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Master's Thesis of Landscape Architecture

Does an introduction of a park
affect the survival of surrounding
industries?

– A case study of Hongdae, Seoul, South Korea

공원의 조성이 주변 산업의 생존에 미치는 영향
– 홍대지역을 중심으로 –

February, 2020

Graduate School of Seoul National University

Department of Landscape Architecture and Rural
Systems Engineering, Landscape Architecture Major

Haewon Moon

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– A case study of Hongdae, Seoul, South Korea

Under the Direction of Adviser, Prof. Heeyun Yoon

Submitting a master's thesis of
Landscape Architecture

February, 2020

Graduate School of Seoul National University
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February, 2020

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Abstract

This study aims to reveal how the creation of urban parks affects the business survivals of retail establishments in the vicinity. We conducted a survival analysis with a case of Hongdae and Yeonnam retail district in Seoul, South Korea from 2009 to 2018. We revealed that distance from Gyeongui Line Forest affected the survival rate of individual stores. Specifically, stores within 500m from the park had a lower probability of closure than those situated farther. Also, the characteristics of stores showed different survival rate such as stores located in residential area, a more larger store size, and whether if it is located in the first floor were significant. Findings from this study and its methodology will be valuable in observing the relationship of urban parks and retail districts.

Keyword : Urban park, Hongdae, Retail district, Gentrification, Survival Analysis

Student Number : 2018-28675

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Chapter 1. Introduction

Urban parks and open spaces provide benefits to the vicinity, such as recreational opportunities, aesthetic enjoyment, and even the mere existence values (Brander & Koetse, 2011). Parks near residential areas offer outdoor recreational opportunities to the neighborhoods (Jim, 2004; Lo & Jim, 2010; Oh & Jeong, 2007); within a walking distance, residents use urban parks as a place for jogging, cycling, picnicking, and meeting people for social interactions (Peters et al., 2010). Studies have pointed that this kind of induced outdoor activities have improved health conditions (Bedimo–Rung et al., 2005; Kardan et al., 2015; Kondo et al., 2018). Also, the property values near well–built parks generally exceed those of the equivalent properties located elsewhere, getting positive externalities from the improved physical neighborhood environments. A large quantity of literature has revealed the impact of parks on real estate values by using hedonic pricing model (Ahn, 2016; Brander & Koetse, 2011; Jim & Chen, 2010; Panduro & Veie, 2013).

Urban parks near retail areas, on the other hand, accommodate more diversified visitors than residents, providing naturalistic environments and scenic views for them to get chances to refresh themselves in a busy urban setting (McCormack et al., 2010). They also attract potential customers, and consequently help retailers to earn higher sales revenues (Jo, 2017). Some of such public amenities, however, upgrade environments nearby and adversely affect the existing retail communities through gentrification (Lees, 2003; Yoon & Currid–Halkett, 2015).

Retail gentrification, a kind of involuntary displacement of existing local stores and services due to raised rents or property values, has long been an issue that has drawn attentions from scholars and practitioners (Lees & Phillips, 2018; Byrne, 2003; LeVeen, 2004). Particularly Seoul, South Korea saw an increasing level of retail gentrification in recent years. Seoul has undergone a relatively more rapid urbanization driven by public authorities compared with cities in western countries, and has deployed government-led urban redevelopment projects to intentionally promote gentrification in declined areas (Kim & Heo, 2015; Shin & Kim, 2016).

Retail gentrification could be understood in various ways. On one hand, it is frequently observed in upward-moving commercial areas. Property values increase and the landlords of those could be benefitted by the increased rent, while the existing tenants cannot afford the excessive rent increment and are displaced (Kim, 2019 ; Bae, 2019 ; Lee, 2015 ; Heo, 2015 ; Jeong et al., 2018). Another perspective looks at retail gentrification as an inevitable process in the growth of a city. An increasing number of consumers revitalizes the retail areas, triggering new constructions and renovations of old buildings. Sometimes, diversification of land uses would positively change the nearby areas by inviting visitors in multiple purposes and improving pedestrian experiences (Kim, 2018 ; Lee, 2018 ; Seo, 2017).

The topic of gentrification has been studied mainly using qualitative methods (Collis et al., 2000 ; Link et al., 2005 ; Cameron & Coaffee, 2005 ; Kim, 2013 ; Kim & Heo, 2015 ; Jeong et al., 2015 ; Zukin et al., 2017). The most frequently used methods are questionnaire survey, observations and interviews (Collis et al., 2000 ; Link et al.,

2005), since the relevant data, such as retail rents and sales revenue, are difficult to collect (Kim & Heo; 2015). Collis et al. (2000) conducted surveys for the local businesses in small towns of Atherstone, and revealed that lack of accessibility, poor image of the town because of empty shops, and deterioration of outdoor market were major contributory factors to the decline of the town centre. With the survey respondent, Cameron and Coaffee (2005) found that on the one hand, gentrification is evidence to drive successive waves of redevelopment, but on the other hand, it brings tensions between gentrifiers. Davidson (2008) examined levels of social mixing between gentrifying and communities in three neighborhoods undergoing new-build gentrification in London. By social surveys the study found that policy and planning frameworks which transform the neighborhoods in ways such as high-density, new-build developments, and self-contained create new-build gentrification. Zukin et al. (2017) examined 7064 reviews of restaurants in gentrifying neighborhoods in Brooklyn and emphasized that participation in social media has a material effect on capital investment in the urban environment. After looking at the causes and the process of gentrification, another research interviewed 68 merchants working in the gentrified area and found that the entry of new stores was influenced by the rent gap and future expectation (Heo et al., 2015). Zukin et al. (2009) looked at low-income neighborhoods which have become prime targets of both commercial and residential redevelopment. When interviewed, seven of the eight store owners who opened their business in the early years, also lived in Williamsburg. But as the local identity of new stores weakened, only two of seven recent new retail entrepreneurs lived there. This

change happened after the location has received higher visibility, and the rents increased consequently (Zukin et al., 2009).

The limitations of such studies come from the lack of systematic and comprehensive analyses of the phenomenon. Interview, observations and/or case studies of a small geographic area would not yield a general understanding on the process, spatial and temporal extent, as well as the contributing factors to gentrifications. Particularly, changes of retail district after a neighborhood improvement project, such as park constructions, has been indirectly explained by the changes in the population, sales revenues or residents' preferences (Parker, 2018; Jim & Chen, 2010; Kho & Kim, 2016), only a few research investigated the opening and closure of individual stores (Yoon & Currid–Halkett, 2015).

In this study, we aim to assess the survivals of business establishments in a gentrifying area reportedly by a public amenity project, called Gyeongui Line Forest from 2009 to 2018. It is a park project in a declined neighborhood, in Seoul, South Korea. Through this study, we aim to answer the question on whether an introduction of a new park would be advantageous to nearby retailers in operating their business. We adopted survival analysis, using multi–year dataset. We compared the survival rate of the business establishments in the park vicinity before and after the park completion in 2015.

The text unfolds as follows. After describing the background of the study site, we present the analytical design, including data and the statistical method. After describing the analytical results, we then discuss the findings of our study with some policy implications.

Chapter 2. Background

Gyeongui Line Forest is a linear park on an abandoned railroad – Gyeongui railroad. Gyeongui railroad was built in 1906 during Japanese colonial period initially for Russo–Japanese War, and later became a part of the international railway connecting Seoul and Sinuiju, a city in the North Korea. The operation was ceased in 1945 with the division of the Korea into south and north (Jung et al., 2016), then after 55 years of abandonment, a part of the route was reconstructed between the Munsan Station in South Korea and Panmun Station in North Korea after the South and North Korea Summit in 2000 (Won, 2017). In 2011, to make transportation easier, a 6.3 km segment of Gyeongui railroad in Seoul, from Hyochang Station to Gajwa Station, was rebuilt on underground level, and on the emptied street level, Gyeongui Line Forest Park was constructed (Na, 2018). Reportedly, the creation of Gyeongui Line Forest improved the nearby neighborhoods and connected the formerly disconnected surrounding urban spaces (Jung et al., 2016; Jo et al., 2017 ; Kim et al., 2019).

Gyeongui Line Forest is a 6.3km or 28 block–long linear park, with its width varies from 10 to 60m, totaling $195,624m^2$. After the announcement of the park conversion project in 2006, the condition of the surrounding areas has changed. The largest change is observed in the land use. Before the project, most of the buildings in the abandoned Gyeongui railroad were residential, while after the project, building containing retail industries, mostly food businesses, took 47.2% of the total building area situated around the park as of 2017 (Kim, 2018). Also, 22% of the first floor usage has changed,

mostly from residential to retail (Lee, 2016). In addition, various types of retailers have moved to the area, such as guesthouses and craft workshops, revitalizing the local economy (Won, 2017).

After the opening of the entire section of Gyeongui Line Forest in July 2016, such change has accelerated by the increased visitors. First, Hongdae retail district (Hongdae), one of the top campus-oriented retail areas in the city, located south-east from the park, began interacting with the park. Various programs such as flea markets and artistic performances previously held in Hongdae area extended the stages to the Gyeongui Line Forest (Jeong, 2016). More diversified visitors and consumers have come to Hongdae, which used to mostly attract students or young professionals in their 20s and 30s (Kho & Kim, 2016). The number of guesthouse businesses and restaurants increased drastically, making the Hongdae the fifth most popular tourist sites in Korea (Ministry of Culture, Sports and Tourism, 2018 ; digitaltimes, 2017).

Second, Yeonnam-dong retail area (Yeonnam), located south-north from Hongdae district and encompassing the Gyeongui Line Forest Yeonnam section, also has experienced similar changes. The announcement of the park plan attracted retail industries to the vicinity such as restaurants, cafes, pubs, workshops, hotels and guesthouses and the customers. The unique park-retail spatial relationship earned the nickname to the park; ‘Yeontral Park’ or ‘Central Park in Yeonnam’ (Kim, 2015; Sung, 2013). It is now one of the top 50% most popular retail districts in the city as of 2014. Considering its past life as a residential area, the current status of Yeonnam means a drastic change (Kim, 2018).

Anecdotal evidences suggest that Hongdae and Yeonnam are one of the most representative cases under a threat of retail gentrification (Kim et al., 2019). The price of real estate increased significantly after the construction of the park and the opening of a new subway station (Digital Times, 2017). The unit price of commercially used buildings, has been raised up to 45% after the construction, while a similar pattern was observed for retail rents; 1.5 to 2 times of increment after the construction (Hankookilbo, 2015; Jo, 2017). Being unable to afford the spaces, small enterprisers began to leave the area, seeking for a cheaper rent (Lee, 2018).

2.1 Relationship between urban parks and retail district

The relationship between urban parks and retail district has been viewed from multiple angles. Some of such examples include the assessment of the park impacts on the retail revenue (Chu, 2018; McInroy, 2000; Won, 2017), the change in the number of visitors (Kim, 2018; Loughran, 2014), the retail rent (Chandralal, 2010 ; Sutton, 2010), the residential development (Jo, 2017; Russell, 2011), and retail survival (Yoon & Currid–Halkett, 2015).

First, the opening of a park has been known to lead an increase in retail revenues. The High Line, an urban park built on an old railroad track in New York City in U.S., is referred frequently in this context. Song (2013) analyzed that the most affected industry sectors are retail trade, food services, and accommodations. Nearly 148 million dollars were increased through the industry sectors most affected from multiplier effect such as retail trade, food services and drinking places, accommodation, transportation, and recreation, in 2011 which have continuously increased since the opening in 2009. For the case of Gyeongui Line Forest, Park and Kim (2019) compared the total sales of the surrounding retail area, before and after the formation. After the completion in 2016, the gross sale increased by 10–12%.

Second, the creation of parks increases the number of visitors to the surrounding area. The High Line, when it was merely an abandoned rail track, has not attracted visitors. After the park conversion, it has become one of the landmarks of the city, and attracted over 7.6 million visitors in 2015, which was more than other landmarks in New York city, such as the Metropolitan Museum of Art with 6.3 million visitors and the Empire State Building with 4.2 million

visitors annually (Ganser, 2017). Kim (2018) revealed that the formation of a park – Seoulo 7017, situated in Seoul, South Korea – also changes the visitors’ usage pattern. In addition to walking activities, relaxation and leisure activities were observed, and picnickers gathered day and night (Oh & Lee, 2018).

Third, buildings near a well–designed and maintained parks earns higher rents (Park & Kim, 2019). A study suggests that office rents near Bryant Park, New York City has been raised after the park renovation. The park has transformed from a crime–ridden place to a safe and active place where office workers have lunch and citizens gather for activities. (Ernst & Young, 2003). A study on Yeonnam–dong in Seoul, concluded that the retail rent rose up to two times more than that of before the creation of the park (Jo, 2017).

The creation of an urban park might increase the value of existing residential units and/or stimulate new developments. Jung et al. (2016) did a multilevel analysis and found that apartments 100m closer to Gyeongui Line Park was 15% higher in market value compared to those located further away. The residential properties located 100 feet closer to the High Line, situated in West Chelsea, New York, has 0.25% lower market transaction value (Yoon, 2013).Brambilla and Ronchi (2016), in a case study of Lombardy Region, northern Italy, found that the availability of open space was an advantage that helps increasing value of nearby properties by 9%.

Lastly, studies have looked at the relationship between urban parks and retail survival. A research on the High Line suggested that after the neighborhood had undergone a series of urban planning interventions and new addition of the public amenity, businesses established earlier than those changes, particularly art studio and

gallery businesses, have been displaced (Yoon & Currid–Halkett, 2015). Choi et al. (2015) explored the characteristics of different parks located in central business district of Daegu, South Korea, and suggest improvements and complements. In this study, apparent difference in the surrounding commercial area may be due not only to the spatial characteristics but also because of park differences, such as the use hierarchy, facilities, or the internal environment.

Chapter 3. Analytical Design

In this research, we aim to reveal how the creation of urban parks – Gyeongui Line Forest Yeonnam section – affects the business operations of retail establishments in the vicinity, with a case of Hongdae and Yeonnam retail district in Seoul, South Korea from 2009 to 2018. The business operations are measured with the duration and risk of closure of the businesses, hence the survival analysis is employed.

The analysis is two-fold. By using Kernel density estimation, we first depicted the geographic pattern of new opening and closing of retail establishments around the park, and then we analyzed whether the proximity to the park was advantageous in business survival, using Kaplan–Meier method and Cox’s proportional hazards regression. We conducted the analysis twice for the samples opened before and after 2015, to compare their vulnerability depending on the timing of the opening. We assumed that the businesses established earlier would be more susceptible to gentrification (Yoon & Currid–Halkett, 2015).

3.1 Study site, period and data

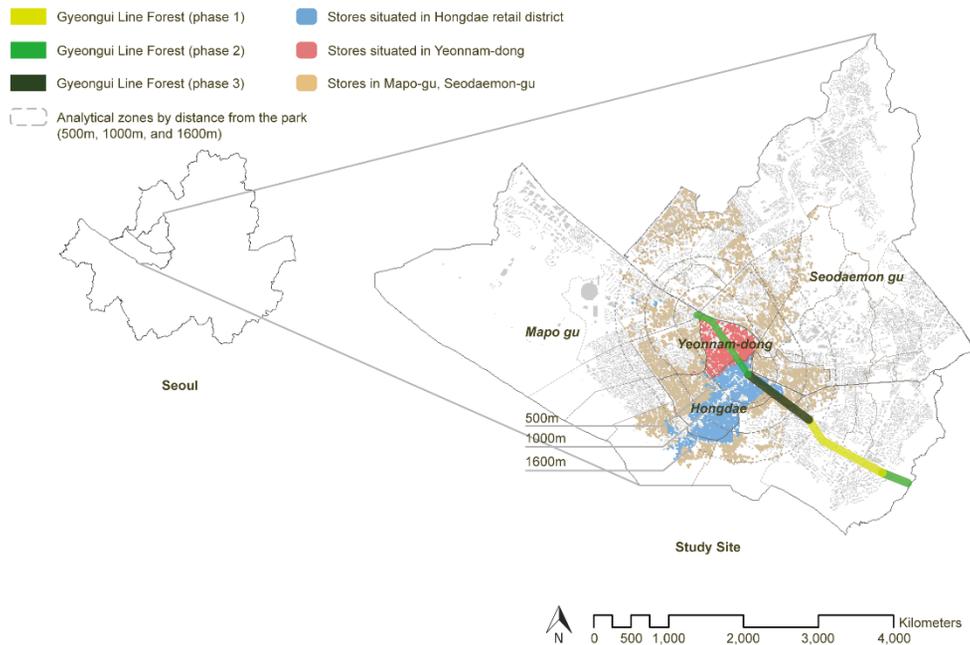


Figure 1. The boundary of study site and the location of stores in the sample with reference to the Gyeongui Line Forest

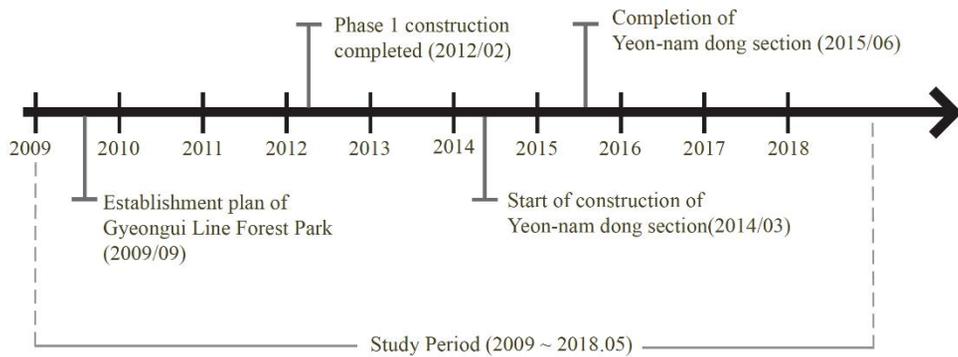


Figure 2. Gyeongui Line Forest in study period from establishment plan to completion

Our study site is the two retail districts – Yeonnam and Hongdae – around the Gyeongui Line Forest Phase 2, so called Yeonnam section in Seoul, South Korea.

The study period is from 2009 to 2018. In 2009, the plan of the park creation has been initiated, and 2018 is the current point. In detail, from 2009 to 2011, the basic plan and design of the park was completed, and in 2012, 2015 and 2016, the three sections have been constructed respectively (Fig 2) (Seoul Metropolitan Government, 2014).

The Yeonnam section is 1.31km long and 28,500 m^2 wide, with an average width of about 25m (Friends of Gyeongui line forest, 2018). We limited our study site up to 1600m from the park considering the general extent of the park influences to the vicinity (Wolch, 2005 ; Moore et al., 2008).

The primary dataset is the business licensing data of retail establishments, provided by the Korea Local Information Research & Development Institute (KLID). This contains information on the name, business address, geo-code, phone numbers, industrial classification (Korean standard industrial classification (KSIC)), and opening and closing date of business establishments, collected and updated every month. Following the KSIC, we categorized the retail businesses into 6: manufacturing, whole sale, retail, service, restaurant, and publication (Yoon & Kang, 2018). To consider the location and characteristics of each store, building registrations, digital topographic map, and landmark map were used additionally. Also, to address the macroeconomic factors, we used the GDP (Gross Domestic Product) growth rate, annual average KOSPI (Korea Stock

Exchange Price Index), and price index of the national indicator system.

The final sample includes 22,582 stores situated in Hongdae and Yeonnam.

3.2 Methods and variables

3.2.1 Measure

The dependent variable for the subsequent survival analysis is the probability of business closures (*closure*) of individual stores situated in the study site. The question variable is a dummy variable indicating whether the store is located within 500m from the Gyeongui Line Forest (*within_500m*). 500m or approximately five minutes walking distance is a hypothetical distance within which parks have their immediate influence in general, adopted in many studies (Nicholls, 2001; Wolch, 2005; New York City 2007). The coefficient of this variable represents how much impact the proximity to the park has on the survival of those business establishments.

The explanatory variables consist of locational, store-specific characteristics, and macroeconomic factors, according to previous studies (Hong, 2014; Jung, 2017; Lo, 2010; Oh, 2018). First, locational characteristics can be divided into the two categories. The first is the accessibility to transportation facilities. We assumed that the closer the distance to the main transportation facilities such as the subway stations (*sub_dist*) and the arterial roads (*dr_dist*), the higher the number of visitors to nearby stores. The second is the land use characteristics. If a store is located within residential use, it takes value one in the dummy variable (*resi_use*). Locational characteristics are also explained with Urban Network Analysis. Urban Network Analysis (UNA) can provide meaningful explanations of the store accessibility, reflecting the transportation network as well as other physical factor of the building such as the building

volume, location, and population (Sevtsuk & Mekonnen, 2012; Park & Lee, 2015). We specified the convenience to reach multiple destinations (*reach*), which is calculated as the number of accessible buildings from the subject building. The relationship with adjacent buildings (*betweenness*), is calculated as the median of buildings from the subjective building within the study area. We also specified the straightness (*straightness*) as the shortest network distances between a subject building to other buildings, closeness (*closeness*) as the shortest distance to another building from the subject building, and the accessibility to reach a store (*gravity*) as the spatial impedance required to reach each buildings to the subject building.

Store characteristics are divided into two categories. First is the building characteristics; store area (*store_area*), total area of the building of the subject store (*bld_area*), the land area of the building (*land_area*), the building coverage rate (*bcrat*), whether the store is located in the first floor (*first_flr*). The second is the 6 industrial type: restaurant (*class_restr*), publication (*class_public*), manufacturing (*class_manuf*), wholesale (*class_whs*), retail trade (*class_retail*), and service (*class_serv*). Wholesale trade includes large markets which sales goods in large quantities from manufacturers, clothing, and import sales. Retail trade here specifically includes speciality stores such as clothing and accessories, handicraft workshop, and department stores. Service industry includes medical services, beauty and hairdressing services, leisure services, and lodging services. To see the differing effect of the park proximity by industrial type, we included the interaction term as the multiplication of those two sets of variables (*class_restr_500m*, *class_serv_500m*,

class_public_500m, *class_manuf_500m*, *class_whs_500m*,
class_retail_500m).

We considered 4 types of macroeconomic factors. First, we used Gross Domestic Product (*gdp*) along with consumer sales (*cpi*) to track the inflows and outflows of consumer wealth and estimate the economic situation for the year (Breedon & Thomas, 2008; Jung & Yoon, 2017). We also considered Korea Composite Stock Price Index (*kospi*), because stock prices are related to real consumption of the retail market (Li & Wang, 2010; Nam, 2006). Also, if the economy gets better, the demand will rise (Leoker & Eeckhout, 2017). Therefore, we added Producer Price Index (*ppi*), assuming if the annual average CPI and PPI are high, the risk of closure is lowered.

3.2.2 Kernel density analysis

Kernel density estimation is a way to assess the probability density of a point data distribution using kernel function (Botev et al. 2010). The probability density differs according to the size of the smoothing parameter called the bandwidth (Sheather & Jones, 1991). In this study, we used the bandwidth (h) as the GIS default value (Silverman, 1986; Jung & Yoon, 2017).

$$h = 0.9 * \min\left(SD, \sqrt{\frac{1}{\ln(2)}} * D_m\right) * n^{-0.2}$$

SD : standard distance

D_m : median distance

n : number of points if no population field is used

(Function 1).

Kernel function is expressed as

$$f(x, y) = \frac{1}{n} \sum_{i=1}^n K_h(x - x_i) = \frac{1}{n^{\frac{d}{h}}} \sum_{i=1}^n K\left(\frac{x-x_i}{h}\right)$$

$f(x, y)$: Kernel function of estimates

n : number of points

h : bandwidth

d : data dimension

$k(x)$: kernel function

x : unknown point

x_i : i th base point

(Function 2).

3.2.3 Survival analysis

We employed a survival analysis to infer whether the creation of Gyeongui Line affect the survival of the surrounding retail districts. Survival analysis is a statistical method for assessing the occurrence and timing of an event (Allison, 2010), and has been widely applied to various fields of study including public health (Coleman, 2011), business marketing (Solomon, 2013), gentrification (Yoon & Currid-Halkett, 2015) and urban planning (Chen, 2016).

Kaplan–Meier estimator

Through Kaplan–Meier estimator, the average survival probability of retail establishments can be derived for each time unit (Goel et al. 2010). We defined the survival period as the business duration between the opening to the closing, and the event as the business closure. The survival function by the Kaplan–Meier estimator is described as below Function 3.

$$S(t_i) = \prod_{s=1}^t (1 - h_{si})$$

(Function 3).

It is the probability that the store i continue to operate from the start of the analysis until the time t_i . h_{si} is the hazard rate i.e. the ratio of the stores experiencing the business closing over the total number of the stores in the risk set at time t .

Cox proportional hazard model

We used Cox proportional hazard model, because it is a multivariate approach and we can deduct the effects of both time-variant and time-invariant variables (Song et al., 1996). The hazard function $h(t_i)$ is the risk of closing business for store i at time t (Function 4).

$$h(t|X_i) = h_0(t)\exp(\beta X_i + \beta X_{it})$$

βX_i : location and store characteristics

βX_{it} : time-dependent macroeconomic indicator

(Function 4).

βX_i is a vector of locational and store characteristics which does not change by time, and βX_{it} is a vector of the time-dependent macroeconomic indicators such as GDP growth rate, annual average KOSPI, and annual average producer and consumer price index.

Chapter 4. Results

4.1 Estimation of retail district area

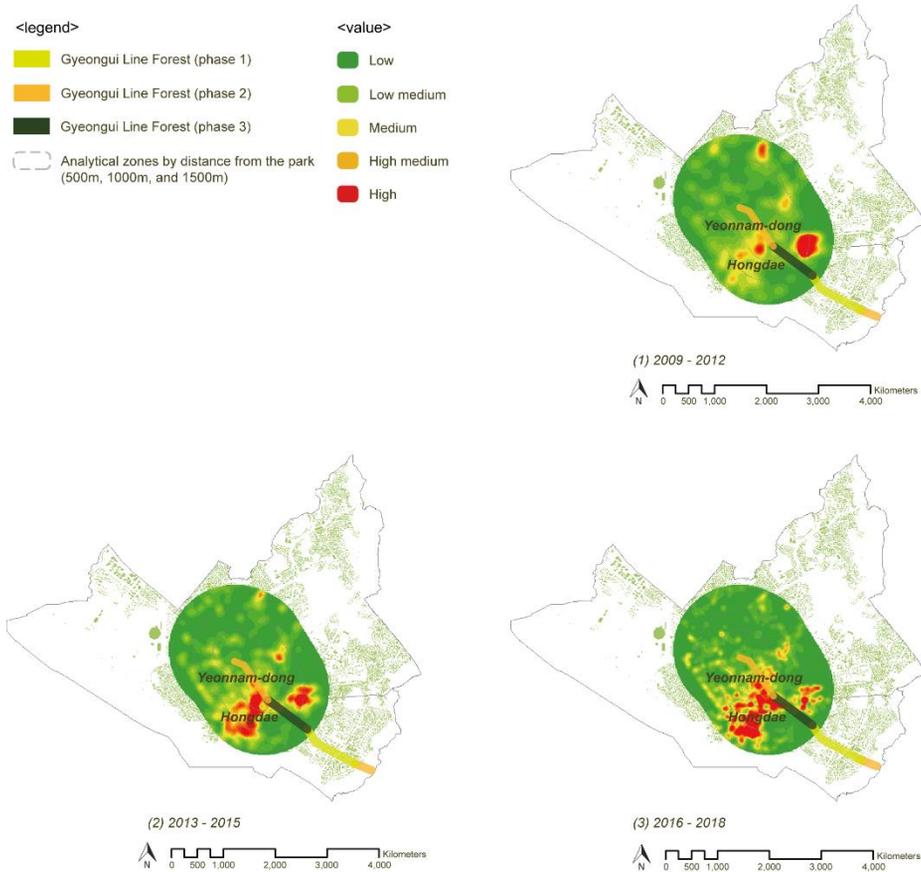


Figure 3. Kernel density of the distribution of stores in the study site from 2009 to 2018

By kernel density analysis, we can see the geographic distribution of the opening of retail establishments in the site. Fig.3.(1) illustrates the distribution of the new openings between 2009 and 2012. Along

with the design and construction phase of the park, the number of new stores in Yeonnam and Hongdae increased rapidly. The retail, restaurant, café in this area expanded to reach the Gyeongui Line Forest. On the other hand, new openings around the south–east side of the park, Fig.3.(3), gradually declined during this process.

Through this analysis, it can be observed that the creation of Gyeongui Line Forest is coincided with a general growth or decline of the nearby retail areas. While retail industries in Yeonnam and Hongdae increased alongside the park, stores with similar characteristics declined in other retail district far from the park.

4.2 Survival of stores by characteristics

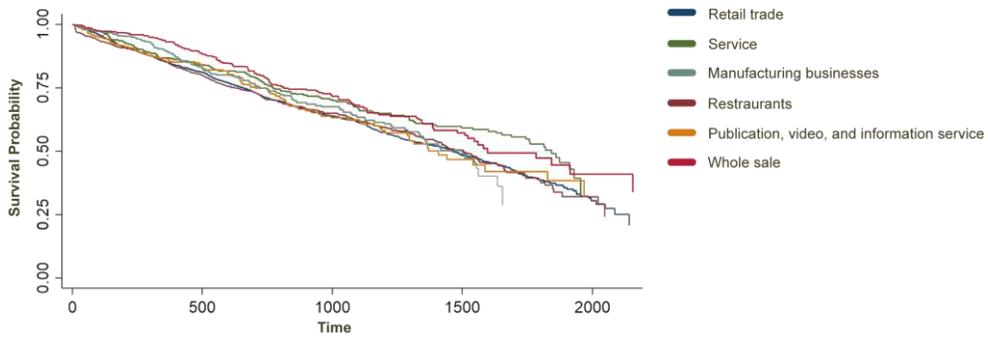


Figure 4. Kaplan–Meier estimation of industries before the creation of Gyeongui Line Forest in 2015

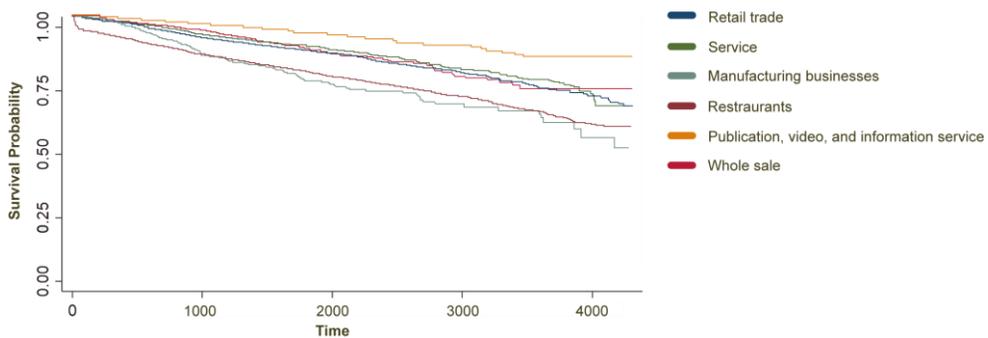


Figure 5. Kaplan–Meier estimation of industries after the creation of Gyeongui Line Forest in 2015

We present the Kaplan–Meier estimation of industries before and after the creation of Gyeongui Line Forest in Figure 4 and 5. The total 22,582 stores covered in the study, 9,674 stores or 42.84% have closed during the study period from 2008 to 2019. When looking at industries before the creation of Gyeongui Line Forest in 2015 (Figure 4), we can see that all 6 industries' survival probability goes

down constantly. The initial survival rates of stores located within the study site decreased relatively similarly at first, but the gap began to arise between industries from about 700 days (about 1.9 years) before the park was completed. This can be understood as the construction of Gyeongui Line Forest, Yeonnam-dong section began on March, 2014, existing stores were more likely to have become hard to survive than new stores flowing in. Figure 5 shows the survival probability of industries after the creation of Gyeongui Line Forest in 2015. From this, we can see the decrease of survival rate, but at the same time, we can also that the probability rate itself is much higher compared to the probability of industries before the creation of the park. The results suggest that, as discussed in previous studies, the park affects the usage behavior of commercial users (Ganser, 2017 ; Kim, 2018), and the survival of stores made after the creation of the park is better than that of existing stores due to more stores tailored to the users usage behavior (Ernst & Young, 2003 ; Jo, 2017).

In the Table 2, we present the result of the survival analysis for the business establishment opened before the park completion in 2015. Restaurants, service, and publication had a higher probability of survival compared to retail each by restaurants 0.83 times, service 0.7 times, and publication 0.27 times the fitted odds. 1.40 times the fitted odds. On the contrary, manufacturing businesses had a lower probability of survival than the retail trade by 1.40 times the fitted odds. This pattern changes after the creation of Gyeongui Line Forest in 2015 (Table 3). Restaurants had a higher rate of closure, respectively, compared with the retail industry (1.36 times). It could be assumed that the introduction of the parks was disadvantageous

to restaurant businesses, as many new restaurants have been created nearby Gyeongui Line Forest due to the behaviors of users such as freely moving in and out of the park to take out food and eat on benches or sit inside stores which can overlook the view. However, at the same time, many restaurant businesses which could not afford the sharply rising rents closed down thereby increasing the closure rate. (Jo, 2017; Lee, 2018).

Unlike the before condition, wholesales, on the other hand, had a higher probability of survival than retail trade by 51.3%. It could be assumed that because the introduction of the park attract individual consumers, it was disadvantageous to wholesale businesses which trade sale goods in large quantities.

Service and publication industries also had a lower rate of closure, by 19.7% and 73.9%, respectively, compared with the retail industry.

Table 1. Industrial type categories

Category	Sub-category	Numbers	Number of closure	Percent
manufacturing		747	399	53.41
retail		7,890	3,721	47.16
restaurant		7,177	3,326	46.73
service		2,507	967	38.73
	medical			
	beauty and hairdressing			
	leisure			
	lodging			
wholesale		2,279	750	32.9
publication, video and information		1,982	511	25.78
Total		22,582	9,674	42.84

Table 2. Odds Ratio results of industries before the creation of Gyeongui Line Forest in 2015

Variables	Description	Odds Ratio	Std. Err.	z	P> z 	[95% Conf Interval]	
Question variable							
<i>within_500m</i>	Distance to Gyeongui Line Park (in 500m dummy 1, 0)	0.910*	0.464	-1.85	0.064	0.824	1.006
Location characteristics							
<i>dr_dist</i>	Distance to road (m)	0.999	0.002	-0.38	0.706	0.994	1.004
<i>resi_use</i>	Residential area district (1, 0)	0.815***	0.044	-3.81	0.000	0.733	0.905
<i>reach</i>	number of accessible buildings	0.999	0.001	-1.35	0.177	0.998	1.000
<i>betweenness</i>	median value of the building	1.000*	0.000	-1.86	0.063	1.000	1.000
<i>straightness</i>	linear distance	1.000	0.000	0.38	0.703	0.999	1.001
<i>closeness</i>	shortest distance to another building	1.255	0.580	0.49	0.622	0.508	3.103
<i>gravity</i>	spatial resistance to arrive at store	0.997	0.019	-0.18	0.857	0.960	1.034
Store characteristics							
<i>store_area</i>	Store area (m^2)	1.000***	0.000	-4.33	0.000	1.000	0.905
<i>bld_area</i>	Area of building which the store is located (m^2)	1.000	0.000	-0.78	0.438	1.000	1.000
<i>land_area</i>	Land area (m^2)	1.000***	0.000	5.08	0.000	1.000	1.000
<i>bcrat</i>	Coverage ratio	1.001	0.002	0.63	0.528	0.997	1.005
<i>first_flr</i>	Whether the store is located in the first floor (1,0)	0.970	0.034	-0.88	0.380	0.906	1.038
Industrial type of stores							
<i>class_restr</i>	Industrial type 'Restaurant'	0.833***	0.030	-5.08	0.000	0.776	0.894
<i>class_serv</i>	Industrial type 'Services'	0.705***	0.041	-6.00	0.000	0.628	0.790
<i>class_public</i>	Industrial type 'Publication, Video and Information service industry'	0.273***	0.021	-17.11	0.000	0.235	0.316
<i>class_manuf</i>	Industrial type 'Manufacturing business'	1.401***	0.103	4.60	0.000	1.213	1.617
<i>class_whs</i>	Industrial type 'Wholesale'	1.124	0.898	1.46	0.145	0.961	1.314

Interaction between industrial type and distance

<i>class_restr_500m</i>	Interaction of industrial type ‘Restaurant’ and Gyeongui Line Park (in 500m dummy)	1.087	0.094	0.97	0.332	0.918	1.287
<i>class_serv_500m</i>	Interaction of industrial type ‘Services’ and Gyeongui Line Park (in 500m dummy)	0.833	0.118	-1.29	0.196	0.630	1.099
<i>class_public_500m</i>	Interaction of industrial type ‘Publication, Video and Information service industry’ and Gyeongui Line Park (in 500m dummy)	1.434**	0.237	2.18	0.029	1.037	1.983
<i>class_manuf_500m</i>	Interaction of industrial type ‘Manufacturing business’ and Gyeongui Line Park (in 500m dummy)	1.106	0.193	0.58	0.562	0.786	1.556
<i>class_whs_500m</i>	Interaction of industrial type ‘Wholesale’ and Gyeongui Line Park (in 500m dummy)	0.885	0.168	-0.64	0.521	0.610	1.284

Total Variable Cost

<i>sub_dist</i>	Distance to subway (m)	1.000***	0.000	6.21	0.000	1.000	1.000
<i>gdp</i>	Growth Domestic Product growth rate	1.000***	0.000	5.02	0.000	1.000	1.000
<i>kospi</i>	Annual average Korea Composite Stock Price Index	0.999***	0.000	-3.34	0.001	0.999	1.000
<i>ppi</i>	Annual average Producer Price Index	0.894***	0.021	-4.68	0.000	0.999	1.000
<i>cpi</i>	Annual average Consumer Price Index	1.407***	0.130	3.69	0.000	1.174	1.686
<i>_cons</i>		0.006***	0.004	-7.12	0.000	0.001	0.024

* Standard errors in parentheses; ***p<0.01, **p<0.05, *p<0.1

Table 3. Odds Ratio results of industries after the creation of Gyeongui Line Forest in 2015

Variables	Description	Odds Ratio	Std. Err.	z	P> z 	[95% Conf Interval]	
Question variable							
<i>within_500m</i>	Distance to Gyeongui Line Park (in 500m dummy 1, 0)	0.771***	0.727	-2.76	0.006	0.641	0.927
Location characteristics							
<i>dr_dist</i>	Distance to road (m)	0.998	0.005	-0.47	0.642	0.989	1.007
<i>resi_use</i>	Residential area district (1, 0)	0.580***	0.045	-7.03	0.000	0.499	0.675
<i>reach</i>	number of accessible buildings	0.998**	0.001	-2.43	0.015	0.996	1.000
<i>betweenness</i>	median value of the building	1.000	0.000	-0.20	0.841	1.000	1.000
<i>straightness</i>	linear distance	1.000	0.001	-0.54	0.591	0.998	1.001
<i>closeness</i>	shortest distance to another building	1.118	0.569	0.22	0.827	0.412	3.032
<i>gravity</i>	spatial resistance to arrive at store	1.000	0.032	-0.01	0.992	0.939	1.064
Store characteristics							
<i>store_area</i>	Store area (m^2)	0.999***	0.000	-6.18	0.000	0.999	1.000
<i>bld_area</i>	Area of building which the store is located (m^2)	1.000***	0.000	-3.15	0.002	1.000	1.000
<i>land_area</i>	Land area (m^2)	1.001***	0.000	6.80	0.000	1.001	1.001
<i>bcrat</i>	Coverage ratio	1.004	0.004	0.99	0.320	0.996	1.012
<i>first_flr</i>	Whether the store is located in the first floor (1,0)	0.878**	0.526	-2.16	0.030	0.781	0.988
Industrial type of stores							
<i>class_restr</i>	Industrial type 'Restaurant'	1.361***	0.080	5.29	0.000	1.214	1.526
<i>class_serv</i>	Industrial type 'Services'	0.803**	0.070	-2.53	0.011	0.677	0.952
<i>class_public</i>	Industrial type 'Publication, Video and Information service industry'	0.261***	0.046	-7.63	0.000	0.185	0.369
<i>class_manuf</i>	Industrial type 'Manufacturing business'	1.211	0.180	1.29	0.197	0.906	1.618

<i>class_whs</i>	Industrial type 'Wholesale'	0.487***	0.117	-3.00	0.003	0.304	0.780
Interaction between industrial type and distance							
<i>class_restr_500m</i>	Interaction of industrial type 'Restaurant' and Gyeongui Line Park (in 500m dummy)	0.939	0.128	-0.46	0.646	0.720	1.227
<i>class_serv_500m</i>	Interaction of industrial type 'Services' and Gyeongui Line Park (in 500m dummy)	1.459**	0.269	2.05	0.041	1.016	2.094
<i>class_public_500m</i>	Interaction of industrial type 'Publication, Video and Information service industry' and Gyeongui Line Park (in 500m dummy)	0.973	0.407	-0.07	0.948	0.429	2.208
<i>class_manuf_500m</i>	Interaction of industrial type 'Manufacturing business' and Gyeongui Line Park (in 500m dummy)	0.988	0.352	-0.03	0.974	0.492	1.897
<i>class_whs_500m</i>	Interaction of industrial type 'Wholesale' and Gyeongui Line Park (in 500m dummy)	0.884	0.513	-0.21	0.832	0.283	2.759
Total Variable Cost							
<i>sub_dist</i>	Distance to subway (m)	1.000	0.000	1.05	0.292	1.000	1.000
<i>gdp</i>	Growth Domestic Product growth rate	1.000	0.000	1.60	0.109	1.000	1.000
<i>kospi</i>	Annual average Korea Composite Stock Price Index	0.996***	0.000	-8.63	0.000	0.995	0.997
<i>ppi</i>	Annual average Producer Price Index	1.258***	0.214	13.53	0.000	1.217	0.301
<i>cpi</i>	Annual average Consumer Price Index	1.274	3.431	0.09	0.928	0.007	249.6
<i>_cons</i>		0.771***	0.727	-2.76	0.006	0.641	0.927

* Standard errors in parentheses; ***p<0.01, **p<0.05, *p<0.1

4.3 Survival rate by distance to the park

As shown in Table 2, before the creation of Gyeongui Line Park, stores in all industries within 500 m from the park has a lower probability of closing businesses compared with the rest of the industries beyond the distance. The fitted odds that a prototypical store within 500 m from the park experience a business failure is 0.91 times of the fitted odds for a store beyond 500 m range. After the creation (Table 3), a similar difference is observed with smaller magnitude. It shows stores in all industries after the creation of Gyeongui Line Park, and we can see that industries within 500 m from the park experience business failure 0.77 times of the fitted odds compared to stores beyond 500 m range. This means that the proximity to park benefits the nearby businesses more than the proximity to an abandoned railroad.

The distance variable alone describes that stores which is located beyond 500 m from the park has lower probability of survival. When the distance from the park is interacted with the industrial classification as shown in Table 2, we can see that before the creation of the park, industries related to publication experience business failure 1.434 times of the fitted odds compared to retail industries for a store within 500 m range. Looking at Table 3, service stores including medical, lodging, laundry, and beauty, also showed 1.459 times business failure compared to retail industries within 500 m range of Gyeongui Line Forest.

4.4 Factors affecting the survival of stores

Among the location characteristics, distance from Gyeongui Line Forest, location in a residential use showed statistical significance.

From Table 2, the result shows that probability of failure of stores before the creation of Gyeongui Line Forest, decreases when the stores are located in a residential area rather than commercial area by 18.5%. The probability failure of the residential area decreased to 42% after the creation of the park as shown in Table 3.

Also, Table 3 shows us that store size, building area of the store, and whether the store is located in the first floor were significant. If the store is situated on the first floor, the probability of failure decreases by 12.2%.

Chapter 5. Conclusion and discussion

Through this research, we revealed how the creation of urban parks affects the business operations of the nearby retail establishments, in terms of their survivals. To do this we first depicted the geographic pattern of new opening and closing of retail establishments around the park, then we analyzed whether the distance to the park explained would help retailers in their surviving in the market, using Kaplan–Meier method and Cox’s proportional hazard regression.

The analytical results suggested that during the creation of Gyeongui Line Forest, retail establishments located within a close range from the park experienced lower rate of closure than the ones far from the park, supporting the common belief that parks contribute to enhancing visibility as well as to increasing pedestrian volumes of the vicinity area, hence benefitting the retailers (Friedland & Palmer, 1984; Won, 2017). This finding applies when comparing industries before the park completion and after the creation, while the park benefits the nearby industries more than an abandoned railroad and decreases the probability of failure of industries. A research which aimed to look at the economic effect of pedestrianization because increasing rental values in pedestrianized areas are highly related with displacement of small shops, found that there was a positive effect between the increase of pedestrians and the increase of sales which also corresponds with our findings (Ozdemir & Selcuk,2017).

Second, we also observed some other characteristics of retail establishments that had significant influences to the survival time of

individual shops. Some researchers consider the rapid neighborhood change as gentrification. Ocejó (2011) defined commercial gentrification as an introduction of new business establishments that satisfied the needs of middle-class gentrifiers. Zukin and Kosta (2004) emphasized the importance of commercial districts when understanding the neighborhoods undergoing gentrification. The study suggested that a neighborhood should have retailers that cater to both existing and new comers, who are linked in a beneficial relation which can lead to marketable and sociable neighborhood innovation (Zukin & Kosta, 2004). Deener (2007) argued that because commercial streets have a symbolic value in building the local neighborhood identity, studying its role might be the key to solving a gentrification problem. Those with positive effects on retail establishments are stores situated in residential area, with smaller store and building size, and also situated on the first floor. This finding corresponds to the formation of a park changing the nearby industries as to visitors' usage pattern such as enjoying take-out food stores or preferring to eat on sites where they can view the park (Kim, 2018 ; Jo, 2017).

Lastly, when comparing the pattern of before and after the construction, we can see that restaurants experience a more frequent closer after the creation of Gyeongui Line Forest. Since the establishment of a park consider the park users, it can be seen that the growth rate of stores is higher in the food and retail businesses compared to similar commercial areas (Won, 2017). As the number of stores related to food industry increase due to the urban park, at the same time, more closure occurs because of problems such as high retail rents and users' taste (Park & Kim, 2019 ; Sutton, 2010).

However, in the research done by Yoon and Park (2018) which focused on the decrease in diversity of business types due to gentrification, the result showed a slight difference with our findings. They selected 16 neighborhoods from Seoul and analyzed the changes in physical environment over time. The results showed that as time goes, residence and neighborhood commerce changed into fashion or cosmetic related stores and western style restaurants. When looking at the open number of shops, restaurants were the highest but also many closed down with a percentage higher than neighborhood commerce industries such as medical services and laundry industries.

Additionally, with detailed data on retail establishments, more analysis could be possible to examine the interrelationship between business survival and urban parks. First, a variety of industry type of stores in retail districts could be analyzed. The amount of the effect park has on individual stores were different both by their characteristics and distance. In this study, we found factors affecting the survival of business retails by location, store characteristics, and macroeconomics characteristics. If there were detailed data on individual stores, such as the opening hour, and the number of customer and workers, the factors related would be more accurate. Also, data on financial statements and card use would be an indicator to economic relationship (Won, 2017; Herman, 2007).

By examining how urban parks affect retail industries, this paper offers implications for revitalizations of retail districts through environmental improvement, suggesting favorable green amenity characteristics for pedestrians and the surrounding commercial area (Peters & Elands, 2010). By providing an urban park for pedestrians,

more pedestrians will be attracted to the open space, shops will be created nearby for use, and consequently the surrounding neighborhood will be activated (Inroy, 2000).

Our research also contains expectation to provide diverse research and policy implications for urban revitalization. The long-time revitalization of cities is done by a variety of large and small projects, some in process and some already completed (Lee, 2016; Seo, 2017). From a long-term point of view, the government should implement appropriate projects interacting with green amenities which contribute to the revitalization of the city and economic aspect of commercial areas, connecting the uneven urban neighborhoods on a large scale. It would be also a helpful reference for retailers considering what kind of industry type or location to choose when wanting to be in business for a long time.

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Abstract (Korean)

공원의 조성이 주변 산업의 생존에 미치는 영향 - 홍대지역을 중심으로 -

문혜원

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이 연구는 도시 공원의 조성이 인근 상점의 생존에 어떤 영향을 미치는지 밝히는 것을 목표로 합니다. 2009년부터 2018년까지 홍대 및 연남동 상업지역에 위치한 상점들을 대상으로 생존 분석을 실시하였습니다. 이를 통해 경의선 숲길공원과의 거리가 개별 상점의 생존율에 영향을 미치는 것을 밝혀냈습니다. 구체적으로, 공원에서 500m 이내에 있는 상점은 폐업 가능성이 500m보다 멀리 있는 상점보다 낮았습니다. 또한 상점의 특성상 주거 지역에 위치한 매장, 더 큰 매장 규모, 1층에 위치한 매장 등에 따라 생존율에 차이가 있는 것으로 나타났습니다. 이 연구에서 얻은 결과와 방법론은 도시공원과 주변 상업지역의 관계를 관찰하는데 정보를 제공할 것으로 기대됩니다.

주요어: 도시공원, 홍대, 상업지역, 젠트리피케이션, 생존분석

학 번: 2018-28675