Do built environments affect pedestrians' choices of walking routes in retail districts? A study with GPS experiments in Hongdae retail district in Seoul, South Korea

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ABSTRACT

This study aims to reveal components of built environments that influence pedestrians' walking patterns and potential consumption in a retail district. We conducted a Global Positioning System (GPS) experiment observing 82 pedestrians' choices of walking routes in Hongdae, a campus-oriented retail district near Hongik University in Seoul, South Korea, and assessed their causal relationships with built environments using a structural equation model (SEM). We revealed that all four categories of built environments studied—accessibility, diversity, design, and density—affected pedestrians' choices of walking route, controlling for retail attributes. Specifically, pedestrians prefer shaded streets and openness, confirming the importance of design quality in pedestrian retail environments. Contrary to conventional wisdom, however, shorter distances from public transportation would not guarantee more pedestrian traffic in specialized shopping areas such as Hongdae, unlike what we have observed in residential neighborhoods. Additionally, pedestrians prefer streets with concentrations of similar types and high-density retails, affirming the agglomeration economies theory.

1. Introduction

Location is one of the most critical factors for the success of retail operation. Retailers are eager to find locations where potential customers would purchase more products or services than from other locations (Roig-Tierno, Baviera-Puig, Buitrago-Vera, & Mas-Verdu, 2013). Examples of those are places with high visibility, convenient transportation, and proximity to office complexes or residential districts with large numbers of commuters or residents, respectively. Those factors may be likely reasons for high pedestrian volume, and thus a greater chance to capture impulse shoppers, resulting in higher profit margins than in locations lacking such features (Salvaneschi, 1996).

Favorable walking experience is also one of the most important components comprising an advantageous retail location. Well-designed streetscapes invite pedestrians (Handy, Boarnet, Ewing, & Killingsworth, 2002; Vojnovic, 2006). When pedestrians are attracted to a certain location by its better spatial quality, they become willing to spend time there, and thus tend to consume goods or services from nearby stores (Nisco & Warnaby, 2014). Consequently, business owners pay premiums to rent spaces offering favorable walking experiences (Hack, 2013).

Studies have been conducted to reveal the relationships between pedestrians' choices of walking routes and their surrounding built environments, mostly in the fields of business marketing and urban planning. In the studies of business marketing, focus has been made on revealing factors in retail environments that contribute to customers' stated satisfaction, typically gleaned through interviews and questionnaires. Customers' satisfaction is ordinarily stated as the level of pleasure they experienced and their intent to revisit to specific stores or districts (Teller & Elms, 2010). This approach, due to the limitation of stated-preference methods, only helps an understanding of the relatively weak and indirect link between customers' recollection of itemized retail environments and their satisfaction on the general shopping experience.

In urban planning studies, on the other hand, more direct such relationships have been sought. Rather than conducting surveys, those researches have developed experiments, often using Global Positioning System (GPS) technologies to measure duration and speed of walking, detect how pedestrians maneuver, and infer what spatial elements are attractive to them (Hurvitz, Moudon, Kang, Saelens, & Duncan, 2014). However, most of these studies have focused on neighborhood

environments (Tribby, Miller, Brown, Werner, & Smith, 2016), of which the findings are not easily generalized to retail environment. Pedestrian experience is influenced not only by physical environments, but also by the purpose of walking (Daamen & Hoogendoorn, 2003). While in neighborhoods, the most common purposes of these walking activities may be reaching public transit, schools, and/or grocery stores, or strolling for relaxation or exercise, pedestrians in retail districts may prefer different physical features that maximize their shopping and recreational experiences and facilitate their consumption (Lee & Moudon, 2006).

While shopping has become a major leisure activity for urbanites, and a highly ranked purpose of visiting cities for tourists (Lehto, Cai, O'Leary, & Huan, 2004), empirical research has not been sufficient to help understanding on components of greater pedestrian environments in retail districts directly. Therefore, through this research, we aim to investigate built environments that affect pedestrians' walking behaviors in a campus-oriented retail district, Hongdae in Seoul, South Korea. Campus-oriented retail districts are one of the significant types in studying the pedestrian behaviors in retail districts, because it has been formed as the most pedestrian friendly environment, under assumption that majority of the visitors would come to the site via public transportation or on foot (Bunnell & Lawson, 2006).

We investigate the effects of the four categories of physical factors - accessibility, diversity, design, and density, controlling for retail attributes – on pedestrians' choice of walking route represented by the two types of walking patterns - volume and speed on each street segment. Pedestrian volume on street segments implies pedestrians' attraction to the specific street, and pedestrians' walking speed means their willingness-to-stay, leading to potential consumption in retail establishments on the specific street. In order to deduce the pure effect of the built environments, we controlled attributes of stores such as their scales and types. We conducted GPS experiments, one of the most direct and accurate methods to reveal the pedestrians' preference on built environments, as well as a supplementary questionnaire surveying 82 visitors in Hongdae, then analyzed the data using a structural equation model (SEM). Our research could be a useful reference for urban planners wanting to revitalize pedestrian-oriented retail districts through improving physical environment, and increase pedestrian traffic.

The structure of this study is as follows. After we describe the background, we show the analytical design, including study site, GPS experiments, data, samples, and the method of our statistical analysis. After presenting the analytical results, we discuss the findings, policy implications, and some opportunities for future research.

2. Background

2.1. Built environment factors affecting walking behavior in shopping districts

2.1.1. Factors affecting customers' satisfaction

The quality of store experience influences the shopper's mood, and leads their purchasing decision (Maslow & Mintz, 1956). Customers who are in a pleasant environment are more likely to spend more than those who shop in a low quality environment (Zenker & Rütter, 2014). Previous studies have discerned the factors in retail environments formulating retail attractiveness and customers' satisfaction that induces consuming activity (Hunter, 2006; Teller & Reutterer, 2008; Nisco & Warnaby, 2013, 2014).

Previous studies revealed environment factors in retail district affecting customers' satisfaction such as general atmosphere, accessibility to stores, condition of pedestrian amenity, physical appearance of building or public space, and type of goods sold by stores (Hart, Stachow, & Cadogan, 2013). The accessibility means the level of convenience to reach the destination, determined by the distance to transportation facilities (Nisco & Warnaby, 2013; Reimers & Clulow,

2009). The pedestrian amenity such as street stall, bench, public restrooms, and recreational areas provide pedestrians with pleasant and convenience shopping experience, and increase the attractiveness of the shopping district (Hui, Zhang, & Zheng, 2013). Atmosphere of retail district is generally affected by the condition of maintenance, and high quality of which increase visitors' satisfaction (Teller & Elms, 2012). Physical appearance is the aesthetic quality of retail environments, made by façade of buildings and design of public spaces (Nisco & Warnaby, 2013). Visitors prefer organized and well-maintained street, elaborated exterior design, and attractive window display of stores. Product type also affects the visitors' satisfaction. They prefer to go to retail districts with broader range of products to be purchased or enjoyed together, such as apparel, cosmetic, food, and entertainment (Nisco & Warnaby, 2014; Teller & Elms, 2010).

2.1.2. Factors affecting walking behaviors

Scholars have identified more direct relationships between pedestrians' choices of walking routes and the components of surrounding built environment that induce travel demands in neighborhood areas.

Cervero and Kockelman (1997) suggested that three attributes of such spatial quality - density, diversity in land use, and pedestrian oriented design - also called 3Ds, increased walking activities (Cervero & Kockelman, 1997). Lee and Moudon (2006) later extended the idea and reformulated a set of environmental elements as 3Ds + R, meaning destination, distance, density, and route (Lee & Moudon, 2006). They proposed that compact neighborhood, mixed land uses, pedestrian friendly design encourage residents to walk to their destination rather than choosing vehicular transportation. Ewing and Cervero (2010) integrated these factors into D variables including density, diversity, design, and destination accessibility (Ewing & Cervero, 2010). Walking activity is encouraged by the higher density of population, employment, and dwelling units, diverse land use. Favorable street design, such as wide-street, frequent pedestrian crossings and existence of street tree increases walking activity. Using these variables, many researches have tested the walkability of a specific site (Chen, Hui, Lang, & Tao, 2016; Kang, 2015; Vojnovic, 2006).

3. Analytical design

3.1. Study site

Our study site is Hongdae retail district (hereafter Hongdae) in Seoul, South Korea (Fig. 1). Seoul contains 42 major retail districts, and 32.50% of those are located near universities; 32 out of 38 universities have retail districts around themselves in Seoul. Being in the vicinity of a university is advantageous to retail establishments, as most of the universities in Seoul is well served by public transportation, thus attracts abundant visitors with youthful culture and activities (Yoon, 2007).

Hongdae, casually referring to areas near Hongik University, is one such campus-oriented retail district in the city. It is popular, highest-density, and pedestrian-friendly retail districts, attracting 200,000 people a day (Yoon, 2007). Among those, the twenties, including students, explains 53.12% of total pedestrian volume, and 53.60% of total card transactions in Hongdae (Park & Na, 2017). Hongdae encompasses an area of 797,312 square meters, with Hongik University at its center, served by the three subway stations - Hapjeong, Sangsu, and Hongik University, as well as 44 bus stops. Out of 2,242 buildings within the district, 1,421 are in commercial use, containing more than 4000 retail establishments. Because the university specializes in the fine arts, Hongdae was formed by artists' migration initially in the 1980s, then populated with artists' studios, galleries, performance theaters, and publishing companies soon after. Once the area had gained visibility, commercial enterprises chased in, such as restaurants, café, clubs, and trendy fashion retail stores during the 1990s, contributing to the unique identity of today's hip Hongdae (Lee, 2015).