Spatio-temporal features and the dynamic mechanism of shopping center expansion in Shanghai

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ABSTRACT

Since the first modern shopping centre was built in the United States in the 1920s, shopping centres have gradually become representative patterns of economic growth and consumerism in the United States, and these patterns are now trending globally. Shopping centres have demonstrated tremendous development potential since their initial entry into China in the 1990s. Shanghai is the most economically prosperous city in China, and the development and evolution of its shopping centres reflect the trend in China's commercial real estate development. Therefore, based on the central-place and agglomeration economy theory, this paper quantitatively measures and analyses the spatial gravity, extending direction, agglomeration characteristics and hierarchical structure of Shanghai's shopping centres using GIS (Geographic Information Systems) and spatial analysis. Moreover, this paper analyses the dynamic mechanism of urban development and its patterns of centripetal and centrifugal movement. The results demonstrate the following. (1) The spatial gravity points are located in the districts of Huangpu, Luwan and Xuhui in the city centre and within the inner ring. In addition, there is a trend to be gradually near the middle ring, exhibiting an obvious tendency from the northeast to the southwest. (2) Shopping centres in Shanghai exhibit a clustered distribution in the centres of urban areas, which form numerous business districts that extend in the same direction. (3) The hot spot analysis is a very effective method for identifying the hierarchy of business circles. (4) Planning by the government is the most important external impetus, and commercial agglomeration is the internal force determining the spatial expansion of shopping centres. Additionally, urban transportation patterns have an obvious influence on the spatial morphology of shopping centres. (5) Over the last two decades, the spatial development of Shanghai's shopping centres has reached a balance between the centripetal and centrifugal forces. In other words, we have not observed a tendency towards suburbanization, which indicates that Shanghai's shopping centres are still in the early stages of development. Therefore, future shopping centres may be primarily located in the stretch or peripheral zones of the city.

1. Introduction

The shopping centre is a spatial pattern of homogeneous or heterogeneous retailers agglomerating in the same place. On one hand, it is a highly organized commercial complex that consists of a variety of retail stores and service facilities in a building or an area that exists to provide comprehensive services to consumers. On the other hand, the shopping centre is also a kind of commercial real estate that serves to integrate business and is usually a blend of retail, services, catering, leisure, entertainment and other composite forms. In the last twenty years, the shopping centre has been the focus of commercial real estate development in the big cities of China; in a sense, the shopping centre is a microcosm of China's commercial real estate industry development. As commercial real estate is a somewhat more ideal carrier of capitalization than housing due to its long-term capital appreciation and stable earnings ability, some large developers have focused on developing commercial real estate, especially the shopping centre. At the same time, the development of the shopping centre has increasingly aroused the concern of the urban government and academia. Following the entry of shopping centres into China in the 1990s, their large-scale expansion and the "enclosure" phenomenon has become increasingly significant. Additionally, the narrowing of financing channels and business convergence are also

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substantial. These factors demonstrate that the development, operation and management of shopping centres in China currently lack the necessary theoretical underpinnings and policy guidelines. Furthermore, studies of domestic business agglomeration using spatial statistical analysis are still in their initial stages (Ding, P F and Wang, Y F, 2005; Wu, Z Y, 2007; Wu, Z Y and Wang, Y F, 2010; Yang, L J and Zhu, H L, 2003). China is in a key period of rapid industrialization and urbanization, and as a form of highly concentrated retailing, shopping centres have high development potential. Because Shanghai is the most economically prosperous city in China, the development and evolution of its shopping centres will reflect the growth trends of China's commercial real estate. Therefore, with the help of spatial statistical analysis methods and GIS (Geographic Information Systems), this paper analyses the spatio-temporal characteristics, the dynamic mechanism and the pattern of the centripetal and centrifugal movement of shopping centres to provide guidance for sustainable and coordinated development of shopping centres and commercial real estate in Shanghai.

The analyses of shopping centres in the U.S.A, Western European countries, Japan, China and Southeast Asian areas are mainly based on the central-place theory and the economic agglomeration theory (Aloys & Cindy, 2011; Baker & Funaro, 1951; Berry & Parr, 1988; Burns, 1959; Clark, 1970; Huff, 1963; Simmons, 1966; Vida, 2000; Wang, S G, Zhang Y C, Wang, Y F, 2006; Yu, Z Z, 2006; Zhang, Y X, 2006). The central-place theory is currently the most developed theory of retail location, with the patterns of retailers' spatial behaviour and consumers' shopping behaviour having garnered increased attention, but its assumption of single-purpose shopping is controversial (Berry, 1967; Christaller, 1966; Clark, 1968; Ingene & Ghosh, 1990; Ning, Y M and Huang, S L, 2005; Shi, Y S and Wang, S Y, 2013; Urban Land Institute, 1985; Wang, S and Jones, 2002; Wrigley & Lowe, 2002). Based on the central-place theory and the principle of minimum differentiation, some scholars have analysed the agglomeration of both homogeneous and heterogeneous retailers (Hanson, 1980; O'Kelly, 1981). Homogeneous agglomeration occurs when several retailers selling similar products gather together in the same place to form a specialized shopping centre. Heterogeneous agglomeration occurs when many retailers selling different kinds of products together in the same place form a comprehensive shopping centre. The agglomeration of heterogeneous retailers is related to multi-purpose shopping behaviour. However, because the central-place theory does not explain the agglomeration of homogeneous retailers, the principle of minimum differentiation was developed (Boulding, 1966; Zhou, R Y, 2006). The theory of homogeneous agglomeration of retailers provides a simple model to estimate the agglomeration of retailing activities. Because consumers can compare shops among homogeneous retailers to find exactly what they want, the uncertainty of searching for an ideal product will be reduced (Scott, 1970; Webber, 1972). Based on the principle of minimum differentiation and the theory of economic agglomeration, Bucklin (1967) divided comparison shopping behaviour into carpet searching, direct searching and aimless searching. The author found that for carpet searching or high-end commodity consumption, a multi-purpose parking fee might exceed any savings in transportation costs. In addition, scholars have found that the centralized planning and management of shopping centres vitally influence their successful operation. Well-planned shopping centres always have better combinations of businesses and create more agglomeration economic benefits for NONANC (non-anchor stores). The research of Eaton and Lipsey (1982) showed that the developers of well-planned shopping centres may restrict the entry of low-end retailers. By restricting the low-end retailers that sell similar products, the developers effectively avoid direct price rivalry. Some scholars considered

that shopping centres should optimize the ratio between anchor tenants and non-anchor tenants according to the market situation, thus forming a reasonable rental composite structure (West, Von Hohenbalken, & Kroner, 1985).

Studies of shopping centres have shown a tendency towards refinement and diversification in recent years. Along with the development of quantitative geography and geographic information systems, mathematical models and spatial statistical analyses are new tools for the quantitative analysis of shopping centres (Gundogdu Ceren Erdin, 2011; Ozuduru, 2013). Vitorino and Maria (2012) performed an empirical study of regional shopping centre combinations in the USA and quantitatively analysed the spillover from stores via optimization calculations that use mathematical programs with equilibrium constraints (MPEC). Teller and Schnedlitz (2011) studied the driving power of the centralized management of tenants in large-scale shopping centres. Yu Tun-Hsiang, Cho Seong-Hoon and Kim Seung (2012) estimated the impact of shopping centres on surrounding real estate taxes and creatively used time costs at different scales, instead of the Euclidean distance, as a variable when building the models. Some scholars have also paid more attention to international comparisons and the spatial competition among shopping centres (Brandao Antonio, Correia-da-Silva Joaao and Pinho Joana, 2010; Graff, 2006; Meyer, 2009).

Research on Shanghai retailing has mainly focused on retail location analysis and selection (Bai, G R, 2006; Jiang, H B, Xu, J G, Qi, Y and Chen, J T, 2010; Ning, Y M, 1984; Shi, Z and Bai, G R, 2003), retailing spatial structure and evolution (Du,X and Bai, G R, 2007), large supermarket planning and layout (Shi, S H, 2008), consumer behaviour characteristics, simulation of retail spatial structure in commercial spaces (Xu, Z and Wang, D, 2012; Zhu,W and Wang, D, 2011), spatial diffusion of transnational retailers (Wang, S and Zhang, Y, 2005; Shi, Y S and Yu, B H, 2013), etc. As mentioned above, studies on Shanghai shopping centres have made initial progress; however, the existing results mainly reflect in the dissertations and consulting reports, and their research breadth and depth are still very insufficient.

2. Data and methods

2.1. Study area and data sources

Since the 1990s, retail markets in the Shanghai metropolitan area have not only been driven by the growing population but have also been influenced by factors that include rising incomes, increased accessibility to transportation and globalization. The multi-core urban spatial structure formed gradually with the expansion of the city, but people's lifestyles have changed completely. The entry of shopping centres has met the need for a burgeoning business pattern that has been created by the global value of assimilation. Although some traditional shopping streets or specialized markets may also have integrated functions, such as entertainment, retail shopping and food and beverages, shopping centres have additional advantages, such as modern designs, improved lighting, colour combinations and international commodity brands. These shopping centres will succeed in an increasingly competitive environment.

This article selects Shanghai as the study area, with a study period from 1993 (the first shopping centre appeared in Shanghai) to 2010. The research base map is obtained by means of digitizing the main road, the administrative area, rivers and green space of Shanghai with the help of software ArcGIS. Data of shopping centres come from the 2011 edition of "Shopping Centers in Shanghai," and were compiled by the Shanghai shopping centre association according to the address information for vector quantization. By the end of 2010, a total of 73 shopping