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A Study on Competition Analysis in Retail Distribution Industry Using GIS in Seoul*

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Abstract

Purpose: This study aims to utilize geographic data to analyze how various retail formats of large-scale stores around the traditional market affect the performance of the traditional market in Seoul, Korea. **Research design, data, and methodology:** The two types of catchment areas were demarcated (circle of 1km radius and Thiessen polygon) for each traditional market, and the large-scale stores located within each catchment area were identified for 153 traditional markets in Seoul, Korea. Additionally, multiple regression analysis was utilized. **Results:** The results revealed that the influence on the performance of the traditional markets were different depending on the retail format of the large-scale stores. Large discount stores were found to have a negative effect on the sales and the visitors of traditional markets, whereas complex shopping malls and department stores had a positive effect on the traditional markets. **Conclusions:** As a result of the differences in the retail format such as product categories and leisure functions, the impact of some large-scale stores on the traditional market may have a greater agglomeration effect than the consumer churn effect. Therefore, it is suggested that in the regulation of these large-scale stores, the differences in retail format should be considered for the future.

Keywords : Traditional Market, Large-Scale Stores, GIS Buffer and Overlay, Agglomeration Effect

JEL Classification Code : L81, C81, R58

1. Introduction

There are various retail formats of retail stores located around a traditional market that can influence the market's performance. Among the diverse retail stores, large discount stores and SSMs are the representative retailers that mainly influence the traditional market's performance. In recent years, instead of shrinking and reorganizing these discount stores, there is an increasing trend in the number of complex shopping malls, premium outlets, and specialty stores that can provide the combined value of shopping and leisure.

From the perspective of existing local retailers such as traditional markets, this phenomenon means that their competitors will expand into various types of large-scale stores such as complex shopping malls and outlets, in addition to the existing large discount stores. In light of this, the current study aims to use geographic data to analyze how these various retail formats of large-scale stores affects the performance of the nearby traditional markets.

Studies on the impact of large-scale stores on local retailers have been actively conducted both internationally and domestically (Ailawadi et al., 2010; Basker, 2005; Capps, & Griffin, 1998; Di, Lopez, & Liu, 2017; Ellickson, & Grieco, 2013; Singh, Hansen, & Blattberg, 2006). Most of these studies focused on the influence of the local retailers by a specific format of large-scale stores such as

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large discount stores. The conclusions derived from these studies of the impact on local retailers were also observed to be limited to the specific format of the large-scale stores that were researched. However, in reality, it can be seen that the performance of local retailers such as traditional markets is complicatedly and intricately influenced by various formats of large-scale stores located nearby (Aranda, Martin, & Santos, 2018; Fox, & Sethuraman, 2006; Gonzalez-Benito, Munoz-Gallego, & Kopalle, 2005). In order to analyze such an impact, spatial and geographic information analysis of not only the traditional markets but also large-scale stores located in the surrounding area must be preceded (Shields, & Kures, 2007). Until now, the studies on the impact of large-scale stores on the traditional market based on such geographic data were relatively insufficient (Benoit, & Clark, 1997; Shields, & Kures, 2007; Jin, & Zhang, 2018).

In Korea, the influence large-scale stores confer on the performance of traditional markets has been an important distribution policy issue for many years. Particularly, there has been controversy over the necessity of government regulations for large discount stores with the increase in new distribution channels, such as complex shopping malls. In light of this and many other factors, this study aimed to empirically analyze the relationship between the performance of the traditional market and the retail formats of large-scale stores located around the traditional market in Seoul, identified through GIS analysis.

Thus, in this study we intend to use the GIS buffer and overlay techniques to identify the location of large-scale stores in the catchment area (or trade area, market area) of each traditional market in Seoul. That is, after demarcating the catchment area of the traditional market using the buffer technique, data on the location of large-scale stores in the catchment area is obtained using overlay technique. Multiple regression analysis is conducted using data on the location of large-scale stores corresponding to the catchment area of each traditional market, and through this, an understanding of how the store formats of large-scale stores affect the performance of the traditional market is expected to be derived.

The expected contributions of this study include extrapolating trends and conclusions by empirically analyzing the relationship between the performance of traditional markets in Seoul and retail formats of large-scale stores in the surrounding area, unlike previous case studies centering on specific locations and specific large-scale stores.

The procedure of this study is as follows:

1. The catchment area of each traditional market in Seoul is demarcated using the following two methods: circles with a radius of 1km (hereinafter referred to as ‘1km radius’) and Thiessen polygons.

2. The store format of large-scale stores located in the catchment area of each traditional market is identified.

3. Through regression analysis, the effect of the store format of large-scale stores on the performance of the traditional market (sales per area and number of visitors per area) is analyzed.

2. Literature Review

In order to examine the effects of competition between traditional markets and large-scale stores, it is necessary to define what the retail format of large-scale stores are. Defining a retail format in a word is often inaccurate and inevitably confused, reflecting on the diversity and the heterogeneity of the store model (Gonzalez-Benito, Munoz-Gallego, & Kopalle, 2005). Occasionally, it is difficult to identify a clear retail format depending on the specific company's store strategy (Aranda, Martin, & Santos, 2018). For example, Wal-Mart, one of the most important distribution companies in the world, has been classified as a supercenter, large discount store, or hypermarket depending on the situation. Therefore, it is necessary to recognize the various limitations regarding the classification of the retail format (Anitsal, & Anitsal, 2011).

However, in the case of public administrators, a clear classification of retail format may be necessary for proper regulation of the retail industry (Gonzalez-Benito, Munoz-Gallego, & Kopalle, 2005). In the case of Korea, the retail formats of large-scale stores are classified in the Distribution Industry Development Act in order to develop the distribution industry and protect small retailers including the traditional markets. In the Distribution Industry Development Act, the stores with an area of 3,000 m^2 or more are classified as large-scale stores, and are classified into one of the five types of retail format (large discount store, department store, complex shopping mall, specialty store, and shopping center, see Table 1). The stores that are not included in these five retail formats are classified as other large stores. The retail format of each large-scale store is registered and managed by the local government, and this study used the internal data from the Seoul Metropolitan Government.

According to Fox and Sethuraman (2006), the competition of retail format can be largely divided into the between-format competition and within-format competition.

The within-format competition is defined as a competition between stores with the same or nearly similar product categories. From the traditional market's point of view, within-format competition can be either competition with the same traditional markets or competition with large discount stores that have similar product categories. Compared to this, the between-format competition includes

competition with department stores, complex shopping malls, shopping centers, specialty stores, and other large-scale stores in which they have different product categories from the traditional market among large-scale stores. Gonzalez-Benito, Munoz-Gallego, and Kopalle (2005) presented a model showing the intensity of competition between large discount stores, hypermarkets and discount stores in Spain. In that paper, it was argued that competition was more intense in the within-format competition than in the between-format competition.

Table 1: Retail format of large-scale stores

Category	Definition	Number	Average Area(m^2)
Large discount store	A group of stores that retail to consumers, focusing on food appliances and household goods	54	12,401
Department store	A group of stores with more than 30% of direct-managed stores as stores with modern sales facilities and consumer convenience facilities	30	32,550
Complex shopping mall	A group of stores developed, managed, and operated by one company, where shopping, entertainment, and business functions are integrated in one place and serve as cultural and tourism facilities.	9	45,742
Specialty store	A group of stores specialized in specific items such as clothing, home appliances, or household goods	22	17,012
Shopping center	A group of stores operated in the form of direct management or rental stores as a number of large-scale stores, retail stores, and various convenience facilities are integrated	36	22,613
Other large stores	Groups of large stores that do not belong to the above categories	166	9,915

A typical example of within-format competition is in the United States, which is the competition between Wal-Mart and local retailers. When a large-scale discount store such as Wal-Mart enters a local commercial area, the effect on the performance of traditional retail stores located nearby is generally negative. Capps and Griffin (1998) said Wal-Mart, which opened in the Dallas/Ft. Worth metroplex area, was responsible for 21% of the reduction in sales of a traditional food retailer comprising of 30 stores in the surrounding area. Singh, Hansen, and Blattberg (2006) found that through a case study in the Northeast, Wal-Mart absorbed bulk buyers, resulting in fewer visitors and a 17% decrease in sales to nearby supermarkets. The degree of such damage varies by region or store size. Artz and Stone (2006) compared metropolitan and suburban areas and pointed out that Wal-Mart caused a greater loss of sales to local grocery stores in metropolitan areas (8%) than in suburban areas (4%). Ellickson and Grico (2013) argued that Wal-Mart affected commercial districts within a radius of 2 km in a study surveyed from 1994-2006, and that large retailers rather than small-scale small businesses suffered damage. They also argued that old distributors were negatively affected rather than the new ones. Ailawadi, Zhang, Krishna, and Krueger (2010) argued that the entry of Wal-Mart caused significant losses to existing stores, which resulted in a sales loss of about 17% in supermarkets and 40% in other large stores.

A representative example of between-format competition can be said to be the competition between local retailers such as traditional markets and large-scale stores such as complex shopping malls and outlets that can provide combined value for shopping and leisure to the customers. The effects of this between-format competition on traditional markets have a mixture of positive and negative effects.

Retail stores differ in the manner in which they fulfill consumer expectations (Ghosh, & McLafferty, 1987). For example, in the case of merchandise assortment, large discount stores are mostly similar to traditional markets in their arrangement and merchandise assortment of groceries, while department stores, shopping centers, and specialty stores differ from the traditional markets. Complex shopping malls also have merchandise assortments that are similar to department stores and shopping centers, but differ in that they also provide leisure and relaxation options for their shoppers.

Ghosh and McLafferty(1987) regarded merchandise assortment as one of the important factors in forming value platforms of retail stores. According to Ghosh and McLafferty (1987, p.19), when two retail stores had similar value platforms, their target markets overlapped, resulting in higher levels of competition between them.

Most of these studies focus on the influence of local retailers by a single format of large-scale store. However, in reality, it can be seen that the performance of local retailers such as traditional markets is influenced by various formats of large-scale stores located in the surrounding area. In order to analyze this impact, spatial and geographic

information analysis of not only traditional markets but also large-scale stores located in the surrounding area should be preceded.

Based on the geographical location of traditional markets and large-scale stores, information on the distribution of large-scale stores in the catchment area of the traditional market can be identified using GIS buffer and overlay techniques. The buffer and overlay techniques are the techniques commonly used for market analysis in a general GIS environment, and are mainly used to quantify the market size or demand (Clarke, 1998).

Shields and Kures (2007) set up a logit model to determine the cause of Kmart's closure, and used the overlay technique to identify the other competing stores (Wal-Mart, Target, another Kmart) closest to each Kmart. Benoit and Clark (1997) used the buffer and overlay techniques to demarcate the catchment area of existing retail stores and attempted to identify the optimal location of new stores in south Leeds, UK.

The buffer technique establishes a distance or travel time boundary (circle, polygon, etc.) around a specific location on the map (Birkin, Clark, & Clark, 2017). Here we use the buffer technique to demarcate the catchment area corresponding to each traditional market. The overlay technique is a technique that integrates different layers of spatially overlapping geographic information (Ahlqvist, 2009). Here, we used the overlay technique to obtain the location information of large-scale stores that overlap with the catchment area of each traditional market.

3. Methodology

There are currently 153 traditional markets and 317 large-scale stores in Seoul, and the average area per store is 5,616m^2 and 15,437m^2, respectively. The area of large-scale stores can be seen to be about three times the area of traditional markets on average. Information on the geographical address of traditional markets and large-scale stores was based on current status data on retail businesses collected by the Seoul Metropolitan Government. The geographical addresses of traditional markets and large-scale stores collected in this way were converted into coordinates of latitude and longitude corresponding to the address by using Google Maps API (using the geocode function of the R package).

3.1. Dependent Variable

The dependent variables for measuring the performance of traditional markets were sales per area and number of visitors per area of each traditional market. Data on sales and visitors of traditional markets included survey data which was restricted externally by the small enterprises and market services (SEMAS) in 2017. The basic statistics on sales per area and number of visitors per area of 153 traditional markets located in Seoul are shown in Table 2. In the case of traditional markets in Seoul, the average daily sales per area(m^2) is shown to be 9,500 won, and the average daily number of visitors per area(m^2) is 0.87.

Table 2: Descriptive statistics of dependent variables

Variable	Mean	Standard Deviation	Median	Min	Max
Daily sales per area (10 thousand won)	0.95	1.43	0.65	0.04	15.55
Daily visits per area	0.87	1.49	0.58	0.03	17.31

3.2. Explanatory Variables

There are a number of variables or factors that can have an impact on the performance of the individual traditional market as one format of the retail stores. They include variables such as product offerings; store location; strength, number, and strategies of competitors; promotional efforts; store factors (store size, inventory levels, and number of employees), store manager factors (experience, educational level), and market factors (income, population) (Hise et al., 1983). Among them, variables such as store location, competitors in the surrounding region, and market factors are uncontrollable or sometimes irreversible characteristics that affect the performance of the traditional markets.

In this paper, we will focus on the competitors among these uncontrollable variables and examine the effect of large-scale stores in the surrounding area on the performance of the traditional markets. For this purpose, the independent variables are limited to the variables representing the number of large-scale stores by format, which are located around a specific traditional market. As independent variables, not only the number of stores, but also the size and the distance of the stores (from the traditional market) might be considered. In this context, the number of stores was selected in order to more readily observe the marginal effects on the dependent variables (sales and visitors) that result from changing the number of specific large-scale stores.

To find out which large-scale stores in the surrounding area can affect the performance of a traditional market, it is necessary to first demarcate the catchment area of the traditional market. According to Ghosh and McLafferty (1987), a catchment area is defined as the geographic area from which the store draws most of its customers and within which market penetration is highest. There are

various methods to demarcate the catchment area in consideration of factors such as store area, population, customer preferences, and competition situation (Birkin, Clarke, & Clarke, 2017; Ghosh, & McLafferty, 1987). Considering that the customers in the traditional market are mainly non-vehicle users, the following two simplistic approaches are considered.

3.2.1 Radial (ring) based approach

Radial or ring based approaches are performed by selecting and evaluating geographic data that fall within a pre-defined radial distance from the store location (Segal, 1999; Jones, & Simmons, 1993). This approach assumes that the catchment area is circular, and is centered on the store location. Radial studies are a simplistic approach, which may cause errors of omission or commission (Segal,1999). In this study, an area within a 1km radius of the traditional market is demarcated as a catchment area. This approach can be relatively valid in metropolitan areas such as Seoul where the variation in population density is not large depending on the geographical location of the traditional markets (Birkin, Clarke, & Clarke, 2010). However, depending on the distribution of traditional markets, some areas of Seoul may be excluded from the analysis (see Figure 1), and when catchment areas overlap, two or more traditional markets may exist in one catchment area. In this paper, the 1km radius for each traditional market was set using the buffer technique (st_buffer function) of the R package. Figure 1 shows the circle of a 1km radius for each traditional market, and retail stores (the traditional markets and the large-scale stores) whose locations are indicated by dots on a map of the Seoul area.

Also, we can use the overlay technique (st_intersection function) of the R package to identify the large-scale stores located in each circle (catchment area). Figure 2 shows the case of the Seokyo market (which can be also seen the dark part in Figure 1 above), one of the traditional markets, in which there are three large-scale stores in the circle with a 1km radius. It can be seen that the large-scale stores located within a 1km radius of Seokyo market are two large discount stores and one specialty store.

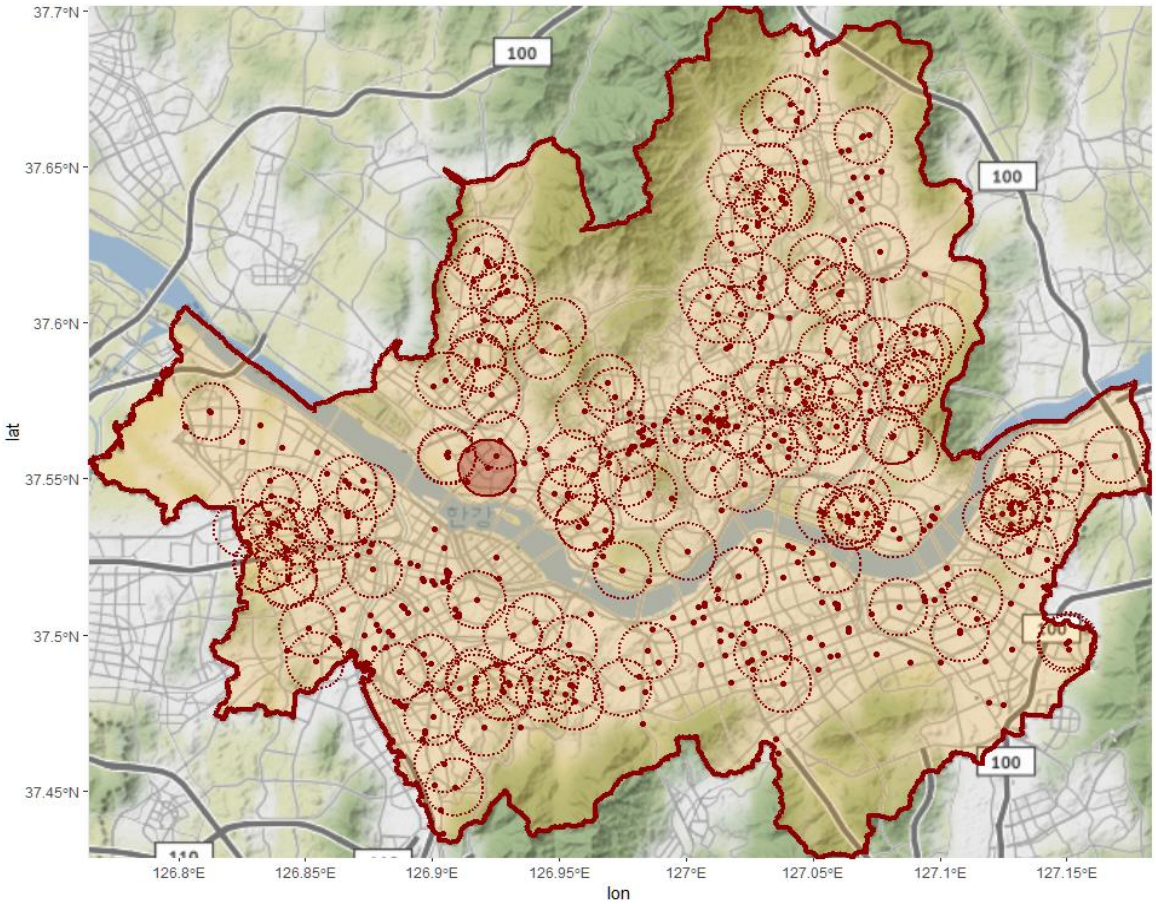

Figure 1: Catchment areas of 1 km radius

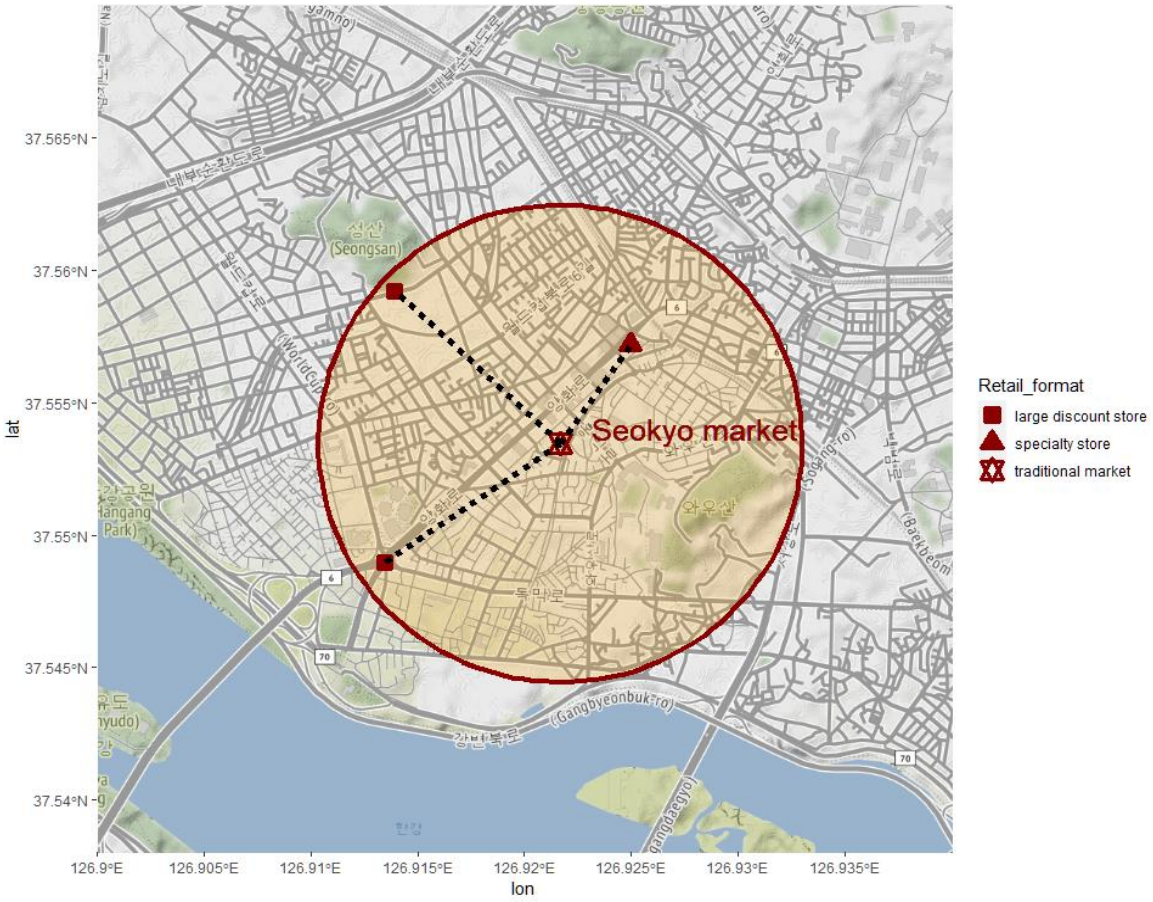

Figure 2: 1 km radius ring of Seokyo market

In this way, the information on large-scale stores located on each 1km radius can be obtained for 153 traditional markets. Table 3 summarizes the statistics of the distribution of the retail format of large-scale stores (including traditional markets) located on each 1km radius. As shown in Table 3, there are 1.6 other traditional markets, on average, within a 1km radius of the traditional market located in Seoul, and 1.3 other large stores. Others exist in the order of large discount stores, shopping centers, department stores, specialty stores, and complex shopping malls. For example, in the case of large discount stores, there are an average of 0.4 and a maximum of three within a 1 km radius.

Table 3: Descriptive statistics (radial approach)

Variable	Variable description (within a 1km radius)	Max	Mean	Min
Other_traditional_market_1km	Number of traditional markets	7	1.61	0
Large_discount_store_1km	Number of large discount stores	3	0.39	0
Department_store_1km	Number of department stores	3	0.20	0
Complex_shopping_mall_1km	Number of complex shopping malls	2	0.10	0
Specialty_store_1km	Number of specialty stores	2	0.14	0
Shopping_center_1km	Number of shopping center	5	0.31	0
Other_large_stores_1km	Number of other large stores	13	1.35	0

As described above, the independent variables are the number of each format of the large-scale stores and the other traditional markets located within a 1 km radius of each traditional market.

3.2.2. Thiessen polygon approach

The above radial approach demarcates the area within a specific distance as a catchment area from the perspective of a retail store (traditional market). However, from the perspective of visitors to the traditional market, if the other conditions are the same, then the consumers may try to go to the traditional market closest to their location (Ghosh, & McLafferty, 1987).

Thiessen polygon approach here is to identify the proximal area of each traditional market in order to demarcate the catchment areas of the traditional markets. Proximal area refers to an area closer to a reference point, and generally constructs Thiessen or Dirichlet polygons (Thiessen, & Alter, 1911). Thiessen polygons are also referred to as spatial monopoly, Voronoi, or equal competition catchment areas. Jones and Mock (1984) made a map of Thiessen polygons for a chain of fast food restaurants in Toronto.

In this paper, Thiessen polygons for each traditional market was set using the Voronoi function of the R package. Figure 3 shows Thiessen polygons for 153 traditional markets in Seoul. The dot within each Thiessen polygon area represents the closest traditional market to that area. In this case, unlike the radial approach, all areas in Seoul are included in the catchment areas of traditional markets, and only one traditional market exists in one catchment area. When these Thiessen polygons are used as the catchment areas, the size of the catchment area of the traditional market varies from 0.06 km^2 to 33.21 km^2, and the average is 3.91 km^2, which is wider than that of the circle of radius 1km (3.14 km^2).

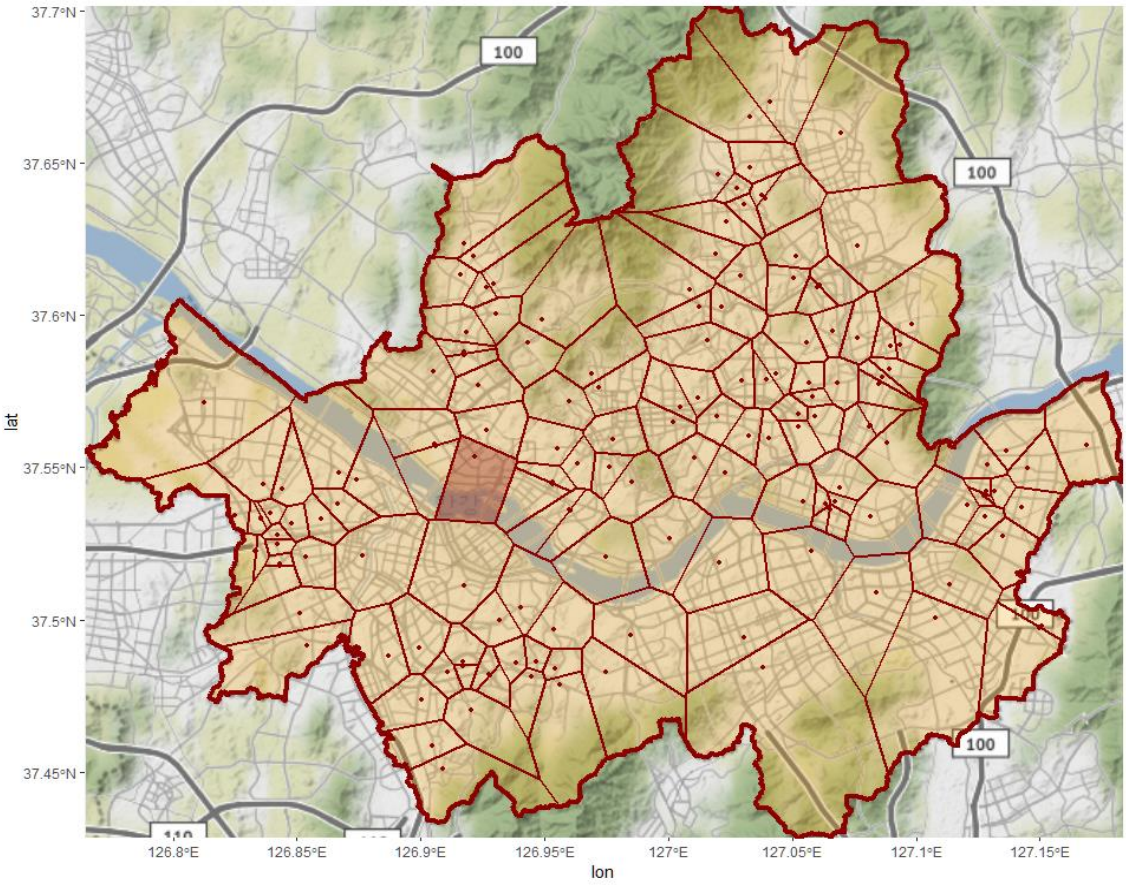

Figure 3: Catchment areas by Thiessen polygons

For each Thiessen polygon, the overlay technique (st_intersection function) of the R package can be used to identify the large-scale stores located within each Thiessen polygon. Figure 4 shows the large-scale stores located in the Thiessen polygon of Seokyo market as mentioned earlier (the dark part in Figure 3 above). As shown in

Figure 4, it can be seen that one large discount store that was included in the circle of 1 km radius was excluded, while one other large store was newly added. As a result, it can be seen that the large-scale stores located in the Thiessen polygon of Seokyo market consist of one large discount store, one specialty store, and one other large store.

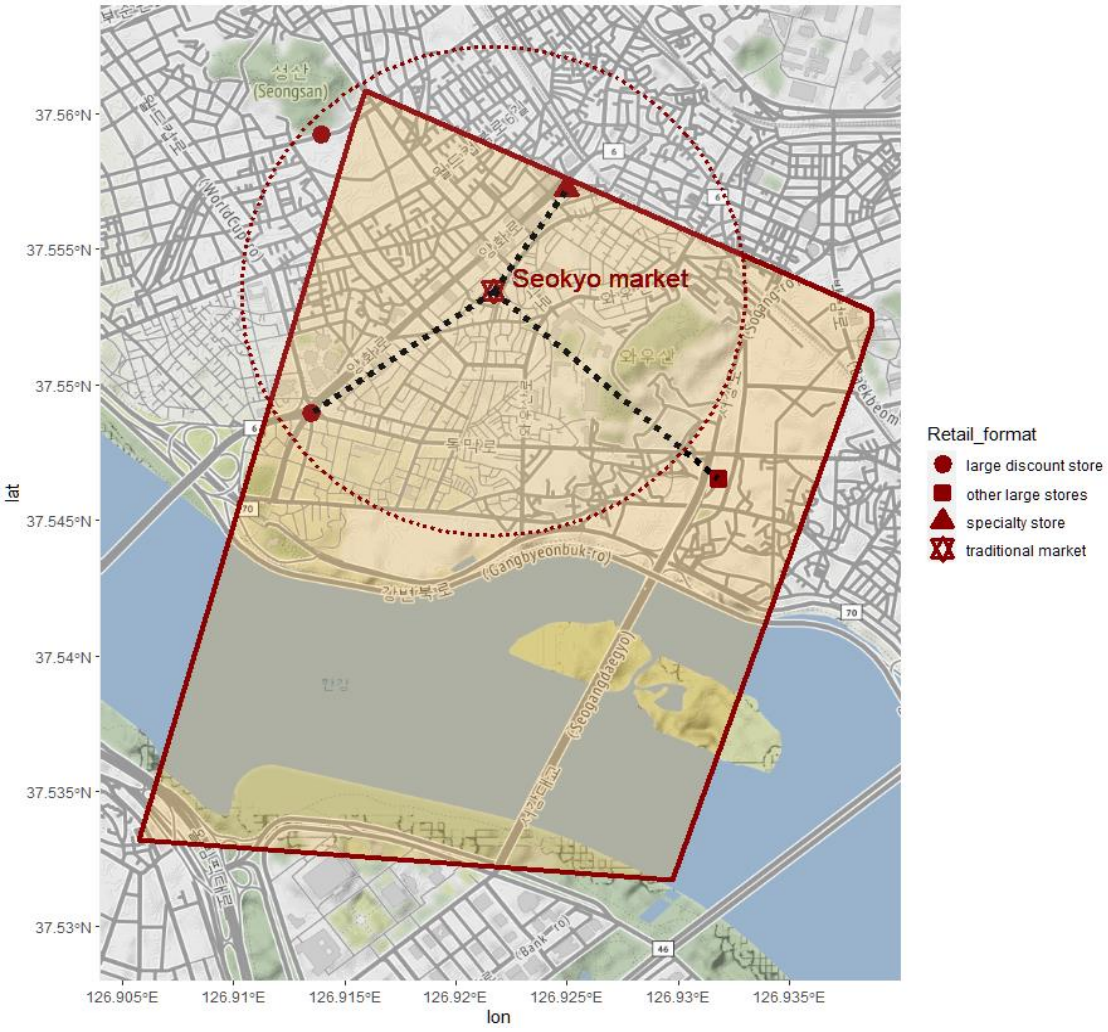

Figure 4: Thiessen polygon of Seokyo market

Table 4: Descriptive statistics (Thiessen polygon)

Variable	Variable description (within a Thiessen polygon)	Max	Mean	Min
Large_discount_store_Thiessen	Number of large discount stores	4	0.35	0
Department_store_Thiessen	Number of department stores	4	0.20	0
Complex_shopping_mall_Thiessen	Number of complex shopping malls	1	0.06	0
Specialty_store_Thiessen	Number of specialty stores	2	0.14	0
Shopping_center_Thiessen	Number of shopping center	3	0.24	0
Other_large_stores_Thiessen	Number of other large stores	11	1.09	0

Table 4 summarizes the statistics of distribution of the retail format of the large-scale stores located within the Thiessen polygons. As shown in Table 4, there are 1.1 other large stores, on average, within a Thiessen polygon of the

traditional market located in Seoul. Others exist in the order of large discount stores, shopping centers, department stores, specialty stores, and complex shopping malls. For example, in the case of the large discount stores, there are an average of 0.35 and a maximum of four within a Thiessen polygon. Of course, there is one traditional market per a Thiessen polygon. As described above, the independent variables are the number of each format of the large-scale stores (excluding traditional markets) located within a Thiessen polygon of each traditional market.

Based on the above discussion, we attempted to estimate the following two empirical models. In both models, ε is the unobserved term with a normal distribution with a mean of 0 and a variance of 1, and for the robustness of the models, the results of estimation are compared with two dependent variables of sales per area and visitors per area.

The independent variables of the first model are the number of each format of large-scale stores and other traditional markets located within the 1km radius of each traditional market.

$$\begin{aligned} sales\ per\ area\ (or\ visits\ per\ area) = {} & \beta_0 \\ & + \beta_1\ other\_traditional\_market\_1km \\ & + \beta_2\ large\_discount\_store\_1km \\ & + \beta_3\ departmant\_store\_1km \\ & + \beta_4\ complex\_shopping\_mall\_1km \\ & + \beta_5\ specialty\_store\_1km \\ & + \beta_6\ shopping\_center\_1km \\ & + \beta_7\ other\_large\_stores\_1km \\ & + \varepsilon \end{aligned}$$

The independent variables of the second model are the number of each format of the large-scale stores located within the Thiessen polygon of each traditional market. In the case of Thiessen polygons, the number of traditional market is excluded from the independent variable.

$$\begin{aligned} sales\ per\ area\ (or\ visits\ per\ area) = {} & \beta_0 \\ & + \beta_1\ large\_discount\_store\_Thiessen \\ & + \beta_2\ departmant\_store\_Thiessen \\ & + \beta_3\ complex\_shopping\_mall\_Thiessen \\ & + \beta_4\ shopping\_center\_Thiessen \\ & + \beta_5\ specialty\_store\_Thiessen \\ & + \beta_6\ other\_large\_stores\_Thiessen + \varepsilon \end{aligned}$$

4. Results

4.1. Radial (ring) approach

Table 5 is the result of regression analysis when the catchment area of the traditional market is 1 km radius. In order to test the existence of multicollinearity of the independent variables, a variation inflation factor (VIF) was calculated. Looking at the contents of the VIF column on the right side of Table 5, the VIF values of all independent variables are less than 10, indicating that there is no problem of multicollinearity.

Table 5: Regression results (1 km radius ring)

Independent variable	Dependent variable		VIF
	Daily sales per area	Daily visits per area	
Other_traditional_market_1km	-0.05121 (0.07135)	-0.06510 (0.07303)	1.11
Large_discount_store_1km	-0.37257** (0.17693)	-0.33151* (0.18109)	1.11
Department_store_1km	0.54594** (0.23894)	0.67253*** (0.24456)	1.11
Complex_shopping_mall_1km	1.53831*** (0.30139)	1.75474*** (0.30847)	1.52
Shopping_center_1km	-0.02262 (0.15403)	-0.12036 (0.15765)	1.05
Specialty_store_1km	0.18753 (0.26756)	0.13528 (0.27384)	1.23
Other_large_store_1km	0.02281 (0.06551)	0.03158 (0.06705)	1.63
Constant	0.86271*** (0.17517)	0.76488*** (0.17929)	
Observations	153	153	
R^2	0.179	0.210	

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

Table 5 show that among the seven competing store formats, large discount stores, department stores, and complex shopping malls have a significant effect on the sales per area and the number of visitors per area of the traditional market. In other words, if one additional large discount store enters the 1km radius of the traditional market, it is shown that the sales per area and the number of visitors per area of the traditional market decrease by 3,726 won and 0.33 people, respectively. This figure corresponds to 40% of the average sales per area of the traditional market, 9,500 won, and 38% of the average number of visitors per area of the traditional market, 0.87 people.

On the other hand, the increase in department stores and complex shopping malls appears to have a significant positive impact on the performance of the traditional market. In other words, in the case of a department store, the increase of one department store leads to an increase of 5,459 won (57% of average sales) in sales per area of the traditional market and 0.673 people (77% of average visitors) in number of visitors per area of the traditional market. In the case of an increase of one complex shopping mall, sales per area of traditional markets and the number of visitors per area increased by 15,383 won (162% of average sales) and 1.76 people (202% of average visitors), respectively, showing a further increase.

From the above results, the effects of within-format competition (competition between traditional markets and large discount stores) and between-format competition (competition between traditional markets and department stores, or complex shopping malls) show very patterns. In other words, if a large discount store with similar product categories exists in the surrounding area of the traditional market, sales and the number of visitors simultaneously decrease in the traditional market. On the other hand, if department stores or complex shopping malls exist, positive effects from agglomeration effects are stronger than the negative effects from increased competition. In general, the agglomeration of various retail stores in a specific region tends to increase the attractiveness of the region while reducing the cost and uncertainty of shopping (Shields, & Kures, 2007). According to Craig, Ghosh, and McLafferty (1984), such agglomeration effects can occur due to the hierarchical role of retail stores, the increase of consumers' multipurpose trips or comparison shopping, and the improvement of infrastructure due to construction of large-scale stores.

4.2. Thiessen polygon approach

Looking at the contents of the VIF column of Table 6, the VIF values of all independent variables are less than 10, indicating that there is no problem of multicollinearity.

When the catchment area of the traditional market is delimited to Thiessen polygon, the representative store format that has a significant effect on the performance of the traditional market is a complex shopping mall. In other words, when there is a large discount store in the Thiessen polygon of the traditional market, such as in the case of a 1km radius, the sales of the traditional market decrease, but when a complex shopping mall exists, the sales of the traditional market increase. If there is one complex shopping mall in the Thiessen polygon, the increase in sales per area of the traditional market is 18,498 won (195% of average sales), and the increase of visitors per area of the traditional market is 2.1 people (241% of average visitors), even more than from the case of the 1km radius.

Table 6: Regression results (Thiessen polygon)

Independent variable	Dependent variable		
	Daily sales per area	Daily visits per area	VIF
Large_discount_store_Thiessen	-0.32051* (0.19021)	-0.20618 (0.19818)	1.31
Department_store_Thiessen	-0.05104 (0.23820)	-0.11313 (0.24819)	1.61
Complex_shopping_mall_Thiessen	1.84979*** (0.50582)	2.12369*** (0.52704)	1.25
Shopping_center_Thiessen	-0.10744 (0.20797)	-0.16770 (0.21669)	1.46
Specialty_store_Thiessen	0.37236 (0.28022)	0.21708 (0.29197)	1.20
Other_large_stores_Thiessen	0.02669 (0.7390)	0.03211 (0.07700)	1.58
Constant	0.91138*** (0.13616)	0.81551*** (0.14187)	
Observations	153	153	
R^2	0.101	0.104	

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the case of a Thiessen polygon, the area of the catchment area of the traditional market is increased compared to the case of a 1km radius. In this case, it becomes more inconvenient for non-vehicle travelers to access the traditional market. Nevertheless, it is noteworthy in that the complex shopping mall shows a significant positive relationship.

5. Conclusions

5.1. Discussions and implications

In Korea, the influence of large-scale stores on the performance of traditional markets has been an important distribution policy issue for many years. In particular, with the recent emergence of the complex shopping malls as a new distribution channel, the interest in how it will affect the performance of the traditional market has been steadily increasing in this field.

In the competition between retail stores, the location of the competitive stores and its retail format are very important factors. For this study, we investigated how the market performance of traditional markets in Seoul were affected by the presence of large-scale stores that surrounded the area.

This study contributed to this field in that it enabled a more general trend analysis by empirically analyzing the relationship between the performances of 153 traditional markets in Seoul and 6 retail formats of large-scale stores in the surrounding area. Previous studies had usually only focused mainly on case studies centering on specific locations and specific large-scale stores, making this current analysis a distinctive study in this discipline.

The main findings are as follows.

First, it was observed that if large discount stores are located near traditional markets (especially within 1km), which can then be called within-format competition, the sales of traditional markets and visitors decreased by about 40%.

Second, in the case of department stores and complex shopping malls located near traditional markets, they were seen to have agglomeration effects that significantly increased sales and the number of visitors to traditional markets. In other words, since there is a difference in product categories, the negative effect of customer decline due to increased competition seems to be relatively small, and it was seen that there was a sharing of the positive effects where the consumers flowed into department stores or shopping complexes for various leisure activities. In particular, this effect was observed to be more prominent in the complex shopping malls than in the department stores.

The results of this study suggest that a differentiated policy for each retail format is needed in the location regulation for large-scale stores and are as follows.

First, according to the Distribution Industry Development Act, the area within a 1km radius of the traditional market is currently designated as the Traditional Industry Preservation Zone, limiting the entry of large-scale stores. Like previous studies, the result of negative effects of large discount stores on local retail stores highlighted the importance of location policies for these large discount stores.

Second, there has been an active claim to regulate the location of complex shopping malls like large discount stores. Looking at the results of this study, it can be interpreted that the location of the complex shopping mall has a greater agglomeration effect or spill-over effect than the substitution effect that reduces sales or visitors to the surrounding traditional market. Accordingly, it seems necessary to be more cautious about the movement to amend the current Distribution Industry Development Act to add the same location or business regulations as large discount stores for complex shopping malls.

Third, in general, the range of catchment areas affected by retail stores might have varied depending on the retail formats. In the case of large-scale stores, the range of (positive or negative) influence of complex shopping malls could have been broader than that of large discount stores. In the case of traditional markets, which were a certain distance away from complex shopping malls, negative effects from customer churn may be greater than positive effects from agglomeration. Therefore, in this study, the effect of the complex shopping malls on the traditional markets (or local economy) should be limited to the effect on the surrounding area where the complex shopping mall is located.

5.2. Limitations and future directions for research

In this study, there were inevitably several limitations, and are as follows, as well as future research tasks.

First, this study focused on the effect of large-scale stores, which have been an issue in Korea, on the performance of traditional markets. However, in addition to these competitive variables, various factors such as the store factors, market factors, and store manager factors existed as the variables that affected the performance of traditional markets. If these variables are given consideration in future studies, the explanatory power of the model will be able to significantly increase as a result.

Second, in this model, the number of large-scale stores located within a certain range was considered. However, for competition between retail stores, the actual distance (or

travel time) may be more important. Therefore, it can be a more realistic model if the distance between the traditional market and the large-scale stores are examined as a variable in future research.

Third, this study considered only the large-scale stores prescribed by the Distribution Industry Development Act as major competing stores for the traditional markets. However, the presence of local retail stores such as local supermarkets and convenience stores, as well as smaller SSMs, can sufficiently affect the performance of traditional markets as well. Along with these, the influence of online shopping, which has been increasing in weight recently, should be scrutinized in future studies as well.

Fourth, in general, the spatial shape of a specific traditional market is atypical and it is difficult to specify the coordinates of the center point of the shape. In the case of this study, the registration address of the traditional market was used as the coordinates for the center point. Therefore, there might have been limitations in setting the center point depending on the spatial shape of the traditional market.

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