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A spatial–temporal analysis of hotels in urban tourism destination

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ABSTRACT

This study investigates the spatial associations of urban tourism phenomena by using GIS and statistical methods to examine the relationships between hotels and land use types, attractions, transportation facilities, and the economic variables of the tertiary planning units in which the hotels are located. Hong Kong is used as an example. The study first introduces the spatial characteristics of hotels and attractions development in Hong Kong. A geographical information system is then used to map hotels and investigate the characteristics of the land use, attractions, and transport facilities around hotels. The spatial relationships are then analyzed with a set of logistic regression models. The results reveal that commercial land type and the number of attractions around hotels are significantly related to the distribution of upper-grade hotels in Hong Kong. The determinants vary over time and the spatial structure changes accordingly. The analysis is important theoretically as it enriches the methodologies for analyzing the relationships between hotels and urban structure, and for conceptualizing and identifying tourism functional zones. It is important for practitioners as it provides useful information for selecting sites for hotels.

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1. Introduction

Interest in urban tourism has grown since the 1980s when it was first recognized as a distinct field (Edwards et al., 2008). Within the field, the spatial structure of tourism in cities has been an important research area (Pearce, 1998), focusing on the ways in which phenomena are arranged in space, and how this affects urban tourism planning and design applications. One important research direction is to empirically analyze the distribution of tourism-related phenomena, such as selected attractions, supporting facilities (Pearce, 1995), and accommodations in general, hotels in particular. These studies have identified distinct distribution patterns of particular tourism sectors in certain parts of cities, the most notable being clustering and linear patterns; these patterns can be explained by factors such as accessibility, land rent, planning restrictions, comparative shopping, and proximity to other tourism-related phenomena (Ashworth and Tunbridge, 1990; Pearce, 1987, 1995). However, previous studies have largely focused on the influence of the surrounding environment on the selected tourism sector, and have not fully addressed the interactions and associations between all of the urban tourism phenomena.

The current study is therefore carried out to use geographical information system (GIS) tools and statistical models to investigate the spatial associations of urban tourism phenomena by examining the spatial relationships between hotel distribution and land types, attractions, and other surrounding environmental factors in Hong Kong. More specifically, this study attempts to (1) analyze the factors that affect the location strategies of upper-grade hotels; and (2) identify factors that influence changes in spatial patterns after a hotel’s establishment. To achieve these objectives, the association between the level of hotels and the environmental characteristics around the hotels from 2000 to 2010 are investigated using a set of logistic models.

2. Literature review

2.1. Spatial structure of urban tourism

Cities have been among the most significant tourist destinations since urbanization began (Edwards et al., 2008; Karski, 1990). Nowadays, tourism occupies substantial amounts of space within urban destinations via tourist-historic urban cores, museums of all kinds, urban waterfronts, theme parks, and specialized precincts (Edwards et al., 2008). However, before the 1980s, studies of urban tourism were fragmented and it was not recognized as a distinct...
field (Edwards et al., 2008). An upsurge in interest in urban tourism was sparked by Ashworth’s work in 1989, in which he stated that “…the failure to consider tourism as a specifically urban activity imposes a serious constraint that cannot fail to impede the development of tourism as a subject of serious study” (Ashworth, 1989:33). In his pioneer work, Ashworth (1989) outlined four extant approaches to analyzing urban tourism: (1) the facility approach, which focuses on the spatial analysis of the location of tourism attractions, facilities, infrastructure, and zones; (2) the ecological approach, which focuses on the structure and morphology of urban areas and features the identification of functional zones or districts such as central business districts (CBD); (3) the user approach, which adopts a marketing perspective focused on tourists; and (4) the policy approach, which is concerned with a range of policy issues including infrastructure provision and destination marketing (Ashworth, 1989).

Establishing the spatial structure of tourism in cities has been an ongoing concern within the urban tourism research field from an early stage (Pearce, 1998). From a supply-side perspective, this reflects an inherent interest in the ways in which phenomena are arranged in space, and the implications for urban tourism planning and design applications. Two broad approaches are taken to this issue: (1) empirically analyzing the distribution of tourism-related phenomena, especially accommodation; and (2) conceptually examining the existence and functioning of tourist districts, particularly with regard to heritage and planning.

Most of the distributional studies have focused on one particular sector of the tourism industry, most commonly on accommodation and hotels. The distribution of selected attractions and supporting facilities has also been examined in these studies (Pearce, 1995). The studies carried out to date have established distinct distribution patterns, particularly clustering and linear patterns, in tourism-related phenomena in certain parts of cities. The distribution pattern of a city’s tourist phenomena can be explained by factors such as accessibility, land rent, the recency effect, planning restrictions, comparative shopping, and proximity to other tourism-related phenomena (Ashworth and Tunbridge, 1990; Pearce, 1987, 1995).

Based on previous studies, Pearce (2001) outlined an integrative framework for urban tourism and illustrated applications with reference to selected aspects of the literature. The framework emphasized the identification of subject cells within a matrix defined in terms of scale (site, district, city-wide, regional, national, and international) and themes (demand, supply, development, and impacts). For instance, Rigall-I-Torrent et al. (2011) examined the effects of beach characteristics (such as beach length, width, sand type, or beach services) and distance of a hotel from the beach on sun-and-beach hotel prices at the regional level. A study at the city level by Yang et al. (2012) investigated potential factors contributing to hotel location choice in Beijing by incorporating both hotel and location characteristics. They found that star rating, years since opening, service diversification, ownership, the agglomeration effect, public service infrastructure, road accessibility, subway accessibility, and accessibility to tourism sites are all important determinants. While Ruggiero and Rodolfo (2014) found that structural social capital is the strongest positive determinant of hotel performance, compared with weaker and generally not significant relations linking occupancy and control variables, such as category, size, location.

Our review of the distributional literature identified two research gaps. First, current studies have failed to provide an integrated interpretation of how tourism in an urban area is related to surrounding spatial elements such as land use types, and therefore the spatial associations were not well explained. Second, few studies have examined the temporal variations in the spatial relationships between hotel location and surrounding environmental factors. GIS is a useful tool for tackling these research problems.

Geographical information systems (GIS) have been used to develop a number of applications for tourism that allow the analysis of regional information (Poslad et al., 2001). They can be divided into two basic categories: (a) spatial decision support applications and (b) spatial statistics support applications. The former uses GIS systems that are specifically designed to handle spatial relationships to integrate four types of relevant data: tourist characteristics (e.g., Lau and McKercher, 2006), actual temporal–spatial behavior (e.g., Shoval et al., 2011), landscape elements and tourist locations (e.g., Brown, 2006), and the images added to these locations (e.g., Gaughan et al., 2009). Then, a decision-support model is added to the GIS to analyze the overall temporal–spatial behavior and to obtain some optimal conclusions (Baharia and Elliott-White, 1999; Beedasy and Whyatt, 1999; Bertazon et al., 1997; Boers and Cottrell, 2007; Brown, 2006; Dye and Shaw, 2007; Gaughan et al., 2009; Lau and McKercher, 2006; Perez et al., 2003; Shoval et al., 2011; Van der Knaap, 1999). The second type of application uses GIS not only to integrate data, but also to analyze the spatial patterns of tourism (Allen et al., 1999; Atasoy, 2010; Farsari and Prastacos, 2004; Porter and Tarrant, 2001). Allen et al. (1999) developed a parcel-based GIS model for assessing land-use change in the past; they built a spatial multivariate logistic regression model and selected 20 variables to predict the possibilities of land-use change for Murrells Inlet, South Carolina. However, the study focused on land-use change in a coastal tourism destination area without investigating the relationship between tourism phenomena and the changes in land use.

2.2. Factors influencing the location distribution of hotels

Hotel location selection is a critical element of destination management strategy. The understanding of the determinants of hotel location selection is key to ensure coherent spatial planning at tourism destinations (Issahaku and Francis, 2013). According to previous studies, the main research approach used to explain location choices and spatial patterning of hotels are regression methods based on economic theory (e.g., Zhang et al., 2012; Yang et al., 2014). The explanatory variables in these regression models are related to labor, culture, capital, and policy characteristics. In addition, as the hotel industry is closely linked to the real estate industries, which are significantly driven by economic conditions and external events, factors that affect these industries should be included in the analysis of the location of hotels (e.g., Yang et al., 2012). For instance, Porter and Tarrant (2001) identified and examined inequalities in federal tourism sites and campsites in Southern Appalachia based on five socioeconomic variables including race, education, household income, occupation, and local heritage.

Spatial characteristics are also regarded as important determinants of hotel locations. Tourism accommodation comprises a bundle of private attributes located in a specific physical environment which embeds public attributes, such as natural environment, public safety or cultural heritage (Albert et al., 2014). Seul (2015) found that hotels compete with more distant neighbors of similar quality than those who are quality-differentiated. In addition, the results also suggest possibility of cooperation among neighboring hotels similar in quality. To increase the demand, hotels are likely to be located in places that are proximate to their potential markets. They are usually highly clustered so as to obtain benefits from agglomeration effects. Barros (2005) found that hotels close to their potential markets are more efficient than their counterparts that have poor accessibility. A model proposed by Yokeno (1968) indicated that in a mono-centric city, spatial centrality is observed among hotels, due to the large demand for accommodation in the city center such as the central business district (CBD) or the tourist district (Yokeno, 1968; Shoval, 2006). Weaver (1993) argued that
this is because tourists prefer a location where a variety of services are available.

Accessibility to tourist attractions (Arbel and Pizam, 1977) and transportation facilities (Wall et al., 1985; Ashworth and Tunbridge, 1990) were also found to be important factors influencing hotel locations. This was supported by Rigall-I-Torrent and Fluvia (2007, 2011), who pointed out that hotel products and other tourism-related products can be viewed as bundles of public and private characteristics or attributes, and that the public attributes include characteristics of public good, such as non-rivalry and non-excludability (Samuelson, 1954). Some examples of attributes that contribute to the public good include, but are not limited to, environmental quality, public safety, public infrastructure availability, and cultural diversity. Therefore, these attributes and services are believed to influence both the tourists’ utility functions on the demand side and the tourism agents’ production functions on the supply side (Rigall-I-Torrent and Fluvia, 2007). Rigall-I-Torrent and Fluvia (2007, 2011) argued that the supply of attributes related to the public good and services influence hotel’s room rates, and hence, generate higher revenue for hotels near rich public infrastructures. Based on this argument, hotels are likely to choose locations with a high rate of public good and an abundant supply of services.

Moreover, a recent study by Yang et al. (2012) investigated potential factors contributing to the choice of hotel location with an ordered Logit model that incorporated both hotel and location characteristics. They found that factors such as hotel star rating, years since opening, service diversification, ownership, the agglomeration effect, public service infrastructure, road accessibility, subway accessibility, and accessibility to tourism sites are important determinants. It is indirectly suggested that within the metropolitan area, there is a greater degree of substitution in hotel locations for tourism consumers than for business consumers (Jacint and José, 2013).

3. Methodology

To investigate the spatial associations of urban tourism phenomena, a set of logistic models is used with the assistance of ArcGIS 9.0. We selected Hong Kong as an example because Hong Kong is a typical urban tourism destination. Tourism in Hong Kong has developed dramatically since 1957, when the Hong Kong Tourist Association (now known as the Hong Kong Tourism Board) was constituted, and the city has now established itself as an internationally renowned destination. According to the most recent statistics released by Euro monitor International (2013) – the world’s leading independent provider of business intelligence on industries, countries, and consumers – Hong Kong was ranked as the top city tourism destination in 2011. One of the major characteristics of tourism in urban areas is that it is only one of many functions fulfilled by a city. Tourists share or compete with local residents for many spaces and services (Hammes, 1994) and the competition is particularly intense in Hong Kong which has scarce resources. Unlike many other urban tourism destinations, Hong Kong’s compact nature restricts its capacity to expand to suburban areas, and all development is confined to the limited land available. This makes Hong Kong a suitable place to conduct the study as the spatial and functional association between tourism-related phenomena and their surrounding environment is more evident and intense.

3.1. Variables selection

The variables in this study include the level of hotels, commercial land area (CLA), traffic land area (TLA), the number of MTR stations (NMTR), the land use mix index (LUD), gross floor area of commercial use (GFA), and the number of attractions (AN). The variables were identified based on the literature review, as discussed in the previous section. All of the attractions were divided into four categories: natural (N,AN), man-made (M,AN), cultural (C,AN), and shopping (S,AN), according to the classification rules of the Hong Kong Tourism Board (Table 1).

The study uses all the Hong Kong hotels built during the 2000–2010 period. The names of the hotels were taken from the statistics of the HKTB and the Census and Statistics Department of the Hong Kong Special Administrative Region (hereafter ‘HKSAR’) and the address of each hotel was taken from the hotel’s website. The address matching method of the GIS software was used to plot the hotels on the map. The Hong Kong Tourism Board of HKSAR divides the hotels in Hong Kong into three classes (HKTB, 2009a, 2009b, 2009c, 2001): high tariff A hotels, high tariff B hotels, and medium tariff hotels. For this study, the level of the hotels, the dependent variable, is further categorized into lower-grade hotels (representing medium tariff hotels) and upper-grade hotels (high tariff A and high tariff B hotels).

CLA and GFA represent market demand and market size, both of which may have positive effects on the location of hotels because they directly affect the occupancy rates. As tourists are likely to choose hotels near traffic facilities, we also investigate the effect of traffic by incorporating TLA and NMTR. In addition, one of the purposes of a hotel is to provide accommodation for leisure tourists who are interested in shopping and sightseeing (Yang et al., 2012). Therefore, the attractions around hotels in Hong Kong may be positively related to hotel location (Arbel and Pizam, 1977; Shoval, 2006). LUD represents the diversity and complexity of land use types that may, to a large extent, reflect the complexity of business activities in an area.

The effect of mega-events such as international festivals and sports competitions on the tourism industry has also drawn much attention from researchers. The main argument is that these mega-events affect local tourism and the local economy (e.g., Burgan and Mules, 1992; Lee and Taylor, 2005; Maffes et al., 2004). Cities compete for the opportunity to host events that draw large crowds of visitors because such visitors tend to spend a great deal in hotels and restaurants. As Hong Kong’s hosting of the equestrian competitions at the 2008 Olympic Games may have affected the spatial distribution of star hotels, the influence of mega-events is also explored in this research. It should be pointed out that some factors such as socio-economic variables that may also affect the spatial distribution of hotels are not included in the model. However, the influence of socio-economic factors will be to a large extent reflected in the changes in land use patterns.

The land use data (2000–2010) were extracted from paper maps of land utilization in Hong Kong; the data are compiled from the Planning Department of the HKSAR and other relevant sources including SPOT satellite images. The transformation from a paper map to a digitized vector map was performed using ENVI, which is the premier software for processing and analyzing geospatial imagery. As mentioned above, previous studies have found that commercial and traffic land use types may have significant close relationships with hotel locations. Hence, this study focuses on these two land use types and broadly divided the land use data into three categories (commercial, traffic, and other). The area surrounding each hotel is defined using buffers with a 500-m, 1000-m, or 1500-m radii. By overlaying land use and buffers with GIS data, we are able to derive the land utilization in the environment surrounding each hotel. The net area of each land use type (commercial and traffic) is then calculated.

The land use mix is calculated based on the Simpson Diversity Index. This is a biological diversity measurement that evaluates the number of land use categories within a neighborhood. Following
the formal expression of the index, the land use diversity, denoted as LUD, can be calculated by

\[
LUD = \frac{\sum n_i(n_i - 1)}{N(N - 1)},
\]

where \(N\) is the total number of land use types and \(n_i\) is the number of land use types in the \(i\)th category. After identifying the land utilization within the buffer zones, LUD is calculated using Eq. (1).

As comprehensive floor use data within each buffer zone are not available, the floor use variable is introduced into our model at the tertiary planning unit (TPU) level. The TPU system is devised by the Planning Department of HKSAR for town planning and population census purposes. The TPU in which each hotel is located can be considered the surrounding area of the hotel. Due to data availability, GFA in the TPU is treated as a proxy variable.

The number of MTR stations is calculated by counting the stations within the buffer zones using the GIS. According to the classification rules of the Hong Kong Tourism Board, the attractions are divided into four categories: natural, man-made, cultural, and shopping. The number of attractions is calculated by counting the attractions within the buffer zones using the GIS. As an example, Table 2 shows the descriptive statistics for the independent variables in 2006.

### 3.2. Analytical models

The relationships between the level of hotels and various factors are investigated using logistic regression models. In particular, to investigate the temporal effects, a set of models is established for each year. Sensitivity analysis is also performed for the 1000 m and 2000 m buffer radii. We choose 500 m, 1000 m, and 2000 m as roughly equal to 10, 15, and 30 min walking distances at an average walking speed of around 1 m/s.

Logit regression is a type of regression analysis used for predicting the outcome of a categorical dependent variable based on one or more predictor variables. That is, it is used to estimate the empirical values of the parameters in a qualitative response model. The probabilities describing the possible outcomes of a single trial are modeled, as a function of the explanatory (predictor) variables, using a logistic function. Frequently (and subsequently in this study) “logistic regression” is used to refer specifically to a problem in which the dependent variable is binary; problems with more than two categories are referred to as multinomial logistic regressions or, if the multiple categories are ordered, as ordered logistic regressions. Logistic regression measures the relationship between a categorical dependent variable and one or more independent variables, which are usually (but not necessarily) continuous, by using probability scores as the predicted values of the dependent variable. Its function can be expressed as

\[
\text{Logit}(P) = \ln \left( \frac{P}{1-P} \right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k
\]

and equivalently

\[
P = \frac{e^{\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k}}{1 + e^{\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k}},
\]

where \(P\) denotes the probability that the dependent variable equals 1. \(\ln \left( \frac{P}{1-P} \right)\) refers to the linear function of explanatory variables, \(x_i\). \(\beta_0\) is the intercept from the linear regression equation (the value of the criterion when the predictor is equal to zero), \(\beta_i x_i\) is the regression coefficient multiplied by some value of the predictor, and base e denotes the exponential function. The dependent variable of the binary logistic model is the level of hotels with 1 = being upper-grade hotel (high tariff A and high tariff B hotels), and 0 = being lower-grade hotel (medium tariff hotels). In this study a positive coefficient indicates that increasing the value of the variable would increase the chance of the hotel being an upper-grade hotel, whereas a negative coefficient value means the hotel is more likely to be lower grade when the value of the variable is increased.

The independent variables are defined and measured as follows: CLA, TLA, LUD, GFA, MTR, AN, N_AN, M_AN, C_AN, S_AN, where \(t\) means the variables at time \(t\). The proposed model for this

### Table 1

| Variables and reference | Independent variables | Symbol | Description |
|-------------------------|-----------------------|--------|-------------|
| Spatial structure (such as land use) | Commercial land area | CLA | Continuously variable, calculated within the buffer zones using GIS |
| | Gross floor area of commercial use | GFA | Continuously variable, calculated within the buffer zones using GIS |
| | Traffic land area | TLA | Continuously variable, calculated within the buffer zones using GIS |
| | Number of MTR stations | NMTR | Continuously variable, calculated within the buffer zones using GIS |
| | Land use mix index | LUD | Calculated using Eq. (1) |
| Tourism phenomena | Number of natural attractions | N_AN | Continuously variable, calculated within the buffer zones using GIS |
| | Number of man-made attractions | M_AN | Continuously variable, calculated within the buffer zones using GIS |
| | Number of cultural attractions | C_AN | Continuously variable, calculated within the buffer zones using GIS |
| | Number of shopping attractions | S_AN | Continuously variable, calculated within the buffer zones using GIS |

### Table 2

| Variables and reference | Description | \(N\) | Minimum | Maximum | Mean | S.D. |
|-------------------------|-------------|------|--------|--------|-----|------|
| LUD2006 | Land use mix | 143 | 0.32 | 1.64 | 0.785 | 0.24 |
| MTR2006 | Number of MTR stations | 143 | 0 | 3 | 0.93 | 0.85 |
| GFA2006 | GFA of commercial use | 143 | 0 | 1.72 | 0.639 | 0.5 |
| TLA2006 | Traffic land type | 143 | 0 | 0.42 | 0.203 | 0.07 |
| CLA2006 | Commercial land type | 143 | 0 | 0.12 | 0.024 | 0.03 |
| AN2006 | Number of attractions | 143 | 0 | 26 | 5.85 | 5.14 |
| N_AN2006 | Number of natural attractions | 143 | 0 | 2 | 0.06 | 0.3 |
| M_AN2006 | Number of man-made attractions | 143 | 0 | 12 | 1.79 | 2.05 |
| C_AN2006 | Number of culture attractions | 143 | 0 | 10 | 1.89 | 2.1 |
| S_AN2006 | Number of shopping attractions | 143 | 0 | 8 | 2.1 | 1.95 |
study is
\[
\ln \left( \frac{P_t}{1 - P_t} \right) = \beta_0 + \beta_{1t}\text{CLT}_t + \beta_{2t}\text{TLT}_t + \beta_{3t}\text{LUD}_t + \beta_{4t}\text{GFAC}_t \\
+ \beta_{5t}\text{MTR}_t + \beta_{6t}\text{AN}_t 
\]  
(4)

\[
\ln \left( \frac{P_t}{1 - P_t} \right) = \beta_0 + \beta_{1t}\text{CLT}_t + \beta_{2t}\text{TLT}_t + \beta_{3t}\text{LUD}_t + \beta_{4t}\text{GFAC}_t \\
+ \beta_{5t}\text{MTR}_t + \beta_{6t}\text{AN}_t + \beta_{7t}\text{M}_t\text{AN}_t \\
+ \beta_{8t}\text{C}_t\text{AN}_t + \beta_{9t}\text{S}_t\text{AN}_t 
\]  
(5)

Different models are based on all of the existing hotels at a specific time (operation period). To investigate the temporal effect, 11 models, namely models for 2000 (Model 00), 2001 (Model 01), 2002 (Model 02), 2003 (Model 03), 2004 (Model 04), 2005 (Model 05), 2006 (Model 06), 2007 (Model 07), 2008 (Model 08), 2009 (Model 09) and 2010 (Model 10) were established. To examine the overall effects, another model is established that includes all of the samples from the 11 models (From Model 0 to Model 10).

4. Results

4.1. Hotel development in Hong Kong

According to the tourism statistics for the 2000 to 2010 period, the number of hotels increased from 87 in 2000 to 199 in 2010, with a peak growth of 21 hotels in 2005 (see Fig. 1a). Growth peaks of upper-grade hotels are observed in 2007, 2001, and 2004 (see Fig. 1b). Of the 199 hotels that existed in 2010, 106 are upper-grade and 93 are lower-grade hotels. Fig. 2 shows the spatial distribution of hotels in 2010. Visually, the hotels concentrate in the central districts (e.g., the Yau Tsing Mong and Wan Chai Districts). The hotel locations reveal two main trends. First, there is continuous development in the central business district (CBD). Second, the hotels are expanding into surrounding districts. This pattern is related to the urban structure of Hong Kong. Older urban areas of Hong Kong are to the north of Hong Kong Island and Tsim Sha Tsui; between 1973 and 1990 Hong Kong began to develop nine new towns to cope with population growth. Due to the limited land resources, a large part of the rural land cannot be easily changed to other land use types (e.g., cargo port back-up or large development areas). Thus,
urban areas have grown slowly since 1990 and the city now has a relatively stable spatial pattern (Fig. 2).

4.2. Spatial factors influencing hotel location

In order to ensure the stability and accuracy of model, multicollinearity test has been conducted before the Logistic regression analysis. In the correlation matrix of independent variables, correlation coefficient between NMTR and S\textsubscript{AN} is 0.39, which is the biggest of all the correlation coefficients. In order to confirm this conclusion, tolerance is used to test multicollinearity among the variables. The results show that the minimum value of tolerance is 0.335, which is still higher than the lower limit value 0.1. Hence, the logit regression could perform as multicollinearity among the variables being acceptable.

Table 2 presents the estimation results of models in selected years. As expected, the results of all of the models consistently show that the CLA is statistically significant, indicating that shopping and business facilities play important roles in determining the location of upper-grade hotels. As for the variables capturing the location attributes, the negative coefficient of AN suggests that the level of hotel has a negative relationship with the distance to attractions, perhaps because it is difficult for investors to establish hotels near natural and cultural attractions due to the resources constraint policies in Hong Kong. Upper-grade hotels are more likely than lower-grade hotels to be closer to the commercial and business areas, rather than to attractions, suggesting that business facilities and shopping play an important role in determining the location of upper-grade hotels in Hong Kong. However, the negative coefficient of S\textsubscript{AN}, which represents distance to shopping attractions, suggests that super shopping centers impose exclusivity obligations and thus investors cannot change land use in surrounding areas to build upper-grade hotels. It also can be inferred that the upper-grade hotels are located closer to secondary level shopping malls than to super shopping centers.

Compared to many urban destinations in Europe or Mainland China, Hong Kong suffers from a lack of major historical and heritage sites and landmarks. The tourism industry in Hong Kong therefore relies heavily on business travelers, VFR tourists (those visiting friends and relatives), and tourists who come to take advantage of the shopping facilities (Zhang and Lam, 1999; Heung and Cheng, 2000). Deniz et al. (2013) investigated perceptions of visitors to Hong Kong (HK) toward the Corporate Social Responsibility practices of its four-and five-star hotels, results show that environment and mission and vision are the two most important factors affecting service quality, preference to stay, willingness to pay, and brand image. These findings suggest that upper-grade hotels will continue to be established in the commercial and business areas in the future.

CLA accounts for more than 30% of the total area in the 1000 m buffer zones of most (80%) upper-grade hotels, implying that upper-grade hotels are located in areas with a greater share of commercial land use. To predict the possible location of new upper-grade hotels, we assign a set of random circles with 1000 meters radii to identify high density commercial and business areas and repeatedly scan all of Hong Kong. The circles in Fig. 3 delineate possible future locations of upper-grade hotels, calculated using the floating catchment area method (FCA) (Morrill and Earickson, 1968). These circles can be regarded as a “constraint window”. Most hotels are located in this window due partly to land use policies that result in a much stronger hotel agglomeration effect, as land is limited. Because of the tourism demand, competition or cooperation between hotels in Hong Kong is stronger than in other cities.

It is also interesting to note that TLA and NMTR are not statistically significant. The results show that there is no difference between lower-grade and upper-grade hotels in terms of traffic accessibility. Hong Kong has highly convenient transport facilities giving each hotel access to potential tourism markets without needing extra accessibility. Thus traffic accessibility might not be an important consideration for establishing upper-grade hotels in cities with highly convenient transport facilities.
The discrete choice model explains hotel location choice based on the economic principle of utility maximization. It suggests that when hotel investors are facing a spectrum of choices of different locations, they are going to pick the most desirable location to maximize its associated utility subject to certain constraints (Yang et al., 2014). The non-significance of the land use diversification indicator (LUD) shows that the establishment and operation of upper-grade hotels are not dependent on diversity of land use. Compared to the significance of CLA, the non-significance of GFA is interesting. CLA is the area of land zoned for commercial use surrounding hotels, whereas GFA is the gross floor area for commercial use in a TPU. Theoretically, both of them should be strongly correlated as the former is the basis of the latter. The difference might be partly attributed to the way we collected the data. The GFA data are collected at the TPU level. Upper-grade hotels may be established in the most prosperous parts of a TPU, where commercial land is clustered, making the relationship between CLA and hotel location significant. When calculating GFA, we not only include the floor space of commercial and business buildings, but also some residential buildings, because in Hong Kong many buildings have shops on the lower floors and dwellings on the higher floors. These types of shops might not be any more attractive to upper-grade hotels than to lower-grade hotels. Furthermore, many shop owners rent space on higher floors to operate shops, the so-called “Upstairs Shops.” Obviously, tourists are unlikely to purchase goods in these shops.

4.3. A temporal analysis of the influence of spatial factors

Models 0–11 provide a chronological analysis of the factors influencing the spatial distribution pattern of hotels. Models 0–10 can be regarded as the cross-sectional data of Model 11. The estimation results of Models 0–11 give information on the annual changes in hotel spatial patterns. Fig. 4 illustrates the changes in the coefficients shown in Table 3. The effect of commercial land use type on the spatial distribution of upper-grade hotels increased year by year from 2000 until it reached a peak in 2006.
Table 3
Estimation results of the models.

| Variables | Model 00 | | | Model 04 | | | Model 06 | | | Model 08 | | | Model 10 |
|-----------|----------|----------|---|----------|----------|---|----------|----------|---|----------|----------|---|----------|
|           | Coefficient B | Exp(B) | Coefficient B | Exp(B) | Coefficient B | Exp(B) | Coefficient B | Exp(B) | Coefficient B | Exp(B) | Coefficient B | Exp(B) |
| LUD       | –.894    | 4.044    | 4.806 | 3.172 | .946    | .549 | 3.022    | 1.397 | .956    | 1.957 |
| MTR       | –.141    | .288     | –.263 | .243 | –.050   | .216 | –.015    | .192 | .063    | .172 |
| GFAC      | .506     | .565     | .094 | .511 | .419    | .475 | .565    | .451 | .666    | .431 |
| TLA       | 1.976    | 2.481    | 1.380 | 2.148 | .533    | 1.383 | –.182   | 1.031 | .518    | .884 |
| CLA       | 6.093    | 4.619    | 14.936 | 5.868 | 31.609** | 12.018 | 9.743*  | 3.661 | 20.763** | 6.125 |
| N,AN      | –.302    | .546     | –.071 | .455 | –.168** | .363 | –.455** | .342 | –.182   | .518 |
| M,AN      | .142     | .167     | .091  | .124 | –.136   | .132 | .023    | .0094 | –.117   | .101 |
| C,AN      | –.124    | .207     | –.115 | .175 | .024    | .168 | –.152   | .123 | –.002   | .125 |
| S,AN      | .263     | .164     | –.349 | .144 | –.360   | .133 | –.344** | .099 | –.403** | .110 |
| Likelihood| 114.13   | 111.26   | 136.40 | 133.75 | 175.70  | 172.43 | 217.88  | 210.24 | 250.56  | 241.798 |
| Pseudo R² | .083    | .112     | .105  | .126 | .188    | .214 | .132    | .169 | .116    | .154 |

N = 90
90 109 144 175 199

Standard errors are in parentheses. Intercepts are not reported for simplicity.

* Significant at the 0.05 level.
** Significant at the 0.01 level.

Table 4
Estimation results of the model 11 (N = 716).

| Variables | Coefficient B | Exp(B) |
|-----------|---------------|--------|
| LUD       | –.496*        | .184   |
| MTR       | .00028        | .082   |
| GFAC      | .717**        | .205   |
| TLA       | .052          | .372   |
| CLA       | 4.433**       | 1.474  |
| N,AN      | –.211         | .159   |
| M,AN      | .071          | .042   |
| C,AN      | .051          | .060   |
| S,AN      | –.223**       | .045   |
| Log-likelihood | 919.764  | 918.366 |
| Pseudo R² | .065          | .093   |

Standard errors are in parentheses. Intercepts are not reported for simplicity.

* Significant at the 0.1 level.
** Significant at the 0.05 level.
*** Significant at the 0.01 level.

2006, this influence was reduced significantly. The extent of the effect of NA's was enlarged from 2000 to 2004 but reduced after 2004.

According to the statistical data of the Hong Kong Tourism Board, 2005 is usually regarded as the peak period of tourism development in Hong Kong (HKTB, 2010). Our findings show that in 2006, commercial area had the closest spatial association with upper-grade hotels, indicating that most upper-grade hotels are located in commercial areas. In addition, as the effect of Severe Acute Respiratory Syndrome (SARS) gave rise to atypical travel and spending patterns in 2003, there was a low growth rate in new hotels established in 2003 (see Fig. 1). This trend is not seen in the spatial patterns of hotels and their surrounding environments, indicating that the spatial pattern in the development of hotels is not sensitive to mega-events.

In this study, we use the year in which a hotel is built to identify its establishment period, and the years when the hotel is open for business as the operation period. The determinants for upper-grade hotels in their operation period are investigated in Models 11. The estimation results are used to examine how various factors affecting hotel spatial pattern change overtime during the operation period (Model 11). The results of Models 11 (see Table 4), we find that some factors, such as land use mix, become significantly related to the spatial patterns of the hotels, suggesting that the operation of hotels influences the land use pattern.

To determine the influence of spatial patterns on upper-grade hotels, the results of one model under different buffer radii are compared (see Table 5). We find that the significance levels and coefficients have small changes when the buffer radius is increased from 500 m to 1000 m. This indicates that the spatial pattern of hotels and their surrounding environments is stable within the 1000-m buffer. However, when the buffer radius is increased from 1000 m to 2000 m, the coefficients change significantly. Perhaps, when establishing a hotel, an investor focuses on the spatial structure within a certain distance (around 1000 m) of a hotel, but once established, the concrete jungle blocks the propagation of the spatial pattern beyond that limit.

Table 5
Estimation results of the model 08 with different buffers (N = 175).

| Variables | Model 08 (buffer radius = 500 m) | | | Model 08 (buffer radius = 100 m) | | | Model 08 (buffer radius = 2000 m) |
|-----------|--------------------------------|----------|---|--------------------------------|----------|---|--------------------------------|
|           | Coefficient B | Exp(B) | Coefficient B | Exp(B) | Coefficient B | Exp(B) |
| LUD       | 1.760    | 1.576   | 3.022* | 1.397 | .851    | 1.134 |
| MTR       | –.369   | .256    | –.015  | .192 | –.057   | .110 |
| GFAC      | .679     | .457    | .565   | .451 | .379    | .410 |
| TLA       | –1.811  | 2.701   | –1.82  | 1.031 | .391    | .461 |
| CLA       | 12.483** | 5.132   | 9.743* | 3.641 | 5.475** | 2.452 |
| N,AN      | –.521   | .705    | –.455* | .343 | –.393   | .314 |
| M,AN      | .285    | .162    | .023   | .0094 | –.042   | .073 |
| C,AN      | –.522** | .151    | –.152  | .123 | .090    | .111 |
| S,AN      | –.230   | .114    | –.344  | .099 | –.259** | .083 |
| Log-likelihood | 221.63  | 211.46  | 217.88 | 210.24 | 222.90  | 216.32 |
| Pseudo R² | .113    | .163    | .132   | .169 | .106    | .139 |

Standard errors are in parentheses. Intercepts are not reported for simplicity.

* Significant at the 0.1 level.
** Significant at the 0.05 level.
*** Significant at the 0.01 level.
5. Conclusions

This study uses binary logistic models and GIS methods and tools to investigate the spatial pattern of urban tourism, with Hong Kong as an example. Generally, the number of attractions in an area is negatively and significantly associated with the likelihood of establishing an upper-grade hotel. Commercial land use type has the most significant and positive influence on the spatial distribution of upper-grade hotels. Moreover, although tourists are inclined to choose hotels near traffic facilities, we find that traffic land type is not statistically significant. Traffic accessibility is not an important consideration for establishing upper-grade hotels in highly convenient transport facilities areas such as Hong Kong. We also find that determinants vary over time.

This study has both theoretical and practical implications. Theoretically, it contributes to the literature of urban tourism by conducting a spatial and temporal analysis of urban tourism phenomena. It examines two aspects of urban hotel spatial structure. The first is the effect of the built environment on hotel location choice, which is the main focus of many previous hotel studies. The second, neglected by most previous research, is a temporal analysis of the relationship between hotels and the built environment after the hotels are built. The results reveal that after a certain period of operation, the spatial structure of hotels and their surrounding built environments are significantly changed within a certain radius. Although this research is not able to directly examine how a hotel’s operation influences the surrounding built environment, the significant temporal variation in the relationship between the dependent and independent variables such as the commercial land use may partly suggest that hotels influence the built environment in the surrounding area.

This research also makes a methodological contribution by using logistic models for both the temporal and spatial dimensions. First, it uses a set of yearly models using time series data from 2000 to 2010. These models are not only able to explore the relationship between the hotel level and built environment, but are also capable of examining temporal variation so that the changes in spatial structure can be investigated. To analyze the changes in the spatial patterns during the operation period, Model 11 is established. Second, as the issue of spatial scale may greatly affect the result, different buffers are created so that the way in which spatial interaction varies with spatial scale can be understood.

The study also has practical implications. The results suggest that in Hong Kong, traffic accessibility is not a significant variable, as Hong Kong is well known for its convenient public transport system, so developers need not consider this factor. Furthermore, the establishment of hotels may affect the surrounding land use within a 1-km radius; for example, it may increase the area of commercial land. This in turn may attract more upper-grade hotels, which prefer to be located near commercial centers. In addition, due to limited land resources and the concrete jungle, some upper-floor shops could be regarded as potential tourism products, but these have not been fully developed. More promotion efforts should be dedicated to these shops to increase the diversity of tourism products and the attractiveness of Hong Kong as a shopping paradise.

Finally, several limitations of the study should be mentioned. First, the empirical model is developed under the assumption that there are already hotels at the selected locations, so it cannot analyze and predict the location choice of all types of hotels. Second, owing to the limitations of the data sources, we cannot obtain historical data for hotels established before 2000 (e.g., the Peninsula Hong Kong in 1928). If the historical data could be obtained, the results would be more convincing. Finally, although it can be inferred that the changes in the spatial pattern of the area surrounding a hotel are related to the hotel’s existence, the study is not able to quantify this relationship. Future research efforts will be dedicated to developing a method for modeling the effect of hotels on the surrounding environment.

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