

The Formation Factors and Distribution Analysis of High-Class Residential Areas in Seoul

서울시 고급 주택지역의 형성요인과 분포 분석

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Abstract

도시화는 현대사회의 가장 큰 특징이며 도시가 성장하면서 과거의 기능이 변화하고 도시내부의 공간구조가 점차 기능적으로 분화하는 경향이 있다. 그 중 가장 주목할 만한 것 중의 하나는 주거지역의 입지변화와 공간적 확산과정에서 나타나는 주거지 분화현상이다. 도시생태학자 Hoyt은 주거지 이동패턴에 대하여 도시 내의 주거지분포 패턴을 결정짓는 핵심적인 요인으로 최고지대를 지볼할 수 있는 부유층의 주거입지 선택에 따라 전체 도시의 계층별 주거분포가 영향을 받게 된다고 주장하였다. 서울은 소규모로 계획된 역사도시에서 인구 1000만의 대도시로 성장하여 오면서 많은 구조적 변화를 경험하여 현재의 공간구조를 이루게 되었다. 현재 전체 서울의 주택지는 동일한 것이 아니고 각종 주위환경에 따른 성격과 특성을 달리하는 요소로 구성되어 있다. 이 특성을 달리하는 주택지들이 모여서 각기 상이한 역할을 수행하고 서로 기능적 관계를 맺으면서 주택지를 형성하고 있다. 선형이론(Hoyt's Sector theory)에 따르면 고급주택지역의 도시 공간구조에 많은 영향을 미치고 있다고 주장하였다. 그럼에도 불구하고 서울의 고급주택지역의 분포와 그 입지 특성에 관한 연구는 미비한 실정이다. 본 연구의 목적은 서울시 고급주택지역의 분포를 형성하는 원인을 규명하는데 있다. 고급주택지의 지역적 분포를 파악하여 그 입지 성향과 특성을 알게 되면 도시의 토지이용계획, 특히 주거지계획에 도움이 될 수 있다.

Keywords : high class residential areas, distribution analysis, Seoul, cluster analysis

주요어 : 고급주택지역, 분포분석, 서울시, 클러스터 분석

1. Introduction

1. Backgrounds and Purpose of Research

Urbanization is the most conspicuous characteristic of the modern society. With the expansion of urban areas, the functions of cities are changing and urban spatial structure tends to be functionally specialized. One of the most noticeable things is the specialization of residential areas resulting from location changes and spatial expansion of residential areas. Urban ecologist Hoyt insisted, "As for the pattern of change in residential areas, a key factor that determines the pattern of the distribution of residential areas in cities is the choice of residential location by wealthy classes who can pay the highest land prices, which influences the distribution of residential areas of the whole city by class." As Seoul has grown from a historical city planned on a small scale to a metropolitan with a population of over ten million, it has experienced a lot of structure changes and has formed its

present spatial structure. Housing lots in Seoul are not homogeneous but different according to the properties and characteristics of surrounding environments. These heterogeneous residential areas form a city, playing different roles and establishing functional relationship with one another. According to Hoyt's sector theory, "High class residential areas have the most significant influences on the spatial structure of the city." Nevertheless, there have been few researches on how high class residential areas distribute in Seoul and what characteristics the locations have.

The objective of this study is to identify factors that form the distribution of high class residential areas in Seoul, the capital of Korea. Information about the geographic distribution of high class residential streets and the properties and characteristics of their locations will be valuable in urban land use planning and, particularly, in residential area planning.

2. Limits and Methods of Research

This study defined the limits of research as follows. First, the subjects of this study were high class house residential areas in Seoul. Second, houses, the land size of which is over 150 pyeong, were classified as high class ones. The research methodologies are as follows.

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First, high class residential areas were defined according to the frequency of high quality classes at each dong in Seoul, and a distribution chart was made to examine the conditions of the location of high class residential areas. Second, this study carried out a cluster analysis using twelve variables¹⁾, which are housing site rate, official land value, health facility rate, service rate, shopping facility rate, financial institution rate, park rate, medical institution rate, hygiene facility rate, social facility rate, educational facility rate and famous person rate. Third, it carried out a factor analysis for each cluster to identify factors that influences the location of high class residential areas in the cluster. Based on the results of these analyses, finally, it investigated the characteristics of the location of high class residential areas.

II. Theoretical Investigation

1. Theories of Urban Structure

1) The Burgess Concentric Ring Model

In 1925, Ernest Burgess incorporated these ideas into a concentric zone model based on empirical research in Chicago and other American cities. Burgess observed that the city consisted of a non-residential core surrounded by a girdle of residential zones. These residential zones were arranged concentrically around the city center, spreading outwards like ripples on a pond, with each zone tending to be distinctive in age and character and dominated by a particular class of inhabitants.

Burgess's model suggested that lower status groups were to be found near the city centre and that social class became higher as one moved towards the suburbs. This was explained by the dynamics of urban growth and change. The ecological process of invasion and succession caused population groups to filter outwards gradually from the centre as their status and level of assimilation improved.

2) Hoyt's Sector Model

Another model developed in America in 1939 was Homer Hoyt's Sector Model and this can be seen as an extension of the Concentric Ring Model. Hoyt's model was based on residential rent patterns derived from a survey of 64 widely distributed American cities. Hoyt concluded that 'there is a general pattern of rent that applies to all cities' and that 'rent areas in American cities tend to conform to a pattern of sectors rather than concentric circles'. The residential areas of a particular

class develop outwards from the city centre as wedge-like sectors.

Hoyt's results showed that: High rent/status areas are found in one or more sectors of the city. Medium rent/status areas are found in the same sectors as the high status areas, but nearer to the city center. Low rent/status areas are found in different sectors with no graduations in rent as one moves outwards from the city center.

2. Residential Segregation

1) Historical approach

In the era of urbanization, the most critical problem of cities was lack of housing caused by concentration of population in 1960's and 1970's in Korea. To solve the problem of housing, studies on urban housing and residential area were largely conducted in region of geographic since 1970's.

Won (1978) analyzed the formation of residential areas in the suburbs of Seoul in the time of Joseon Dynasty (1392~ 1910) and explained that the residential areas had formed differently as one's position and rank. Rii (1984) researched the residential segregation by ethnic groups in the Kyongsung-bu and insisted that the city of Seoul had been formed to dualistic urban structure which consisted of the urban district developed by Japanese and the traditional district formed by national group.

2) Human Ecology approach

The researches of residential segregation approached by ethological methods have been conducted for large cities in Korea after 1970's. Park (1983) declared that the process of residential segregation in Seoul is resulted by the gap of resident's income levels and regional housing supply. Lee (1987) has shown that a type of housing is the major factor of residential segregation because the spatial distribution of housing pattern considerably related with the condition of income level and the possession of cultural facilities. Won (1980) insisted, in his study on formation of residential areas in the suburbs of Seoul, that the people of relatively low class are frontiers of residential area and the residential area formed with the period of generation, growing up, and maturity based on ethology. Kim (1983) examined into the residential area of Seoul and classified that by quality, size, age of housing, and density of population in his study on the division of residential areas in Seoul. According to the result of that study, the pattern of residence is being changed by housing-building and movement of residence.

III. Used Materials and Basic Analysis

1. Definition and Distribution of High Class Residential Areas

To find the distribution of high class residential areas

1) It was hard to find the previous research defining the factor of forming high class residential areas. Alternately, most of factors in this study follow the official statistic data which are published by provincial government and national association for the credibility of facts and the other factor, 'famous persons', was derived from a directory.

in Seoul, this study selected high class houses according to Article 156 of the Enforcement Ordinance of the Income Tax Law. It defined a high class residence as a house the land size of which is over 495 m² (150 pyeong)²⁾.

According to the result of examining the distribution of high class residential areas in Seoul³⁾, high class residential areas were found at 43 dong in 16 districts among 226 dong in 25 districts in Seoul. 43 dong in 16 districts means that they have at least one high class houses satisfying condition above. Especially Gangnam-gu, Jongro-gu and Mapo-gu have the largest number of high class residential areas.

2. Composition of Used Materials

Materials used in this study were twelve items, which were the size of high class residential areas, official land value, health facilities, private service facilities, shopping facilities, financial institutions, the area of parks, medical institutions, hygiene-related facilities, social welfare facilities, educational services and famous persons. Data on ten of them, namely, the size of high class residential areas, health facilities, private service facilities, shopping facilities, financial institutions, the area of parks, medical institutions, hygiene-related facilities, social welfare facilities and educational services were obtained from 1998 Statistical Yearbook of each district in Seoul. Official land value was obtained from Korea Association of Property Appraisers and data on famous persons were collected from 1998 Korean and Foreigner Directory published by Dong-A Ilbo.

The descriptions of materials are explained as <Table 1>. All Variables are the ratio of the number or size of each item at high class residential areas to that in the whole area of Seoul except the 'Official land value' whose unit is a thousand won per m².

Table 1. The descriptions of materials

Items	Description
Housing size	the size of high class residential areas
Official land value	the land price per of high class houses
Health facility	the number of health welfare facilities at high class residential areas
Service	the number of movie theaters, sports facilities, barber and beauty shops, religious facilities, etc.
Shopping facility	the number of department stores, shopping centers, large-sized markets, etc.
Financial institution	the number of banks, investment trusts and insurance companies, etc.
Park	the size of park
Medical institution	the number of meical institutions at high class residential areas
Hygiene facility	the number of hygiene related facilities at high class residential areas
Social facility	the number of social welfare facilities at high class residential areas
Educational facility	the number of elementary, middle and high school, colleges, universities and private educational institutions
Famous person	position of bureau directors or higher at legislative or administrative offices, heads of local governments, judges, public prosecutors, principles of universities, famous professors, directors of research institutes, members of science and art academies, representatives of companies, heads of departments or higher at press companies, famous figures in the press and representatives of social and religious circles

3. Cluster Analysis of High Class Residential Areas

This study carried out a cluster analysis based on statistical data of 43 dong in 16 districts among 226 dong in 25, which include high class residential areas, to distinguish high class residential areas with similar characteristics. For the cluster analysis, it used the hierarchical clustering method, in which a cluster may be wholly included in but not partly overlap with another. As mentioned earlier, twelve variables were used to analyze how the 43 dong including high class residential areas are clustered, and the flexible method was used to abstract clusters. The result of cluster analysis is as <Table 2>. The abstracted three clusters are as <Table 3>.

Looking at the distribution of high class residential areas belonging to the first cluster in <Figure 1>, most areas are situated around the downtown and several high class residential areas are located nearby subcenter (secondary central business district) of Seoul. For example, Songnae-dong and Seongsan-dong in this cluster are located nearby Jamsil and Shinchon subcenters respectively. As a whole, they are not contiguous to one another but scattered. Therefore, it was named Downtown-Subcenter Cluster for convenience.

Looking at the distribution of high class residential

2) This study classifies houses by the size of land rather than the floor area of the building. Because the latter is harder than the former to analyze physical data of all area in Seoul. The limits of high class houses according to the Article 156 of the Enforcement Ordinance of the Income Tax Law are as below.

1. Houses falling under one of following items, and the current standard acquisition tax according to the local tax law for the houses is 20 million won or more

A. The floor area of the building (including parts regarded as a house and basements used exclusively for residence according to provisions in Clause 3 of Article 154) is 264 m² or larger, and the actual trading price of the house and the annexed land on the assignment exceeds 600 million won.

B. The size of land annexed to the house is 495 m² or larger, and the actual trading price of the house and the annexed land on the assignment exceeds 600 million won.

3) Park, Jung-Hun (2001), The Distribution of 'The neighborhood of the Rich', Dong-A Ilbo.

Table 2. Results of cluster analysis

Number of cluster	Number of observation	R	Value of Capital
10	8	0.9926	489.3
9	6	0.9908	458.9
8	6	0.9867	370.8
7	10	0.9829	344.2
6	13	0.9783	334.3
5	9	0.9579	216.4
4	15	0.9440	218.9
3	15	0.8625	125.5
2	28	0.7799	145.3
1	43	0	.

Table 3. High class residential areas included in cluster

Cluster	Dong	Number
Downtown-Gangdong	Pil-dong, Dongsomun-dong, Hyehwa-dong, Seongnae-dong, Seongbuk-dong, Mia-dong, Seongsan-dong, Yeonnam-dong, Seogyo-dong, Hapjeong-dong, Sajik-dong,	13
Gangbuk-Gangseo	Bogwang-dong, Yonggang-dong, Cheongun-dong, Yeonhui-dong, Pyeongchang-dong, Suyu-dong, Daebang-dong, Bulgwang-dong, Hwagok-dong, Siheung-dong, Banghwa-dong, Heukseok-dong, Gireum-dong, Jeongneung-dong, Sangdo-dong	15
Gangnam-Hannam	Sindang-dong, Hannam-dong, Hyochang-dong, Itaewon-dong, Jangchung-dong, Samsong-dong, Nonhyeon-dong, Banpo-dong, Sinsa-dong, Jegi-dong, Seocho-dong, Bangbae-dong, Yeoksam-dong, Cheongdam-dong, Jeonnon-dong	15



Fig. 1. Distribution diagram of the Downtown-Subcenter clust.

areas belonging to the second cluster in <Figure 2>, most areas are situated in Gangbuk and Gangseo. While high class residential areas in Gangbuk are close to one another, those in Gangseo are scattered. Therefore, it was named Gangbuk-Gangseo Cluster.

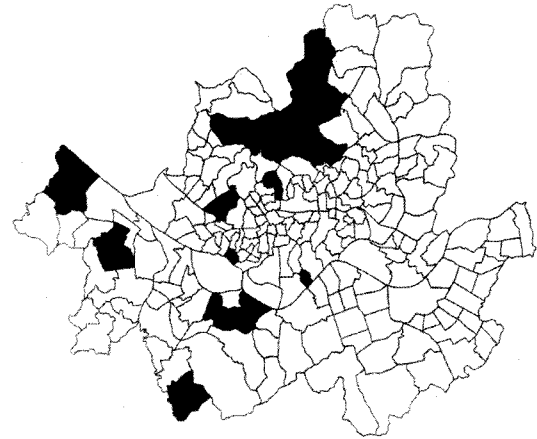


Fig. 2. Distribution diagram of the Gangbuk-Gangseo cluster.



Fig. 3. Distribution diagram of the Gangnam-Hannam cluster.

Looking at the distribution of high class residential areas belonging to the third cluster in <Figure 3>, most areas are situated in Gangnam, Hannam and neighbor districts. Therefore, it was named Gangnam-Hannam Cluster for convenience. High class residential areas in the Gangnam-Hannam cluster are close to one another in general.

IV. Cluster Characteristic Analysis

This study carried out factor analysis for each the three clusters to identify factors that influence the formation of the cluster. Variables used in the factor analysis were the twelve that were used in the cluster analysis, and the varimax rotation was used for the factor analysis.

1. Factor Analysis for Downtown-Subcenter Cluster

A factor analysis was carried out on variables to explain the characteristics of the Downtown-Subcenter cluster. The explanatory power of factors for the variables is as shown in <Table 4>. Factor 1 explains

Table 4. Explanatory power of factors for the variables of the Downtown-Subcenter cluster

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigen value	5.1772	2.4052	1.2048	1.0051	0.5329
Variate rate	0.4707	0.2187	0.1095	0.0914	0.0484
Accumulative variate rate	0.4707	0.6893	0.7988	0.8902	0.9387

Table 5. Loadings of factors for the variables of the Downtown-Subcenter cluster

Variable	Factor1	Factor2
Housing site rate	-0.25	-0.12
Official land value	0.02	-0.82
Health facility rate	0.96	0.03
Service rate	0.94	0.03
Shopping facility rate	0.00	0.00
Financial institution rate	0.87	-0.06
Park rate	0.19	0.91
Medical institution rate	0.75	0.38
Hygiene facility rate	0.73	0.34
Social facility rate	0.19	-0.13
Educational facility rate	0.96	-0.01
Famous person rate	-0.01	-0.20

47.07% of the whole variate, and Factor 2 does 21.87%. With the increase of the number of factors, the accumulative ratio of the variate of the factors to the whole variate increases and as a result the explanatory power of the factors for the whole variate goes up, but the growth rate of the variate decreases as the number of factors increases. For factors related to the Downtown-Subcenter cluster, the accumulative ratio of the variate of Factor 1 and Factor 2 to the whole variate was over 60%, so the two factors were defined as main factors. The loadings of Factor 1 and Factor 2 that explain the Downtown-Subcenter cluster are in <Table 4>.

Factor A1 can be defined as "the residents of high class residential areas in this cluster has a tendency to keep the health and property of themselves ." According to loadings in <Table 5>, the rate of health facility, educational facility service, financial institution, medical institution, hygiene facility and appeared to be main factors for Factor A1. They want to maintain their health and ensure their success.

Factor A2 can be defined as "the residents of high class residential areas in this cluster want to live in comfortable and downtown based area." The park rate affect the highest effect on clustering this area and the official land value variable is opposite for Factor A2.

The rate of those facilities might meet the needs of occupants in this area and cluster high class residential area.

2. Factor Analysis for Gangbuk-Gangseo Cluster

According to the result of a factor analysis carried out

Table 6. Explanatory power of factors for the variables of the Gangbuk-Gangseo cluster

	Factor 1	Factor2	Factor 3	Factor 4	Factor 5
Eigenvalue	6.2435	1.8185	1.4364	0.8580	0.6468
Variate rate	0.5203	0.1515	0.1197	0.0715	0.0539
Accumulative variate rate	0.5203	0.6718	0.7915	0.8630	0.9169

Table 7. Loadings of factors for the variables of the Gangbuk-Gangseo cluster

Variable	Factor1	Factor2
Housing site rate	-0.57	0.07
Official land value	-0.09	-0.37
Health facility rate	0.96	0.11
Service rate	0.98	0.08
Shopping facility rate	0.01	-0.70
Financial institution rate	0.94	0.24
Park rate	0.09	0.67
Medical institution rate	0.97	0.09
Hygiene facility rate	0.85	0.09
Social facility rate	0.28	0.76
Educational facility rate	0.98	0.05
Famous person rate	-0.02	0.39

Table 8. Explanatory power of factors for the variables of the Gangnam-Hannam cluster

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalue	5.8011	1.8247	1.5166	0.8411	0.7677
Variate rate	0.4834	0.1521	0.1264	0.0701	0.0640
Accumulative variate rate	0.4834	0.6355	0.7619	0.8320	0.8959

on variables to explain the characteristics of the Gangbuk-Gangseo cluster, the explanatory power of factors for the variables is as shown in <Table 6>. Factor 1 explains 52.03% of the whole variate, and Factor 2 does 15.15%. For factors related to the Gangbuk-Gangseo cluster, the accumulative ratio of the variate of Factor 1 and Factor 2 to the whole variate was over 60 %, so the two factors were defined as main factors. The loadings of Factor 1 and Factor 2 that explain the Gangbuk-Gangseo cluster are in <Table 7>.

Factor B1 can be defined as "the residents of high class residential areas in this cluster has a concern about the future of themselves and their children." According to loadings in <Table 8>, health facility rate, service rate, financial institution rate, medical institution rate, hygiene facility rate and educational facility rate appeared to be main factors for Factor B1. It is comparable with Factor A1 in main items for each factor.

Factor B2 can be defined as "the residents of high class residential areas in this cluster want to live in restful and comfortable residential area." While the rate of park and social facility variables have positive value,

Table 9. Loadings of factors for the variables of the Gangnam-Hannam cluster

Variable	Factor1	Factor2
Housing site rate	-0.32	0.05
Official land value	0.12	0.62
Health facility rate	0.52	0.07
Service rate	0.90	0.37
Shopping facility rate	-0.10	0.03
Financial institution rate	0.65	0.55
Park rate	0.82	-0.39
Medical institution rate	0.76	0.53
Hygiene facility rate	0.92	0.31
Social facility rate	0.05	0.78
Educational facility rate	0.87	0.12
Famous person rate	0.57	0.66

shopping facility rate have negative value for Factor B2. This result infer that the high rate of shopping facility may cause congestion and traffic jam reducing the preference of the residents in this cluster.

3. Factor Analysis for Gangnam-Hannam Cluster

The explanatory power of factors for the variables in Gangnam-Hannam Cluster is as shown in <Table 9>. Factor 1 explains 48.34% of the whole variate, and Factor 2 does 15.21%. For factors related to the Gangnam-Hannam cluster, the accumulative ratio of the variate of Factor 1 and Factor 2 to the whole variate was over 60%, so the two factors were defined as main factors.

Factor C1 can be defined as "the residents of high class residential areas in this cluster have a trend to consider high quality services of facilities." According to the loadings of Factor C1 and Factor C2 that explain the Gangnam-Hannam cluster, service rate, financial institution rate, park rate, medical institution rate, hygiene facility rate and educational facility rate appeared to be main factors for Factor C1. It is interesting that the health facility value is relatively low in distinction from Factor A1 and B2.

Factor C2 can be defined as "the residents of high class residential areas in this cluster value the relationship with high class persons for the further success." The loading of social facility rate and famous person rate for Factor 2 is high and official land value variable also shows significant value in distinction from Factor A1 and B2.

4. Comparison of Characteristics of Three Clusters

According to the result of factor analysis for three clusters, there are tendency of common and discriminate factor among those clusters. The comparison of variables for factor 1 is as shown in <Table 10>.

For all clusters, five variables including the rate of health, service, medical institution, hygiene facility and educational facility appeared to influence distinctively the formation of the clusters in common. Those variables

Table 10. The comparison of variables for factor 1

Variable	Factor1		
	A1	B1	C1
Housing size	-0.25	-0.57	-0.32
Official land value	0.02	-0.09	0.12
Health facility	0.96	0.96	0.52
Service	0.94	0.98	0.90
Shopping facility	0.00	0.01	-0.10
Financial institution	0.87	0.94	0.65
Park	0.19	0.09	0.82
Medical institution	0.75	0.97	0.76
Hygiene facility	0.73	0.85	0.92
Social facility	0.19	0.28	0.05
Educational facility	0.96	0.98	0.87
Famous person	-0.01	-0.02	0.57

Table 11. The comparison of variables for factor 2

Variable	Factor2		
	A2	B2	C2
Housing size	-0.12	0.07	0.05
Official land value	-0.82	-0.37	0.62
Health facility	0.03	0.11	0.07
Service	0.03	0.08	0.37
Shopping facility	0.00	-0.70	0.03
Financial institution	-0.06	0.24	0.55
Park	0.91	0.67	-0.39
Medical institution	0.38	0.09	0.53
Hygiene facility	0.34	0.09	0.31
Social facility	-0.13	0.76	0.78
Educational facility	-0.01	0.05	0.12
Famous person	-0.20	0.39	0.66

infer that the common factor of clusters is "The high class residential area is formed where the facilities are properly placed for the better life of residents and their children." The high tendency of residents for their quality of life and for the success of their children encourages these five variable values high.

On the other hand, the variables among the clusters are discriminated by Factor 2 of each cluster. The comparison of variables for factor 2 is as shown in <Table 11>.

The Downtown-Subcenter cluster was influenced by a factor including official land value and park rate, the Gangbuk-Gangseo cluster by one including shopping facility rate, park rate and social facility rate, and the Gangnam-Hannam cluster by one including official land value, social facility rate and famous person rate. Those differences discriminate the characteristics of each cluster defined as each section of 3.4.1 to 3.4.3. Furthermore, those differences may explain the distribution of high class residential areas in each cluster.

V. Conclusions

This study examined the distribution of high class residential areas in Seoul and carried out a cluster

analysis on 43 dong in 16 districts that were selected as high class residential areas. High class residential areas are analysed by twelve variables to find factors that form high class residential areas.

Through the cluster analysis, it defined three clusters of high class residential areas. According to the result of a factor analysis on the twelve variables, all the three clusters were commonly influenced by a factor, "The high class residential area is formed where the facilities are properly placed for the better life of residents and their children." That common factor includes the rate of health facility, service, financial institution, medical institution and educational facility, so these items are considered to have a significant influence on the formation of high-class residential areas. In addition, the formation of the Downtown-Subcenter cluster appeared to be influenced by official land value and park rate, that of the Gangbuk-Gangseo cluster by shopping facility rate, park rate and social facility rate, and that of the Gangnam-Hannam cluster by official land value, social facility rate and famous person rate. Accordingly, the disposition and characteristics of location according to these factors influencing the formation of high class residential areas must be considered in urban land use planning and, particularly, in residential area planning.

Finally, the factors which define the characteristics of clusters can be colligated in three concepts.

First, the formation factor of Downtown-Subcenter cluster is a tendency to keep the health and property of themselves and to live in comfortable and downtown based area. For example, Seongbuk-dong in this cluster is considered as the rich village from old times because it is located nearby Gwanghwamun-district(CBD) and has a favorable environment.

Second, the formation factor of Gangbuk-Gangseo cluster is a concern about the future of themselves and their children and to live in restful and comfortable residential area. For example, Pyeonchang-dong in this cluster also considered as the rich village where many entrepreneurs lives from old times. Also a school of high reputation, Kyungbok High School, is located in Cheongun-dong in this area.

Third, the formation factor of Gangnam-Hannam cluster is having a trend to consider high quality services of facilities and valuing the relationship with high class persons for the further success. For example, many specialists, such as doctor and lawyer, and famous persons lives in Gannam-gu. Also many entrepreneurs live in Hannam-dong because several Chief Executive Officers of a large enterprise company are live in there.

This study identified three clusters of high class residential areas using twelve variables that represent the characteristics of high class residential areas, and carried

out a factor analysis to examine the characteristics of each of the identified clusters. However, it could not consider additional variables such as social and geo-graphic variables that may also influence the formation of high class residential areas. Because high class residential areas have significant effects on urban land use and spatial structure, it is necessary to study not only the factors of the formation of high class residential areas but also the patterns of distribution of the areas considering a larger number of variables and data for several years.

Furthermore, the problem of the distinction between rich and poor also should be concerned in following studies on urban land use planning and planning of residential areas.

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