; N.S.: Not Significant