

# Assessing the Impact of Pedestrian Traffic Volumes on Locational Goodwill

## 보행자통행량이 상가권리금에 미치는 영향의 평가

정승영\*

Jeong, Seung-Young

### ABSTRACT

The effect of passing pedestrians' characteristics on locational goodwill was empirically modeled and tested. The theoretical basis for the study was central place theory, bid rent and agglomeration theory, and demand externality theory. The data included information on goodwill, retail rents and passing pedestrians' characteristics in 100 retail trade areas in Seoul. The empirical model was tested with the sample of 1,307 retail units in Seoul, South Korea. The data set was analyzed with the Classification and Regression Tree software. As the results, using the regression tree method, the variables does affect locational goodwill in the each retail trade area were the volume of pedestrians around 2:00 pm on weekdays, volume of pedestrians around 4:00 pm on weekdays, and volume of pedestrians around 8:00 pm on weekdays. In summary, not only the economic base in the retail trade area but also the volume of passing pedestrians should be considered to determine the locational goodwill.

• **KEYWORDS** : Passing Pedestrians, Goodwill, Retail Trade Area, Retail Rents, Classification and Regression Tree(CART)

### 초록

통행하는 보행자의 특징이 상가권리금에 미치는 효과를 실증적으로 모형을 구축하고 시험 하였다. 이 연구를 위한 이론적 근거는 중심지 이론, 입찰지대, 집적이론, 외부수요 이론이다. 자료에는 서울시

\* 김포대학교 물류부동산과 조교수(전자우편: jk0519@kimpo.ac.kr)

100개 3.3㎡당 상권의 상가권리금, 3.3㎡당 상가보증금, 3.3㎡당 상가월세 그리고 보행자의 특성과 관련된 정보가 포함되어 있다. 실증분석은 서울시 상가 1,307개를 표본을 사용하여 시험하였다. 그리고 자료집합은 회귀나무 및 회귀방법을 이용하여 분석이 이루어졌다. 이 분석한 결과로서, 각각의 상권에서 상가권리금에 영향을 주는 변수는 평일 오후 2시 보행자의 통행량, 평일 오후 4시 보행자의 통행량, 평일 오후 8시 보행자의 통행량이다. 요약하면, 상권의 경제적 기반을 뿐만 아니라 통행 보행자의 특징은 상가권리금을 결정하기 위해 고려되어야한다.

• **주요어** : 통행 보행자, 상가권리금, 상권, 상가임대료, 분류 및 회귀나무(CART)

## 1. Introduction

After the disputes about compensation of the goodwill in 2009, the South Korean Government has revised the commercial building lease protection on act to compensation the goodwill, and the investors put a special emphasis on the goodwill in retail property market. The tenants have been more interested in the goodwill that has been traded in retail property market and provided a index to estimate the economic base of retail trade-area. In the retail property market, the investors focus on the strip center and pedestrian shopping streets that usually have very high volume of pedestrians. The shopping centres in the large housing complex were regarded as a good investment because of the large potential customers in the areas. The property investors were much interested in the indicators that can forecast the rents and risks in the retail property market. The amount of

goodwill is one of the important items in the retail lease contract including deposit bond and monthly rents. The impact of location on rents has been mainly studied in real estate studies, urban economics, and regional economics. The volume of foot traffic of retail stores depended on the location, and it is one of important criterion for selection and valuation of a retail store. The volume of foot traffic is one of the vital indexes of the retail trade-areas for property market analysis and property development. It is an important factor in determining goodwill, selection of tenants' mixture, estimation of retail sales, evaluation of shopping center's attractiveness. There were not many empirical analyses of the relationships between volume of foot traffic and goodwill, as it was very hard to get the related data. Most of the previous researches focus on the populations in the retail trade-areas and the distances from

workplace or home to retail stores. But, the number of visitors in the shopping centre generated by a anchor tenant was considered as an important factor to determine the lease conditions for the anchor tenant, including rents, lease terms, size of the store, allocation of space, and type of business. The volume of foot traffic on shopping streets was recently regarded as one of the important factors in the retail property market. Sirmans and Guidry(1993) showed the volume of passing foot traffic as one of factors which influenced on the rents and retail sales in the retail property market.

This study of relationship between the volume of passing pedestrian and the goodwill would be useful to recognize the effect of pedestrian on goodwill of retail property. It provided necessary information for determining goodwill, estimation of retail sales, selecting location, decision on type of business, marketing strategy, and competitive activities in the retail property market<sup>1)</sup>. This article is organized as follow: in the section two literature concerning goodwill and retail rents; the third section describes a theoretical model; in the fourth section data which is used in this research; empirical analysis in the section 5; and conclusions in the section 6.

## 2. Goodwill, Retail Rents and Passing Pedestrians

The factors that influence the goodwill can be classified into the following four levels. Firstly, the national economic conditions affects goodwill. the goodwill are influenced by interest rates, Gross Domestic Products(GDP), inflation rate, and revised commercial lease protection laws. Secondly, Regional Characteristics, including the urban's spatial structure, condition of regional economy, average of land price and retail rents of the surrounding housing market, accessibility of public transportation system, and utilization of surrounding land also determine the goodwill.

Thirdly, at the local level, the retail area's purchasing power, supply and demand, competition, volume of passing pedestrians, increase in local population (natural and societal increases), occupancy rate of the surrounding stores, number of households, density of population and household, income level, new housing construction, level of competition and protection, influence the goodwill and retail rents. Lastly, in terms of the property level, goodwill are influenced by the factors such as, distance from the city centre, length and width of

1) Jeong, Seung-Young, et al.(2013), 「The effect of passing pedestrians Characteristics on retail rents,」, Appraisal studies, Vol.20, pp.111-123.

shopping strip, distance from public transportation, quality of the building, location of the store within shopping mall, and type of business. For the goodwill determination models, the multiple regression analysis was generally used, and the least squares method for deduction equations. The retail rents have associated with tenant profile, gross floor areas of shopping centre, interaction between lease terms and percentage rent, relative size of shopping centre, age of property, and the presence of anchor tenants (William, 2001; Sirmans & Guidry, 1993; Benjamin, Boyle & Sirmans, 1992). Vandell and Cater(2001) explained the types of store locations in a shopping mall with bid-rent curve, and there were diverse aspects of the bid-rent curve with the distance from the centre of the shopping mall and type of store. Samuelson(1976) defined customer traffic generators as the retail demand externalities, and Sirmans and Guidry(1993) argued that higher volume of consumer traffic was a prerequisite for the success of a store. Ownbey, Davis and Sundel(1994) present that accessibility factors such as parking and traffic, and visibility factors such as retailer exposure helped to explain the variability of neighborhood

shopping centre rents. The combined factors of the distance from the anchor store, the size of anchor tenant, and store type were regarded as one independent variable representing the volume of foot traffic. There were few studies that analyzed the volume and characteristics of passing foot traffic as number of independent variables for the retail rents. Goodwill are determined by the equilibrium between supply and demand for retail real estate. Different from the housing market, the supply and demand for retail stores should be related the supply and demand of the goods handled in the retail stores. The Volume of foot traffic around the stores and total retail sales can be the representative variables for demand for stores. The large volume of passing foot traffics can forecast the amount of visitors into the store. Furthermore, an increase of a store's potential total retail sales means that an increase in demand for the goods in the store. It will be then translated into an increase in demand for the actual retail store. Ultimately, such an increase will result in an increase in the goodwill<sup>2)</sup>.

### 3. Theoretical Model

The goodwill can be formulated with the

2) Jeong, Seung-Young, et al.(2013), op. cit, pp.111-123.

following combination of variables. The research hypothesis of this study is that ‘the goodwill are associated with the volume of passing pedestrians’.

$$GW_{jt} = f(PE_{jt}, RE_{jt}, MA_{jt}, PR_{jt}) \quad (1)$$

The dependent variable  $[Goodwill_{jt}]$  shows the average goodwill per  $3.3m^2$  at the retail real estate  $[j]$  and the time period of  $[t]$ . Independent variable  $[PE_{jt}]$  shows volume of foot traffic in one day;  $[LE_{jt}]$  is a vector of the level of average real estate price ;  $[MA_{jt}]$  is vector of the economic base for the retail trade-areas ; and  $[PR_{jt}]$  is a vector of retail real estate characteristics variables.

### 3.1. Volume of foot traffic

The volumes of foot traffic are useful data to provide the actual number of foot traffic and their characteristics. The large volume of passing foot traffic is an indicator of the demand side of the market. The data of foot traffic are particularly useful for housing and retail property market rather for industrial property market. The retail stores need large volume of foot traffic. A large volume of foot traffic is a vital condition for retail trade areas and a

guideline for planning of the size of retail trade-areas. About 10% of the foot traffic are considered as the possible customers to purchase goods from a store. A large volume of foot traffic can be generally translated into a high goodwill, and the goodwill are determined by the quality and quantity of the foot traffic regardless of the total retail sales. The shops with less volume of foot traffics could pay less for goodwill, but they should spend more on marketing efforts. The volume of foot traffic is closely associated with the business type of the stores.<sup>3)</sup>

### 3.2. Statistical Characteristics of the foot traffic

The retail sales of a store are determined by the quality and quantity of the population around the area. The statistical characteristics of foot traffic have influenced on not only the total retail sales of a store but also its rents and goodwill. The volume of young foot traffic who pass the front of a store and the proportion of female foot traffic in them affect the type of business and goodwill for the store. The volume of foot traffic, their occupations, and peak traffic hours vary according to the main business activities of the particular area

3) Jeong, Seung-Young, et al.(2013), op. cit, pp.111-123.

where the store is located. The stores located in the city centre have a high number of female shoppers and the stores near business areas a high number of male ones. Male and female foot traffics in their teens, 20s, 30s, and 40s represent the population with high productivity and high spending power and they may increase the retail activities in the area. Especially, the male and female foot traffic in their 20s can increase the retail activities in the area. The goods sold by a particular store as well as its price are influenced by the characteristics of the foot traffic(numbers, age, education, job, and culture).<sup>4)</sup>

### 3.3. Volume of foot traffic by Time Frame

The volume of foot traffic per time frame is important information to identify the time for most and least number of pedestrians. The volume of foot traffic varies according to daily, weekly, seasonal, and yearly cycle. In South Korea, the highest Volume of foot traffic would normally occur in early spring, summer holidays, and year-end. The volume of foot traffic in a city centre generally shows two or three peaks in a day, between 8:00 and 9:00 am, between 12:00 pm and 2:00 pm, and between 6:00 and 7:00 pm.

The peak hours of the foot traffic for a store could vary according to the local characteristics of the shopping area.

The shopping areas of the city centre has the peak hours of foot traffic between 6:00 and 7:00 pm, and the shopping centers have the peak hours between 4:00 and 5:00 pm with lot of female pedestrians. The residential areas have the peak hours of foot traffic during commuting hours instead of daytime.<sup>5)</sup>

### 3.4. Volume of foot traffic by Location

The location of a store determines the total retail sales and the value of the store. It is also closely associated with the local retail activities. An area with more than average 5,000~6,000 passing foot traffics per a day is the best location for retail stores. Good retail stores are located in the areas with easy customers' access and high volume of foot traffic. Where the front store is facing a subway exit or a bus stop, there would be a high volume of foot traffics and a higher goodwill. Hence, the changes in transportation such as new subway and development of bus terminals will influence on the Volume of foot traffic in those retail areas nearby.<sup>6)</sup>

4) Jeong, Seung-Young, et al.(2013), op. cit, pp.111-123.

5) Jeong, Seung-Young, et al.(2013), ibid., pp.111-123.

6) Jeong, Seung-Young, et al.(2013), op. cit, pp.111-123.

### 3.5. The monthly rent or deposit bond of retail trade-area

The center has high land price, so the price of housing, deposit bond for renting housing, rental price of office, and retail rents are set at higher price. Higher average deposit bond and monthly rent for store within retail trade-area lead to higher rental price per 3.3m<sup>2</sup>. Among them, the average retail rents of retail trade area represents the present and future economic power index of retail trade area, so this study included deposit bond and monthly rent as important variables.

### 3.6. Major Industry groups

The source of demand for real estate is a part of the business activity in a given region. Changes in hiring practice of economically active population for each industry greatly affect the market, and they are followed by changes in the consumption patterns. That is, people working in the secondary or tertiary industry maintain the westernized life style, so they contribute greatly in increasing the demand for consumer goods including durable consumer goods. In this case, department stores with the concentration of whole and sales busi-

nesses or discount stores with restaurants will suitably cater to the population as well as the food court, entertainment district, hotel, cram school, or theater.<sup>7)</sup>

## 4. Data

The data for this research were collected in May 2014 by the Korea Chamber of Commerce · Industry (KCCI) and Seoul Metropolitan Government for the major retail trade areas in South Korea. The total sample areas are 100 major retail trade-areas and the collected data were the monthly rents, goodwill per 3.3m<sup>2</sup> and the volumes of passing pedestrians. Most of the sample stores are located in the ground floor of the retail buildings in the 100 major retail trade-areas. The average goodwill were KRW 1,328,881 per 3.3m<sup>2</sup>(US\$ 1,308.91 per 3.3m<sup>2</sup>) and the highest goodwill were KRW 2,064,900 per 3.3m<sup>2</sup>(US\$ 2,033.98 per 3.3m<sup>2</sup>).

The commercial areas in Jongro, Gangnam subway station and Kunkook University subway station show the highest goodwill in Seoul. The guarantee deposits of a store were an average of KRW 112.87 per 3.3m<sup>2</sup>(US\$ 1,111.80 per 3.3m<sup>2</sup>) with ranging from 580,000(US\$ 571.32 per 3.3m<sup>2</sup>) to KRW 2,790,000 per 3.3m<sup>2</sup>(US\$ 2,748.23 per 3.3m<sup>2</sup>).

7) Jeong, Seung-Young, et al.(2013), *ibid.*, pp.111-123.

It means that there were large differences among the retail rents and the guarantee deposits according to the location of a store. The volume of pedestrians for each study areas was measured on Thursday(weekday) and on Saturday(weekend) between 12:00 pm and 1:00 pm, between 4:00 pm and 5:00 pm, and between 7:00 pm and 8:00 pm respectively. The pedestrians were divided into male and female in their teens, 20s, 30s, and over 40s, and tertiary industry by retail trade-areas in seoul averages 25,867.72 firms, ranging 14,427 firms from 0 to 55,294 firms.

### 5. Empirical Results

Figure 1 shows the average volume of pedestrians according to the time frame. The highest volume of pedestrians occurred between 7:00 pm and 8:00 pm in weekend and the lowest volume of pedestrians between 12:00 pm and 1:00 pm in weekday. There were more pedestrians in weekend rather than in weekday and there were more pedestrians between 7:00 pm and 8:00 pm rather than around noon in weekday and weekend.

#### 5.1. Analysis of Relationship between the Variables

The correlation analysis was carried out to investigate the relationships between the

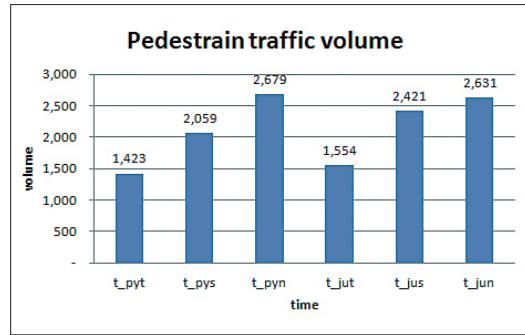


Figure 1. Volume of Pedestrians

Note:

t\_pyt = total volume of pedestrians around noon in weekday ; t\_pys = total volume of pedestrians around 4:00 pm in weekday ; t\_pyn = total volume of pedestrians around 7:00 pm in weekday ; t\_jut = total volume of pedestrians around noon in weekend ; t\_jus = total volume of pedestrians around 4:00 pm in weekend ; t\_jun = total volume of pedestrians around 7:00 pm in weekend

goodwill and the independent variables. The highest correlation coefficient between the goodwill and the volume of pedestrians was 0.50(p-value <0.01) and the null hypothesis can be rejected. The Pearson Correlation Coefficients between the goodwill and the following volumes of pedestrians were: 0.49(p-value=0.01) with the volume of male pedestrians in the 20s around noon in weekend ; 0.37(p-value=0.05) with the volume of female pedestrians in the 20s around noon in weekend ; 0.50(p-value=0.05) with the volume of male pedestrians in the 20s around 4:00 pm in weekend; 0.48(p-value=0.05) with the volume of male pedestrians in the 20s around



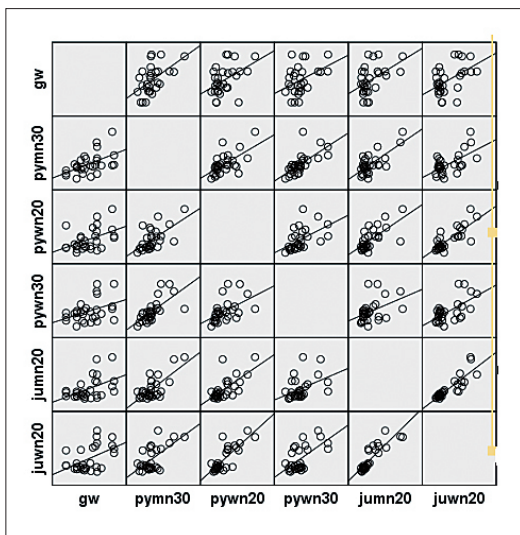


Figure 2. Scatter Plot Matrix Response Variable and Major Explanatory Variables

Notes:

- GW = Average goodwill per 3.3m<sup>2</sup>
- PYMN30 = volume of male pedestrians in 30s around 7:00 pm in weekday
- PYWN20 = volume of female pedestrians in 20s around 7:00 pm in weekday
- PYWN30 = volume of female pedestrians in 30s around 7:00 pm in weekday
- JUMN20 = volume of male pedestrians in 20s around 7:00 pm in weekend
- JUWN20 = volume of female pedestrians in 20s around 7:00 pm in weekend

noon in weekend ;and 0.50(p-value=0.05) with the volume of female pedestrians in the 30s around 7:00pm in weekend ; 0.53(p-value=0.05)with the volume of male pedestrians in the 30s around 7:00pm in weekday ; and 0.45(p-value=0.05) with the volume of female pedestrians in the 20s around 7:00pm in weekday ; also0.40(p-

value=0.05) with the volume of female pedestrians in the 30s around 7:00pm in weekday. Figure 2 shows that there are weak relationships between the goodwill and the volumes of pedestrians. There are strong relationship between the volume of pedestrians in weekday and one in weekend(correlation coefficient=0.500, p-value=0.00).

## 5.2. Classification and Regression Tree (CART)

This study used the Classification and Regression Tree(CART) of SPSS Answer Tree(version 3.1) software. The tree diagram in Figure 3 shows that the first node is split into two child nodes based on total volume of pedestrians in weekday. The cases with more than 6,161.48 passing pedestrians in weekday have higher goodwill(average KRW 1,328,812 per 3.3m<sup>2</sup>, USD1,308.92 per 3.3m<sup>2</sup>).The cases with less than1,544 passing pedestrians in weekday have lower goodwill(average KRW 1,399,000 per 3.3 m<sup>2</sup>,USD1,376.70 per 3.3m<sup>2</sup>). Hence, the goodwill can be affected by the volume of pedestrians. Then each child node is split into second child node based on total volume of pedestrians in weekend and the volume of female pedestrians around 7:00 pm in weekend. The tree diagram shows

the subsequent splits based on the volume of female pedestrians around 4:00 pm in weekday and total volume of pedestrians in weekend.

In Figure 3, the first split variable is the volume of pedestrians on Tuesday of weekday and the result decreases in dispersion by 6057 (Improvement=486.5748). It shows that the split significantly lower total

dispersion. This means that the volume of pedestrians on Tuesday of weekday is the most important variable to determine the goodwill.

The retail trade-areas where the volume of pedestrians on Tuesday of weekday exceeds 6,057 are again split into two areas with the volume of pedestrians on Saturday over 5,286.5 and less 5,286.5. The retail

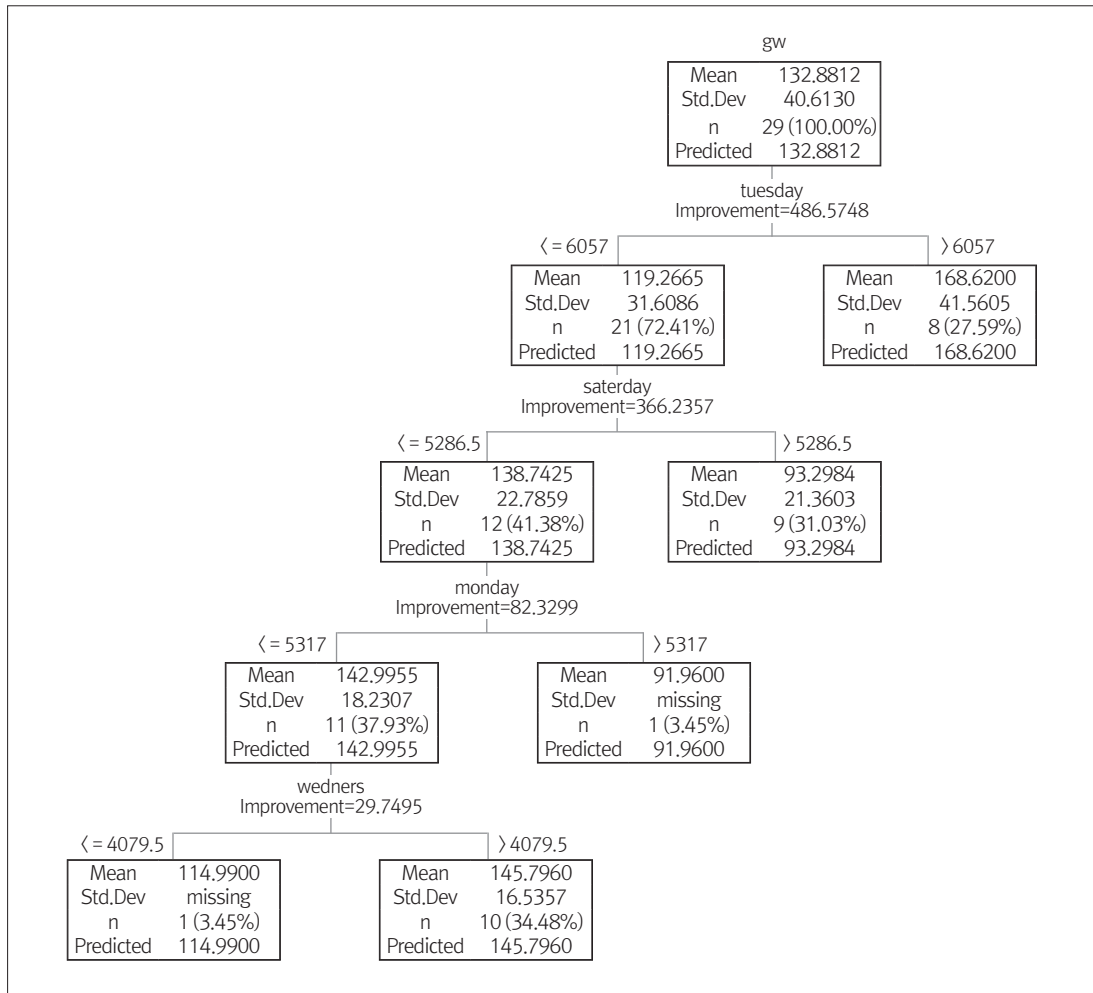


Figure 3. Regression Tree (Goodwill and Volumes of Pedestrians in Weekday and Weekday)

trade-areas where the volume of pedestrians on Monday of weekday is less than 5,317 are again split into two areas with the volume of pedestrians on Wednesday of weekday. Population is the basic unit of demand for goods or services. The demand here means the valid demand for goods or services, and it is included in this study as a major variable because the object among the population is determined by the types of goods or services. Fixed and floating population is directly related to the amount of sale in retail real estate. Thus, the valu-

ation of retail real estate is proportionally related to the number of people passing through the area.

The average retail property price of retail trade area represents the present and future the economic conditions index of retail trade area. Retail rent is also interpreted as the index which reflects the present and future possibility of the relevant retail trade area.

Figure 4 shows a different variable to avoid the same standard in the nodes and to use different classifications, which will

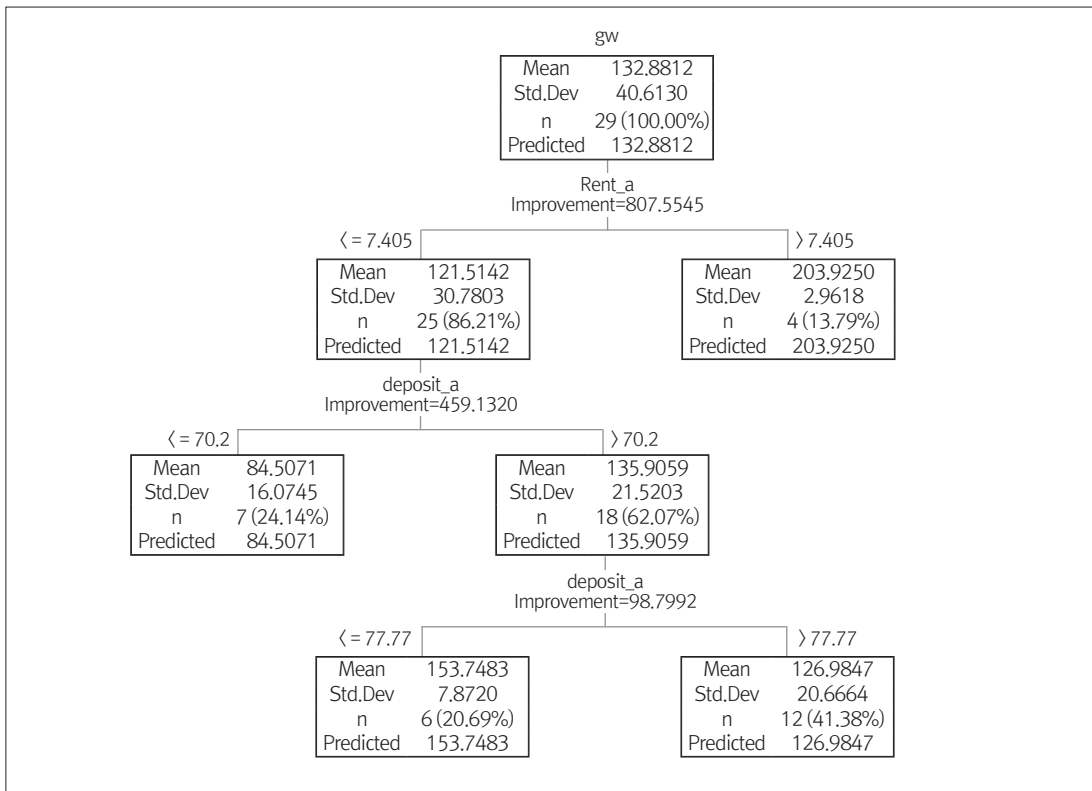


Figure 4. Regression Tree (Goodwill and Volume of Pedestrians in Time Frame)

maintain the maximum results and re-  
place the optimum separation standard.  
The substitute variable for goodwill in  
Figure 5 is the average monthly rents and  
deposit bond per m<sup>2</sup> in the retail trade-  
area(Improvement=807.55). for example,  
that tenant mix in retail trade-areas affect  
to some extent shopping center patronage.

Table 1 show a risk indicator to evaluate  
the decision tree automatically established  
to predict the average goodwill.

Table 1. Goodwill Data Risk Indicator

Risk Statistics		
	Root node	Child node
Value	1,592.54	76.99

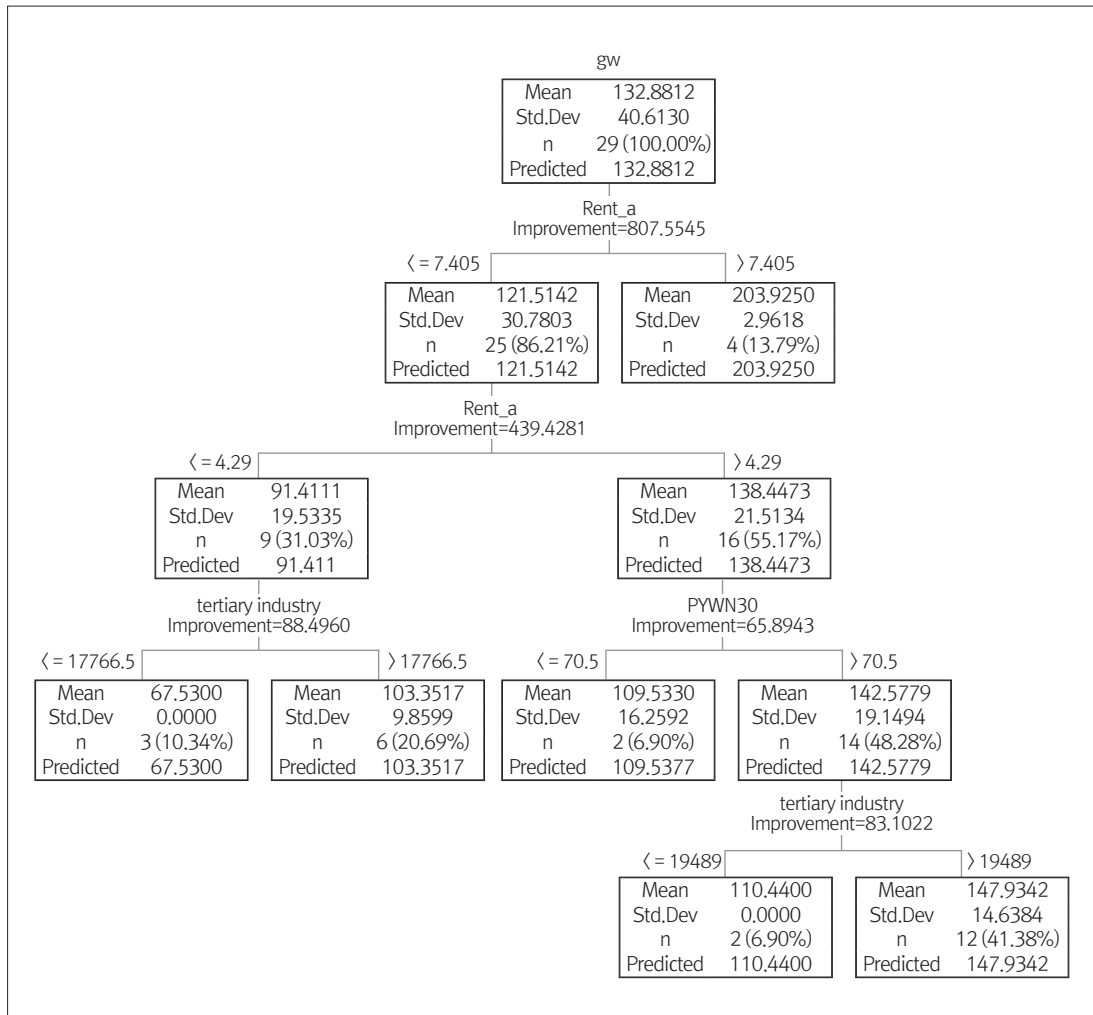


Figure 5. Regression Tree Using Substitute Effect Variable

The risk prediction number(1,592.54) indicates the inter-group dispersion of the second generation node that is the result of subtracting the increment of each node from total dispersion. The smaller risk prediction number is preferred. The total dispersion is 1,592.54(risk forecast for root node) while the dispersion in child node is 76.99. The dispersion rate between the root joint only and the occurrence of a regression tree is 0.048 ( $76.99/1592.54=0.048$ ), and it means that this regression tree could explain 95.1%( $100-4.8=95.1$ ) more than the result with the root node only.

The combinations of highly significant positive coefficients on the trade purchasing power variable inclusive of the statistically significant Demographic Characteristics and core business variable coefficient indicates that agglomeration are important determinants of the average goodwill.

The result from analyzing the final OLS(Ordinary Least Square) regres-

sion model using the stepwise regression method is summarized in Table 2 below. The stepwise selection of variable was appropriate for this scenario because the value of F0 was higher than values obtained from other variable selection methods.

When the statistic of 30 explanatory variables is investigated, P-values of only two variables are below 0.05, thereby making them significant above 95% confidence level. In addition, the adjusted coefficient of determination(adjR2) which denotes the explanatory power of the optimal regression model was 0.60, which was rather high when compared to the results from previous studies. Based on the parameter estimate of regression coefficient, implies the following regression equation:

$$\ln_{\hat{y}} = -2.584 - 0.379*(\ln_{\text{the volume of pedestrians on Wednesday}}) + 0.684*(\ln_{\text{average deposit bond}}) - 0.449*(\ln_{\text{average monthly rents}}) + 0.590*(\ln_{\text{single-person household}}) + 0.558*(\text{tertiary industry}) + e \quad (2)$$

Table 2. OLS regression models

Variable	Parameter Estimate	Standard Error	t Value	Prob >  t	Variance Inflation
Intercept	-2.584	1.809	-1.428	0.169	
The Volume of Pedestrians on Wednesday	-0.379	0.184	-2.063	0.053	2.0
Average Dopsit Bond	0.684	0.321	2.132	0.046	4.4
Average Monthly Rents	-0.449	0.272	-1.651	0.115	4.8
Single-person Household(%)	0.590	0.196	3.012	0.007	1.5
Tertiary Industry	0.558	0.150	3.727	0.001	1.9

Next, this study investigated the relative importance of variables in explaining goodwill. Here, when the standard error of the estimate was employed to find out the weight of each explanatory variable, the importance decreased among the variables in the following order: tertiary industry(+3.72), single-person household(+3.01), average deposit bond(+2.13), the volume of pedestrians on Wednesday(-2.06).

## 6. Conclusion

Prior empirical analysis of goodwill has been limited. The focus of this study is the impact of the volume of foot traffic on the goodwill. The theoretical model was developed from the location theory and valuation theory for goodwill. The empirical model was tested with the sample of 1,307 retail units observations in Seoul, South Korea. The data set was analyzed with the Classification and Regression Tree (SPSS Answer Tree 3.1) software. The results show that the goodwill in Seoul can be influenced by the volume of pedestrians on Tuesday of weekday(+), average deposit bond(+), single - person household(+), and number of the tertiary industry in the retail trade-area(+). in conclusion, The passing pedestrians and the group of the residents of an market area affects goodwill. Especially, the 20 to 30 age group spends a

higher percentage its discretionary income. Hence, the retail real estate developers should consider not only the retail sales but also the volume of foot traffic to estimate the goodwill. Also the real estate developer considers the importance of foot traffic and economic base in determining retail rents and goodwill.

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