THE UNIVERSITY OF CALGARY

The Differentiation of South Korean Cities : A Multivariate Analysis

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF

MASTER OF ARTS

DEPARTMENT OF GEOGRAPHY

CALGARY, ALBERTA

JUNE, 1997

0-612-24596-9

ABSTRACT

This study is a contemporary, cross-sectional structure of the South Korean urban system which identifies the underlying dimensions of the system and the differentiation of individual cities. It is set within the context of the changes that have led to South Korea becoming 79.6 % urbanized in 1990 from 35.8 % in 1960. This study shows the results of these changes based on a data set which was composed of 31 census-based variables and 73 cities. Principal Component Analysis was applied to this matrix, followed by Oblimin rotation, to derive the latent dimensions. Eight axes, accounting for 71.3 % of total variance, were revealed. By subjecting the factor score matrix to a cluster analysis using Ward's method, a summary classification of the South Korean urban system was obtained. The 73 urban centres over 50,000 population were classified into 13 groups, many of which had strong regional patterns.

ACKNOWLEDGMENTS

I thank all persons who contributed advice, encouragement, and assistance to my research project. I specially thank my supervisor, Dr. W.K.D. Davies, who provided encouragement, direction and detailed comments and advice at all stages of this research project. I am also grateful to my thesis committee members for providing me the opportunities toward its completion. I will remember my friends and fellow students provided an invigorating working atmosphere and a pleasant social atmosphere. Especially, Jenny Chan gave me lots of help. I also thank Yon family (Hyung-mo, Sang-hee) who have encouraged me to work hard. I must acknowledge my family who have helped me to keep researching. I return the most profound thanks to my wife, Young-Han Park, for her patience and loving supports during this study.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

The identification of the latent structure, or the underlying sources of variations in urban systems became one of the major research efforts in Urban Geography in the late 1960s (Berry, 1972; Davies, 1984). Many studies of the dimensionality of urban systems were carried out, especially in developed countries, together with a handful studies in other parts of the world. Although the major research efforts in Urban Geography have moved away from the multi-dimensional study of urban structures, the descriptions they provide are still useful in identifying the main characteristics of an urban system and, if different time periods are adopted in showing changes through time. This study presents a contemporary, cross-sectional study of the South Korean urban system using factor analysis methods to expose the underlying dimensions of the system and the differentiation of individual cities. The analysis is set within the context of the population growth and size distribution of South Korean urban places. During the last three decades, the Korean urban system has experienced tremendous changes, both in quantitative and qualitative terms. The South Korean population has increased from 25 million in 1960 to 44 million in 1990 and the proportion of urban population has increased from 35.8 % to 79.6 % over the same period, mainly as a result of massive industrialization (GRK, 1992). This study shows the structure of South Korea's urban system that has resulted from these changes and demonstrates the extent to which the dimensionality of the Korean urban system has been transformed to a structure that is a very similar to the western model.

1.2 City Classifications and Urban Dimensions Study

1.2.1 Functional City Classifications

From the earliest times, Urban Geography texts have included descriptions of town functions and have identified classes or groups of town based on the functions they perform. At first, the groupings were based on simple descriptive terms: for example, the simple designations 'market town' or 'seaport' are forms of functional classification (Carter, 1975). Later works that grouped and compared sets of towns used very subjective and descriptive methods, based on the characteristics of their economic profiles. One of the earliest city classification studies was carried out by the British Commission on the Health of Towns in 1840 where a five fold typology was proposed: metropolis, manufacturing centres, populous seaports, great watering places, county and other inland towns (Carter, 1975; Davies, 1984). By the 1920's more sophisticated groupings can be recognized, as in the urban system classification of Aurosseau (1921). This can be seen as a seminal work, one that marked a new and important stage in the development of urban classifications. It identified a set of categories of urban characteristics and assigned individual cities into these groups. However, it has been argued that: "such studies are certainly useful in pinpointing the differences between cities, but the subjective nature of both the categories used in the typologies, as well as the allocation decision used to put cities in the group represent real problems with this type of approach" (Davies, 1984, p 256).

By the 1940's and 1950's, the recognition of these problems of subjectivity led to the application of various measures of statistical description and analysis to the classification of city functions. The most widely quoted examples are those of Harris

(1943) and Nelson (1955). Harris outlined a functional classification of cities of the USA, using a set of percentage cut-off values to identify the stage at which cities were allocated into distinct categories – although the categories were subjectively defined. Nelson applied the conventional concepts of the mean and the standard deviation to the percentages of the urban labor force in each activity to replace the arbitrary percentages that were used to identify the degree of specialization in towns. The Minimum Requirements method of Dacey and Ullman (1960) was also popular before the wide use of multivariate statistical methods, whilst Gini coefficients and other indices of specialization were widely used in attempts to define basic and non-basic centres (Marshall, 1989). These latter studies were carried out under the belief that the economic specialties of cities would reflect the economic, social and political activities in the cities and that basic activities were 'city forming' and represented the real dynamic process of urban growth. However, they relied entirely upon employment or labor force characteristics. So although the results are often useful and are still applied (Davies & Donoghue, 1991), they are limited because they are concerned only with one aspect of intercity differences, namely, the differences in economic character.

1.2 .2 Improved Classification Schemes

The limitations of the economic studies of the classifications of towns led investigators to consider an alternative approach, namely the incorporation of several aspects of urban character simultaneously, using multidimensional methods to integrate the data used. The first application of multivariate techniques to the urban system, using the factor analysis, can be traced back to Price's (1942) study of American metropolitan area and to Hoftstaetter's (1952) follow-up analysis. From the 1960s onwards, when high speed computers became widely available, a large number of studies utilized factor analytical techniques as a means of investigating urban structure (see reviews by Berry, 1972; Davies, 1984). An important early work was an analysis of British towns by Moser and Scott (1961) using Principal Component methods. Other early works include those of Hadden and Borgatta (1965) and Berry (1965, 1969) in the USA, followed by King (1966) and Hodge (1968) in Canada, Ahmad (1965) in India. More recent studies include Seong (1977) in South Korea and Yeboah (1993) in Ghana.

Most studies were content to identify a set of factor axes – defining categories of urban differentiation – in each country. Given the use of different data sets and techniques as well as national variations, it meant that a confusing series of seemingly different factor axes were produced. During the 1960's, several attempts were made to provide generalizations about the basic latent dimensions of urban structure derived from the findings of the various multivariate classifications of cities. The first attempt was made by Ahmad (1965), who suggested that five factors – Size, Economic Base, Population Change, Density and Social Status – were fundamental to urban system differentiation. Hodge (1968) extended these ideas in a study of Canadian cities. He maintained that urban structure can be defined in terms of eight axes: Size, Physical Development, Age Structure, Education, Economic Base, Ethnic or Religious Orientations, Welfare and Geographical Situation. Hodge asserted that the economic base of cities acted independently of the rest of the structural features of urban systems and the dimensions tended to be the same from region to region, regardless of the stage or character of regional development. Berry (1969) tried to generalize the results of the various studies, suggesting that seven basic dimensions should characterize urban systems: Size, Status, Age/Family Structure, Mobility-Growth, Ethnic Heterogeneity, and Location in the space-economy. Paralleling Hodge's (1968) assertions, Berry (1972) also argued that the economic base of a centre frequently acted independently of the other urban dimensions, so the urban system should be considered as a combination of economic base variations and the other socio-cultural characteristics. However, not all city systems in the world were considered to be the same. Ahmad (1965) suggested that non-western countries had latent structures which differed from those in the developed world. For example, older traditional economies could be identified in third world urban systems, which led to a major factor axis identifying a Traditional / Modern Economy divide. Davies (1984) reviewed these and other studies and attempted to provide a more comprehensive summary of the variations in urban dimensionality. He suggested that there were eight basic dimensions in western urban systems: Size-Density, Quality of Life, Socio-Economic Status, Economic Base, Education, Age, Ethnicity and Growth-Mobility. However, he observed that the Economic Base and Ethnicity axes may have more than one type in particular countries.

1.2.3 Problems of Data and Techniques

There is little doubt that some of the variations in the multivariate classifications of urban structure came from the different data sets that were used. Coughlin (1973), Smith (1972, 1973) and Abrahamson (1974) attempted to widen the scope of factorial studies of the urban system by using variable sets related largely to social condition and quality-of-life measures. However they suggested that the dimensions produced from these variables were a little different from the results obtained from studies of census variables. Davies (1984) observed the differences were primarily associated with a number of 'social condition' axes and the failure of some 'quality of life' studies to find some of the 'traditional' dimensions because the appropriate census indicators were absent.

A related problem in the comparison of urban system results came from the variation in the factorial methods that were used. The majority of the initial studies in this field have been based on the R mode approach, using the Principal Axes technique and a component model. Few of the early studies applied rotation after the derivation of the initial axes, which meant that the results contained a large general axis. Subsequent works showed that greater similarity between the studies could be found if rotation was used, which re-allocated the variance from the general Principal Axis, producing components that were easier to interpret. The popularity of orthogonal – especially Varimax – rotation methods in the early 1970's was soon followed by the adoption of various oblique rotations (Davies, 1984). The advantage of the use of oblique rotations is that they are more flexible, since they do not impose orthogonal or right angled factor dimensions. In addition, the approach can produce higher order axes from the correlations between the first order axes, which is not possible if orthogonal rotation solutions are used. Few investigators in this field believed that is was appropriate to use common factor methods.

The debates regarding the choice among alternate techniques have concentrated mainly on the evaluation of the invariance of those methods. Davies (1984) noted that limited attention has been paid to these issues in geographical studies, despite Berry's (1971) early warnings about the critical nature of the problem. Studies of the utility of various factorial techniques have been provided by Davies (1973), Giggs & Mather (1975), Hunter & Latif (1973), and Davies (1978). All these studies attempted to examine the technique-dependence of factor solutions through the application of the same data sets. For example, Davies (1978) applied eight different factoring methods to a set of data related to the city of Calgary to examine the differences in urban dimensions that were derived by different methods. He discovered a basic stability in the results of different methods, even though there were some differences in the total variance explanation. He suggested that: "it is important for an investigator to justify to other workers the fact that a stable solution has been obtained" (Davies, 1984). The study showed that the Principal Axes technique was still a robust one – one that gave results as good as some of the newer and more sophisticated methods.

1.2.4 City Classifications in South Korea

Previous studies of the South Korean urban system have used many of the classification techniques described above. Hong (1965) and Lee (1965) both analyzed the largest 27 cities (over 50,000 population) and 85 towns (over 20,000 population) using Nelson's (1955) method. Hong concluded that a three fold typology characterized the South Korea's urban system : Standard Type, Specialized Type and Rural Type. He suggested that 45% of South Korean urban centres belonged to the Standard Type cities. Although the study was very useful in helping to summarize the variation in the urban system, the very general nature of the categories did not produce a major increase in understanding. Lee (1965) applied Nelson's method to 27 cities and concluded that there were four types of Specialized Centres (Military Cities, Manufacturing Cities, Transportation Centres, and Education Cities), in addition to Hong's Standard and Rural Types.

In contrast to such studies based on univariate economic specialties, Seong (1977) examined the structure of South Korean urban system in 1975 by multivariate techniques. He used a set of 34 variables for the 35 cities over 50,000 population in South Korea utilizing the Principal Axes Technique, Component model, followed by Varimax rotation and then applied Ward's cluster analysis to the factor scores to derive a typology of centres. His results showed that six major dimensions accounted for 66.3% of the explained variance. He concluded that the South Korean city system could be defined in terms of the following axes: 1) Size, 2) Traditional-Modernization Contrast, 3) Housing Condition, 4) Age Structure, 5) Mobility, 6) Education. This study provided much more details on the South Korean urban system than the previous works and showed a great deal of similarity with the generalizations made by the previous factorial studies of urban system that were described above. The presence of a Traditional-Modernization axis seemed to confirm Ahmad's ideas in India although some doubt about the existence of this dimension will be discussed later. Seong concluded that South Korean city system had the character of a Transitional Society in 1975, the type that was postulated by Berry (1969). The most important axis of differentiation indexed a Traditional Society-Modernization split, in which the agricultural, commercial and cultural urban centres of traditional Korean society were separated from the growing, modernizing nodes. Cluster Analysis was applied to the six sets of component scores and produced a six fold grouping : 1) Capital City or Seoul, 2) Large and Industrial Cities, 3) Satellite Cities, 4) Multi-Function Cities, 4) Stagnant and Small Cities, 6) Island City: Jeju. The big advance of this study over the previous analyses was that it produced an objective summary of the categories defining the urban system derived from the data, rather than being imposed on them. At the same time, the individual cities could be scaled on these dimensions and generalized into a smaller umber of descriptive categories.

1.3 Objectives of Study

In the 15 years since Seong's research on a 1975 data set, the South Korean urban system has undergone profound changes with massive increases in urbanization and industrialization levels, in city size and in the dominance of the biggest places. So it seemed appropriate to return to the question of city classifications in South Korea, to define the current structure and also to determine the utility of the transitional urban system model. This study has five main objectives.

1. To briefly describe the process of urbanization and urban growth in South Korea during the past three decades. This provides a context for the analysis of the underlying urban system dimensions at the data of the last census in 1990.

2. To identify and summarize the primary dimensions of urban structure in South Korea at the time of the last census (1990), using as comprehensive a set of variables as possible that index the expected dimensions.

3. To examine the spatial patterning of each dimension, as shown by the factor scores.

4. To create a summary classification of South Korean cities based on the scores associated with the various dimensions.

5. To compare these results to the previous studies on the South Korean urban system and other countries. A major question is whether the South Korean system still shows the transitional system characteristics of modernizing countries in which an axis indexing Traditional and Modern centres can be identified. Seong's results showed a Modern / Traditional axis in 1975 – reputedly a feature of all underdeveloped and transitional urban systems. Ideally, comparable data sets for 1960 and 1970 should be analyzed and compared with 1990 to trace the changes through time. This type of study was contemplated in the early planning stage. Unfortunately, changes in the urban boundaries of the centres and the absence of similar data sets made this task impossible for a work of this scope.

1.4 Cities Used in This Study

Urban centres in South Korea are administratively classified into three groups:

(a) Metropolitan centres with populations over 1 million;

(b) Cities (Shies) with populations between 1 million and 50,000;

(c) Townships (Eups) with populations between 50,000 and 20,000 or having county administration offices.

Table 1.1 shows the number of cities and towns by population groups. In 1990, there were 253 cities and towns in South Korea – 6 metropolitan areas, 67 cities and 180 towns.

Table 1.1 The Number of Cities and Towns by Population Size

Population Size (In Thousands)	1960	1970	1980	1990
over 1000	2 (2)*	3 (3)	4 (4)	6 (6)
500 - 1000	1 (3)	2 (5)	2 (6)	5 (11)
250 - 500	2 (5)	2 (7)	7 (13)	9 (20)
100 - 250	4 (9)	12 (19)	22 (35)	20 (40)
50 - 100	19 (28)	22 (41)	21 (56)	30 (70)
20 - 50	75 (103)	73 (114)	80 (136)	79 (149)
under 20	19 (122)	11 (125)	64 (200)	104 (253)
Total	122	125	200	253

*( ) : Cumulative number

Basically, all the centres in the first two size categories, those with population over 50,000 have been selected for the multi-variate part of this study. Attempts were made to extend the analysis to incorporate the smaller places. Unfortunately, this work could not be completed because comparable data sets for 1990 were not available. Rather than leaving out this important set of small centres in the background description of urban growth, Chapter 2 also includes an analysis of places between 20,000 and 50,000 population, as well as the metropolitan, city and township level centres – so as to provide as complete a context for the factorial study as possible. The data set used to identify the urban dimensions and classifications in Chapters 3 and 4 used 73 cities in 1990 – those that qualify as Metropolitan Centres and Cities (Shies) by the Korean Local Autonomy Law. Only four centres among them have the populations less than 50,000; this is a consequence of the fact that their populations have decreased – but only marginally – since they were established as cities. The 50,000 population cut-off was chosen because quite detailed data was available for the centres from the last census in 1990. The locations and list of all the cities are shown in Figure 1.1 and Table 1.2 respectively.

1.5 Choice of Variables

The primary intent of this study was to examine the South Korean urban system characteristics by summarizing and describing the similarities and differences between the 73 cities over 50,000 in population using a large number of variables. Given the descriptive nature of this research, the variables were chosen to encompass as wide a range of different social and economic indicators as possible. At the same time, the data should form a standard and comparable array of measures which can be replicated in other studies. Traditionally, studies of the basic dimensions of urban systems have used census-derived variables, due largely to the fact that census is the only source of consistent wide-ranging data for a national system of cities. This study follows the standard practice in this field. Basically, all variables were derived from the population and housing censuses of South Korea, the Municipal Year Book of South Korea (as of the end of 1990) and the Regional Statistic Year Books of the nine provinces – the areas of which are identified in Figure 1.1. Three of the variables – which have values in total population, national tax per capita and local tax per capita – were transformed to reduce

Figure 1.1 Location of Major South Korean Urban Centres

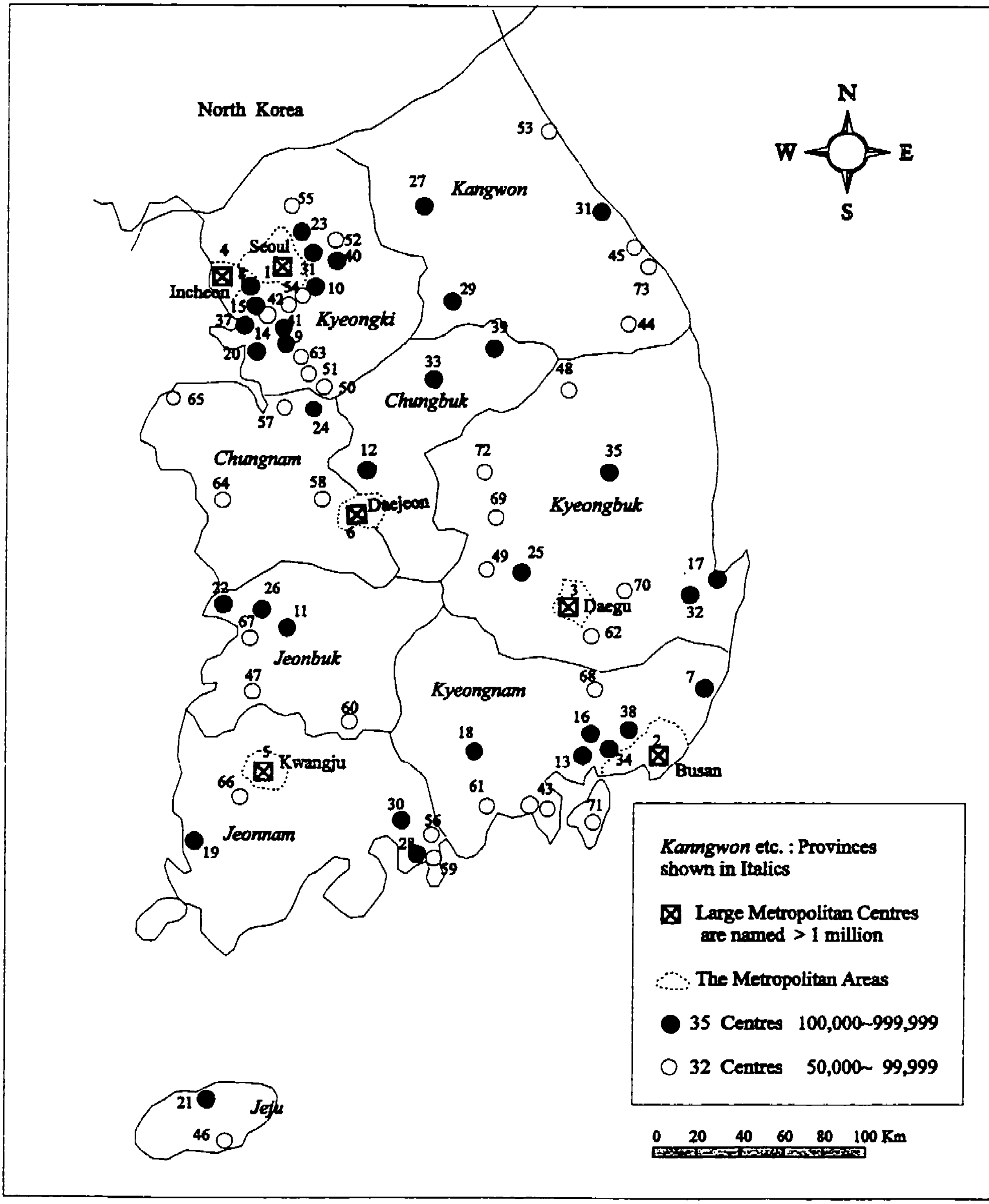


Table 1.2 The Cities Used in This Study (Population in Thousands, 1990)

No.	Names	Pop.	No.	Names	Pop.	No.	Names	Pop.
1	Seoul	10,628	31	Kangneung	153	61	Samcheonpo	63
2	Busan	3,798	32	Kyungju	142	62	Kyungsan	60
3	Daegu	2,229	33	Chungju	130	63	Osan	59
4	Incheon	1,818	34	Jinhae	120	64	Daecheon	57
5	Kwang ju	1,145	35	Andong	117	65	Seosan	56
6	Dajeon	1,062	36	Kuri	109	66	Naju	55
7	Ulsan	683	37	Siheung	107	67	Kimje	55
8	Bucheon	668	38	Kimhae	106	68	Milyang	53
9	Suwon	665	39	Jecheon	102	69	Sangju	52
10	Seongnam	541	40	Hanam	101	70	Youngcheon	49
11	Jeonju	517	41	Kunpo	100	71	Jangseungpo	49
12	Cheongju	497	42	Uiwang	97	72	Jeomchon	48
13	Masan	497	43	Chungmu	92	73	Samcheok	42
14	Anyang	481	44	Taebaek	90			
15	Kwangmyung	329	45	Donghae	89			
16	Changwon	323	46	Seogwipo	88			
17	Pohang	319	47	Jeongju	87			
18	Jinju	258	48	Youngju	84			
19	Mokpo	253	49	Kimcheon	81			
20	Ansan	252	50	Pyungtaek	79			
21	Jeju	233	51	Songtan	77			
22	Kusan	218	52	Miguem	75			
23	Uijeongbu	212	53	Sokcho	74			
24	Cheonan	211	54	Kwacheon	72			
25	Kumi	206	55	Dongduchun	71			
26	Iri	203	56	DongKwang	70			
27	Chuncheon	174	57	Onyang	66			
28	Yeosu	173	58	Kongju	65			
29	Wonju	173	59	Yeocheon	64			
30	Sucheon	167	60	Namwon	63			

the effect of size differences by adopting the typical approach of taking the logarithm of the variables with extreme values. Although this census-based data set limits the array of variables to demographic and socio-economic measures, it follows the works of many others in the same field. In total, a set of 31 measures of potential interurban differentiation were used, as shown in Table 1.3. Ten hypothesized categories of variation were derived from previous generalizations of factorial studies. It can be seen that there was an attempt to have approximately equal numbers of variables in each of the categories initially identified, with from 2-5 variables in each category to avoid biasing the study in terms of a single characteristic by using too many variables in the same category. The data set is similar to other factorial studies of urban studies but excludes the ethnicity variables used in many countries. Given the high homogeneity of population, ethnicity is not an appropriate variable to use in the differentiation of South Korean cities. These variables were as comprehensive a set as possible, given the limited range of data available for South Korean urban places.

1.6 Statistical Techniques

The major part of this study depends upon factor analytical methods to uncover the patterns of relationships in data sets. These patterns are revealed by what amounts to a mathematical rewriting of the original data set to produce more parsimonious descriptions of the variables in the form of new vectors, called factors. This procedure separated the general patterns of variation from the specific patterns associated with individual variables. In many ways, therefore, the factorial methods provided a synthesis of the 73×31 data set into more manageable groups or generalization, thereby providing a summary of the urban system variations.

Table 1.3 Variables and Hypothesized Categories of Variation

1. Size 1) Total Population, 1990 * 2) Population Density, 1990 **2. Growth** 1) Population Change (1980 -1990) 2) Birth Rate 3) Death Rate **3. Family and Female** 1) Average Family size 2) Male to Female Ratio (% Male / Female) 3) Divorced Ratio **4. Age** 1) Children (% Population 0 - 14 years) 2) Young Adult (% Population 15 - 24 years) 3) Adult (% Population 45 -60 years) 4) Old age (% Population over 60 years) 5) City Age **5. Education** 1) University Degree (% Population with university degrees among total population) 2) Limited Education (% Population less than middle school) 3) High School Graduates Who go into Universities or Colleges (%)	**6. Economic Prosperity, Wealth** 1) National Tax per capita* 2) Local Tax per capita* 3) Car Tax per capita **7. Mobility** 1) In -Migration (% Population moved in a city in 1990) 2) Out-Migration (% Population moved out from a city in 1990) **8. Dwelling Character** 1) Rented dwelling 2) Detached Dwelling 3) Apartment Dwelling **9. Economic Base Differences** 1) Primary Industry (% employment in agriculture, fishing and mining) 2) Secondary Industry (% employment in manufacturing and construction) 3) Tertiary Industry (% employment in retail, wholesale, trade, restaurant & hotel, transport, storage, and communication) 4) Quaternary Industry (% employment in financing, insurance, real estate and business services) 5) Quinary Industry (% employment in community, social, and personal services) **10. Urban Facilities** 1) Telephone Supply (per 100 persons) 2) Pipe Water Supply (%)

Sources : Ministry of Home Affairs(MHA), Municipal Yearbook, 1991;
Korean Statistical Association(KSA), Population and Housing Report, 1991;
Statistics Administration, Korean Statistic Yearbook, 1991

* logarithmic transformation was used for these variables.

Factor analytical techniques have long been used in many social science disciplines to provide concise and objective results of the dimensionality of data sets (Harman,1975). The methods can be utilized as a testing procedure through the use of the common factor model, or more commonly, as an inductive, descriptive procedure by applying the component model (Clark, Davies and Johnston,1974). Since a complete data set is being used, the common factor approach may not be so appropriate, since it is more commonly used for sample data. This research adopted the component model using the Principal Axes technique in order to identify the latent dimensions of South Korean urban structure, since previous investigators (Davies 1978, Giggs & Mather 1975) have shown the robustness of the technique in comparison with other factor extraction methods. This solution was followed by an oblique rotation to create a more stable and interpretable set of factorial results, using the SPSS package programme (SPSS inc., 1994)

In the second stage of the research, cluster analysis was applied to the matrix of component scores. Cluster analysis is the general label applied to a number of related numerical taxonomic techniques, including those which classify cases through the objective, stepwise grouping of pairs of cases based on some measures of association or similarity (Sneath and Sokal,1973). The first question to be addressed was the choice of clustering methods. This study follows traditional approach used in this field by using Euclidean Distance measures to define the similarity between each pair of cities over the component scores. There are many types of clustering methods, two of which are the hierarchical (Ward's Method) and non-hierarchical approaches (Wishart's Relocate Procedure). Ward's method has been used most frequently in studies of this nature and was chosen for this analysis. Although some investigators (Davies, 1984) have claimed that the non-hierarchical methods are more appropriate, there is often a high degree of similarity in the results when there is a strong structure in the data. Now that the problems, data and techniques have been identified, it is necessary to set the scene for the study by an review of the changes that have taken place in the South Korean urban system.

CHAPTER 2
URBANIZATION IN SOUTH KOREA

2.1 Background of Urbanization

The scale and pace of urbanization has varied throughout the world in the last century (Gugler, 1988; UN, 1989). Developed countries continued the rapid urban growth experienced during the Industrial Revolution but most saw a stagnation in the 1930's followed by an increase in the post World War II period and limited growth or stagnation from the 1970's. In contrast, the developing countries are currently in the throes of the greatest urban population increase ever seen. Some nations, like South Korea, have moved from an urbanization pattern similar to the undeveloped world in the 1940's and 1950's to the one that parallels the developed world today. Until 1930, 95 percent of the population of Korea (21,058,305 in 1930) lived in rural areas and 90 percent was engaged in agricultural employment (Mills & Song, 1979). South Korea has urbanized at an extraordinary rapid pace during the years since World War II. The disruption and devastation of the Korean War led many to leave the countryside. But the rapid industrialization of the country from the 1950's has meant that in the last three decades South Korea has experienced not only a high rate of economic growth but also unprecedented urban growth – both in absolute and relative terms. The result by 1990 was that 79.6 percent of Korea's population was urbanized, as shown in Table 2.1. This compared with only 36.8 percent in 1960, the approximate start of economic modernization. It means that the urban proportion has more than doubled in 30 years and in absolute terms has increased from 9 million to 35 million – almost 4 times. During the last three decades, the urban population grew by an average annual rate of 4.5 percent

Table 2.1 Process of Urbanization in South Korea, 1960-1990 (Pop. in Thousand)

Item	1960	1970	1980	1990
Total Population	24,989	31,434	38,124	43,520
Urban population*	8,947	15,652	25,428	34,634
Rural Population	16,042	15,782	12,696	8,886
% of Urban Population	35.8	49.8	66.7	79.6

Source : Government of the Republic of Korea (GRK.), The Third Comprehensive National Development Plan (1992-2001), 1992
*Urban population : The population which resides in cities and towns of more than 20,000 population

to nearly 34.6 million by 1990, while the total population grew by 1.5 percent per year from 24 to 43 million (World Bank, 1992). This means that both the urban *proportion* and the absolute *size* of the urban population grew faster than the total population. This is a remarkable rate of increase in such a short period – an increase which has transformed the country.

Before 1960, the urban proportion in South Korea was similar to the average world standard of 34.1 % urban. But it exceeded the world standard of 37.2% in 1970 and 42.7% in 1990 respectively (United Nations, 1989). The growth rate is likely to continue. United Nations demographers project that South Korea will have an urban proportion of 87.9 percent by the year 2025 (United Nations, 1989) – with a national total of 48 million. If this projection holds, nine out of ten persons in South Korea will live in urban areas – almost the same as in Israel, another country which has gone through a similar transformation and maintained a high rate of urbanization with high income.

Kingley Davis (1975) has suggested that it is inappropriate to look at urbanization separately from economic development and migration, for the three processes have become interlinked in many different countries. Hence it is impossible to explain this rapid urban growth in South Korea without considering its economic development, in which government-inspired macro-economic decisions have provided a successful basis for the rapid urbanization and population growth shown in Table 2.1. In South Korea, the inter-sectoral economic shifts, from a subsistence agricultural base to a market economy based on the production of non-agricultural goods and services, were paralleled by spatial shifts in the distribution of economic activity and population that involved urbanization (Richardson, 1977). This process of economic development and growth in South Korea involved a dramatic re-allocation of resources, both sectorally and spatially. Traditionally, South Korea had been an agricultural country with relatively poor natural resources, limited wealth sharing, and a resulting lack of capital formation as a consequence of a small domestic market. To break this vicious cycle, South Korea adopted a strong government policy to increase investment in industrialization with foreign aid, focusing on an export-led strategy (Sohng, 1989). This strategy created a high rate of expansion of foreign trade and allowed the country to dramatically enter into the world economy. This was complemented by an urbanization policy designed to maximize the goals of growth; development was focused on a few metropolitan areas, especially the capital city, Seoul .

Table 2.2 uses several economic indicators to indicate that economic development and urbanization are highly interrelated in South Korea. The major economic development indicators – Gross National Product (GNP) per Capita, Exports and Imports – all have dramatically increased after 1960. In contrast, the share of agriculture in GNP fell from 35.9 percent in 1960 to 9.1 percent in 1990. In the same period, the share of non-agricultural sectors in GNP rose from 64.1 percent to 90.9 percent and urbanization ratio from 35.8 to 79.6 % (BOK, 1991, GRK, 1992).

Table 2.2 Major Economic Indicators and Urbanization, 1960-1990

Year / Indicator	1960	1970	1980	1990
GNP per Capita (US$)	79	252	1,592	5,569
Exports (US million $)	32.8	835.2	17,500	63,124
Imports (US million $)	343.5	1984.0	22,300	65,127
Share of Agriculture in GNP (%)	35.9	26.5	14.9	9.1
Share of nonagricultural in GNP (%)	64.1	73.5	85.1	90.9
Urbanization Ratio	35.8	49.8	66.7	79.6

Source: Bank of Korea (BOK), Economic Statistics Yearbook, 1991
Government of the Republic of Korea (GRK), The Third Comprehensive National Development Plan (1992-2001), 1992

These macro-economic changes brought about a rapid structural change from agriculture to industry. With this acceleration in industrialization, metropolitan areas required many young workers. South Korea began to experience the typical rural to urban migration that fueled urban growth. In this context, the relatively well-developed road system of the country allowed migrants to move easily to metropolitan areas. The consequence was a massive shift in human and other resources to metropolitan areas – especially to the two major core areas: Seoul and its surrounding cities; and Busan. This meant that the initial stages of economic development growth were deliberately focused on a few metropolitan areas to achieve high economic efficiency under limited financial circumstances (Renaud, 1981).

The consequence was that young migrants went to metropolitan areas to find better economic opportunities. Urban areas were very attractive to rural dwellers because in their minds the urban areas possessed everything needed for a better life: jobs, entertainment, culture and opportunities for a modern life style. Thus, several combined factors – economic, psychological, and social – prompted much of the rural population to migrate to metropolitan areas (EPB, 1977).

Economic and urban development in South Korea between 1960 and 1990 led to a migration rate that nearly doubled in that period. Table 2.3 shows that 11.7 percent of the total population moved between places in 1967-70, but this had risen to 22.4 percent in the 1986 -1990 period. The biggest increase in the migration rate started in the mid 1970s. However, a note of caution must be introduced. South Korea is a relatively small country, so migration – either within or between provinces – could occur easily

Table 2.3 Migration in Korea (Populations in Thousands)

Year	Total Number in Thousands (% of Migration)*	Intra-Provincial** Number (%)	Inter-Provincial Number (%)
1967 - 1970	3,504 (11.7)	2,490 (8.5)	1,014 (3.2)
1971 - 1975	5,414 (16.6)	3,757 (12.5)	1,657 (5.1)
1976 - 1980	7,633 (21.1)	5,276 (14.6)	2,363 (6.5)
1981 - 1985	8,866 (22.4)	5,916 (15.0)	2,950 (7.4)
1986 - 1990	9,343 (22.4)	6,350 (14.7)	3,208 (7.7)

Source : Economic Planning Board (EPB), Annual Report of the Inter-Net Migration Statistics, Republic of Korea, Economic Planning Board, 1977
National Statistical Office, Annual Report on the Internal Migration Statistics, Republic of Korea, National Statistical Office, 1992

* The Percentage of Migrants is the proportion of migrants to total number of people who moved during each period. This table also shows the proportion of Intra-Province as opposed to Between-Province Migrants

** The provinces of South Korea : 2 Metropolitan and 9 provinces in 1970 – Seoul, Busan, Kyungki, Kangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Kyungbuk, Kyungnam, Jeju
In 1990, this was 6 metropolitan areas and 9 provinces in 1990 – Seoul, Busan, Incheon, Daegu, Kwangju, Daejeon, the same provinces as above.

because the distances between places were not excessive. During the late 1970's and 1980s the migration rate reached a high plateau, accounting for a fifth of the total population in each earlier decade. It is worth noting that intra-provincial migration exceeded inter-provincial migration during all the periods, for it was easier to move within a province. Thus, migration was the main factor in the first phase of urban growth in South Korea.

The biggest flow of inter-provincial migrants in the 1960s was towards the two largest metropolitan areas, Seoul and Busan, the primary industrial centres. The Seoul Capital Area (administratively this S.C.A. means Seoul, Incheon and Kyungki Provinces which includes their neighboring satellite cities and rural areas) has been a major recipient of migrants. It reached 18.5 million people in size by 1990. During 1965-75 alone it absorbed half a million migrants annually, about equal to the country's natural population growth in the 10 year period! In the early 1980s, 55 percent of Seoul's (Metropolitan) population consisted of permanent migrants, 67 percent of whom was in the working age group (14 - 44) (United Nations, 1986).

These changes mean that the growth of urban areas in South Korea can be characterized in terms of four phases.

(1) Before the 1960's, the pre-industrialization period, urban growth was primarily from natural increase, resulting from a high fertility rate of 4.8 children per woman (World Bank, 1992). During this period, the ratio of natural increase to migration in Seoul was almost 7 to 3.

(2) The 1960's represented the second phase in which the ratio between the two reversed completely, to almost 3 (Natural Increase) to 7 (Migration) (EPB, 1990). So during this period, urban growth was due primarily to migration, and secondly to natural increase.

(3) The third phase began in the 1970's, in which a decentralization policy (GRK, 1992) was implemented in the 1970's. It led to a reduced rate of migration with the ratio leveling out to a 4.6 (Natural Increase) to 5.4 (Migration) ratio. But migration to cities still had the greater impact on urban growth during this period (EPB, 1992).

(4) A fourth phase can be seen the period since 1980. With the end of the major migration stream, the ratio between natural increase and migration in Seoul has changed back to a situation in which Natural Increase is bigger than Migration, with a 7.4 to 2.6 ratio. For example, from 1981 to 1990, the population increase of Seoul (Metropolitan) was 2.3 million that due to migration in Seoul was 0.6 million while that due to natural increase was 1.7 million (EPB, 1992). Similar features applied to other urban places. This means that the urban growth generated by large scale rural migration had come to an end in South Korea, a consequence of the depletion of young, working age groups in the rural areas and the creation of a young fertile population in the cities. Consequently, both *migration between urban areas and natural increase in the urban areas* are becoming much more important as factors in population growth.

Many administrative reclassifications and boundary changes have occurred since 1960, so it is difficult to be precise about the detailed changes in each centre. But since government reports (KHC, 1992) claim that less than 10 percent of all population growth in cities has taken place because of a boundary change the figures on changing size do not seem to have been significantly influenced by this feature. In South Korea, all settlements are reclassified in administrative terms after they reached populations of 50,000 inhabitants. Between 1960 and 1990, 40 settlements gained city status as a result of boundary changes and population increases. Moreover, since 1971, the areal expansion of urban areas has been severely limited by the establishment of greenbelts and the adoption of more efficient urban land use patterns within the cities (Kim and Mills, 1988).

2.2 Changing Size Distributions

Urban Geographers have summarized the distribution of city sizes in countries in a number of different ways, historically by using two major alternative measures, the primate city distribution and the rank / population relationship. The primate distribution character of many urban systems was identified first by Jefferson (1939). He termed the largest city of a country the primate city, and measured a country's primacy by calculating the size of the second and third largest cities each as a percentage of the largest city. With data for 51 countries, he showed that primate cities often were three times larger than the second ranking cities, although this ratio exhibited wide variation. National city size distributions characterized by an overwhelming population dominance by the largest city are commonly referred to as primate distributions. By contrast, Zipf (1949) showed that many countries had very different size distributions. He suggested that some countries had distributions that followed the rank-size rule, explaining it in terms of least cost principles of optimization. Zipf's rule states that, if P_r is the population of the r-th ranked city and P_1 is that of the largest city, then city sizes can be described by the simple expression $P_r = P_1 / r$. In other words, the second largest city will have a population one-half that of the largest and the n-th ranked city will be one n-th the size of the largest. The rule is referred to as the rank-size rule since rank multiplied by size will be a constant value. Berry (1961) showed that the simple Zipf's formula can be made more general by introducing a variable exponent, q, which will steepen or flatten the slope, but still preserves the linearity of the size distribution. The value of exponent, q, has a special use in that it can explain the differences in types of city size distributions over time in a country and over countries. Richardson (1973) generalized these ideas and showed the application of many other statistical distributions to size distributions of urban systems.

The primate size distribution is useful in describing South Korea's population size distribution, for South Korea has clearly more of a primate than rank size distribution in absolute terms. After all, Seoul Metropolitan Area consists of 10.6 million inhabitants compared to 3.8 million of the second largest city Busan in 1990 and to Daegu 2.2 million and Incheon 1.8 million, two other centres over 1 million and a large gap to Ulsan at 680 thousand (Table 2.1). This is a greater gap than the 2.4 million (Seoul) to 1.2 million (Busan) in 1960, indicating that primacy has increased over the last thirty years. However, the recognition of the primate distribution tells us nothing about the shape or character of the rest of the distribution, so it is necessary to produce a more detailed examination of South Korea's urban growth patterns by population size groups.

Table 2.4 shows the numbers of cities and the proportions of the South Korean urban population by size rank groups. The overall number of cities with a population over 20,000 increased from 103 in 1960 to 149 in 1990. The general urban size distribution in South Korea before 1960 was characterized by a very few large places, a few intermediate centres and a lot of small towns. Between 1960 and 1970, the intermediate cities (50,000 - 249,000) showed the greatest growth in numbers as more South Korean centres achieved 'Shi'(City) status by increasing to 50,000 population or more. By 1980, it was the 100,000 -500,000 sized centres that increased in number quite remarkably. In contrast, the numbers in the 20,000 - 50,000 size category was stable over the period. Between 1980 and 1990, the number of places between 0.5 and 1 million more than doubled from 2 to 5, showing the creation of several new major regional nodes. The number of places between 50,000 and 100,000 also showed a great increase from 21 to 30

Table 2.4 Numbers of Cities by Size Categories, 1960 - 1990

Population Size	1960	1970	1980	1990	Increase (60-90)
over 5 million	0 (0)	1 (35.1)	1 (33.7)	1 (30.7)	+ 1
1 million – 4,999,999	2 (39.4)	2 (18.8)	3 (23.5)	5 (29.0)	+ 3
500,000 – 999,999	1 (7.4)	2 (7.4)	2 (5.6)	5 (8.8)	+ 4
250,000 – 499,999	2 (7.8)	2 (4.4)	7 (9.5)	9 (9.3)	+ 7
100,000 – 249,999	4 (7.7)	12 (10.4)	22 (12.8)	20 (9.1)	+ 16
50,000 – 99,999	19 (14.6)	22 (10.1)	21 (5.3)	30 (6.3)	+ 11
20,000 – 49,999	75 (23.1)	73 (13.8)	80 (9.0)	79 (6.8)	+ 4
Total > 20,000	103	114	136	149	+ 46

Source : Kim, I. , Urban Geography, 1991
Ministry of Home Affairs, Municipal Year Book, 1991
(23.1) : Values in Brackets represent proportion.

Description of the changes in the lower level of the size distribution must not be allowed to obscure the continued dominance of Seoul. It must be stressed that this Metropolitan Area of 10.6 million – the 7th largest centre in the world (United Nations 1994) – now contains 30.7 % of South Korean national urban total of 35 million. The larger Seoul Capital Area contains 52.3 % of the urban total population. Table 2.5 shows another measure of the primacy index, calculated by comparing the ratio of population between the capital city and the second to the fourth largest cities. In 1990, the primacy index is 1.3 compared to 2.8 for the ratio of population between the largest city and the second largest city. Which ever measure is used, the primacy ratio in South Korea is very high and increased through time, although it peaked in the 1970s. Since then the rate has dropped slightly. In part this is due to the consequence of the Plan for Capital Region Regulation, adopted in 1981, which led to the decentralization of the Seoul region

Table 2.5 Urban Primacy and Population of Metropolitan Areas (in Thousand)

Cities	1960	1970	1980	1990
Seoul	2,445	5,423	8,351	10,628
Busan	1,164	1,836	3,154	3,798
Daegu	677	1,061	1,064	2,227
Incheon	401	631	1,081	1,798
Kwangju	314	493	727	1,145
Daejeon	229	406	651	1,062
Ratio1 : 1st / 2nd largest city	2.10	2.95	2.65	2.80
Ratio2*: 1st /2nd to 4th largest city	1.0	1.5	1.4	1.3

Source : Korean Housing Corporation (KHC), Housing Statistics Yearbook, Republic of Korea , Korean Housing Corporation, 1992
*Primary Index : Population of Capital City / Total Population in the Second, Third, and Forth Cities

(12,489 square km in 1981). The result was that "intra-regional decentralization" in the Seoul Capital Area took precedence over interurban dispersal (Yeung, 1989). Actually, the policy did not slow the process of Seoul Capital Area growth, since it created growth in satellite cities rather than Seoul Metropolitan Area itself. So in regional terms, Seoul's primacy within the national context continued. Hence, Seoul's decentralization policy was only partial – it spread growth to surrounding areas rather than restraining it – allowing the growth pressures in Seoul to spill over into the outer part of the metropolitan area. Overspill population and industries were moved to the existing or new towns surrounding Seoul – all taking advantage of easy access to the city. The result in 1990 was that no less than 20 of the 73 cities (27.4%) with populations of over

Table 2.6(A) City Size Rank and Population , 1960-1975, (Pop in Thousand)

1960		1966		1970		1975	
1 Seoul	2,445	1 Seoul	3,805	1 Seoul	5,536	1 Seoul	6,8[illegible]
2 Busan	1,164	2 Busan	1,430	2 Busan	1,881	2 Busan	2,4[illegible]
3 Dague	676	3 Dague	847	3 Dague	1,083	3 Daegu	1,3[illegible]
4 Incheon	401	4 Incheon	529	4 Incheon	646	4 Incheon	7[illegible]
5 Kwangju	315	5 Kwangju	404	5 Kwangju	503	5 Kwangju	6[illegible]
6 Daejeon	229	6 Daejeon	316	6 Daejeon	414	6 Daejeon	5[illegible]
7 Jeonju	188	7 Jeonju	221	7 Jeonju	263	7 Masan	3[illegible]
8 Masan	158	8 Mokpo	162	8 Masan	191	8 Jeonju	3[illegible]
9 Mokpo	130	9 Masan	155	9 Mokpo	178	9 Seongnam	2[illegible]
10 Cheongju	92	10 Suwon	128	10 Suwon	171	10 Ulsan	2[illegible]
11 Suwon	91	11 Cheongju	124	11 Ulsan	159	11 Suwon	2[illegible]
12 Kusan	90	12 Ulsan	113	12 Cheongju	144	12 Mokpo	1[illegible]
13 Yeosu	87	13 Jinju	107	13 Chuncheon	123	13 Cheongju	1[illegible]
14 Jinju	87	14 Wonju	104	14 Jinju	122	14 Jinju	1[illegible]
15 Chuncheon	83	15 Kunsan	103	15 Yeosu	114	15 Kunsan	1[illegible]
16 Wonju	77	16 Yeosu	102	16 Kusan	112	16 Chuncheon	1[illegible]
17 Kyungju	76	17 Chuncheon	100	17 Wonju	112	17 Jeju	1[illegible]
18 Suncheon	69	18 Jeju	88	18 Jeju	106	18 Anyang	1[illegible]
19 Chungju	69	19 Kyungju	86	19 Uijeongbu	95	19 Pohang	1[illegible]
20 Jeju	68	20 JinHae	81	20 Kyoungju	93	20 Yeosu	1[illegible]
21 Jinhae	67	21 Chungju	80	21 Jinhae	92	21 Wonju	1[illegible]
22 Iri	66	22 Suncheon	79	22 Suncheon	91	22 Iri	1[illegible]
23 Pohang	60	23 Iri	78	23 Chungju	88	23 Bucheon	1[illegible]
24 Kangneung	59	24 Uijengbu	75	24 Iri	87	24 Kyeongju	1[illegible]
25 Kimcheon	51	25 Cheonan	71	25 Pohang	79	25 Uijeongbu	1[illegible]
26 Samcheonpo	50	26 Pohang	66	26 Cheonan	78	26 Suncheon	1[illegible]
27 Chungmu	48	27 Kangneung	65	27 Andong	76	27 Chungju	1[illegible]
		28 Andong	64	28 Kangneung	74	28 Jinhae	1[illegible]
		29 Sochok	63	29 Sokcho	73	29 Cheonan	[illegible]
		30 Kimcheon	57	30 Kimcheon	62	30 Andong	[illegible]
		31Samcheonpo	54	31 Chungmu	55	31 Kangneung	[illegible]
		32 Chungmu	50	32 Samcheonpo	55	32 Sokcho	[illegible]
						33 Chungmu	[illegible]
						34 Kimcheon	[illegible]
						35 Samcheonpo	[illegible]

Note : These are the places that qualify as 'Shies' (Cities) with their populations over 50,000 by the Local Autonomy Law

Table 2.6(B) City Size Rank and Population , 1980-1990, (Pop in Thousand)

1980		1985		1985 / 1990		1990	
1 Seoul	8,367	1 Seoul	9,646	48 Dongdu	69	32 Kyoungju	14
2 Busan	3,160	2 Busan	3,517	49 Sontan	66	33 Chungju	13
3 Daegu	1,607	3 Daegu	2,031	50 Kwacheon	65	34 Jinhae	12
4 Incheon	1,085	4 Incheon	1,387	51 Samcheonpo	63	35 Andong	11
5 Kwangju	728	5 Kwangju	906	52 Sangju	62	36 Kuri	10
6 Daejeon	652	6 Daejeon	867	53 Namwon	61	37 Siheung	10
7 Ulsan	418	7 Ulsan	551	54 Naju	59	38 Kimhae	10
8 Masan	387	8 Bucheon	456	55 Jeomchon	58	39 Jecheon	10
9 Seongnam	376	9 Masan	449	56 Onyang	56	40 Hanam	10
10 Jeonju	370	10 Seongnam	448	57 Yeocheon	54	41 Kunpo	10
11 Suwon	311	11 Suwon	431	58 Kongju	54	42 Uiwang	9
12 Anyang	254	12 Jeonju	426	59 Youngcheon	53	43 Chungmu	9
13 Cheongju	253	13 Anyang	362	60 Daecheon	52	44 Taebaek	9
14 Mokpo	223	14 Cheongju	351	61 Samcheok	51	45 Donghae	8
15 Bucheon	221	15 Pohang	261			46 Seogwipo	8
16 Jinju	203	16 Mokpo	236	1990		47 Jeongju	8
17 Pohang	202	17 Jinju	227	1 Seoul	10,628	48 Youngju	8
18 Jeju	168	18Kwangmyung	220	2 Busan	3,798	49 Kimcheon	8
19 Kusan	165	19 Jeju	203	3 Daegu	2,229	50 Pyungtaek	7
20 Yeosu	161	20 Iri	192	4 Incheon	1,818	51 Songtan	7
21 Chuncheon	155	21 Kunsan	186	5 Kwangju	1,145	52 Miguem	7
22 Iri	145	22 Changwon	174	6 Daejeon	1,062	53 Sokcho	7
23 Wonju	137	23 Yeosu	172	7 Ulsan	683	54 Kwacheon	7
24 Uijeongbu	133	24 Cheonan	170	8 Bucheon	668	55Dongducheon	7
25 Kyoung	122	25 Chuncheon	164	9 Suwon	665	56 Dongkwang	7
26 Cheonan	121	26 Uijeongbu	163	10 Seongnam	541	57 Onyang	6
27 Kangneung	117	27 Wonju	151	11 Jeonju	517	58 Kongju	6
28 Suncheon	114	28 Kumi	142	12 Cheongju	497	59 Yeocheon	6
29 Chungju	113	29 Kangneung	133	13 Masan	497	60 Namwon	6
30 Jinhae	112	30 Kyoungju	128	14 Anyang	481	61 Samcheonpo	6
31 Changwon	112	31 Suncheon	122	15 Kwangmyun	329	62 Kyoungsan	6
32 Kumi	105	32 Jinhae	121	16 Changwon	323	63 Osan	5
33 Donghae	104	33 Andong	114	17 Pohang	319	64 Daecheon	5
34 Andong	102	34 Taebak	114	18 Jinju	258	65 Seosan	5
35 Jecheon	86	35 Chungju	113	19 Mokpo	253	66 Naju	5
36 Youngju	78	36 Jecheon	102	20 Ansan	252	67 Kimje	5
37 Chungmu	76	37 Ansan	96	21 Jeju	233	68 Milyang	5
38 Kimcheon	72	38 Donghae	92	22 Kusan	218	69 Sangju	5
39 Sokcho	66	39 Chungmu	87	23 Uijeongbu	212	70 Youngcheon	4
40 Samcheonpo	65	40 Youngju	85	24 Cheonan	211	71 Jangseungpo	4
		41 Kuri	84	25 Kumi	206	72 Jeomchon	4
		42 Seogwipo	83	26 Iri	203	73 Samcheok	4
		43 Jeongju	79	27 Chuncheon	174		
		44 Kimhae	78	28 Yeosu	173		
		45 Kimcheon	77	29 Wonju	173		
		46 Pyeongtak	72	30 Suncheon	167		
		47 Sokcho	70	31 Kangneung	153		

50,000 were located in the region surrounding Seoul, compared to only 2 of 27 (7.4%) in 1960. By 1990, the administrative area (Seoul Capital Area) that encompasses Seoul, Incheon and Kyeongki-Do contained 42.7 percent of the total population and 48.8 percent of manufacturing employment (GRK, 1992). This is a very high degree of core area concentration, a characteristic which is disguised if the Seoul city population alone is used as the indicator of urban change.

Further understanding of the changing size distributions in South Korea for the rest of size distribution can be obtained in relative terms by plotting the rank of the city against population size in five year intervals for 1960 - 1990. Table 2.6 shows the city rank in approximately five year interval from 1960 to 1990 in Korea. The plot of city rank or position in the size distribution, against size, on double logarithmic paper is shown in Figure 2.1 and the q values, which indicate the slopes of the curves, are calculated as shown in Table 2.7. The q value has been over 1 in each of the years. It has increased slightly until 1970, fluctuated in the next 15 years but now seems to have reached a plateau of 1.23. The increase of the q value means that the slope has increased, although the change is not a major one varying from 1.16 to 1.23. In the 1970s, the massive migration toward the major metropolitan, Seoul and Busan, was at the peak, but since 1970, the slope has been more constant, hovering around 1.2. It seems that the urban system in South Korea has entered a more stable stage. It has a primate city, several other large cities and a relatively stable linear distribution when log/log values are used for both rank and size group cities, although Figure 2.1 shows that there has been more variation in the smaller sized centres.

Figure 2.1 Rank Size Distribution in South Korea, 1960- 1990

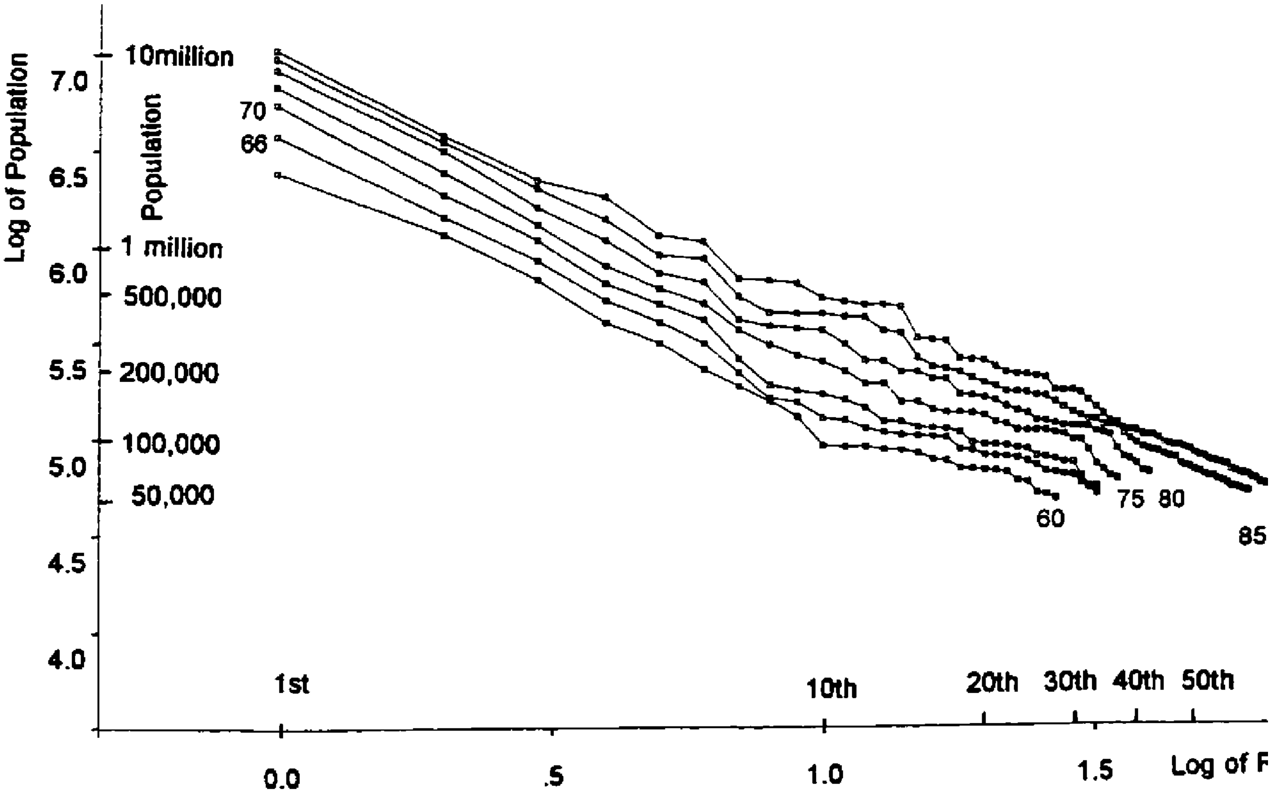


Table 2.7 Change of *q* Parameter, 1960-1990

Year	No of Cities	q Value*
1960	27	1.1787
1966	32	1.1605
1970	32	1.2288
1975	35	1.2086
1980	40	1.2054
1985	61	1.2126
1990	73	1.2283

*These were obtained from regression lines. (Formula : Log P = a -q Log r)

2.3 Discussion

This chapter has described how South Korea has undergone a profound transformation from a rural to urban population distribution. It has also displayed an increasingly primate pattern over the past three decades, during its change from a primarily agricultural to industrial economy and from low to moderate per capita income. Although the transformation in South Korea displays many special features, in part it has followed the process that began in advanced countries with the Industrial Revolution and brought economic development, urbanization and social change. However, as United Nations (1989) shows in South Korea as it occurred at a much more rapid rate and with very high levels of concentration of the population. In this short period, South Korea has experienced a dramatic and thorough transformation in its settlement pattern and economy. The rapid urban and industrial growth has created a strong concentration of population and industries in the Seoul region and in the major metropolitan areas and industrial satellites.

The trend and pattern of South Korean urbanization appear to be closely associated with the national development strategies and national characteristics, namely; the export-oriented industrialization strategy, the high population density resulting from the large population size and small national land area (98,965 square kilometers), poor resource endowments, and interventionist economic planning by the government. The industrialization policy induced a massive migration from rural to urban areas. So urban growth in South Korea during the last three decades was due mainly to migration rather than natural increase, accompanied by the process of urbanization and industrialization. Not until more recent times has the natural increase within the cities and inter-urban migration become the most important factors in urban growth, replacing the rural-urban migration dominance of the past. Although the general city size distribution in South Korea as a whole can be characterized by a linear trend, if the log. of size is plotted against the log. of rank, it is the primacy of the South Korean system that is the dominant trend. The size distribution of cities has been characterized by an increasingly primate pattern with the South Korean urban system dominated by the Seoul Metropolitan Area – an area of even greater concentration when the surrounding centres are included. However, this has been accompanied by an equivalent rapid growth of intermediate sized centres over 1 million population which has led to a more even size distribution in the middle size categories.

CHAPTER 3

URBAN DIMENSIONS AND PATTERNS IN SOUTH KOREA

3.1 Introduction

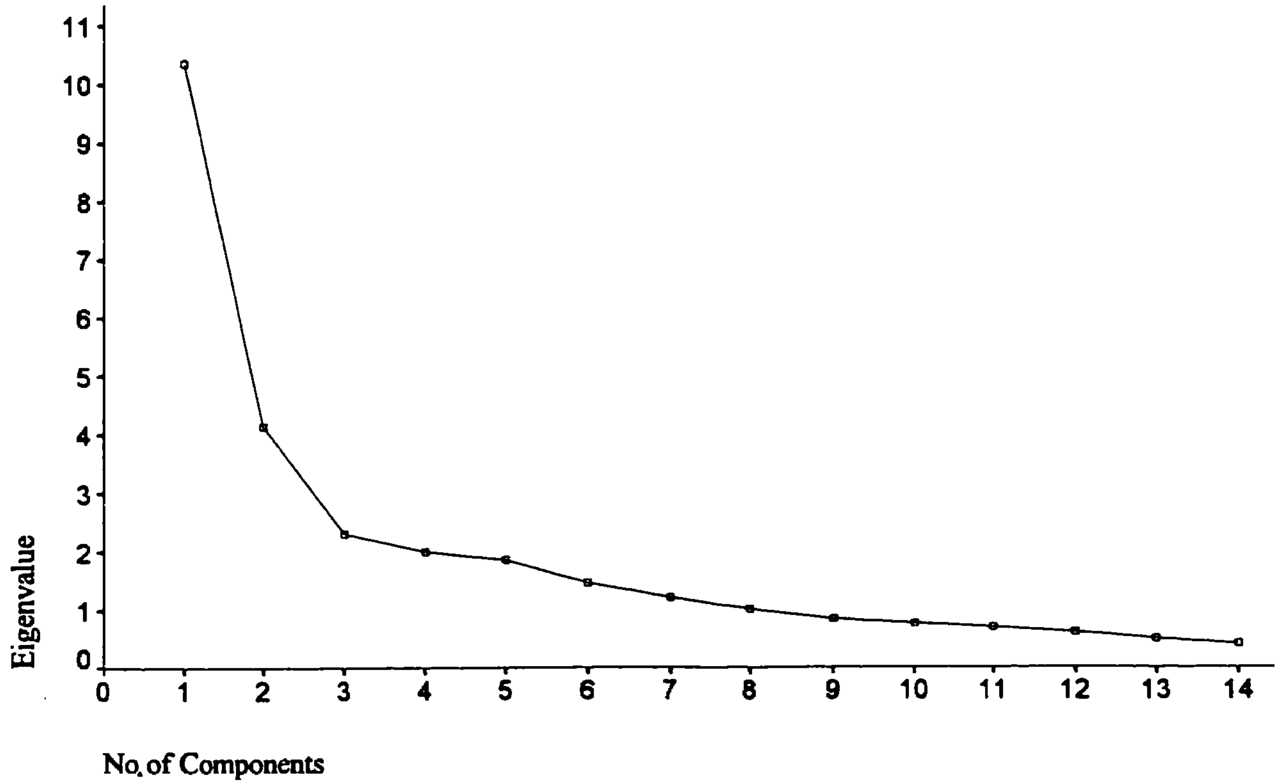
The purpose of this chapter is to provide a summary description of the major characteristics of South Korean cities by identifying the underlying dimensions revealed by a factorial of a wide ranging data set. The spatial pattern of each of these dimensions, the separate characteristics of the system, is also examined to reveal the extent to which there is a regional differentiation of centres. These results are compared with other studies of the dimensionalities of urban systems, described in Chapter 1, especially to Seong's study on South Korean urban dimensionality in 1975. The later comparison will provide an insight into the changes that have occurred over time, although the results are not strictly comparable because of different data sets.

3.2 Selection of Component Solution

This study will use the Principal Axes technique, using the component model followed by oblique rotation – technically a component not a common factor approach. The terms 'factors', 'components' and 'axes' are used inter-changeably in the subsequent discussion. The question of how many components to extract is one of the most fundamental issues in factorial ecology. The selection of too few axes means that loss of a lot of variance; the extraction of too many may produce overfactoring and lead to split axes, highly correlated axes or axes with only minor amounts of variance. In the common factor model, precise statistical tests are available to determine the choice of solution based on the extent to which the sample of data used is a good representation of the complete population. In the data exploration or data generalization approach of the component model used here, a number of guidelines in choosing component solution have been suggested, such as the Eigenvalue 1.0 rule proposed by Kaiser (1961), Cattell's Scree Test (1966), the Communality Tipping Point and the Factor Complexity approach used by Davies and Barrow (1973) etc. Davies (1984) recommended the use of various methods before the decision is made, arguing that it seemed sensible to compare the effect of the use of several different procedures in the search for the final solution to interpret.

With a 31 variable data base, the 1.0 eigenvalue rule meant that the last extracted factor accounted for only 3.2 % of the total variance which may be a rather high cut-off since rotation would re-distribute variance to smaller axes. The application of this procedure would result in the extraction of 8 components. Figure 3.1 shows that the

Figure 3.1 Distribution of Eigenvalues



distribution of eigenvalues reveals no clear break of slope or scree, except at the bottom of the major change of slope – at three components – and minor changes after five and nine axes. The three axis solution accounted for only 56.4 percent of the total variation in the original data - which seemed too small to be of value. However, there seemed to be other, yet smaller, changes of slope, at the five and nine axis levels, which accounted for 68.7 and 83.3 % of the variance respectively. So the area between five and nine components was looked at in more detail to determine what happened to the results obtained at each of these solution levels. Many urban system studies in the past were flawed by only using unrotated solutions in which general axes are produced. So the interpretation of the five to nine axes was made after the rotation of the axes using the Direct Oblimin Oblique method.

The examination of the final communalities for various solutions shows how much of the variance of each variable can be explained according to the selection of component solution (see Table 3.1). Not until the six axes solution do all variables still have more than 50% of their variance explained – which means that the six component solution

Table 3.1 Distribution of Final Communalities

Solution	Number of Variables with Communalities that are : >0.7	0.5 - 0.7	<0.5	Total
Five -component	20	6	5	31
Six - component	21	7	3	31
Seven - component	25	6	0	31
Eight - component	28	3	0	31
Nine - component	29	2	0	31
Ten - component	31	0	0	31

accounted for most of each variable's variance. Table 3.1 shows that at the five axis solution five variables are under 0.5: v6, divorced ratio; v15, % of high school graduates in universities; v17, migration-out of the city; v26, telephone supply; v30, national tax per capita. At the 6 axis solution only three are in this category : v6, divorced ratio; v26, telephone supply; v30, national tax per capita. The seven axis solution, having all variables with communalities over 0.5, seemed an appropriate place to stop factoring at first sight. However, six variables still have communalities between 0.5 and 0.7. The addition of an 8th component reduced this value from 6 to 3 variables; not until 10 component solution was the figure reduced to zero. At first sight the 8 or 9 component solutions seemed to be appropriate places to stop factoring. But, at 9 components, an axis that is identified by a single variable is produced (with v26 telephone supply). This suggests that overfactoring has taken place – for instead of generality, with several variables identifying an axis, a condition of specificity, with identification by a single variable has been reached, which seems contrary to the whole purpose of the generalizing approach of factor analysis. So the choice was between 7 and 8 axis solution. A further check on the utility of various solutions was made by interpreting each of the solutions, from 5 to 9 axes to see whether anything of substance was gained or lost. Table 3.2 shows the short titles provided. The 7 axis solution failed to identify an interpretable and useful axis (Mobility / Divorced ratio with 9.1 % variance), which was found at the 8 axis solution. Since the 7 axis solution "lost" an axis and the 9 axis solution seemed to overfactor, it was decided that an 8 axis solution was the most appropriate to interpret. The 8 axis solution accounted for 71.4 % of total variance – a comparable level of explanation to other urban system studies.

Table 3.2 Short Titles of the Axes : 5 to 9 Solution

Order of Extraction	Number of Axes in Solution 9	8	7	6	5
1	S.E.S*	S.E.S	S.E S	S.E.S	S.E.S
2	Size	Size	Size	Size	Size
3	Ecomic Character	Economic Character	Economic Character	Economic Character	Economic Character
4	Family / Dwelling	Family / Dwelling	Family / Dwelling	Family / Dwelling	Family / Dwelling
5	Primary Industry	Primary Industry	Primary Industry	Primary Industry	Primary Industry
6	University / Age	University / Age	University / Age	University / Age	?
7	Mobility / Divorced	Mobility / Divorced	?	?	?
8	Children / Young Adult	Children / Young Adult	Children / Young Adult	?	?
9	Telephone Supply	?	?	?	?

* S.E.S. : Socio Economic Status, ? : Axes not found in this solution
** The full description of the titles is found in Section 3.3

3.3 Component Interpretation and Spatial Patterns

Many studies of urban dimensionality in the 1960s used unrotated or varimax solutions which imposed orthogonality on the result i.e. each factor axis was at right angles to each other. In the 1980s the oblique approach to rotation was more favored. In this study, the results of an oblique solution (direct oblimin 0.0) will be used, with varimax loadings also presented in parentheses for comparison.

The eight axis solution was considered to represent the major dimensions of urban system for South Korean towns, defining their distinct characteristics by means of different variables. In subsequent sectors each component is listed in order of importance of the amount of variance explained. Next, the loadings on each axis are examined and from this information each component is labeled with a summary description as shown in Table 3.2. All loadings over $\pm$ 0.3 are shown in the factor loading tables. The 0.3 cut-off was used following standard practice (Davies, 1984) and because a value of below 0.3 accounted for less than 9 % (0.3×0.3) of the variability of the variable. Next, the regional pattern of scores on the dimension was examined and mapped.

3.3.1 Component 1

This component is the largest and accounted for 13.5 percent of the total variation. The pattern of the high loading variables shows that it represented a basic dichotomy between Secondary (Manufacturing) Industry and other Economic Activity. Hence, the dimension can be labeled Economic Character. The high positive loadings identify high proportions of employment in quinary, quaternary, and tertiary industry as well as large concentrations of elderly people and university degree holders. By contrast, the large loadings on the negative side included variables that identified high percentages of people employed in secondary industry and high birth rates (see Table 3.3). It should be noted that age structure is linked to this essentially economic axis but since the age loadings are

Table 3.3 Component 1 : Economic Character and Age (13.5%)

Loadings*	Variable
92 (91) **	% Employed in quinary industry
86 (80)	% Employed in quaternary industry
71 (76)	% Employed in tertiary
47 (61)	% Pop. 45-60 years
42 (32)	% University degree holders
40 (55)	% Pop. over 60 years
-41 (-51)	Birth rate
-91 (-90)	% Employed in secondary industry

Cities with largest scores

3.00	Kwacheon (Kwc)	-2.27	Ansan (As)
1.45	Seosan (Ss)	-2.23	Kumi (Km)
1.44	Kongju (Kj)	-1.29	Changwon (Chw)
1.30	Suncheon (Sch)	-1.78	Kunpo (Kp)
1.17	Daecheon (Dch)	-1.51	Kyoungsan (Ks)
1.09	Seogwipo (Sg)	-1.46	Ulsan (Us)
1.08	Mokpo (Mp)	-1.45	Kimhae (Kh)
1.01	Jeongju (Jgj)	-1.30	Siheung (Sh)
1.00	Andong (Ad)	-1.25	Migeum (Mg)
		-1.16	Incheon (Ich)
		-1.14	Bucheon (Bch)
		-1.13	Dongkwangyang (Dk)

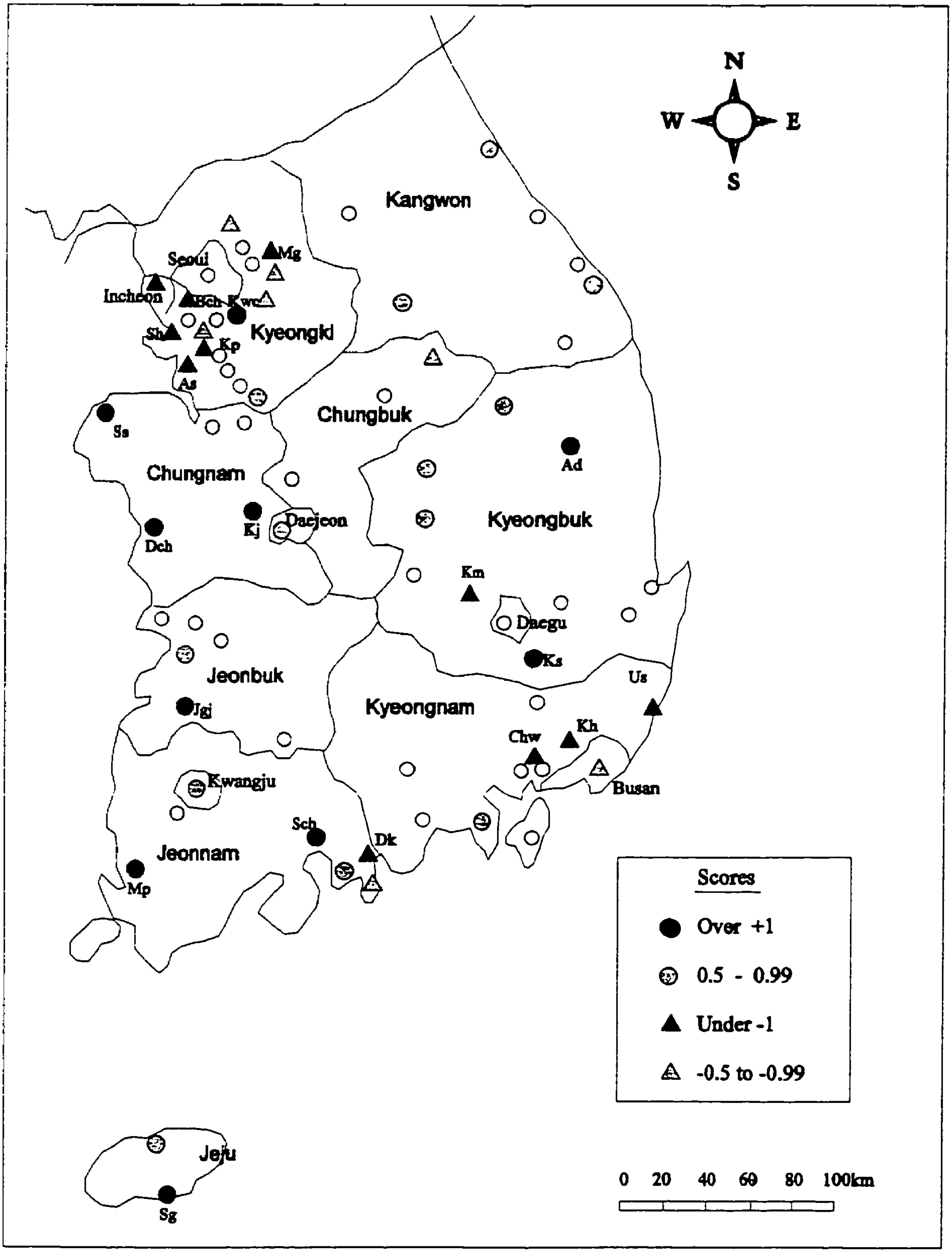
* Decimal points are removed for ease of interpretation : 92 is 0.92.
** Figures in brackets represent loadings for the varimax solution.

only of medium or low value, they were not included in the title. This results indicate that higher percentages of the middle and old aged population in employment are found in the cities with high levels of non-secondary industries. Table 3.4 also shows that the variable indexing high birth rates – associated with greater proportions of people of fertile age – must be linked to areas that contain high value of secondary industry because they are both found on the negative side of Factor 1, although it is worth noting that the birth rate variable has a low loading.

Figure 3.2 shows the areal distribution of the scores on the Economic Character dimension. The high negative scores, reflecting industrial towns shown in Table 3.3, form two distinct groups, those in the Seoul Capital Area in the Northwest and a set of industrial towns in the Southeast. This pattern seems to reflect the results of the performance of South Korea's economic development plans during the last 30 years. Industrial plants were been deliberately concentrated in and around Seoul and Busan and in the transportation belt connecting them (GRK, 1992). Ansan (As), Kumi (Km), and Changwon (Chw) have the largest negative scores and typical examples of industrial towns in South Korea. Ansan is a completely new town built in the late 1970 under Korean government plan as a base for export industries. Kumi and Changwon, which used to be small towns before 1970, have grown to major industrial sites after being chosen for expansion in the development plans of Korean government from the early 1970's.

By contrast, the highest positive score is found in Kwacheon (Kwc), which is a typical administrative town. The remaining high positive scores are mainly found in the cities in the West and Southwest – a region less affected by industrialization.

Figure 3.2 Component 1 Economic Character



3.3.2 Component 2

Table 3.4 shows that this component can be best labeled Socio-Economic Status, for it reveals the strong relationships among the variables associated with relative wealth, levels of education and with taxes. On the positive side are variables identifying taxes and university degrees, whereas the negative side is associated with the indicators of limited education and tertiary employment. At first sight it may be surprising to find the

Table 3.4 Component 2 : Socio-economic Status (13.4%)

Loadings*	Variable
84 (83)	Local tax per person (log scale)
79 (81)	% University degree holders
77 (76)	Car tax per person
74 (81)	% Apartment dwelling
40 (35)	% Employed in quarternary industry
39 (55)	Population change (1980-1990)
-30 (-20)	Average family size
-33 (-38)	% Pop. 15 - 25 years
-37 (-45)	% Employed in tertiary industry
-53 (-68)	% Limited education
-64 (-73)	% Detached dwelling

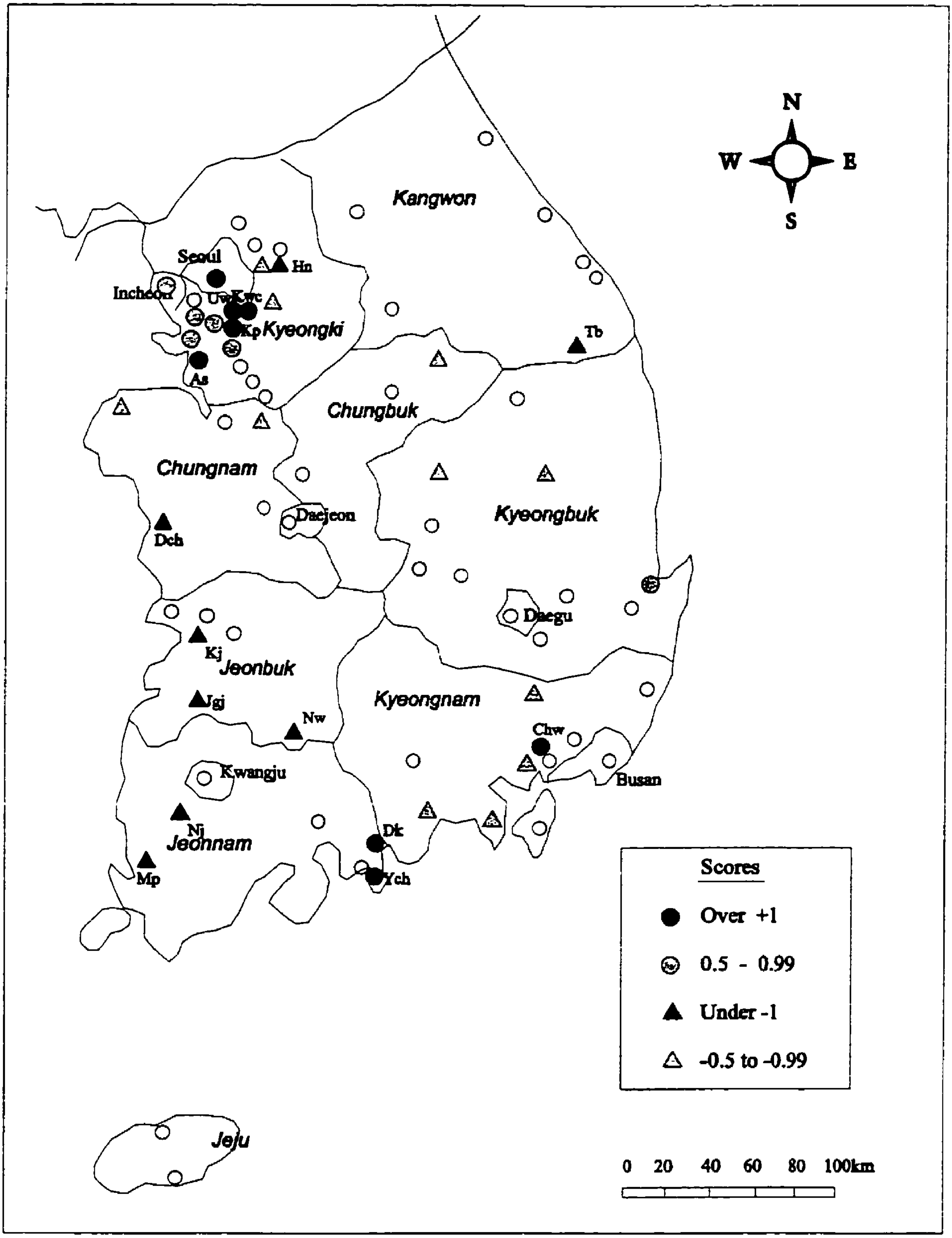
Cities with largest scores

5.67	Kwacheon (Kwc)	-1.59	Jeongju (Jgj)
1.62	Uiwang (Uw)	-1.53	Naju (Nj)
1.44	Ansan (As)	-1.40	Namwon (Nw)
1.40	Dongkwangyang (Dk)	-1.39	Kimje (Kj)
1.39	Yeocheon (Ych)	-1.25	Daecheon (Dch)
1.31	Seoul (Sel)	-1.12	Mokpo (Mp)
1.30	Changwon (Chw)	-1.10	Hanam (Hn)
1.11	Kunpo (Kp)	-1.01	Taebak (Tb)

variable measuring the percentage of detached dwellings on the negative side of the axis and apartment dwelling on the positive side. However, the relationship reflects the high cost of housing in the big cities of South Korea. Moreover, the concept of an apartment in South Korea is different from that in western countries. It is just a type of housing unit – one that does not necessarily indicate a rental unit. In other words, it includes condominiums (owned apartments) as well as rented ones. Indeed, in South Korea apartments are much more favored by the middle or upper classes in the urban areas than are detached houses – because of the high costs and limited supply of the later. The 'local tax' and 'car tax' can be regarded as measures of the concentration of wealth in an area because the former includes property tax, acquisition tax and registration tax and the latter is imposed on the automobile owners.

This dimension accounts for 13.4 % of the total variance, which is almost the same only as the Economic Character axis (with a variance explanation of 13.5%). The Socio-Economic Status vector, combining education, occupation and income variables, has been found in most factorial ecologies of urban systems and cities (Davies, 1984). However, the relative importance of this axis when compared to Seong's study (1977) on Korean urban system is rather surprising, since he did not identify such an axis although his work did include variables that could have indexed this type of axis, namely 'national tax per person', 'car tax per person', 'level of education' etc. It is possible that the difference in socio-economic levels between cities was not large enough to differentiate the centres twenty years ago. Seong's major axis, one that differentiated the Traditional-Modern Contrast included the key variables that make up the Socio-Economic Status axis identified here.

Figure 3.3 Component 2 Socio-Economic Status



This component also shows striking variations in the spatial pattern of the scores (see Figure 3.3) – a product of the late twentieth century process of economic growth in South Korea.

The centres having high positive scores – indexing high status and wealth – such as Seoul (Sel), Ansan (As), Kunpo (Kp), Changwon (Chw), Yeocheon (Ych) and Dongkwangyang (Dk), have all had major increases in population in the last 10 years. Theses cities have attracted more population because of their continuously expanding employment opportunities which created high levels of accumulated wealth.

Kwacheon (Kwc), which has the highest positive score (5.67), is worth commenting on. The town was constructed as an administrative centre with decentralized government offices from Seoul. Consequently, almost half of the graduated residents (45.45 %) have university degrees and most are employed by the national government. Within the Seoul Capital Area, the scores on this dimension also display the contrast between those to the Southwest and Northeast sectors with positive and negative scores, respectively. This feature can be explained by the fact that many of migrants from rural areas to Seoul Metropolitan tend to first settle in the Northeastern satellite cities, such as Hanam (Hn), Miguem (Mg), Seongnam (Sg), Kuri (Kr) and Uijeongbu (Uj), and then move on to the more prosperous southwest centres around Seoul as they become wealthier. Most of the other negative scores – places of lower prosperity – are in the southwestern part of the country, the areas that have not industrialized.

3.3.3 Component 3

The third component, accounting for 11 percent of the total original variation, is simply labeled _Size_ although it is also linked with quality of the urbn environment or services. Its highest loadings are dominated by characteristics linked to the importance of a place and its degree of provision of modern services: population size; population density; city age; and piped water supply; and to a lesser degree, with per capita national

Table 3.5 Component 3 : Size (11.0 %)

Loadings	Variables
87 (88)	Population (log scale)
86 (81)	City age
72 (73)	Population density
69 (71)	% Piped water supply
41 (44)	National tax per person (log scale)
-38 (-45)	Death rate
-39 (-42)	% Pop. over 60 years

Cities with largest scores

3.36	Seoul (Sel)	-2.10	Dongkwangyang (Dk)
1.75	Busan (Bs)	-1.80	Kimje (Kj)
1.70	Masan (Ms)	-1.56	Sangju (Sj)
1.60	Daegu (Dg)	-1.30	Seosan (Ss)
1.51	Incheon (Ich)	-1.25	Youngcheon (Ygch)
1.32	Bucheon (Bch)	-1.20	Siheung (Sh)
1.31	Suwon (Sw)	-1.18	Hanam (Hn)
1.22	Daejeon (Dj)	-1.11	Samcheok (Sam)
1.21	Ulsan (Us)	-1.04	Jeongju (Jj)
1.20	Kwangju (Kwj)	-1.03	Naju (Nj)
1.20	Pohang (Ph)	-1.03	Milyang (My)

tax (see Table 3.5). So the large and old cities have higher population densities, higher proportions of piped water supply and higher tax revenues. On the negative side of axis, only low loadings associated with death rate and old aged people are found, which identify the small places that are dominated by people who are retired and by a declining or stagnant population. More quality of life variables would be revealed to label the axis Size and Quality.

Figure 3.4 shows the spatial features of the pattern of component scores. Not unexpectedly, the highest scoring cities on this dimension are almost all the large cities and the old regional centres. The lower scoring towns are newly established cities which only just meet the criteria of a minimum population size (50,000) used in this study and which qualify as legal cities.

Table 3.6 shows the populations and ages of the cities with the highest factor scores. It is obvious that the rank of the scores does not strictly duplicate the size hierarchy. The scale is not simply a ranking of centres in terms of size alone, for the other three major variables – city age, density and piped water supply – also play a significant role in determining the score for an individual town. For example, Masan is ranked on the third position in the scores, in spite of its 12th place ranking on the population size continuum. The centre used to be an industrial base for export trade. Since 1976, when Changwon was established adjacent to the city to fulfill this role, Masan could not expand its administrative district. So Masan remains a relatively small and densely populated centre. Despite these and other exceptions, the rank correlation for these 18 centres produced a value of + 0.78 between population size and the score on the size dimension. The rank correlation between population density and this factor score is only 0.44.

Figure 3.4 Component 3 Size

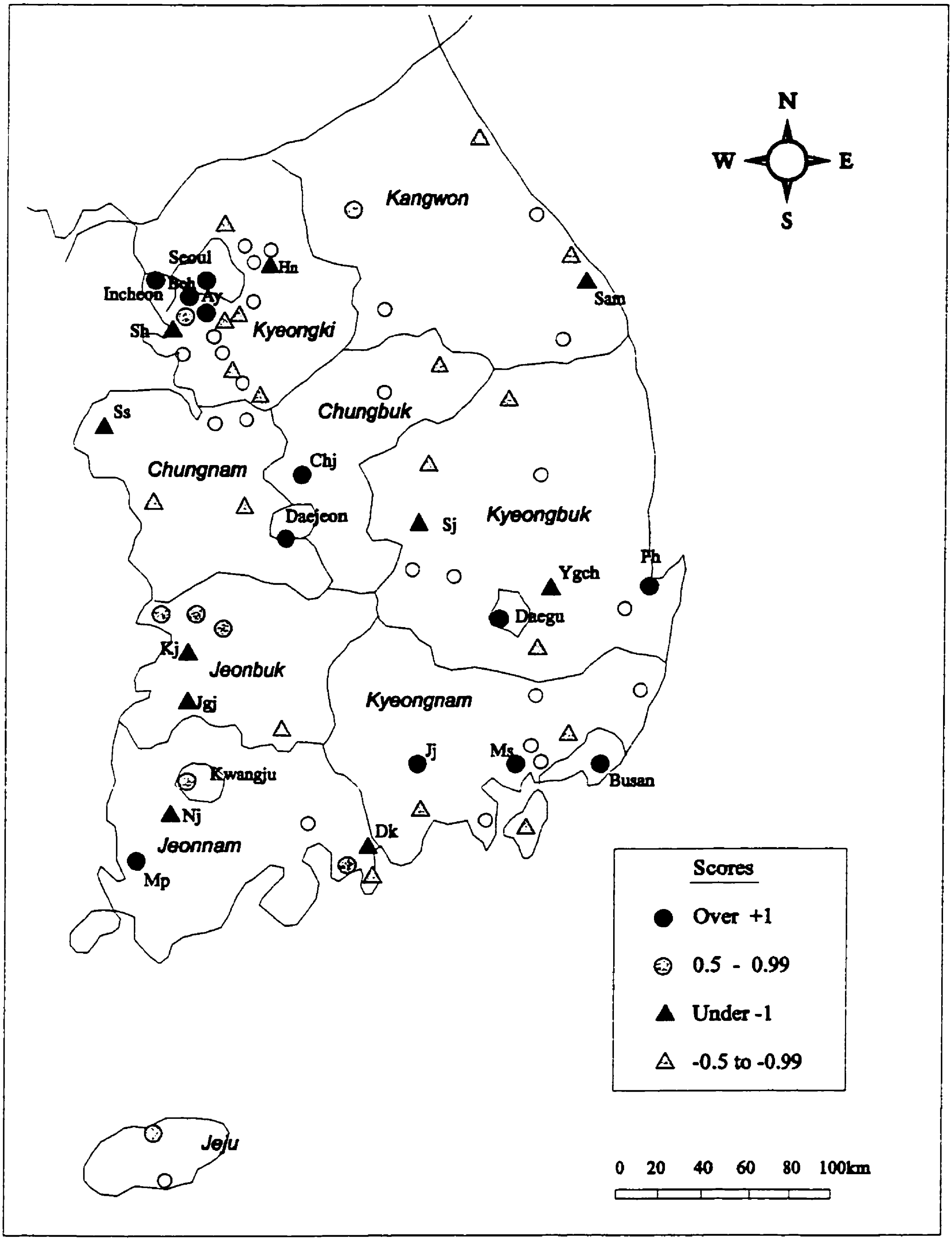


Table 3.6 Scores on Size Axis, Population and Density (Pop. >250,000), 1990

City	Score (Rank)	Population (Rank)	S/P Rank Diff.*	Density	S/D Rank Diff.**	City Age
Seoul	3.36 (1)	10,627,790 (1)	0	17,554 (1)	0	44
Busan	1.75 (2)	3,797,566 (2)	0	7,173 (5)	3	41
Masan	1.70 (3)	496,639 (12)	9	6,773 (6)	3	41
Daegu	1.60 (4)	2,228,834 (3)	1	4,891 (10)	6	41
Incheon	1.51 (5)	1,818,293 (4)	1	5,733 (8)	3	41
Bucheon	1.32 (6)	667,777 (8)	2	12,798 (2)	4	17
Suwon	1.31 (7)	644,968 (9)	2	6,109 (7)	0	41
Daejeon	1.22 (8)	1,062,084 (6)	2	1,969 (18)	10	42
Ulsan	1.21 (9)	682,976 (7)	2	3,766 (12)	3	28
Kwangju	1.20 (10)	1,144,695 (5)	5	2,285 (17)	7	41
Pohang	1.20 (11)	318,595 (15)	4	4,282 (11)	0	41
Anyang	1.17 (12)	480,668 (13)	1	8,219 (4)	8	17
Jinju	1.10 (13)	258,365 (16)	3	3,714 (13)	0	41
Mokpo	1.07 (14)	253,423 (17)	3	5,556 (9)	5	41
Jeonju	0.98 (15)	517,104 (11)	4	2,608 (16)	1	41
Cheongju	0.98 (16)	497,429 (12)	4	3,238 (15)	1	41
Kwangmung	0.81 (17)	328,803 (14)	3	8,461 (3)	14	9
Ansan	-0.31(18)	252,157 (18)	0	3,369 (14)	4	4
Rank Correlation			0.78		0.44	

* Difference between factor score and population rank

** Difference between factor score and density rank

3.3.4 Component 4

This axis, accounting for 9.1% of the overall variance, is more difficult to interpret, for it is linked to variables that seem to be different in character on first sight. On the positive side the mobility variables (population change, in and out-migration) have the highest loadings, whereas it is the divorced ratio that dominates the negative side of the axis, together with a lot of minor loading variables that are linked to older age populations

Table 3.7 Component 4 : Mobility / Divorced Ratio-Old Age

Loadings	Variables
60 (-57)	% Move-in pop. in 1990
55 (-56)	% Move-out pop. in 1990
47 (-49)	% Population change between 1980 and 1990
-32 (40)	% Pop. over 60 years
-34 (41)	% Limited education
-36 (30)	City age
-39 (48)	% Pop. 45-60 years
-89 (80)	% Divorced ratio

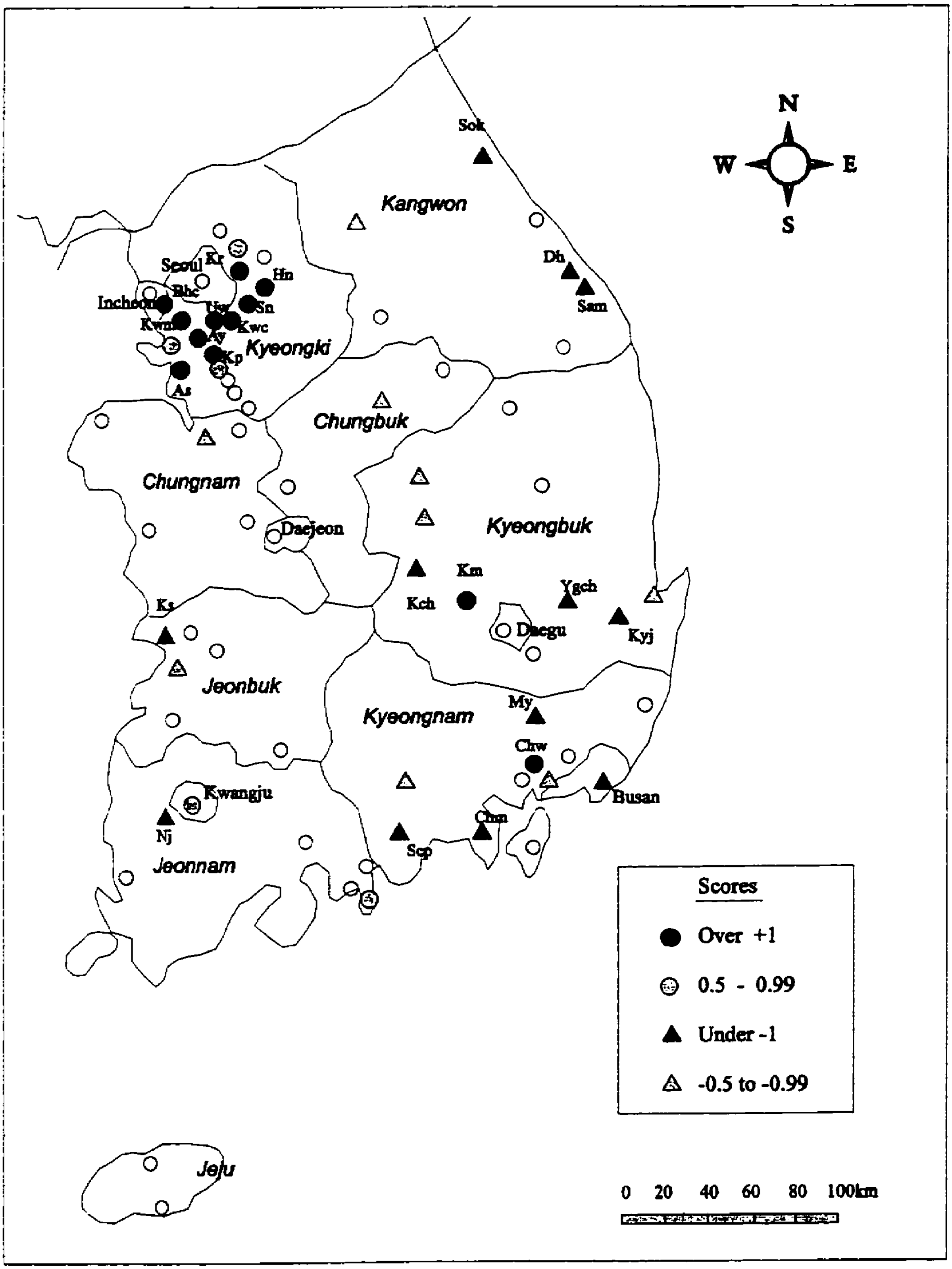
Cities with largest scores

2.92	Ansan (As)	-2.16	Samcheonpo (Scp)
2.38	Kwangmyung (Kwm)	-1.63	Kimcheon (Kch)
2.08	Kunpo (Kp)	-1.53	Sokcho (Sok)
1.68	Kuri (Kr)	-1.41	Samcheok (Sam)
1.63	Bucheon (Bch)	-1.39	Youngcheon (Ygch)
1.51	Kumi (Km)	-1.34	Busan (Bs)
1.45	Kwacheon(Kwc)	-1.32	Donghae (Dh)
1.42	Changwon (Chw)	-1.17	Milyang (My)
1.40	Hanam (Hn)	-1.16	Kunsan (Ks)
1.36	Seongnam (Sn)	-1.12	Naju (Nj)
1.26	Anyang (Ay)	-1.05	Kyoungju (Kyj)
1.25	Uiwang (Uw)	-1.05	Chungju (Chj)

as well as these with limited education etc. This means that places with the high levels of migration in the South Korean urban system are associated with low levels of divorce. The title Mobility / Divorced Ratio describes the essential characteristics of the axis. In this case the varimax values have their signs reversed; this is a function of the assignment signs not any substantial difference.

The main feature of the distribution of scores on this axis is the strong spatial clustering, associated with mobility and growth in the satellite cities, surrounding Seoul (Figure 3.5). All the centres having higher scores over +1.0 are clustered around Seoul,

Figure 3.5 Component 4 : Mobility / Divorced Ratio



except for two cities, Kumi (Km) and Changwon (Chw). This indicates that Seoul and its surrounding towns have the greatest population mobility values of places in the South Korean urban system. Since the migration is both 'in' and 'out' the results show that not only the influx of population from the rural area to Seoul Capital Area, but also the high level movement within the metropolitan area itself are at high levels. The proportion of the Seoul Capital Area in the national population grew from 20.8 percent in 1960 to 42.7 percent in 1990. The average population migration of these centres was 53.8 % in 1990 – which means that over half the population either moved into the area or moved within the area or moved out – which is even higher than the average of the whole set of centres, which is itself a surprising 44.4 % (The proportion of migration in each city was calculated by the following formula : move-out + move-in / total population of the city in the previous year). The proportion of moving homes or migrants in the highest scoring ten cities averaged 59.4 percent (MHA,1991).

The high negative scores – indexing high divorce levels and an older population – also form a distinct band along the North Eastern coast, the South West and the South Eastern Interior and coasts. Most of the centres in this area are either ports or fishing towns or inland centres such as Kimcheon, Youngcheon and Taebak – smaller towns of the interior which have had limited population growth due to an absence of industrialization.

3.3.5 Component 5

This dimension is labeled Family / Dwelling Type and accounted for 6.6 percent of the total variance. On the positive side, only one variable – the family size – has a high value. The negative loadings are associated with high proportions of houses with telephone supply, high proprotions of rented dwelling, and, to a lesser degree, with per capita national tax. This dimension reflects the high family size of the smaller, rural centres, contrasting with the modern centres which are indexed by lots of telephones, rented dwellings and small families.

Table 3.8 Component 5 : Family / Dwelling Type (6.6 %)

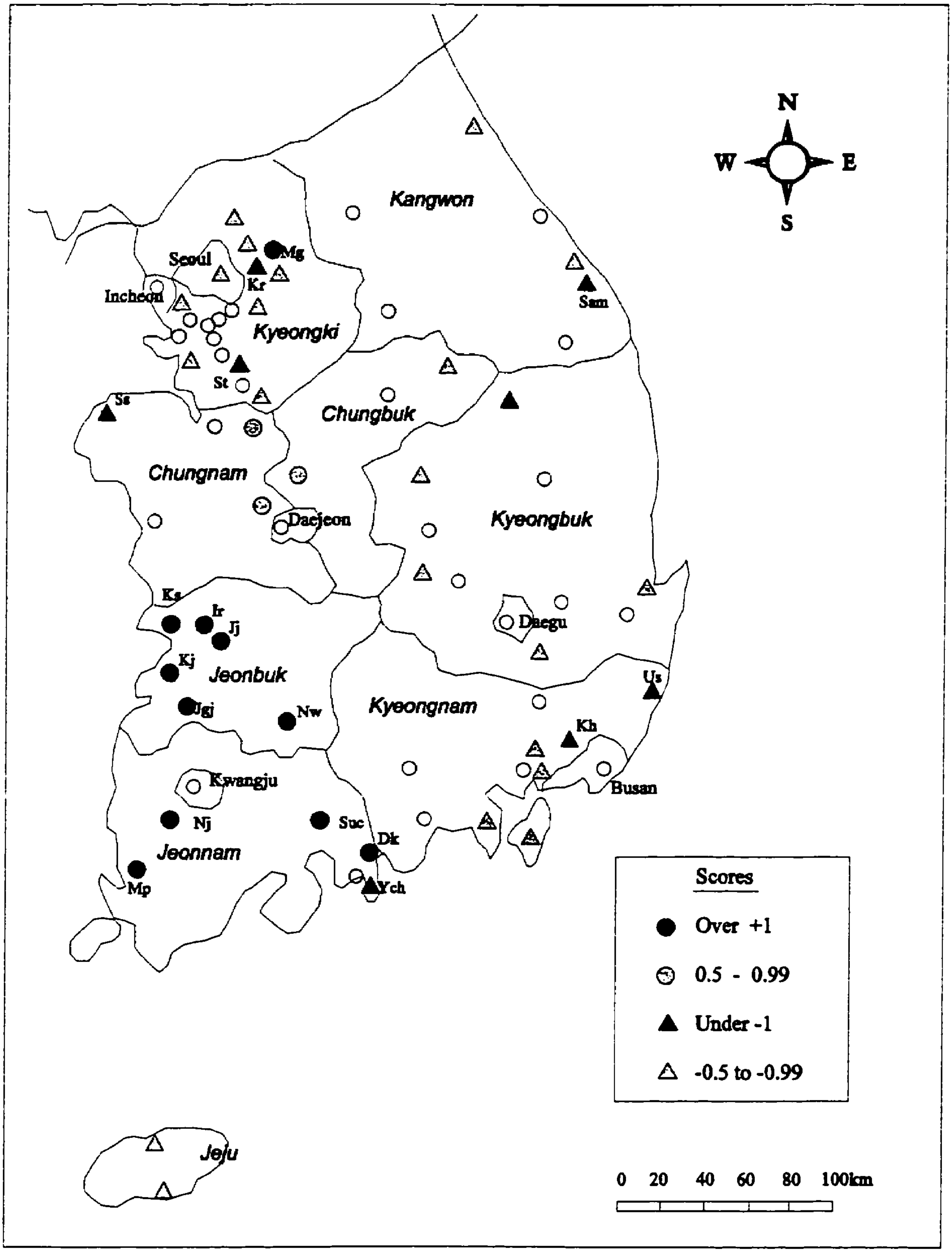
Loadings	Variables
61 (-77)	**Family size**
-41 (45)	National tax
-56 (63)	% Rent dwelling
-72 (62)	% Telephone supply

Cities with largest scores

4.23	Dongkwangyang (Dk)	-2.26	Seosan (Ss)
2.54	Miguem (Mg)	-1.34	Sontan (St)
2.29	Naju (Nj)	-1.29	Yeocheon (Ych)
2.10	Kimje (Kj)	-1.19	Kimhae (Kh)
1.47	Namwon (Nw)	-1.10	Samcheok (Sam)
1.27	Suncheon (Suc)	-1.04	Kuri (Kr)
1.11	Iri (Ir)	-1.04	Ulsan (Us)
1.09	Kusan (Ks)		
1.07	Jeongju (Jgj)		
1.00	Mokpo (Mp)		

The familiar Southwest versus Southeast and Northwest split is again seen in Figure 3.6. It shows that all of the Southwestern (Jeonbuk and Jeonnam Province) cities, except one city (Yeocheon) have high positive scores on this axis. In reality, this Southwest area, historically called the Honam region in Korea, has quite different regional characteristics. Economically the area is still based on agriculture and is the major Korean rice-producing region. Also it is less modern, since it has not shared in the

Figure 3.6 Component 5 Family / Dwelling Type



industrial development of the country. Large family structures survive in this area and can be considered as a typical characteristic of the traditional Korean society, whereas a small nuclear family is more typical in the modern or industrialized society. Yeocheon (Ych) is the only city showing a high negative score in this Southwestern area. This city is one of the major heavy and chemical industrial bases in South Korea, and was constructed in the 1970s under the national government plan. There are few cities with high positive scores in the industrial areas of Northwest and Southeast. The high negative scores on this axis does not show any distinctive spatial pattern, but those cities which have high negative scores are known to be places with high proportions of rental dwelling.

3.3.6 Component 6

This dimension accounted for 6.5 % of the variation in the data set and is mainly associated with the separation between two age characteristics: percentage of children 0-14 years and young adults, from 15 to 24 years(see Table 3.9). Hence, the component is called a Children / Young Adult axis of urban system structure. The difference may be expected, given Component 5, for there are likely to be lots of children in the more traditional, rural towns of the Southwest, whereas the educational opportunities and job availability in the major centers and industrial areas have attracted young adults. The positive loadings relate to high proportions of children under the age of 14 years and , to a lesser degree , apartment dwelling and higher birth rate. The young adult (15-24 years) variable loads on the negative side of the axis, although with a medium (-0.65) loading compared to 0.90 for children variable. Similar axes related to age structure or life cycle

Table 3.9 Component 6 : Children / Young Adult (6.5%)

Loading	Variables
90 (85)	**% Children 0-14 years**
31 (32)	**% Apartment dwelling**
30 (35)	**Birth rate**
-30 (-28)	**% Rent dwelling**
-65 (-66)	**% Young adult 15-24 years**

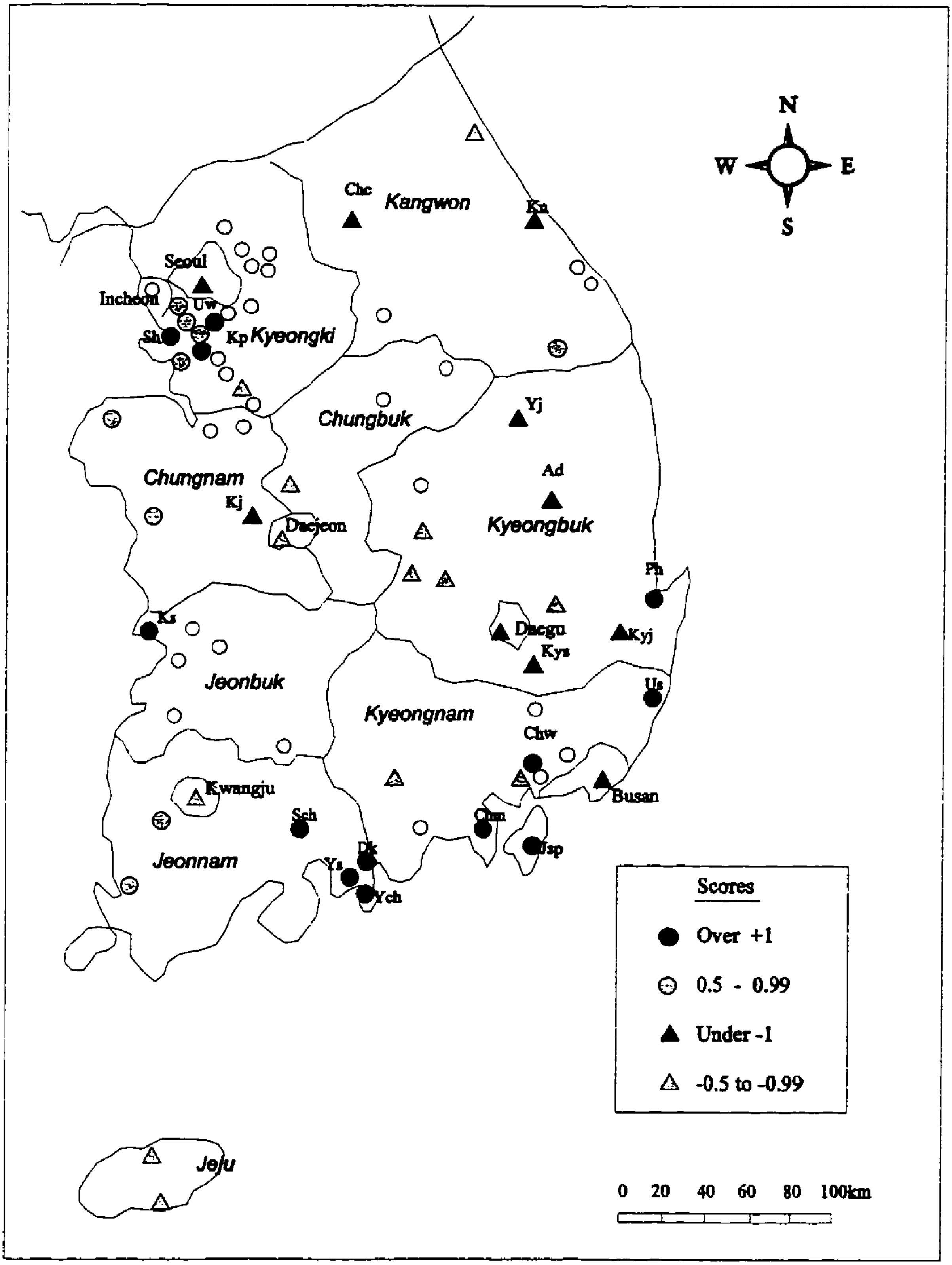
Cities with the largest scores

2.92	Yeocheon (Ych)	-2.18	Chuncheon (Chc)
2.06	Jangseungpo (Jsp)	-2.16	Kyoungsan (Kys)
1.69	Kunpo (Kp)	-2.04	Andong (Ad)
1.63	Uiwang (Uw)	-1.40	Kyoungju (Kyj)
1.47	Ulsan (Us)	-1.35	Kongju (Kj)
1.43	Dongkwangyang (Dk)	-1.35	Daegu (Dg)
1.42	Changwon (Chw)	-1.11	Kangneung (Kn)
1.41	Yeosu (Ys)	-1.09	Youngju (Yj)
1.29	Kunsan (Ks)	-1.09	Seoul (Sel)
1.18	Pohang (Ph)	-1.07	Busan (Bs)
1.17	Chungmu (Chm)		
1.09	Siheung (Sh)		
1.06	Suncheon (Sch)		

have been found in many other factorial studies of urban systems (Berry, 1972 ; Davies, 1984), but are normally linked to differences between children (or young family) and middle/old age (or late family) character. The fact that a Children/Young Adult dimension is present, rather than a Children / Old age contrast identified a special feature of South Korean urban structure, one that reflects its rapid growth and relatively youthful structure. The latter can be seen by the fact that the mean values for the 73 centres in this study shows that 27.5% of the population is under 14 years, another 20.1% between 15 and 24 years, and only 6.5% is over 60 years.

The distribution of the scores on this dimension also shows a distinctive regional pattern, especially in the positive scores, as can be seen in Figure 3.7. The two clusters of the Southern coastal area and Satellite cities around Seoul have the expected high positive scores of growth centres. These cities are the bases of heavy-chemical industries (Yeocheon (Ych) and Yeosu (Ys) are oil refinery and chemical centres; Pohang (Ph) and Dongkwangyang (Dk) are iron and steel towns; Ulsan (Us) is a centre of automobile production; and Changwon is a centre of machinery production). These towns are in the need of young labor power due to the character of their industries. Thus, the proportions of mature aged people (30-40 years old) are high compared that of children under 15 years old. The satellite cities around Seoul are bedroom suburbs within the Capital Area, which are favored by young families. Figure 3.7 shows that the high negative scoring cities do not have such a distinctive spatial concentration. Two different types of city have high proportions of young adults. Since most of the universities and colleges in South Korea are located in the major metropolitan areas, the older, larger metropolitan areas such Seoul , Busan, and Daegu, have high proportions of young adult population. The second set are either relatively small centres, such as Chucheon (Chc), Kangneung (Kn) and Kongju (Kj) which are centres with many universities or colleges or places which contain branch campuses of the universities in Seoul, such as Andong (Ad), Kyoungju (Kyj) and Kyoungsan (Kys).

Figure 3.7 Component 6 Children / Young Adult



3.3.7 Component 7

Table 3.10 shows there are only two variables with loadings greater than 0.5 on this dimension. These two negative values, and the proportion of high school graduates who go to universities as well as the surplus of males, index the axis. Since more males than females attend university, this difference may be expected. It is named University / Age and accounted for 5.9 percent of the original variance. Small family size and rented

Table 3.10 Component 7 : University / Old Age (5.9%)

Loadings	Variables
39 (-36)	% Pop. old age over 60 years
31 (-27)	% Pop. adult 45-60 years
-34 (30)	Family size
-39 (40)	% Rent Dwelling
-55 (49)	Male to female ratio
-77 (80)	% High school graduates who go on to univ.

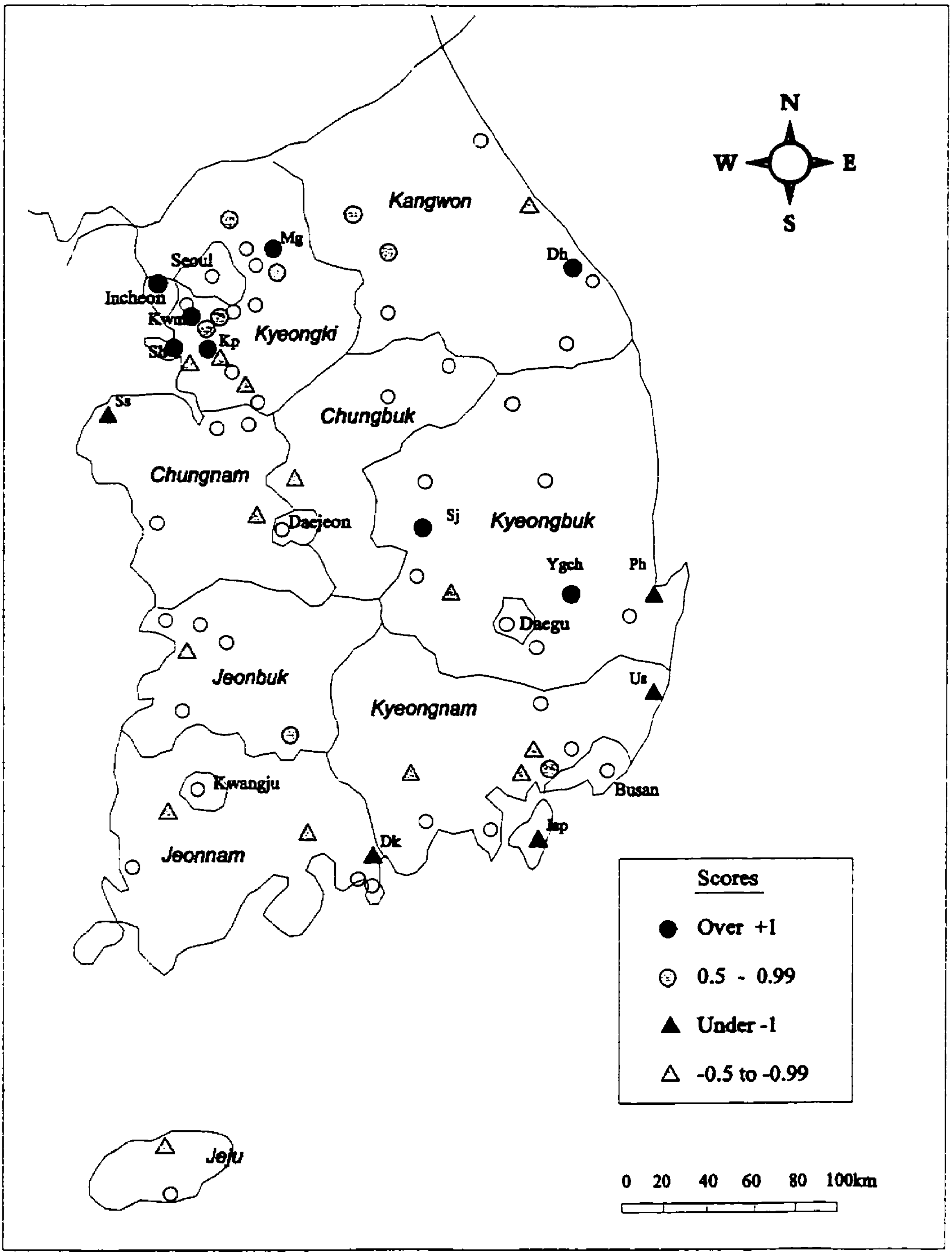
Cities with the largest scores

1.94	Kunpo (Kp)	-4.79	Dongwangyang (Dk)
1.87	Siheung (Sh)	-2.49	Jangseungpo (Jsp)
1.61	Sangju (Sj)	-2.18	Seosan (Ss)
1.55	Kwangmyung (Kwm)	-1.39	Pohang (Ph)
1.31	Miguem (Mg)	-1.31	Ulsan (Us)
1.23	Youngcheon (Ygch)		
1.22	Incheon (Ich)		
1.13	Samcheonpo (Scp)		
1.11	Donghae (Dh)		

dwellings are also associated with this axis, but with low loading. The middle and old age variables load on the opposite side of the axis – although again with small values. The character of the axis – youthful, university, males versus old age character – reflects a particular feature of South Korean society. Colleges and universities in South Korea operate under enrollment limits. There is intensive competition for college admission because the number of high school graduates far surpasses the number of college openings. Thus, the percentage of the graduates admitted to college shows the extent to which the desire for higher educational attainment has been fulfilled in each community. Also it has been a traditional belief in Korea that men rather than women should go to college. Although the opportunities of high level education for women have been widened in recent years, the conventional preference for men in education tends to remain, accounting for the ratio of male to female in South Korean universities, 65.2 to 34.8 %.

Figure 3.8 shows the spatial pattern of the cities with high factor scores on this axis. High negative scoring cities – Pohang, Ulsan, Dongkwangyang and Jangseungpo in the Southeast coastal area – are all centres with high proportions of males, since they are heavy chemical industry bases, and have high levels of university admissions since these have many universities. Seosan on the West coast is a relatively small town (population: 55,930) and has only general high schools but has a high success rate in university admission. In contrast, the high positive scoring cities are divided into two groups, a set composed of satellite cities around Seoul, and a set of scattered small cities in the centre. The satellite cities showing high positive scores have relatively more vocational high schools rather than general high schools. The other cities with high positive scores have high proportions of old aged people, with relatively few general high schools.

Figure 3.8 Component 7 University / Age



3.3.8 Component 8

The final component extracted had a statistical explanation of 5.4 percent. It is another axis linked to economic differences. Simply labeled Primary Industry, to reflect the dominant variable, it is associated with places that have high proportions of primary industry. The Primary Industry axis is also associated with high proportions of males – again expected because these are the people who are employed. High mobility levels are also shown, although with a low loading, a consequence of the fact that the primary industry centres have been losing their population in recent years.

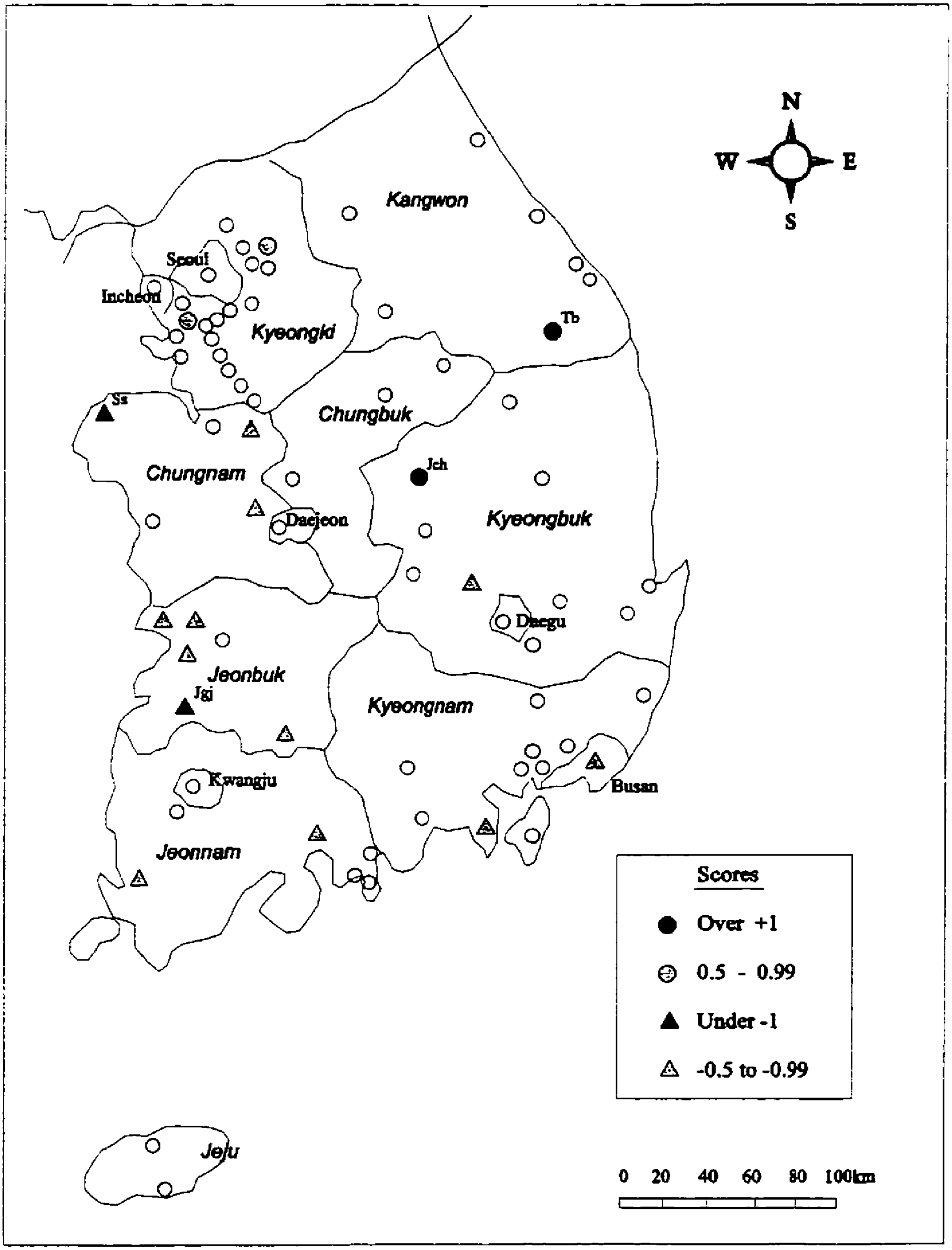
Table 3.11 Component 8 : Primary Industry

Loadings	Variables
92 (90)	% Employed in primary industry
51 (58)	Male to female ratio
38 (34)	Out-migration

Cities with the largest scores			
7.57	Taebak (Tb)	-1.31	Jeongju (Jgj)
1.23	Jeomchon (Jch)	-1.20	Seosan (Ss)

Only two cities attain high positive scores, namely over +1.0 (see Figure 3.9). Both of them are coal mining towns. Taebak, especially, shows an extremely high score (7.57) which reflects the fact that 45.7 % of total employment are engaged in coal mining. Since the industry in South Korea has been in recession in the last decade, there has been a high level of out-migration. Jeomchon is also a coal mining town, with 9.4 % employed in the industry.

Figure 3.9 Component 8 : Primary Industry



3.4 Higher Order Dimensions

Throughout the preceding discussion the interpretation of the components has been based on the loadings derived from the 8 axis oblique rotation. In all the tables the varimax loadings have also been shown. The tables indicate that the oblique rotation solution provides clearer axes than those from varimax, but in all cases the loadings were very similar. However, it must be emphasized that the oblique axes were partially related to another. This make it possible to create a more parsimonious or succinct summary of the data by a higher order analysis.

Table 3.12 shows the results of the application of the same factoring procedures that were used at the first-order level to the correlation matrix between the first order axes. A four-axis solution accounting for 65.5 % of the first order factor correlation matrix

Table 3.12 Higher Order Loadings for South Korean Urban System

First order title	Second Order Axes and Loadings				Communalities
	I	II	III	IV	
4. Mobility / Divorced	82				68
2. Socioeconomic Status	64				53
1. Economic Character	-63		-33		53
6. Children / Young Adult	54	48			58
5. Family / Dwelling Type		71			54
3. Size		-70			58
8. Primary Industry			92		84
7. University / Age				99	96

variance seemed to be the most appropriate solution. At this stage, every variable (the first order axes) had communalities are over 0.5, meaning that over 50 percent of its variance was explained by this solution. In the three-axis solution, one of the variables (one of the eight first order axes) had only a 26 percent explanation – so the variable or first order axis is not part of the higher order summary description. The five-axis solution only added a little extra explanation and started to split existing axes into vectors that were highly correlated. The results of this higher order solution demonstrated the way that some of the first order axes can be combined to produce higher level generations.

1) The largest axes was associated with four first order axes. Basically it shows a negative relationship between Economic Character and Socio-Economic Status in which latter is supported by the Mobility / Divorced Ratio and Children / Young Adult vectors. This demonstrates that the places with high levels of wealth or economic status, migration and lots of children are associated with the negative or manufacturing side of the Economic Character axis. In other words, the characteristics of growing modern industrial centres are shown to be opposed to the traditional centres based on service and administration, with high proportion of young adults, people with limited education and

Table 3.13 Signs of the First-Order Axes on Higher Order Axis I

Axis 1 Econ. Character	Axis 2 Socio-Econ. Status	Axis 4 Mobility/Divorced	Axis 6 Children/ Y. Adult
+Quinary/Quaternary	+ Univ. Degrees	+ Mobility	+ Children
- Manufacturing	- Limited Education	- Divorced	-Young Adult

high divorced ratio. This seems to identify the Modernization-Traditional difference shown in Seong's previous study of South Korean centres. But this time it is shown within the axes that characterize modern places, not as a separate first order axis.

2) The second high order axis shows that the first order Family / Dwelling axes and the Children / Young Adult are inversely related to that of Size. This means that large families can be usually found in the cities of smaller sizes. In other words, the smaller size towns tend to retain one of the features of traditional family systems – large families and lots of children, with fewer young adults – lower levels of modernization (as seen in the telephone supply variable) and fewer rental units.

3)The third and fourth higher order axes are associated with Specialized cities. The Primary Industry and University/Age axes both become separate components at the higher level, indicating they are separate aspects of the South Korean urban system. However, there is a minor negative association between the Primary Industry and the Economic Character axis, for the Primary industrial centres have low levels of secondary industry .

3.5 *Comparisons and Conclusions*

The presence of a large number of studies of urban system dimensionality between the 1960s and 1970s makes it possible to compare the results of this urban structure study with the other independent studies. Although there are some difficulties in directly comparing those studies, due to the differences in the variables used and varied factor techniques, a general comparison of urban systems can be made since the axes are assumed to be the basic constructs that lie behind the various variables. The goal of this section is to compare the structure of the South Korean urban system in 1990 with other studies, especially with Seong's in 1975, taking into account the urban structures of the other countries.

Table 3.14 is a more detailed comparison of the South Korean urban dimensions between Seong's 1975 study and these 1990 results. The re-labeling of Seong's results was suggested by Davies (1997, private communication) based on the table of loadings provided in this work. Davies stated that Seong's titles were often too abbreviated to convey the character of his axes. They also appeared to be more like unrotated factors (given the high to low sequence of eigenvalues) than the varimax results he claimed, but they might have been re-arranged in size order. In addition there is no reason why the three unlabeled axes cannot be given titles as in the table.

When the re-labeling is compared with the 1990 results it can be seen that three of axes are very similar (SS in table) to one another. In addition the Education axis is similar (S in table) with the difference being in the levels of school (high schools in 1975 and universities in 1990). High school entrance ratio cannot be a useful variable any longer, since all children go to high schools. The big difference is that the 1990 study found axes measuring Socio-Economic Status, Economic Base, as well as Primary Industry. However there was no sign of a Sex Ratio difference. In addition, the Traditional / Modern difference – really a High-Low Growth axis if one looks at Seong's loadings in detail – was incorporated within the other axes, and becomes part of a distinctive group in the cluster analysis.

The "disappearance" of the Traditional / Modernism Contrast as a separate axis in 1990 suggests that the South Korean urban system has deviated from the transitional

Table 3.14 Comparison of Urban Dimensions between 1975 and 1990.

Seong (1975)		Comparison	Kim (1990)
Seong's Title	Suggested Re-labeling		
1. Size	Size, Wealth, Economy	SS*	3. Size (+Density, Wealth)
9. Unlabelled	Growth and Wealth	?	2. Socio-Economic Status (+Wealth)
7. Unlabelled	Sex Ratio and Growth	?	
5. Mobility	Growth / Mobility / Manufacturing	SS	4. Mobility / Divorced and Old Age
4. Age	Children / Young Adult	SS	6. Chidren / Young Adult
8. Unlabelled	Family		
3. Housing Condition	Overcrowding and Age	?	5. Family/ Dwelling Type
6. Education	High School Education and Facilities	S	7. University / Old Age (University Education)
2. Traditional-Modernism	Growth-Low Growth (Modern-Traditional)	?	
		?	1. Economic Character (+ Age, Growth)
		?	8. Primary Industry

* SS: very similar, S: similar, ? : different

society in its urban system development, for the axes now parallel those that have been found in Western countries (Davies, 1984). But the older characteristics of cities with low growth and large families has not gone completely. It can be seen in the difference between the negative and positive sides of one of the higher order axes – the Family/Dwelling Type- Size vector. Moreover, many of the axes such as Economic Character show big differences between the Southwestern towns and the rest of the country, suggesting that the variations are now apparent within the factorial dimensions, not as a separate structure entirely.

Davies (1984) summarized the results of the various urban system studies carried out in the 1960's and 1970's and provided some generalizations. Table 3.15 shows the comparison of the urban system dimensions of various studies in North America. After comparing those results, he concluded that most studies identify separate axes linked to the Size, Quality, Economic Base, Education, Age, and Ethnicity axes of Hodge (1968). But to this set must be added both Growth-Mobility and Economic Status dimensions. His comparison shows that less weight can be placed on the presence of a separate Welfare or Geographical Situation axis, whilst the Commuting and Female axes of Berry (1972) also seemed to lack generality. It is also worth noting that a number of different Ethnic and Economic Base axes are likely to be found depending on the character of the urban system.

Table 3.16 shows the comparison between Davies's generalizations and the results of 1990 South Korean study. It can be seen that there is a high level of similarity. It seems clear that Economic Base, Socio-Economic Status and Size differences are the major axes of differentiation, although the economic base variations may produce several distinct axes. In addition, the University axis may be another version of the Education axis found in the studies of the United States where many universities are in small towns and dominate the local economy. The homogeneity of South Korean population means

Table 3.15 Comparison of Urban Dimensions of Various Studies in North America

U. S. A.			Canada			Generalization
Hodge (1968)	Hadden & Borgatta (1965)	Berry (1972)	Ray & Murdie (1972)	Davies (1977)	Simmons (1978)	
1. Size	8. Total Population 6. Population Density	1. Size	8. Centre-periphery	1. size	1. Size	Size (and Density ?)
2. Quality of Development				2. Substandard-ness		Substandard-ness /Housin Quality
	1. Socio-economic Status	2. Socio-economic Status		2. Socio-Economic Status		Socio-economic status
5. Economic Base	9. Wholesale 10. Retail 11.Manufact. (Concentrations) 12.Manufacture (Durables) 13. Communication 16. Transport 14.Public Administration	6. College 9. Manufacturing 11. Special Service 12. Military 13. Mining 8. Recent Employment Experience	4. Primary Manufacturing	3. Economy	2. Economy	Economic Ty
	4.Educational Centre					Education
4. Education	5.High School Education					
3. Age Structure	3. Age Composition	3. Family		4.Life Cycle	3. Demographic	Age
6. Ethnicity-Religion	2. Non-white 4.Foreign-Born	4. Non-white 7.Foreign-born	1. English-French 2. Prairie-Type 3.B.C Type 7. Ethno-Metropolitan	5. Prairie Ethnic 6. Western Ethnic 7. Bi-culture	4. Culture	Ethnic Types
	5. Residential Mobility	5.Recent Growth 10. Female Participation	4.Post war Growth			Growth Mobility ?Female
		11.Elderly Males Working/ Comm uting				?Commuting
7. Welfare						? Welfare
8.Geographical Situation						? Situation

Source : Davies, W.K.D., 1984, Factorial Ecology, p 258

Table 3.16 Comparison between the 1990 South Korean Results and North American Urban Dimension (Davies's Generalization)

South Korean Dimensions	Davies's Generalization	Differences
1. Economic Character (13.5)	Economic Bases	Less diversified
8. Primary Industry (5.4)		
2. Socio-Economic Status (13.4)	Economic Status	Similar
3. Size (11)	Size	Similar
4. Mobility /Divorced Ratio (9.1)	Mobility / Growth	Related to Divorce
5. Family / Dwelling Type (6.6)		
6. Children / Young Adult (6.5)	Age	Young Population
7. University / Age (5.9)	Education	Similar
	Ethnicity	Not Relevant
	Quality of Life	Not found
Total Variance (71.4%)		

that there is no sign of a separate ethnic source of differentiation. In South Korea, the age variation is found in the Children/Young Adult axis, rather than Children/Old Age because the population boom has created a young population. Mobility differences are also seen, although in South Korea this is also linked to divorce levels. The only real difference found in the South Korean study is a Family/Dwelling Type variation. It would seem that familial differences should be added to Davies's summary list. 'Quality of life' variations could not be found, perhaps due to the given the restriction of this study to the census indicators.

Table 3.17 shows a comparison of the urban dimensions found in Non-Western countries a combination of underdeveloped and transitional or modernizing countires.

Table 3.17 Comparison of Urban Dimensions in Non- Western Countries

Modernizing		Underdeveloped				General-
Yugoslavia	Chile	India	Nigeria	Ghana		ization
Fisher (1966)	Berry (1969)	Ahmad (1969)	Mabogunje (1969)	McNulty (1969)	Yeboah* (1994)	
1.Develop-Underdevelop	2.Traditional -Modernism contrast	1.North-South Diff. by Sex 7.N-S Diff. of literacy & urban service 8.E-W Diff. of Migration 10. Fertility & Mortality rate	2.Regional Factor (S-N Urbanization contrast) 4.IboFactor (East- other towns contrast)			1) Traditio Moderni Contrast 2) Regiona Differen
3.Recent Growth	3.Recent Growth	6.Pop.Change		1.General Mobility		3) Mobilit
		9. Size of pop 2. Conurbation Accessibility 4. Compactness				4) Size/ Density
2.Functional type .Construction Transportation .Traditional Cultural .Administration .Industrial	4.Mineral Exploitation 5.Manufact-uring 6.Voting Behavior 1.Size	3.Commertial/ Industrial 5.Rural Orientation	1.Urban Economic Function 5.Male Dominance Factor 6. Minority Factor 3.Demographic Factor (Children / Adult)	2.Occupa-tionnal Diversifi-cation	Economic Base(1984) 1.Government, Social, Modern Services 2. Light Manuf &Distribution 3.Food Manuf. Retail & Primary 4. Other Chemical Manuf. 5. Wood Processing 6.Other services 7.Mining etc.	5) Econom Base Differe

* Only variables on economic functions were used in this study

Some common dimensions emerge: Traditional-Modernism Contrast; Regional Differences; Size/ Density; Mobility/ Growth; Economic Base Differences. The last three components are found in South Korea as well as in the western countries. The major variations seem to lie in the Traditional-Modernism (T/ M) Contrast and Regional Differences. A T/M contrast axis does not exist South Korean urban system in 1990 which shows that South Korea has moved out of the transitional urban system category, although it was found in the higher order factoring. A Regional Difference axis was not directly extracted in South Korean study, but the characteristics of the axis can be found in other axes such as Family/Dwelling Type and Economic Character. Although these axes were named on the basis of the major loadings, the pattern of factor scores reflected the differences between regions; the former axis differentiated the Southwestern centres from the others, whilst the Economic Character axis picked out the secondary industrial areas in the country.

CHAPTER 4

CLASSIFICATION OF KOREAN URBAN CENTRES

4.1 Introduction

This chapter summarizes the differentiation of South Korean urban centres by using Cluster Analysis to identify a set of urban groups or categories, based on the factor scores of the eight factors previously identified in Chapter 3. Although the direct classification of centres is possible by applying Q-mode factor analysis (Britton, 1973) to the data set – which means that the factors identify sets of places with similar loadings – most urban geographers have preferred the R-mode approach. The reason is that it seems more convenient to identify the different sources of variation (the factors) first, then to scale the areas along those axes or factors. By subjecting the factor score matrix to cluster analysis, using Ward's (1963) method with Euclidean distance as the measure of dissimilarity, a summary classification of the South Korean urban system can be derived. Although there are many different clustering methods, Ward's method has been the preferred solution in most studies of this sort. Ward's method is designed to produce optimal grouping at each level. Unfortunately, U of C and U of A computer centres no longer have viable non-hierarchical cluster solutions on their computer systems, so it was not possible to check the results using a Non-Hierarchical procedure.

4.2 Selection of Cluster Solution

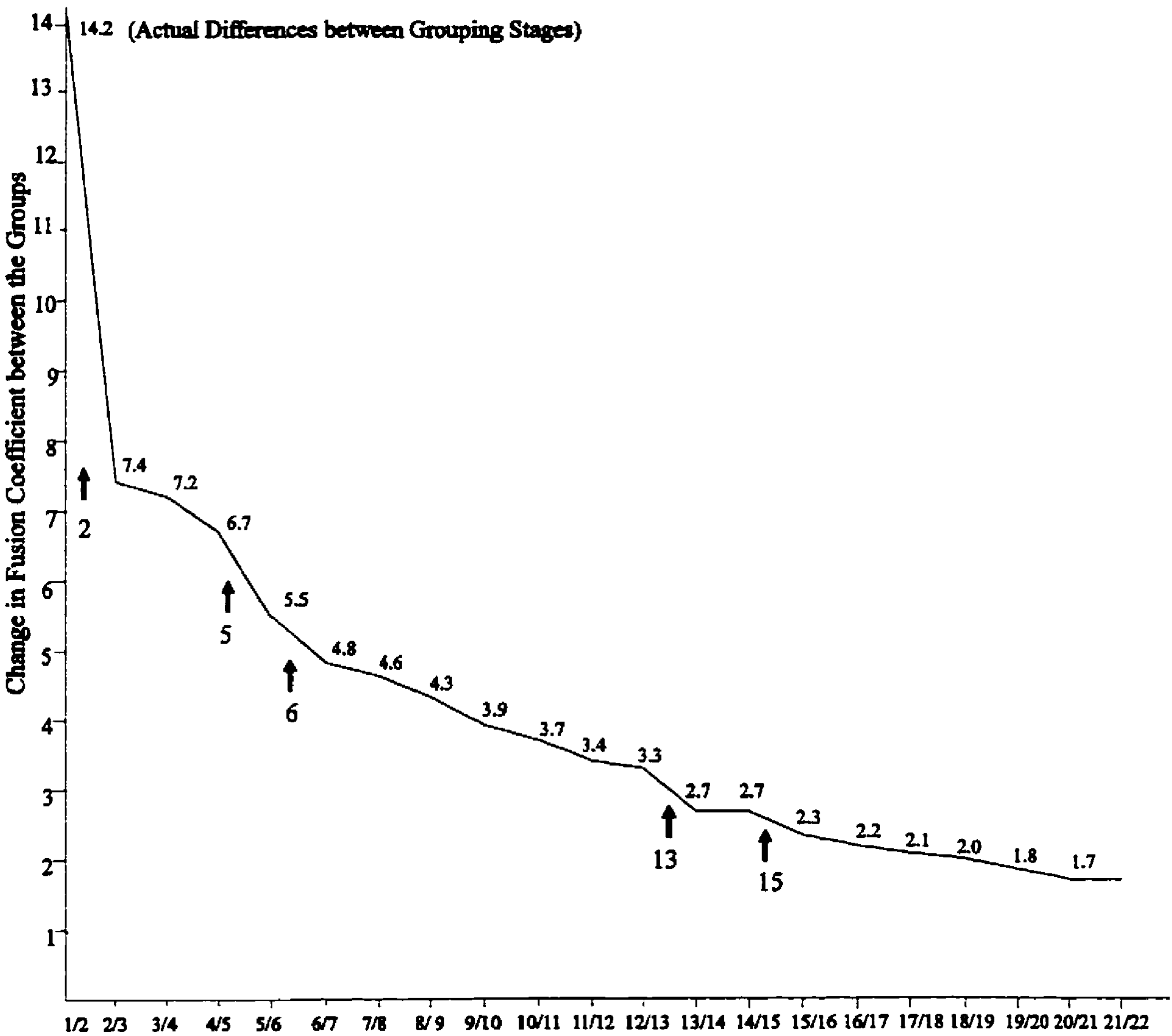
One of the most fundamental problems in cluster analysis is to decide how many clusters are needed to succinctly represent the data set – in this case a 8 (factor axes) × 73 (factor scores) matrix. Since hierarchical grouping routines work sequentially to cluster the most similar places on groups at each step until a final singular cluster containing all the cases is formed, the need is to find a rationale for cutting off the sequence at a particular grouping level. There is no true, objective means of determining one best grouping, since it depends on the objectives of the analysis. In this case, the goal is to find an appropriate level of generalization – a set of clusters that succinctly summarize the variation – without producing clusters that combine places that are very unlike. Hence, it is traditional to examine the successive steps of the agglomeration sequence – especially the final steps – in a search for natural breaks in the distribution of the fusion coefficient – namely the loss of information measure in the cluster routines. If relatively dissimilar groups are joined, a major increase in the fusion coefficient occurs. Table 4.1 is the agglomeration schedule for the last 22 stages showing the change of

Table 4.1 Agglomeration Sequence : 22 to 1 Groups

Stage (No of Group)	Clusters Combined Cluster 1	Cluster 2	Fusion Coefficient (Loss of Info.)	Stage Cluster 1st Appears Cluster 1	Cluster 2	Next Stage
51(22)	37	45	44.109100	29	30	63
52(21)	40	41	45.771755	6	32	63
53(20)	19	20	47.503719	0	43	62
54(19)	14	30	49.247078	46	11	57
55(18)	12	23	51.234249	35	41	59
56(17)	1	4	53.270149	0	39	61
57(16)	14	34	55.397198	54	37	69
58(15)	18	25	57.668694	50	44	64
59(14)	12	15	60.369278	55	48	61
60(13)	39	52	63.114788	0	47	67
61(12)	1	12	66.361694	56	59	65
62(11)	8	19	69.825035	49	53	65
63(10)	37	40	73.531914	51	52	71
64(9)	2	18	77.361458	45	58	69
65(8)	1	8	81.715401	61	62	67
66(7)	16	51	86.294304	0	0	68
67(6)	1	39	91.119148	65	60	70
68(5)	16	29	96.603516	66	0	70
69(4)	2	14	103.322304	64	57	71
70(3)	1	16	110.483147	67	68	72
71(2)	2	37	117.883980	69	63	72
72(1)	1	2	132.101898	70	71	0

fusion coefficients. Figure 4.1 is a graph of the changes in the fusion coefficients at each cluster solution. Major breaks of slopes occur at three levels; 2 or 5 and 6; or 13 and 15 clusters levels. These indicate possible places to cut off the clustering sequence so as to interpret the groups since the breaks indicate positions at which the grouping involves greater increases in the loss of information.

Figure 4.1 Changes in Fusion Coefficients between the Groups



(E.G. From 5 to 4 cluster the fusion coefficient increases by 6.7.
So 5 cluster solution seems a possible place to interpret.)

In deciding which of these five grouping stages is the most appropriate solution to interpret, the greatest emphasis was placed on the degree of generalization involved. A two group solution seemed far too general to produce a detailed differentiation of the urban system. Five and six groups also seemed too general to account for the variety of the places, but the five group level did identify an important change of slope that might represent a useful higher order or general grouping description. At the 15 grouping stage, too many cluster groups had only one case so they were hardly "general" categories. Moreover they were not very different from the 13 group solution. The 13 group solution also represented the end of a major change in the slope of fusion coefficient values. This was the initially chosen solution. However, rather than relying only on the 13 cluster solution, this study looked at the sequence from 13 to 1 groups, also paying special attention to the 5 group solution. This enabled the study to investigate how the interpreted clusters merged with one another to eventually form one group.

4.3 Interpretation of the 13 Group Solution

The group means of the factor scores for each of the clusters provide a summary of the differences between the clusters. Table 4.2 shows the mean factor scores for the eight dimensions in each of the thirteen groups. The values in this table highlight some of salient features that help explain the composition of each cluster of the places. From this basis, the character of each cluster, and its spatial pattern in South Korea, can be described in turn. Finally, a summary title for each group will be allocated on the basis

Table 4.2 Mean Factor Scores for Each Cluster Group in South Korea, 1990

Factors / Clusters	F1 E.C*.	F2 S.E.S	F3 Size	F4 Mobility	F5 F / D	F6 C / Y	F7 U / A	F8 P.I.
C1 Seoul & L. Satellites	<u>-0.61</u>	<u>0.67</u>	**1.74**	<u>0.86</u>	-0.34	0.20	0.30	-0.01
C2 L. Regional Service Centres	-0.02	-0.12	**1.25**	-0.07	0.26	<u>-0.77</u>	<u>-0.53</u>	-0.19
C3 Growing Coastal Centres	<u>-0.56</u>	0.22	0.13	-0.22	**-1.14**	**1.38**	**-1.84**	-0.10
C4 S- M. Sized Satellite Cities	<u>-0.51</u>	-0.33	-0.12	<u>0.73</u>	**-1.07**	-0.36	0.25	0.10
C5 Traditional S.W. Centres	<u>0.67</u>	-0.25	0.77	-0.25	<u>0.97</u>	<u>0.75</u>	0.30	<u>-0.51</u>
C6 Major Manuf.Centres	**-1.41**	**1.14**	-0.02	**1.74**	-0.24	**1.13**	0.31	0.01
C7 Regional Service Centres	<u>0.60</u>	-0.08	-0.11	-0.25	-0.32	**-1.13**	-0.25	-0.03
C8 S. Stagnant Region Centres	0.36	-0.45	<u>-0.67</u>	**-1.15**	-0.27	-0.19	0.43	0.05
C9 S. Manufac. Satellite Cities	**-1.11**	0.07	<u>-0.97</u>	0.38	<u>0.96</u>	0.44	**1.24**	0.37
C10 Small S-W. Centres	<u>0.85</u>	**-1.43**	**-1.11**	-0.15	**1.45**	0.24	0.37	<u>-0.77</u>
C11 Coal Mine Town	-0.11	**-1.01**	-0.29	**-1.03**	<u>0.62</u>	<u>0.85</u>	-0.18	**7.75**
C12 Administ-ration City	**3.00**	**5.67**	-0.45	**1.45**	-0.24	0.02	0.01	-0.08
C13 Steel Refining City	**-1.13**	**1.40**	**-2.10**	<u>0.65</u>	**4.23**	**1.43**	**-4.79**	0.27

* F1:Economic Character, F2:Socio-Economic Status, F3:Size, F4:Mobility, F5:Family/Dwelling Type F6:Children/Young Adult, F7:University/Age, F8:Primary Industry

Note : The mean factor scores have been derived from the Oblique Solution

Bold Numbers : those over ±1.0, Underlined Numbers : ± 0.5 ~ 0.99

Table 4.3 Cluster Membership

C1 (5)	C4 (5)	C7 (12)		C11
			Sangju	
Seoul	Uijeongbu	Chuncheon	Kimcheon	Tabaek
Incheon	Kuri	Kangneung	Youngcheon	
Suwon	Seongnam	Wonj	Milyang	C12
Anyang	Songtan	Pyungtaek	Jinhae	
Bucheon	Kimhae	Chungju	Chungmu	Kwacheon
		Kongju	Samcheonpo	
C2 (8)	C5 (6)	Youngju		C13
	Kunsan	Andong	C9 (4)	
Cheonan	Iri	Kyungsan		Dongkwangyang
Cheongju	Jeongju	Kyungju	Migeum	
Daejeon	Mokpo	Jeju	Hanam	
Kwangju	Suncheon	Seogwipo	Siheung	
Daegu	Yeosu		Osan	
Jinju		C8 (14)		
Masan	C6 (7)		C10 (5)	
Busan		Dongducheon		
	Kwangmyung	Sokcho	Dacheon	
C3 (4)	Uiwang	Donghae	Jeongju	
	Kunpo	Samcheok	Namwon	
Seosan	Ansan	Onyang	Naju	
Pohang	Kumi	Jecheon	Kimje	
Ulsan	Changwon	Jeomcheon		
Jangseung-po	Yeocheon			

of their common characteristics. Table 4.3 shows the cluster membership of the 13 groups. Each of the subsequent sections describes the characteristics of the clusters by the reference to the table of mean factor scores and uses a map to illustrate the spatial pattern involved.

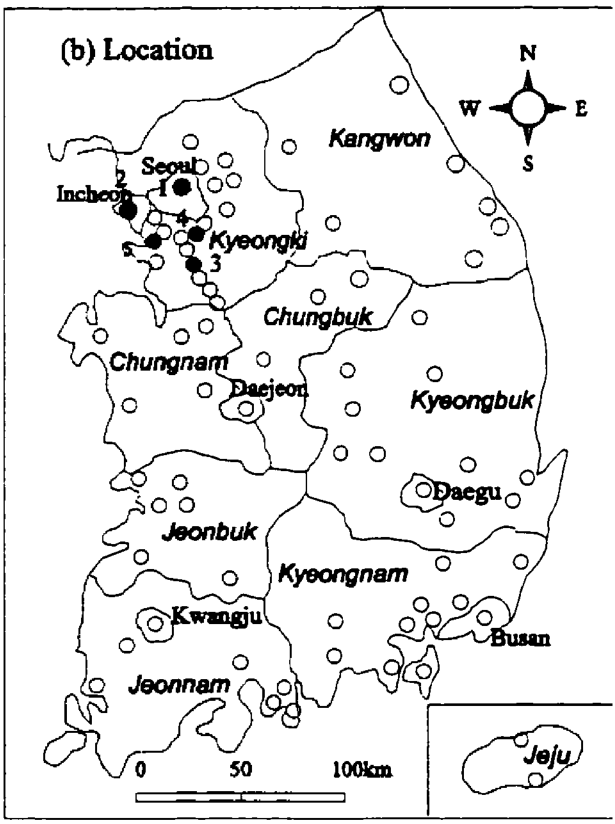
4.3.1 Cluster 1

This is a group composed of Seoul Metropolitan Area and its surrounding large cities as shown in Figure 4.3. All of these centres are located within the southwestern area of Kyeongki Province, which is the most densely populated region in South Korea. The average factor score on the Size axis (F3) for this cluster is 1.74, which is the largest score in all the clusters. It shows that Size and Density are the most important features that differentiate this cluster from the others. Most of the members of this cluster have populations over 0.5 million (Seoul, 10.9 million; Incheon, 1.8 million; Bucheon, 0.66 million; Suwon, 0.64 million; Anyang, 0.48 million). All these cities have population

Figure 4.3 Cluster 1

(a) Membership

Members	Pop. Size,1990	Density
1. Seoul	10,627,790	17,554
2. Incheon	1,818,293	5,733
3. Suwon	644,968	6,109
4. Anyang	480,668	8,219
5. Bucheon	667,777	12,798
Mean	2,847,899	10,083



densities over 5 thousand per square kilometer. This group also shows relatively high positive scores (> 0.60) on the Mobility dimension showing that these clusters also have high levels of migrants. In fact, all the centres in this group have grown rapidly in recent years, and have high rates of both in and out-migration. For instance, in the case of Bucheon, its population was only 109 thousand in 1975 when it was newly established, but it has grown to a population of 667 thousand by 1990. The score on the Socio-Economic Status axis is 0.67, which is also relatively high – the fourth rank among all the clusters – and shows that the areas have a large proportion of adults with university degrees as well as a high level of the amount of tax per person. The title of Seoul and Large Satellites seems an appropriate title for the group.

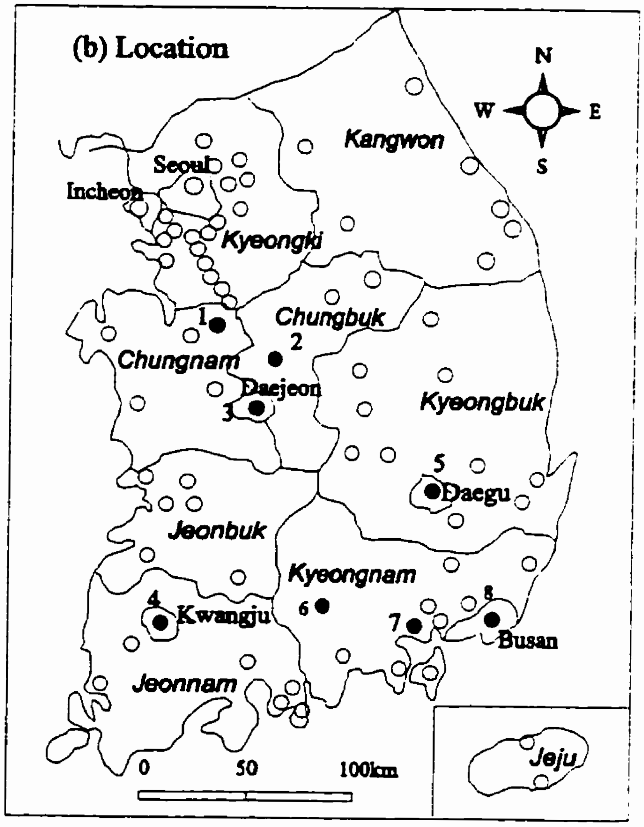
4.3.2 Cluster 2

This group is also strongly related to the size variations since its mean score on the F3 factor is 1.25, the second largest one among all the groups. The cluster is composed of eight centre, four of the six South Korean centres over 1 million, and has a mean population at 1.21 million. Unlike Cluster 1, this group has only two other medium-high scores (>0.5), namely the Children / Young Adult (C/YA or F6) at -0.77 and University / Age (U/A or F7) dimensions at -0.53. The positive side of the C/YA axis (see Chapter 3, Table 3.10) is positively associated with children, whereas the negative side is with youths. So higher proportions of young people live in these centres, which provide a variety of opportunities for jobs, education and so on. The high negative score on the U/A axis indicates that this group also has a large proportion of high school graduates who go to universities. None of the other scores are above ± 0.5. Figure 4.4 shows that these centres are scattered throughout the nation except in the two northern provinces of Kyeongki (Seoul etc.), Kangwon as well as Jeonbuk in the Southwest. Given the size,

Figure 4.4 Cluster 2

(a) Membership

Members	Pop. Size, 1990
1. Cheonan	211,382
2. Cheongju	497,429
3. Daejeon	1,062,084
4. Kwangju	1,144,695
5. Daegu	2,228,834
6. Jinju	258,365
7. Masan	496,639
8. Busan	3,797,566
Mean	1,212,124



youth and location of these places, the title Large Regional Service Centres seems appropriate for this cluster, despite the one or two exceptions – because they have a mixed economy not one dominated by industry.

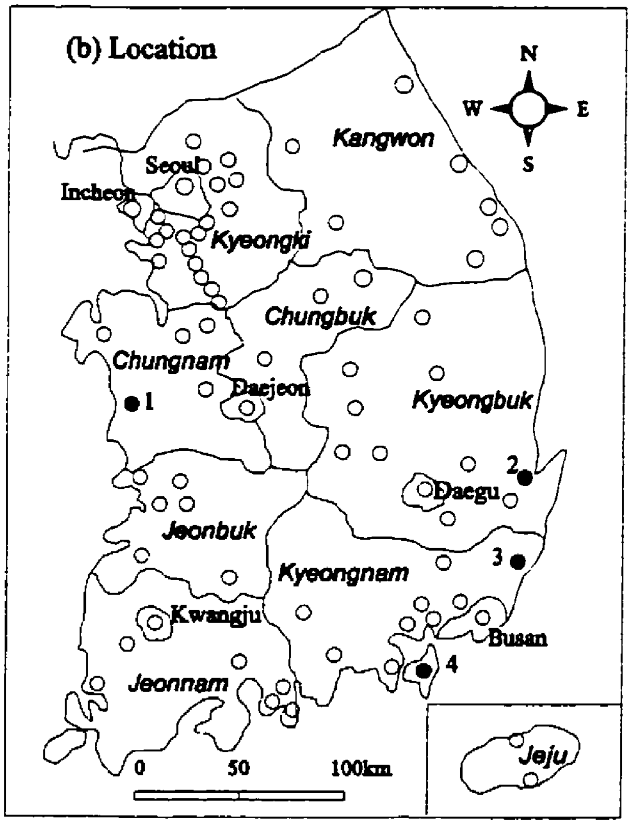
4.3.3 Cluster 3

This group has its highest scores on three dimensions : Family / Dwelling Type (F5 : -1.14); Children / Young Adult (F6 : 1.38) ; and University / Age (F7 : -1.84). The high negative score on the F5 (Family / Dwelling Type) axis means that these places have high proportions of rented dwellings and small families. The high positive score on the Children–Young Adult (F6) indicates high proportions of children in these centres. The high negative score of the University /Age (F7) axis means that the cluster is characterized

Figure 4.5 Cluster 3

(a) Membership

Members	Pop. Size, 1990
1. Seosan	55,930
2. Pohang	318,595
3. Ulsan	682,978
4. Jangseongpo	48,614
Mean	276,529



by places with high proportions of people who are enrolled in universities or colleges. All these characteristics (Youth, Education and Renters) index conditions found in another group of growing and modernizing areas. In addition, F1, meaning the economic character of these centres, shows a medium score of -0.56, which shows an inclination toward higher concentrations of secondary industry, reflecting the fact that three of the centres are major coastal industrial towns in South Korea: Pohang (iron and steel manufacturing); Ulsan (automobile manufacturing); Jangseungpo (shipbuilding). Seosan, the other member of this group, has a different economic character; it is a service town, for 50 percent of its total employment is engaged in the tertiary sector. However, it also displays the growth, education, and renter character of the other centres. This group is named Growing Coastal Centres to focus on their location and relative youth.

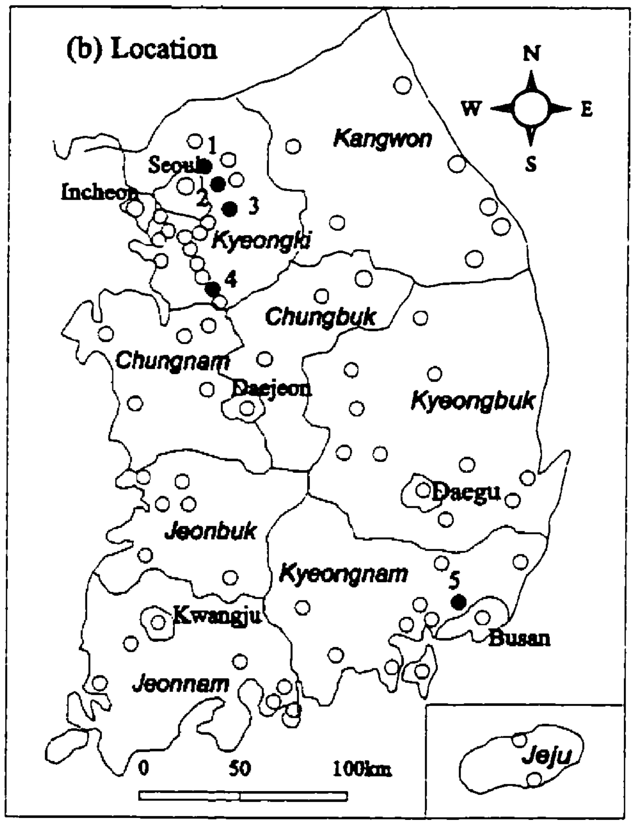
4.3.4 Cluster 4

This cluster is composed of five medium sized satellite cities, four around Seoul and one around Busan as shown in Figure 4.6. Their medium size (mean 209,000) means that they have low scores on the F3 or Size dimension unlike Cluster 1. Their highest factor scores are on the Family/Dwelling Type (-1.14) and the Mobility dimensions (0.75). The proportions of rented dwelling in these centres is 64.6 % and the average proportions of population movement is 51.3%. These values are relatively higher than those of national averages, 51.3% and 44.4% respectively. High proportions of rented dwelling seems to be a key feature of the characteristics of satellite cities in South Korea, for many of the dwellers in those cities are not permanent. This group is called Medium Sized, Satellite Cities.

Figure 4.6 Cluster 4

(a) Membership

Members	Pop. Size, 1990
1. Uijeongbu	212,368
2. Kuri	109,418
3. Seongnam	540,764
4. Songtan	77,460
5. Kimhae	106,116
Mean	209,235



4.3.5 Cluster 5

All the centres in this cluster are located in the Southwestern region (Figure 4.7), called Honam (the Provinces of Jeonbuk and Jeonnam), which has long been known as a distinctive area in South Korea. This area has been Korea's major rice producing region in lowland areas along the major river valleys in the Southwest, isolated from South Korea's new main transportation axis, Seoul-Busan corridor. The Honam region still has more traditional industries and a strong rural emphasis, unlike other areas in South Korea, since it has kept its agricultural basis, rather than developing into an industrial one.

Figure 4.7 Cluster 5

(a) Membership

Members	Pop. Size, 1990
1. Kunsan	218,216
2. Iri	203,401
3. Jeonju	517,104
4. Mokpo	253,423
5. Suncheon	167,209
6. Yeosu	173,164
Mean	255,419

(b) Location

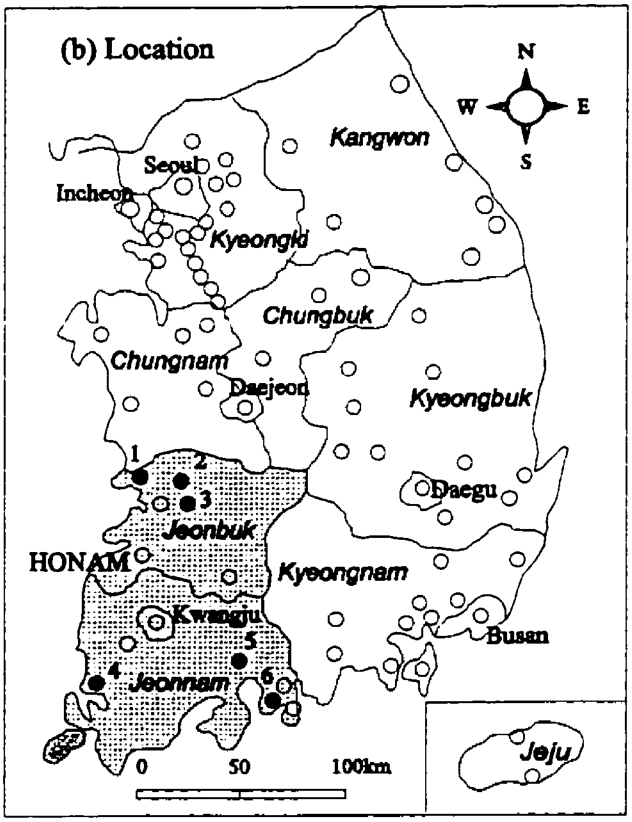


Table 4.2 shows there are five scores greater than 0.5 but below 1.0, showing medium concentrations of the F1, F3, F5, F6 and F8 axes. The Family / Dwelling dimension has a score of 0.97, which indicates that the people in the cities in this area have large families. The scores of 0.67 on the Economic Character (F1) and -0.51 on the Primary Industry (F8) axis show that these Honam cities have higher concentrations of service functions than the cities with manufacturing and primary industries. These cities are also in the middle range of population size (F3 : 0.77) with a mean size of 255 thousand and have high proportions of children. All these features reflect the characteristics of regional service cities, composed of large family-structured communities. The centres in this cluster are named Traditional Southwestern Centres to reflect the location and the traditional character of limited industrialization and low modernization.

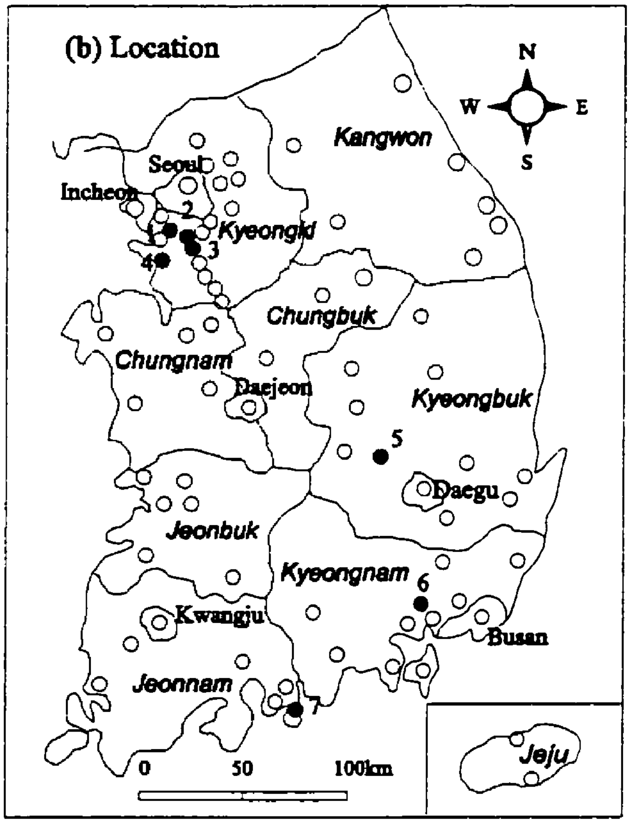
4.3.6 Cluster 6

This cluster has four average scores above 1.0, on four axes measuring Economic Character (F1: -1.41), Socio-economic Status (F2 : 1.14), Mobility (F4 : 1.74) and the Children / Young Adult (F6 :1.13) dimensions. The high negative scores on the Economic Character dimension demonstrates that the centres are specialized in manufacturing, with a high ratio of manufacturing (mean of 65.6 percent for the 7 places) to total employment (KSA, 1991). These places also show high levels of socio-economic status, which indicates the fact that these industrial cities have relatively higher status than other centres. High mobility seems to reflect part of the dynamic character of industrial towns, whilst higher proportions of children are a product of the concentration of young families in their areas. There are seven places in this cluster. Four of them are located around Seoul and the other three are scattered along the network of the Seoul-Busan highway or in the southern coastal region (Figure 4.8).

Figure 4.8 Cluster 6

(a) Membership

Members	Pop. Size, 1990
1. Kwangmyung	328,803
2. Uiwang	96,892
3. Kunpo	99,956
4. Ansan	252,157
5. Kumi	206,102
6. Changwon	323,138
7. Yeocheon	63,802
Mean	195,835



Four of these centres in cluster 6 are government-planned cities for manufacturing: Ansan (a Seoul satellite) and Kumi designed as an export industrial complex; Changwon (near Busan) for heavy machinery industry; Yeocheon for chemical industry. These centres have a mean size of almost 200 thousand and are representative of medium sized growing industrial towns in the South Korean urban system, so the title <u>Medium Sized Manufacturing Centres</u> seems the most appropriate one for this group.

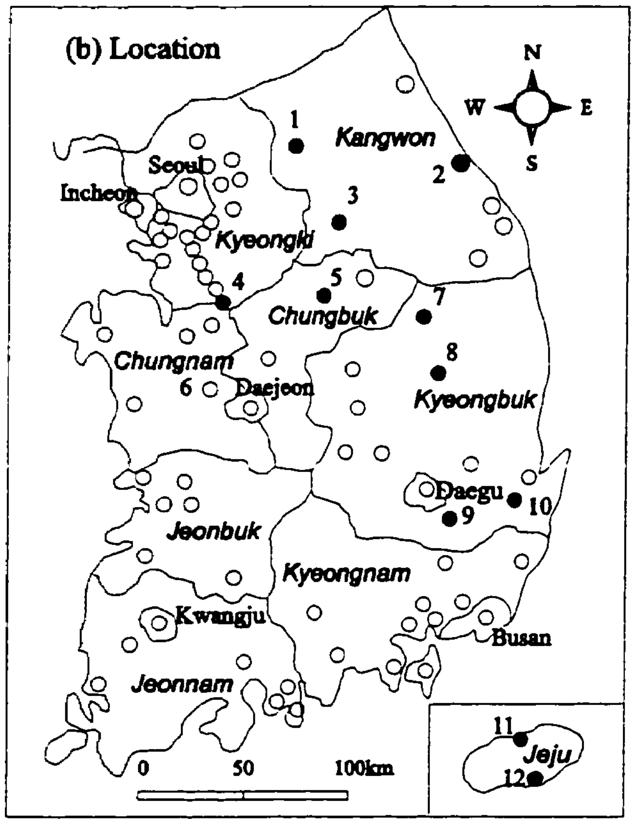
4.3.7 Cluster 7

This cluster is the second largest group among 13 clusters, containing 12 members (Figure 4.9) with an average population of 124,000. Most of the mean factor scores are close to zero – except for F1 (Economic Character) at 0.60 and F6 (Children / Young Adult) at -1.13. This means the centres have relatively high concentrations of service functions, with high proportions of young adults.

Figure 4.9 Cluster 7

(a) Membership

Members	Pop. Size, 1990
1. Chuncheon	174,153
2. Kangneung	152,605
3. Wonju	173,013
4. Pyungtaek	79,238
5. Chungju	129,994
6. Kongju	65,195
7. Youngju	84,355
8. Andong	116,932
9. Kyungsan	60,524
10. Kyungju	141,895
11. Jeju	232,687
12. Seogwipo	
Mean	124,906



The factor scores on the Children / Young Adult axis are high (-1.13) for this group. Hence, ten out of the twelve centres exhibit high proportions of young adults (15-24 years) with a mean value of 23.8 percent in this category for the 12 centres, a function of the fact that most of these centres have universities or colleges which have the effect of dominating these relatively small centres. However, two of the members of the group, Pyungtaek and Seogwipo, have lower proportions. The mean score on the Economic Character dimension for this group is 0.60, which shows the places are more inclined toward service functions. Regionally, these centres are scattered mainly in the Northern area and on the Jeju island, as seen in Figure 4.9. None of the centres in these area have been developed as industrial nodes. Most of the centres are old and have retained their regional service centre and educational functions. This cluster can be described as a Regional Service Centre group.

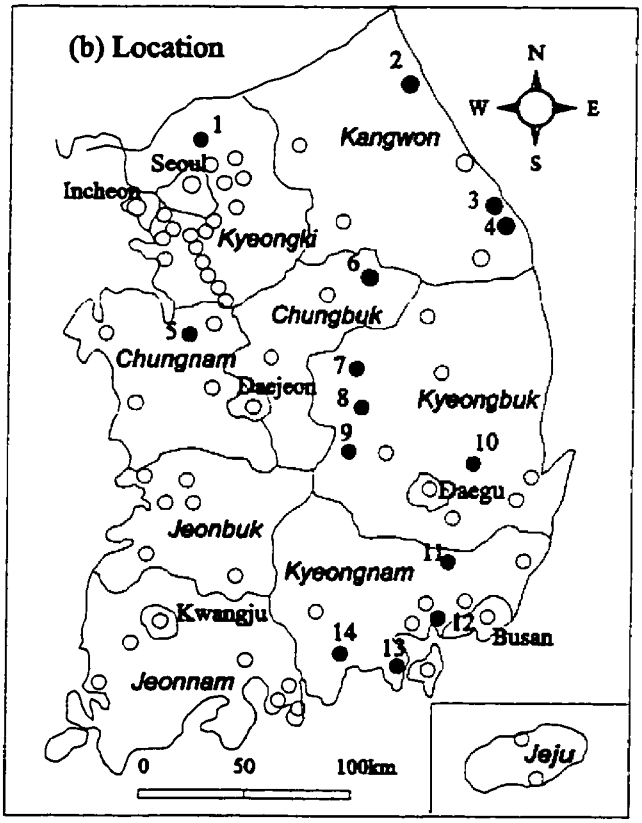
4.3.8 Cluster 8

This cluster is the largest one of all the clusters, with 14 members. The mean scores do not have any extreme characteristics – except for low levels of mobility (F4) with the mean score of -1.15. They are also small in size (mean of 72,000) and are dispersed throughout the nation, except in the Southwestern area, as shown in Figure 4.10. Most are smaller regional nodes, showing either limited growth or stagnation (the mean growth rate during the period 1980-90 for this group: 6.5 %, for entire centres: 65.9 %). These features led to the title Small, Stagnant Regional Centres being allocated to the places.

Figure 4.10 Cluster 8

(a) Membership

Members	Pop. Size, 1990
1. Dongducheon	71,448
2. Sokcho	73,796
3. Donghae	89,162
4. Samcheok	41,673
5. Onyang	66,379
6. Jecheon	102,037
7. Jeomcheon	47,802
8. Sangju	51,875
9. Kimcheon	81,349
10. Youngcheon	48,890
11. Milyang	52,995
12. Jinhae	120,207
13. Chungmu	92,159
14. Samcheonpo	62,824
Mean	71,614



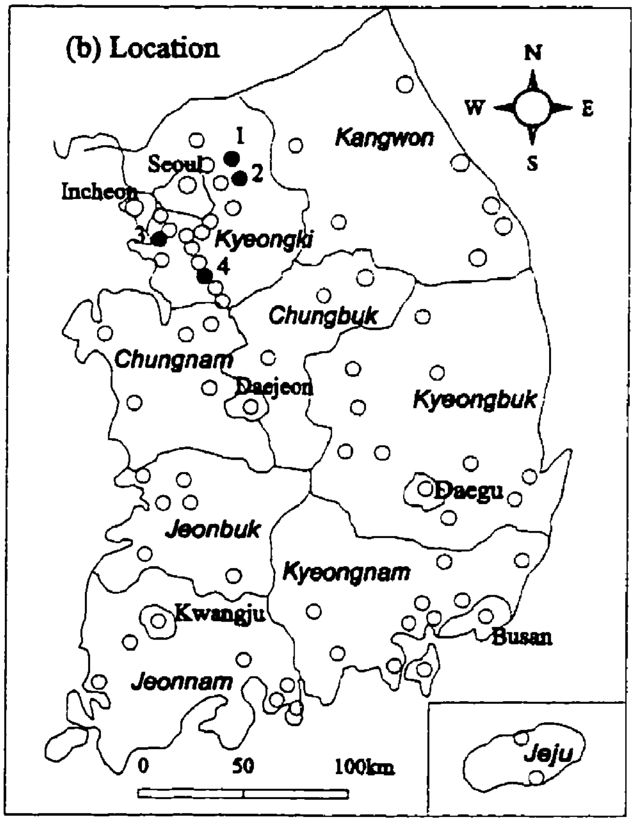
4.3.9 Cluster 9

This group consists of four satellite cities around Seoul. Unlike the group identified as Cluster 4, they are characterized by their relatively small size and relatively high proportions of people engaged in manufacturing – with a mean factor score of -1.11 on F1, the Economic Character axis. This group is also differentiated from Cluster 4 since it has higher scores on the F5 or Family / Dwelling axis (0.96) and the F7 or University / Age axis (1.24). This indicates the presence of large families and a low ratio of people who go into universities or colleges. These characteristics are more similar to those of Southwestern centres than to the other satellites around Seoul. The title Small Manufacturing Satellite Cities seems appropriate for this group.

Figure 4.11 Cluster 9

(a) Member ship

Members	Pop. Size, 1990
1. Migeum	74,688
2. Hanam	101,278
3. Siheung	107,109
4. Osan	59,492
Mean	85,662



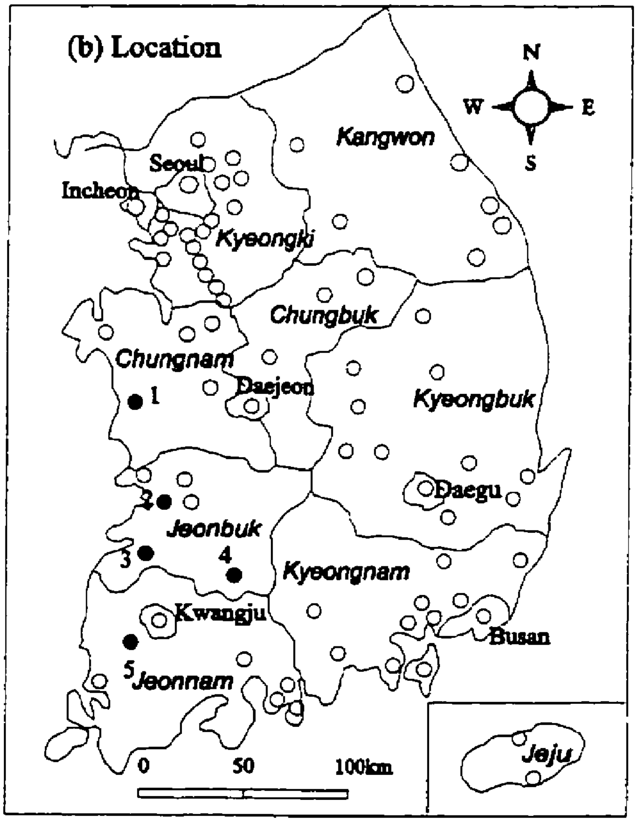
4.3.10 Cluster 10

The cluster consists of five places with an average size of 63,000. All are located in the West Central and Southwestern, as can be seen in Figure 4.12. They have three mean scores over 1.0 on the F2 (Socio-Economic Status : -1.43), F3 (Size : -1.11) and F5 (Children / Young Adult : 1.45) axes, which indicate that they are all small, low status centres in which large families predominate. In addition, their Economic Character (F1 axis) score of + 0.85 indicates high concentrations on service functions in economy. This group is differentiated from the Cluster 5 by being characterized by relatively lower socio-economic status and small population size. All the centres in this cluster are minor regional nodes for their rural areas. These places can be succinctly summarized as Small Southwestern Centres.

Figure 4.12 Cluster 10

(a) Membership

Members	Pop. Size, 1990
1. Daecheon	56,922
2. Kimje	55,136
3. Jeongju	86,850
4. Namwon	63,124
5. Naju	55,306
Mean	63,467



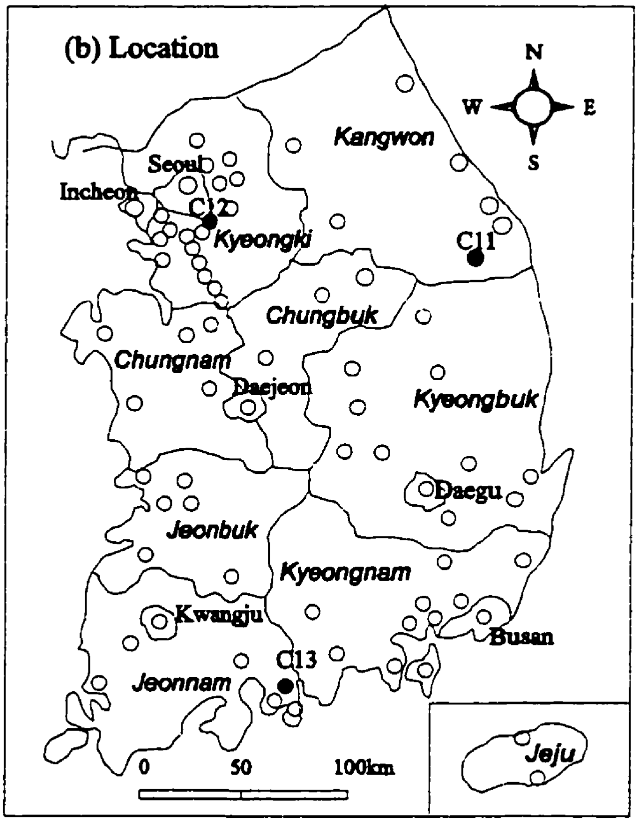
4.3.11 Clusters 11, 12, 13

The last three clusters are sets of specialized towns, each dominated by a single type of industry. Each group only contains a single centre: Taebaek, Kwacheon, and Dongkwangyang. Cluster 11 is composed of Taebaek, a coal mining town, where high proportions of people are engaged in coal mining, so its primary distinctive score is on the F8 (Primary Industry) axis where it achieves a value of 7.75. It also shows low economic status (-1.01 on F2) and a negative growth rate in population (-1.03 on F4 Mobility), reflecting recent recession in the coal mining industry in South Korea.

Figure 4.13 Clusters 11, 12, 13

(a) Membership

Member	Pop. Size
C11 Taebaek	89,770
C12 Kwacheon	72,323
C13 Dongkwangyang	70,118
Mean	77,404



Kwacheon is an administration town, the only member of Group 12 located 20 kilometers from Seoul. Half of the South Korean central government functions has been decentralized out of Seoul to this node (MHA, 1975-1990). Indeed, 38 percent of its entire employment is engaged in the public services sector. This is reflected in a F2 (Socio-Economic Status) score of +5.7. The high scores on the F1 (Economic Character) and the F4 (Mobility) axes demonstrate its high level of administrative activity and the fact that many people have migrated to the centre.

The city of Dongkwangyang, the only member of Cluster 13, was established to support the construction of a large scale iron and steel manufacturing complex. Most of the employment is still in iron and steel manufacturing, as reflected a high score of -1.13 on the F1 or Economic Character axis. The cluster also has lots of high values on other axes, for example the mean score on F5 and F7 are both over 4, which indicates high proportions of children and a high ratio of students who enrolled in universities or colleges. In addition, the F2 (S.E.S) score of 1.40 indicates a high level of status and the F6 score of 1.43 reflects the regional character of large families, paralleling the other Southwestern Centres (C5, C10).

4.4 Subsequent Grouping of the 13 Clusters

The 13 cluster solution was chosen as providing a useful and succinct generalization of the variations in the South Korean urban system; larger number of clusters revealed clusters based on single specialized cities. However, Figure 4.1 showed that the 5 cluster stage represented another major break of slope in the decreasing size of fusion coefficients – indicating a more general summary of the South Korean urban system. So, for the sake of completeness, it is worth examining the results of the cluster sequence from 13 to 5 and beyond, to demonstrate how the groups identified combine together at succeeding

Table 4.4 Clustering Stages (16 to 2 groups)

16	15	14	Titles in 13 Clusters (No of Members)	13	12	11	10	9	8	7	6	5	4	3	2
○	○	○	C8 Small Stagnant Service Centres (14)	○	○	○	○	○	○	○	○	A ●	●	○	I ○
○	○	○	C2 Large Regional Service Centres (8)	○	○	●	○	○	○	○	○	B ●			
○	○	○	C7 Medium Regional Service Centres (12)	○	○	●									
○	○	○	C10 Small Southwestern Centres (5)	○	○	○	●	○	○	○	○	C ○	●		
○	○	○	C5 Large Southwestern Centres (6)	○	○	○	●								
○	○	●	C3 Growing Coastal Centres (4)	○	○	○	○	○	○	●	○	D ○	○	●	II ○
○	○	●													
●	○	○	C1 Seoul & Large Satellites (5)	●	○	○	○	●	○	●					
●															
○	●	○	C6 Manufacturing Centres (7)	●											
○	●														
○	○	○	C4 Medium Satellite Cities (5)	○	●	○	○	●							
○	○	○	C9 Small Manufac. Satellite Cities (4)	○	●										
○	○	○	C12 Administration Town (1)	○	○	○	○	○	●	○	●	E ○	○	●	
○	○	○	C13 Iron and Steel Town (1)	○	○	○	○	○	●						
○	○	○	C11 Coal Mining Town (1)	○	○	○	○	○	○	○	●				
	⇑		Key Breaks of Slope	⇑								⇑			⇑
	C1-15			C1-13							Group	A - E			I, II

● ┬ the clusters which are combined at the next stage cluster level. Table 4.4 illustrates how many of the clusters with similar characteristics combine together at more general grouping stages. The five clusters are labeled A to E.

1) At stage 12, Seoul & Large Satellites (C1) and Manufacturing Centres (C6) join together. These two groups are joined at stage 8 to the two Satellite City Groups (C4 + C9) previously amalgamated at stage 11. The Growing Coastal Centres (C3) join this group (composed of C3+C1+C6+C4+C9). The result is a *Big City and Satellite / Manufacturing* Group at stage 6 in this higher order grouping (Group D) .

2) All the specialized towns (C12: Administration, C13: Steel Manufacturing, C11: Coal Mining) amalgamate by stage 5 to form a set of *Specialized Centres* (Group E).

3) The two Southwestern Centre groups (C5+C10) also amalgamate at step 9 and remain as a separate category at step 5. This higher order generalization can be called *Southwestern Traditional Towns* (Group C).

4) The Large (C2) and Medium (C7) Regional Service Centres join at step 10 to form a *Regional Service Centre group,* which survives to form Group B at the five cluster level.

5) The C8 group namely Small Stagnant Service Centres, survive to form a separate cluster (Group A) called *Small Stagnant Centres* at this higher order level.

Table 4.4 also shows the clustering from 16 to 13 groups. It is clear that the adoption of more clusters simply splits the Growing Coastal Centres, Manufacturing and Seoul-Satellite clusters into smaller entities. Since all these centres eventually join at the 5 cluster level, it seems clear that the extraction of more clusters beyond 13 only provides more details : the procedure seems to add little to the generality of the results already obtained (see Appendix 4).

When the five groups were extracted from the data on 73 South Korean towns, Table 4.5 shows the generalized clusters and the mean scores that were identified, together with summary titles. Figure 4.14 shows the regional pattern of the centres in the five groups. It seems quite clear that the clusters display a strong regional pattern.

Table 4.5 Characteristics of the Higher Order Clusters : 5 Groups

Factors / Groups	F1 E.C.	F2 S.E.S	F3 Size	F4 M / D	F5 F / D	F6 C / YA	F7 U / A	F8 P.I.
A. Small Stagnant Towns	0.36	-0.45	-0.67	-1.15	-0.45	-0.19	0.43	0.02
B. Regional Service Centres	0.36	-0.10	0.43	-0.18	-0.07	-0.98	-0.36	-0.09
C. South-western Centres	0.75	-0.79	-0.09	-0.20	1.19	0.53	0.33	-0.63
D. Big/ Manufac./ Satellite Cities	-0.89	0.43	0.19	0.83	-0.39	0.57	0.10	0.01
E. Specialized Towns	0.59	2.02	-0.94	0.36	1.53	0.77	-1.65	2.58

For example, the Big City and Satellite / Manufacturing centre group (D) are concentrated around Seoul as well as on the southeast coast. The Regional Service Centres (B) are scattered throughout the country, with the Small Stagnant Centres (A) located in the spaces between these larger nodes. The pattern is completed by the concentration of the Southwestern Centres (C) in the Honam region and the dispersed location of the three specialized centres. It seems apparent that the massive changes in the urban development of the country has led to significant spatial clustering of the different types of urban places.

Figure 4.14 The Regional Pattern of the Centres in Five Groups

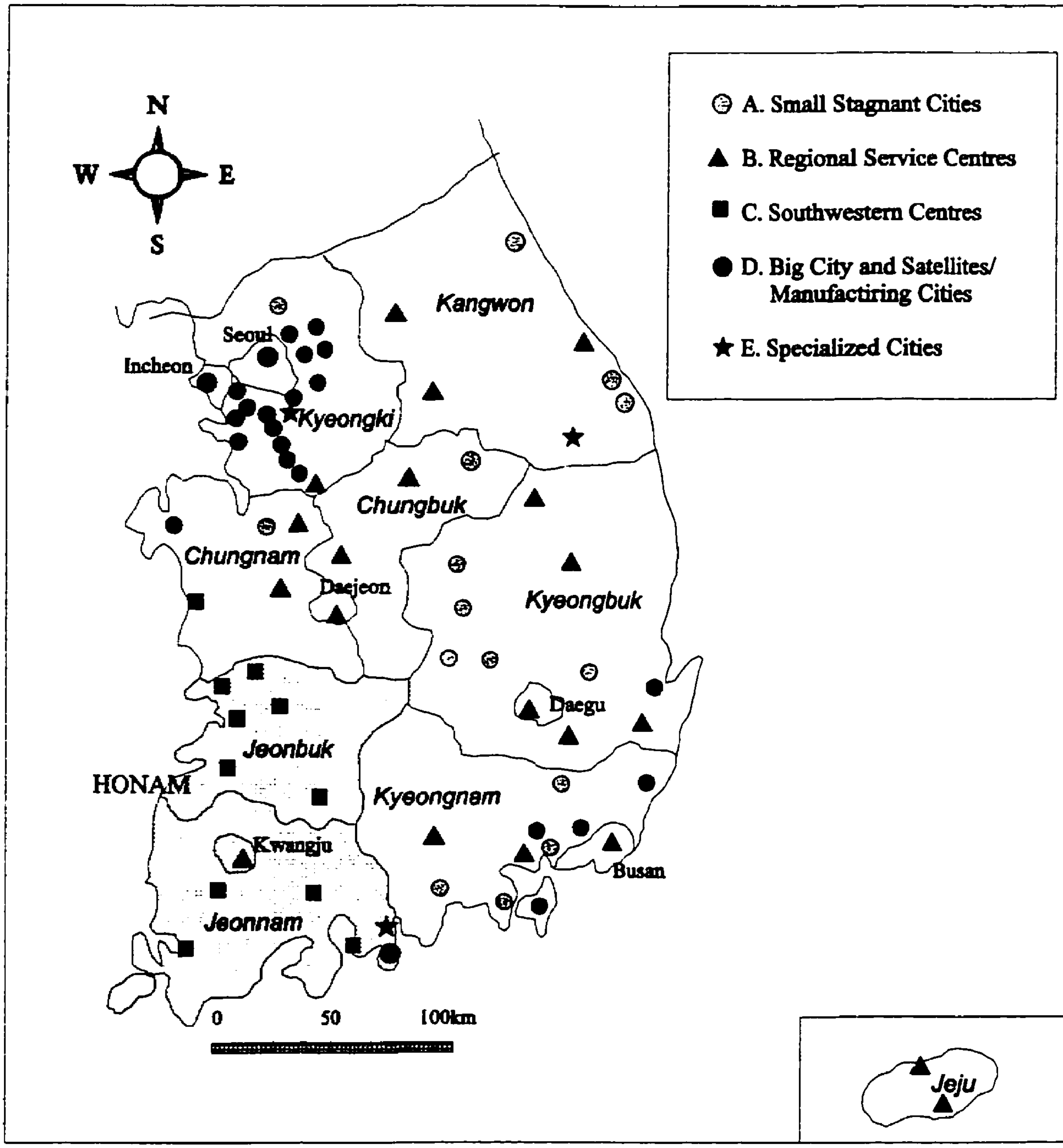


Table 4.6 shows the comparison between the clustering results of this study (13 and 5 groups) and Seong's clusters in 1975. There is only partial relationships with the 6 cluster groups identified by Seong. Obviously, the 13 group solution provided for more differentiation than Seong observed. However, it can be seen that there are some similarities in three of the groups. The biggest difference is that two of the 1990 clusters, the Southwestern Centres and Specialized cities, were not found in 1975. This seems to reflect the fact that Southwestern Centres remained as more rural and traditional places in 1990. The Specialized City group were also split from the other groups, perhaps due to the more diversified economy of urban centres in 1990.

Table 4.6 Comparison with Seong's 1975 Cluster Results

5 Groups in 1990	Seong's Groups in 1975	13 Groups in 1990
A. Small Stagnant Cities (14)	5. Small Stagnant (11) 6. Island : Jeju (1)	C8 Small Stagnant (14)
B. Regional Service Centres (20)*	4. Multi-functional (8)	C2 L. Regional Service (8) C7 M.Regional Service (12)
C. Southwestern Centres (11)	?	C10 Small Southwestern (5) C5 Large Southwestern (6)
D. Big City and Satellites / Manuf. Cities (25)	1. Seoul (1) 2. Large & Industrial (10) 3. Satellite (4)	C1 Seoul & L. Satellite (5) C6 Manufacturing (7) C4 M. Satellite (5) C9 S. Manuf. Satellite (4)
E. Specialized Cities (3)	?	C11 Coal Mining (1) C12 Administration (1) C13 Iron and Steel (1)

* ( ) in the bracket: the number of cities in the cluster

The discussion of the cluster sequence also identified a third major break in the loss of information measure (Figure 4.1) at the 2 cluster level which revealed another important difference among South Korean cities. It identified the most fundamental division of the South Korean centres, separating the 45 Service Centres (Small Stagnant and Regional Service) and Southwestern Nodes (the A, B, and C higher order clusters) from the 28 places in the Big City, Industrial and Satellite Nodes and the Specialized Centres (D and E on Figure 4.13). Since the latter are primarily based on manufacturing and the former upon service activity, this seems very similar to the Basic versus Non-Basic town difference that was found in Davies and Donoghue's study of Canadian towns (1991) – although their analysis was based only on the economic character of places, using a set of industrial categories. The presence of such a fundamental Basic and Non-Basic difference at the last stage of grouping schedule demonstrates that the differential economic character in the South Korean urban system remains at the heart of the urban differentiation and affects a variety of other features – such as demographic character etc.

Table 4.7 shows the characteristics of the Basic and Non-Basic groups (labeled I and II) by their mean scores on the eight factor dimensions. The Basic Centres have four scores over 0.5: a) Economic Character (i.e. high proportion of manufacturing employment); b) Mobility / Divorced ratio (high mobility); c) Socio-Economic Status (higher S.E.S.); d) Children/ Young Adult (higher proportion of children). The Non-Basic Centres have no mean factor scores over 0.5. The values over 0.3 show high proportions of young adults (-0.37 on F6), lower mobility (-0.46 on F4), lower Socio-

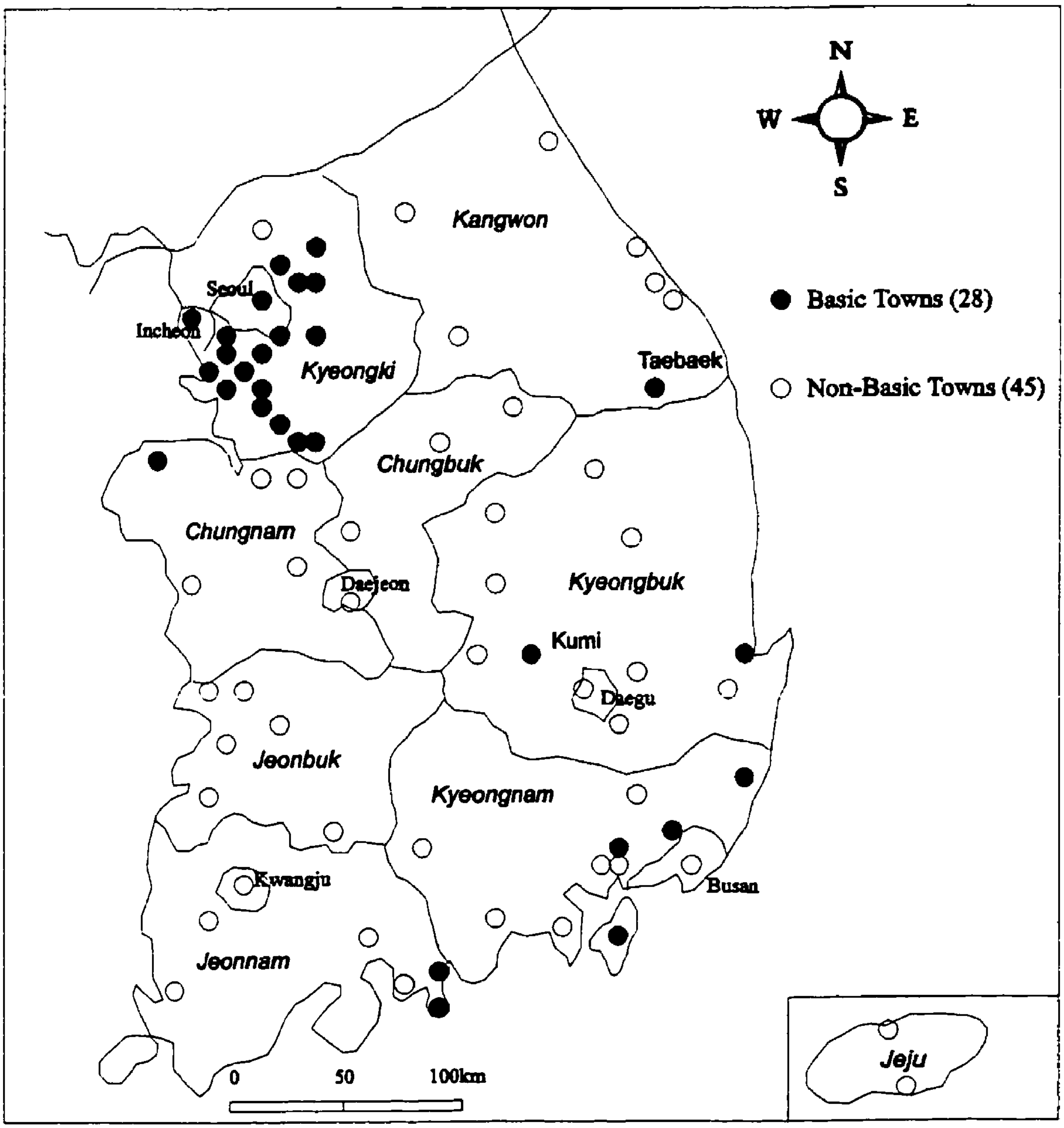
Table 4.7 Characteristics of the Clusters : 2 Groups

Factors Groups	F1 E.C.	F2 S.E.S	F3 Size	F4 M / D	F5 F / D	F6 C / YA	F7 U / A	F8 P.I.
I. Non-Basic Towns	0.45	-0.38	-0.04	-0.46	0.11	-0.37	0.05	-0.18
II. Basic-Towns	-0.72	0.60	0.06	0.78	-0.18	0.59	-0.09	0.29

Economic Status (-0.38 on F2) and a service economy (0.45 on F1). Figure 4.15 shows the regional pattern displayed by the Basic and Non-Basic towns. The Basic Towns are found in two areas: (a) on the south coast – although Busan which has an important regional and service node, a port as well as its manufacturing is not included; and (b) around Seoul. Only two specialized towns are found in the interior (Taebaek, Kumi). The Non-Basic centres are scattered throughout the country. It demonstrates the way that South Korean city growth and industrialization has been concentrated in the two areas – so most of the interior is still associated with the nodes that have their primary function as regional service centres.

Seong's study of the South Korean urban system in 1975 also found that the most fundamental difference in the country was a separation of the large growing centres versus the smaller and more stagnant service centres, but he linked these to separate Size and Traditional & Modernism axes. The presence of the latter axis has been questioned. The dualism in 1990 shows that regional differences can be found in South Korea even though a set of factor dimensions typical of the modern developed countries exists. This finding reconfirms the fact that the changes in the South Korean urban system through the process of rapid economic growth and especially the government-leading industrialization policy has had strong, spatially differentiated characteristics.

Figure 4.15 Basic and Non-Basic Towns Difference



CHAPTER 5
SUMMARY AND CONCLUSIONS

Many studies of the latent structure of urban system have been carried out since the late 1960s to identify the main characteristics of urban systems. This thesis has followed the tradition of previous works. It has reviewed the variety of previous studies in this field and has provided a cross-sectional analysis of the differentiation of South Korean urban system in 1990, set in the context of the major changes since 1960. The main focus of this research has been to define the character of the underlying structure of the urban system, after describing how the population distribution has altered over time. The results show how the South Korean urban dimensionality is now very similar to the typical Western model.

In Chapter 2, the evolution of the South Korean urban system was traced from 1960 to 1990, using population growth and size distribution measures. South Korea has experienced unprecedented urban growth during this period. The urban population has more than doubled from 36.7 percent in 1960 to 79.6 percent of the total population in 1990. Initially, the urban growth was due mainly to migration, accompanied by the process of industrialization – as in advanced countries – but it occurred at a much more rapid rate and within a shorter period. This trend was also accelerated by the national development strategy, that is, the export-oriented industrialization strategy which concentrated development in the larger urban areas. In terms of the size distribution of cities, the South Korean urban system is dominated by a primate pattern focused on the Seoul Capital Area. However, the growth of intermediate sized centres has resulted in a more even size distribution for the other centres. These changes over time seem enough to make one expect that the South Korean urban dimensionality has also altered.

Chapter 3 discussed the methods used to define the dimensionality of the urban system using 31 variables in 73 cities. A set of eight components – considered to represent the variations in the South Korean urban system – was extracted. The eight solution was chosen by using a number of guidelines, such as the variance explanation, the composition of the axis and the distribution of final communalities. The titles and variance explained are shown below:

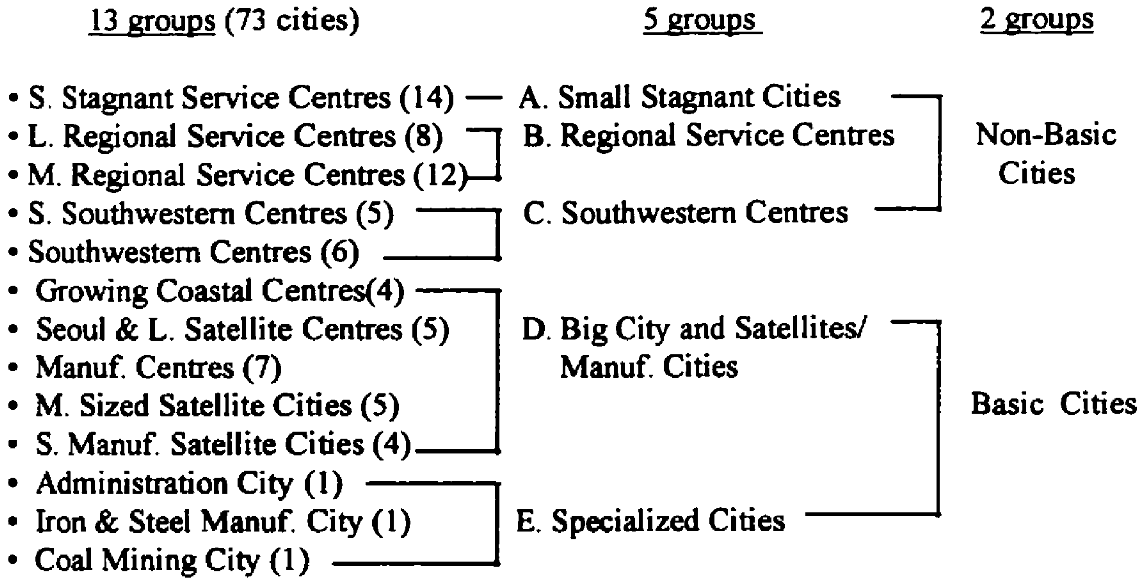
1. Economic Character (13.5 %)	*5. Family / Dwelling Type (6.6 %)*
2. Socio-Economic Status (13.4 %)	*6. Children / Young Adult (6.5 %)*
3. Size (11.0 %)	*7. University / Age (5.9 %)*
4. Mobility / Divorced Ratio (9.1 %)	*8. Primary Industry (5.4 %)*
	Total 71.3 %

The Economic Base dimensions (Economic Character and Primary Industry) were the most important axes, accounting for 18.9 % of the total variance. However both the Socio-Economic Status and Size were also identified as large axes, each explaining more than 10 percent of the total variation. Comparing the results with Seong's 1975 study, the Economic Character, Socio-Economic Status and Family/Dwelling type axes were different in 1990. Although the Economic Character and Socio-Economic Status axes were not identified by Seong as separate components, the characteristics were found in combination with the Size and Mobility axes in 1975. Although the results cannot be directly compared, the separation of those axes in 1990 seems significant. In general, the 1990 results show that the dimensions of South Korean urban system in 1990 have become more diversified than those in 1975. The Traditional / Modernism contrast observed by Seong of 1975 has disappeared – at least as a separate axis in 1990. In addition, an additional Family / Dwelling Type axis in 1990 shows the contrast between the modernized urban centres with high proportions of rented and apartment dwellings and the rural towns with detached dwellings and large families.

When the results are compared with those found in other countries, it was shown that the South Korean urban dimensionality in 1990 now parallels the pattern found in the developed countries. The general dimensions of urban systems in North America , as summarized by Davies (1984), can be considered as eight axes : Size; Economic Status; Quality of life; Economic Base; Education; Age; Ethnicity; Growth-Mobility. Given the homogeneity of population in South Korea, the Ethnicity should be excluded in the comparison. Five of the other hypothesized dimensions – the Size, Economic Base, Age, Education and Growth-Mobility – were found in this South Korean example, although there are minor differences in the character of the dimensions. The Economic Base dimension of the South Korean urban system showed simple features; only the difference between the secondary industry and the others was distinctively identified on the axis, whereas the Western countries have more diversified axes in urban economic base terms. The South Korean axis labeled Children / Young Adult axis replaces the expected Age dimension, which can be explained by the age structure of the South Korean urban system. Its recent growth has meant that many towns have high proportions of children and young adults. The Family / Dwelling type also appeared to be an important difference in the South Korean case. It was one of the major factors that showed the differentiation of the Southwestern centres, which retain the traditional pattern of large families in which detached dwellings, not apartments are found.

In Chapter 4, a series of taxonomies of South Korean centres were produced, based on the resultant factor scores of the eight dimensions previously derived, using Ward's cluster method. A variety of alternative cluster solutions were reviewed since there was no single clear break in the distribution of fusion coefficients or loss of information measure. However, the 13 cluster solution was selected as the most appropriate to describe, followed by more general solutions at the 5 and 2 cluster level. Each of the clusters was described and labeled according to the characteristics expressed by its mean factor scores. The 13 groups of cities were chosen as providing a succinct description of the centres over 50,000 in South Korea but they could also be generalized into 5 and 2 meaningful groups, as seen in Figure 6.1. A study of the changing relationships between the 13 and 5 group solutions shows that the latter represented a more succinct summary – although with considerable loss of detail. At the 2 cluster solution, the previous groups collapsed into what amounts to the old idea of a Basic (Industry) versus Non-Basic (Service) Town difference – or more accurately a Basic & Specialized versus Non-Basic town separation. The grouping separated the Service Centres and Southwestern Nodes from the Large, Industrial and Specialized towns. This result seems to show that the economic character in the South Korean urban system is still one of the most fundamental features in differentiating its urban places, despite the fact that the cities have been

Figure 6.1 A Summarized Linkage Diagram of the 13 to 2 Groups



classified on the basis of the eight factor scores which index a variety of different characteristics. Clearly, the South Korean urban system has been profoundly transformed in the past 30 years, with an even more dominant core in the Seoul area, a secondary and more dispersed core around Busan, together with a scatter of industrial centres. However, the survival of many regional centres with distinct characteristics ensures that there are still strong spatial variations in the differentiation of the South Korean urban places.

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APPENDICES

APPENDIX 1 Input Data Set

	Mean	Std Dev	Variable Description
V1	5.20581	.48765	*log total population
V2	2703.31507	2848.64486	population density
V3	65.92740	108.12071	population change (1980-1990)
V4	3.91589	.33664	average family size
V5	101.74767	7.97161	male to female ratio
V6	12.29452	3.36971	divorced ratio
V7	1.59178	.41088	birth rate
V8	.49233	.15108	death rate
V9	27.50274	2.03442	% pop. 0-14 yrs.
V10	20.13425	3.24620	% pop. 15-24 yrs.
V11	11.63425	2.30731	% pop. 45-60 yrs.
V12	6.49315	1.61635	% pop. 60- yrs.
V13	40.45479	8.34339	limited education (% less than middle s.)
V14	10.82055	5.37135	% university degree holder
V15	39.63288	13.48609	% high school to university
V16	23.80685	6.39970	% move-in in 1990
V17	20.62192	4.69649	% move-out in 1990
V18	48.58356	14.32012	% rent dwelling
V19	68.71370	15.44719	% detached dwelling
V20	18.99452	12.03589	% apartment dwelling
V21	1.17260	5.42499	% employment in primary industry
V22	37.31644	17.81319	% employment in secondary industry
V23	36.08219	11.38917	% employment in tertiary industry
V24	7.67534	2.65590	% employment in quaternary industry
V25	17.42192	5.34897	% employment in quinary industry
V26	32.40822	7.97168	telephone supply per 100 persons
V27	85.77123	11.66608	% pipe water supply
V28	7718.73973	2912.69360	car tax per capita
V29	19.71233	16.53992	city age
V30	5.28223	.37856	*log national tax per capita
V31	5.15513	.16813	*log local tax per capita

* Log $_{10}$ values

Actual Values

V1	443641.47	1330942.82	total population
V30	288104.47	411826.94	national tax per capita
V31	157946.27	109858.16	local tax per capita

Cities	*popsize*	*V1*	*V2*	*V3*	*V4*	*V5*	*V6*	*V7*	*V8*
Seoul	10627790	7.03	17554	27.0	3.76	99.1	12.3	1.40	.36
Busan	3797566	6.58	7173	20.2	3.81	98.4	16.4	1.50	.43
Daegu	2228834	6.35	4891	38.7	3.72	99.8	11.5	1.50	.39
Incheon	1818293	6.26	5733	64.1	3.73	101.5	12.0	1.90	.38
Kwangju	1144695	6.06	2285	57.3	3.97	100.6	11.0	1.50	.44
Daejeon	1062084	6.03	1969	51.9	4.03	101.0	12.4	1.50	.42
Ulsan	682978	5.83	3766	63.3	3.74	109.0	13.4	2.20	.28
Bucheon	667777	5.82	12798	201.5	3.64	101.5	7.1	1.80	.30
Suwon	644968	5.81	6109	107.5	3.75	100.2	9.8	2.00	.33
Seongnam	540764	5.73	3816	43.6	3.74	101.0	8.7	1.80	.37
Jeonju	517104	5.71	2608	33.5	4.13	98.6	13.6	1.40	.45
Cheongju	497429	5.70	3238	84.9	4.23	98.2	12.3	1.30	.35
Masan	496639	5.70	6773	28.4	3.98	96.0	12.7	1.30	.28
Anyang	480668	5.68	8219	89.6	3.72	98.0	8.1	2.00	.33
Kwangmyung	328803	5.52	8461	127.0	3.65	97.7	6.7	1.80	.28
Changwon	323138	5.51	2597	189.3	3.66	109.0	8.0	2.60	.24
Pohang	318595	5.50	4282	58.2	3.77	106.0	16.1	1.90	.39
Jinju	258365	5.41	3714	27.4	4.05	98.0	16.8	1.30	.42
Mokpo	253423	5.40	5556	14.2	4.38	99.7	12.7	1.20	.53
Ansan	252157	5.40	3369	708.4	3.61	107.7	5.1	2.40	.29
Jeju	232687	5.37	915	38.9	3.78	97.2	11.4	1.40	.45
Kunsan	218216	5.34	2519	32.0	4.37	99.4	16.5	1.20	.49
Uijeongbu	212368	5.33	2596	59.4	3.68	99.8	11.5	1.80	.39
Cheonan	211382	5.33	2533	75.2	4.33	100.0	16.8	1.30	.35
Kumi	206101	5.31	1617	95.5	3.97	98.0	8.7	2.30	.25
Iri	203401	5.31	2444	40.0	3.92	93.4	10.7	1.50	.44
Chuncheon	174153	5.24	3268	12.2	3.75	101.4	13.1	1.40	.56
Yeosu	173164	5.24	3834	7.5	3.92	100.8	12.6	1.60	.53
Wonju	173013	5.24	2055	26.4	3.98	101.7	12.6	1.90	.61
Suncheon	167209	5.22	1879	46.4	4.37	103.0	11.1	1.50	.48
Kangneung	152605	5.18	2000	48.0	3.86	100.6	12.4	1.20	.48
Kyoungju	141895	5.15	648	16.2	3.72	99.0	14.5	1.40	.63
Chungju	129994	5.11	1330	14.9	4.04	102.7	13.3	1.80	.66
Jinhae	120207	5.08	1109	.8	3.68	98.2	16.3	1.60	.60
Angdong	116932	5.07	1406	14.6	3.46	97.0	10.3	.50	.32
Kuri	109418	5.04	3634	64.4	3.75	101.0	7.0	1.80	.38
Siheung	107190	5.03	814	154.5	3.68	102.5	10.5	2.10	.50
Kimhae	106166	5.03	1659	52.7	3.71	96.0	16.6	2.40	.51
Jecheon	102037	5.01	1080	19.3	4.01	100.7	14.7	1.40	.61
Hanam	101278	5.01	1153	196.2	3.89	103.8	7.1	1.60	.44

Cities	*Popsize*	*V1*	*V2*	*V3*	*V4*	*V5*	*V6*	*V7*	*V8*
Kunpo	99956	5.00	4831	148.0	3.64	103.7	5.5	2.50	.32
Uiwang	96892	4.99	1815	194.7	3.80	100.0	7.5	2.10	.35
Chungmu	92159	4.96	4317	22.0	3.77	99.0	16.9	1.40	.61
Taebaek	89770	4.95	346	-19.7	3.76	134.0	18.8	1.30	.62
Donghae	89162	4.95	495	-14.6	3.74	101.5	12.7	1.20	.75
Seogwipo	88292	4.95	336	14.3	3.99	100.5	9.9	1.50	.58
Jeongju	86850	4.94	678	18.9	4.71	98.8	12.0	1.20	.60
Youngju	84355	4.93	1395	8.3	3.58	100.0	9.5	1.70	.57
Kimcheon	81349	4.91	1343	12.6	3.66	102.0	16.6	1.40	.65
Pyungtaek	79238	4.90	1842	30.2	3.84	102.8	12.4	1.70	.49
Songtan	77460	4.89	1877	21.5	3.66	99.8	11.5	1.70	.49
Migeum	74688	4.87	1623	91.9	3.73	100.7	16.7	1.70	.42
Sokcho	73796	4.87	703	12.2	3.72	99.0	14.7	1.30	.74
Kwacheon	72328	4.86	2019	350.0	3.60	97.9	9.3	1.90	.32
Dongducheon	71448	4.85	750	18.8	3.73	97.5	16.5	1.50	.58
Dongkwangyang	70118	4.85	1149	436.2	5.37	153.0	9.5	1.80	.30
Onyang	66379	4.82	1482	40.3	4.12	102.9	17.0	1.30	.52
Kongju	65195	4.81	858	49.6	4.43	99.0	13.8	1.20	.60
Yeocheon	63802	4.80	600	41.9	3.89	106.1	5.1	2.40	.62
Namwon	63121	4.80	1211	10.0	4.51	97.3	8.6	1.20	.59
Samcheonpo	62824	4.80	1068	-2.9	3.81	98.0	17.3	.50	.78
Kyoungsan	60524	4.78	1496	55.1	3.42	105.0	17.8	1.40	.52
Osan	59492	4.77	1466	32.2	3.92	98.2	12.8	1.80	.46
Daecheon	56922	4.76	1232	20.6	4.35	101.0	8.9	1.30	.51
Seosan	55930	4.75	1059	31.2	4.11	100.1	13.0	1.40	.51
Naju	55306	4.74	913	-3.6	4.98	99.0	15.2	1.30	.76
Kimje	55136	4.74	722	20.6	4.40	98.6	12.5	1.00	.61
Milyang	52995	4.72	1840	13.7	3.82	97.0	18.0	1.20	.56
Sangju	51875	4.71	472	5.9	3.65	100.0	11.0	1.30	.83
Youngcheon	48890	4.69	611	-9.7	3.82	97.0	12.9	1.40	.86
Jangseungpo	48614	4.69	1608	132.4	3.72	115.0	13.8	2.20	.35
Jeomchon	47802	4.68	1045	-6.8	3.72	101.0	12.0	2.00	.71
Samcheok	41673	4.62	736	-14.2	3.95	105.0	13.4	1.40	.82

Cities	*V9*	*V10*	*V11*	*V12*	*V13*	*V14*	*V15*	*V16*	*V17*	*V18*
Seoul	24.8	21.1	13.0	5.4	29.0	19.6	30.6	25.7	26.4	62.0
Busan	25.6	21.1	12.9	5.8	39.0	11.5	32.4	20.1	7.8	60.6
Daegu	25.4	22.1	12.6	5.5	39.8	13.5	43.9	23.6	23.9	63.6
Incheon	27.4	18.0	10.6	6.2	34.8	11.0	18.6	31.2	24.0	49.0
Kwangju	27.4	23.7	11.8	6.2	35.0	16.8	45.5	28.9	27.1	60.6
Daejeon	26.7	21.7	12.0	6.2	39.3	16.1	49.7	27.9	24.0	56.9
Ulsan	31.3	15.5	8.3	3.3	33.8	10.2	54.9	27.4	22.4	63.4
Bucheon	28.8	16.1	8.4	4.8	29.3	13.9	46.5	30.7	24.9	61.1
Suwon	28.1	18.8	9.4	4.9	29.5	14.1	46.5	29.5	21.8	58.3
Seongnam	27.6	19.5	10.7	5.0	41.2	8.2	28.3	28.0	26.1	69.2
Jeonju	26.7	24.0	12.3	6.5	38.7	16.5	47.9	25.3	22.1	28.8
Cheongju	27.3	23.9	10.9	5.8	38.3	13.8	44.1	27.3	20.5	57.4
Masan	26.9	23.9	10.4	4.6	33.6	9.1	44.6	17.1	19.6	63.8
Anyang	29.0	16.2	9.6	4.1	29.0	15.7	32.5	28.6	25.0	55.9
Kwangmyung	27.7	16.5	9.7	5.5	29.3	16.7	24.0	42.6	30.7	57.4
Changwon	31.3	15.0	6.6	3.3	23.1	17.1	38.3	31.6	23.3	65.9
Pohang	30.6	16.4	9.2	4.2	34.3	11.2	59.7	22.6	22.6	56.1
Jinju	27.1	24.2	11.4	5.6	43.2	13.0	55.9	20.9	20.1	55.0
Mokpo	29.7	22.8	11.9	6.3	45.2	9.1	39.1	22.7	22.6	22.3
Ansan	29.9	16.8	6.3	4.0	29.0	12.0	43.8	47.0	26.8	66.8
Jeju	27.3	22.1	11.6	5.8	34.1	14.0	45.6	20.2	16.8	60.8
Kunsan	30.1	20.6	11.9	6.6	43.2	10.0	38.0	18.4	17.7	24.2
Uijeongbu	26.7	17.7	11.9	5.9	36.0	9.0	36.1	30.2	24.3	64.8
Cheonan	28.3	22.9	10.3	5.6	39.6	10.5	28.7	22.2	18.0	55.7
Kumi	26.3	26.2	5.0	3.2	26.9	9.3	26.0	25.8	23.9	69.8
Iri	26.9	23.8	11.3	6.5	39.2	13.5	37.3	22.8	21.5	28.9
Chuncheon	22.1	25.8	14.2	7.7	38.2	15.1	48.8	24.2	21.0	52.7
Yeosu	29.6	18.8	12.2	6.5	46.2	7.6	36.9	25.5	25.0	27.8
Wonju	25.4	21.0	13.6	7.3	42.3	12.7	56.3	23.8	21.5	49.8
Suncheon	29.8	22.3	10.3	6.1	38.5	11.6	44.0	23.5	19.4	25.9
Kangneung	25.6	23.0	13.3	7.6	43.1	13.2	58.9	21.3	19.3	54.2
Kyoungju	24.5	22.9	12.9	8.1	40.2	10.6	44.1	18.5	16.8	54.7
Chungju	26.2	22.1	13.4	7.4	46.9	9.5	40.9	23.2	20.3	49.2
Jinhae	26.9	17.4	13.4	7.3	37.8	10.3	34.6	23.1	22.1	55.2
Angdong	25.1	25.0	12.8	8.2	45.5	12.1	44.8	20.6	19.5	57.7
Kuri	27.6	21.8	11.0	5.8	42.1	7.3	21.5	30.5	24.4	67.0
Siheung	27.7	15.9	10.3	7.1	38.6	8.2	15.8	32.1	23.5	24.8
Kimhae	27.7	20.1	10.4	5.7	41.3	8.7	30.1	30.4	19.3	65.6
Jecheon	27.7	18.8	14.0	7.5	48.0	6.6	39.5	23.9	21.6	51.6
Hanam	28.1	17.3	11.2	6.4	42.1	6.4	27.3	25.6	24.7	33.9
Kunpo	29.3	16.1	8.1	4.5	31.7	12.1	15.8	38.1	34.2	26.2

Cities	*V9*	*V10*	*V11*	*V12*	*V13*	*V14*	*V15*	*V16*	*V17*	*V18*
Uiwang	29.3	15.7	8.7	5.7	28.8	19.0	38.3	30.3	21.4	32.0
Chungmu	29.9	17.7	11.7	6.4	52.2	6.3	53.4	22.5	20.9	53.3
Taebaek	30.2	16.5	15.1	5.3	56.7	5.3	30.6	17.8	29.2	62.1
Donghae	26.9	17.6	15.4	8.9	51.9	6.7	32.2	16.8	16.8	43.2
Seogwipo	26.1	22.2	13.1	7.1	41.5	8.8	36.8	14.6	13.4	52.0
Jeongju	28.0	24.9	12.2	8.0	47.0	8.6	35.5	19.7	16.5	22.4
Youngju	25.6	23.0	14.5	8.1	48.9	8.5	49.4	19.4	20.1	50.8
Kimcheon	25.6	21.6	13.6	8.1	47.7	8.7	48.9	17.6	15.7	47.8
Pyungtaek	26.8	18.9	13.3	6.3	40.6	9.5	42.5	22.3	21.1	55.5
Songtan	25.0	19.0	13.7	6.7	29.3	9.0	23.3	25.0	18.8	56.4
Migeum	27.9	16.2	11.0	6.8	38.2	10.1	31.7	23.5	22.7	26.0
Sokcho	24.7	19.9	14.1	8.5	50.6	6.8	47.8	18.8	16.8	43.8
Kwacheon	26.7	14.2	11.3	7.6	16.2	45.4	40.5	28.8	25.7	47.8
Dongducheon	26.7	17.7	11.9	5.9	44.9	4.5	19.2	22.0	15.5	52.5
Dongkwang	29.8	16.8	6.3	3.3	28.7	8.5	72.7	22.9	15.2	30.7
Onyang	26.5	19.7	12.8	7.8	44.7	7.6	24.0	17.1	16.2	49.3
Kongju	25.3	27.6	12.1	7.7	46.7	12.4	41.7	20.0	18.6	47.4
Yeocheon	32.3	14.5	9.4	6.0	35.3	11.9	50.0	31.0	27.5	48.9
Namwon	28.7	23.2	11.6	7.7	51.2	8.0	24.1	18.5	18.6	31.5
Samcheonpo	27.7	18.2	14.6	8.8	54.9	5.9	25.3	24.5	7.8	37.2
Kyoungsan	23.7	25.7	11.1	6.5	44.7	9.9	57.9	33.6	23.7	67.0
Osan	27.0	21.8	10.3	5.3	40.8	5.3	13.7	22.2	20.8	34.0
Daecheon	30.2	19.2	12.9	6.8	51.5	7.5	39.1	19.6	17.0	47.1
Seosan	28.6	18.4	12.4	7.0	46.7	8.2	74.3	20.1	15.7	48.0
Naju	29.7	22.8	12.3	9.0	52.2	5.1	21.4	13.4	15.3	18.9
Kimje	27.1	22.0	14.0	10.0	48.3	8.2	27.2	12.3	15.0	14.8
Milyang	27.8	20.3	12.8	7.7	45.2	4.6	47.8	16.6	14.0	47.6
Sangju	25.2	19.3	15.2	11.0	52.1	8.7	30.0	15.4	16.3	40.0
Youngcheon	24.5	21.3	15.2	8.9	50.1	7.0	35.7	17.8	16.8	40.2
Jangseungpo	32.5	14.7	6.5	4.0	28.8	9.3	78.8	19.7	22.6	71.6
Jeomchon	28.1	18.2	14.8	8.2	51.8	8.9	52.2	18.2	19.4	46.6
Samcheok	25.4	22.1	14.3	8.9	49.1	8.3	49.4	13.3	13.8	45.6

Cities	*V19*	*V20*	*V21*	*V22*	*V23*	*V24*	*V25*	*V26*	*V27*	*V28*
Seoul	65.7	18.8	.26	41.8	33.3	11.5	12.8	41.2	99.6	18189
Busan	76.6	15.9	.39	44.7	34.3	6.8	13.6	32.1	97.6	9243
Daegu	78.4	16.1	.10	42.2	34.9	6.8	15.7	30.9	97.0	11732
Incheon	56.1	27.8	.15	58.6	24.2	5.5	11.5	31.5	97.0	8519
Kwangju	76.6	16.8	.20	30.9	38.6	10.3	19.6	29.0	89.6	7419
Daejeon	71.3	18.7	.09	32.9	36.3	9.9	20.6	29.3	95.1	9969
Ulsan	70.1	23.8	.39	60.8	23.9	3.9	11.8	31.7	90.0	11409
Bucheon	58.9	18.4	.02	60.7	23.1	4.3	11.6	35.0	94.5	8603
Suwon	64.4	23.2	.18	43.9	31.1	8.9	15.8	31.0	92.2	10007
Seongnam	83.9	8.9	.04	46.2	30.4	6.4	16.7	35.5	96.4	6440
Jeonju	61.0	30.8	.34	38.4	32.6	8.1	20.5	30.8	91.1	7816
Cheongju	70.8	19.3	.28	41.1	33.2	7.6	17.1	25.8	86.6	7653
Masan	79.7	12.4	.07	42.4	36.3	7.2	13.8	27.6	97.4	7769
Anyang	46.7	28.5	.19	52.5	27.3	5.9	13.9	31.0	95.4	9855
Kwangmyung	38.0	40.8	.00	46.9	29.1	6.4	17.0	30.3	92.3	6611
Changwon	57.7	40.4	.00	72.4	15.2	4.3	7.8	30.9	85.7	11192
Pohang	63.8	21.7	.06	46.5	30.4	8.0	14.8	30.8	95.7	12838
Jinju	78.2	13.8	1.55	31.9	40.3	7.0	19.0	28.5	97.5	8011
Mokpo	77.2	16.6	.16	23.2	41.7	7.5	27.4	35.1	96.5	4551
Ansan	42.3	36.9	.02	76.6	13.3	3.6	6.1	32.3	99.1	9560
Jeju	79.9	7.0	.03	14.9	54.5	9.9	20.2	31.0	100	10697
Kunsan	66.9	19.2	.08	33.2	38.0	8.6	19.4	26.0	96.6	5930
Uijeongbu	77.9	9.8	.00	31.6	40.7	8.4	18.7	37.7	83.8	7334
Cheonan	71.6	15.9	.08	39.3	35.2	7.1	17.9	37.4	84.3	6868
Kumi	62.9	27.8	.11	73.8	14.1	4.8	7.0	26.7	93.0	9383
Iri	56.0	31.2	.04	44.4	32.5	6.6	18.2	28.2	88.3	6567
Chuncheon	71.9	19.0	.13	41.7	30.8	6.6	20.3	37.0	94.7	9960
Yeosu	68.5	24.2	.05	19.3	48.1	10.0	19.9	29.9	95.6	5267
Wonju	70.9	21.7	.07	23.8	45.2	8.5	22.2	36.3	89.4	8017
Suncheon	65.6	26.7	.16	14.3	50.7	10.6	23.6	30.0	87.3	6337
Kangneung	70.5	17.1	.13	16.6	52.2	6.7	23.4	30.7	91.5	9623
Kyoungju	81.1	10.3	.34	27.2	45.9	8.6	18.2	29.8	77.0	9829
Chungju	69.8	15.2	1.33	30.5	40.0	9.1	18.8	42.1	87.0	7044
Jinhae	83.2	10.0	.13	36.8	37.4	7.0	18.3	33.0	93.1	6359
Angdong	82.3	8.1	.48	17.8	48.0	7.5	25.3	27.5	94.1	7092
Kuri	70.9	4.3	.48	42.2	34.7	7.1	15.1	42.0	90.0	6523
Siheung	48.3	33.0	.65	60.8	20.9	4.8	12.8	32.0	63.5	5672
Kimhae	73.2	21.3	.50	58.6	24.0	5.1	11.6	41.1	83.3	6932
Jecheon	75.4	13.1	1.58	14.9	52.2	8.5	20.9	39.0	74.2	5993
Hanam	85.4	3.5	.31	49.1	29.7	5.0	15.1	28.0	61.0	5050
Kunpo	31.1	33.9	.00	71.6	16.3	2.7	9.2	32.0	95.3	8273

Cities	*V19*	*V20*	*V21*	*V22*	*V23*	*V24*	*V25*	*V26*	*V27*	*V28*
Uiwang	24.5	32.9	.02	59.0	15.7	13.7	10.8	30.0	76.7	8989
Chungmu	76.8	16.3	.08	22.6	58.0	9.7	19.2	33.0	90.8	4623
Taebaek	66.6	15.4	45.7	7.2	26.9	4.4	14.9	28.4	92.5	4242
Donghae	77.0	14.7	2.54	29.2	41.6	7.8	18.0	36.6	98.1	5436
Seogwipo	85.4	4.7	1.06	13.2	52.4	10.5	22.4	29.0	99.5	8336
Jeongju	81.4	10.0	.82	22.2	47.0	7.5	21.7	45.7	65.4	4014
Youngju	78.9	5.2	.57	16.9	50.9	7.6	23.6	27.2	88.9	6476
Kimcheon	78.6	10.5	.07	39.0	36.5	6.0	18.0	51.3	84.0	7675
Pyungtaek	70.5	16.4	.24	19.4	46.8	9.9	23.1	37.0	75.3	10303
Songtan	67.3	15.8	.15	39.5	38.6	7.4	14.3	45.4	88.8	7740
Migeum	31.8	33.9	.05	59.1	22.6	4.9	13.3	8.7	83.8	5934
Sokcho	80.7	11.0	.18	16.7	58.7	6.6	17.4	36.5	87.2	7424
Kwacheon	28.2	64.8	.00	10.3	30.9	20.1	38.3	35.4	89.7	21776
Dongducheon	77.8	5.9	.47	38.2	40.3	4.8	15.9	37.0	81.8	5884
Dongkwang.	31.8	47.2	.76	60.3	20.3	9.0	9.4	15.6	52.1	8890
Onyang	76.0	12.4	.89	30.6	43.6	8.0	16.6	28.8	79.0	6429
Kongju	79.0	13.4	.35	14.4	46.1	11.7	26.9	33.6	84.0	6268
Yeocheon	46.1	48.1	.02	59.1	21.4	7.8	8.9	32.0	77.0	8958
Namwon	78.8	16.9	.62	19.0	49.1	7.6	22.9	26.0	72.0	4172
Samcheonpo	79.0	10.7	.07	28.2	44.2	7.8	19.3	29.6	84.5	4565
Kyoungsan	75.9	18.8	.16	61.7	18.8	4.1	14.8	28.2	73.9	8094
Osan	53.9	24.8	.04	58.5	25.0	4.8	11.5	33.3	82.2	7652
Daecheon	80.5	8.4	1.92	15.7	50.0	10.0	21.9	25.0	76.0	5300
Seosan	79.0	7.7	.53	16.4	50.5	11.7	20.0	70.8	71.0	8426
Naju	91.1	4.9	.32	42.5	30.8	7.6	18.2	20.5	73.0	3748
Kimje	90.3	2.1	3.48	23.9	43.3	8.5	20.1	22.8	40.0	4293
Milyang	79.6	12.1	.64	25.9	44.9	9.0	18.5	28.7	68.0	5149
Sangju	81.5	7.5	.33	26.3	41.4	8.4	22.5	23.7	70.4	6612
Youngcheon	77.0	15.6	.39	43.2	34.1	6.8	14.9	29.2	80.1	6589
Jangseungpo	50.2	41.1	.09	66.2	20.6	3.8	9.4	35.2	90.0	4700
Jeomchon	78.8	4.6	9.39	12.9	47.1	9.1	20.7	29.5	88.9	5989
Samcheok	81.4	10.9	2.48	29.8	35.3	10.6	21.2	44.4	87.4	6646

Cities	*V29*	*V30*	*V31*
Seoul	44	5.94	5.31
Busan	41	5.36	5.16
Daegu	41	5.33	5.17
Incheon	41	5.64	5.24
Kwangju	41	5.54	5.11
Daejeon	42	5.55	5.20
Ulsan	28	6.16	5.30
Bucheon	17	5.52	5.17
Suwon	41	5.59	5.22
Seongnam	7	5.22	5.12
Jeonju	41	5.47	5.10
Cheongju	41	5.30	5.11
Masan	41	5.66	5.06
Anyang	17	5.65	5.18
Kwangmyung	9	5.52	5.14
Changwon	10	5.85	5.36
Pohang	41	5.49	5.30
Jinju	41	5.21	5.12
Mokpo	41	5.34	4.96
Ansan	4	5.60	5.45
Jeju	35	5.27	5.19
Kunsan	41	5.81	5.11
Uijeongbu	27	5.03	5.15
Cheonan	27	5.15	5.11
Kumi	12	5.67	5.34
Iri	41	5.23	5.10
Chuncheon	44	5.40	5.16
Yeosu	41	5.12	5.11
Wonju	35	5.22	5.12
Suncheon	41	4.97	5.08
Kangneung	35	5.22	5.11
Kyoungju	35	5.43	5.23
Chungju	34	5.12	5.11
Jinhae	35	5.22	5.09
Angdong	27	5.21	5.04
Kuri	4	5.14	5.11
Siheung	1	5.55	5.20
Kimhae	9	5.10	5.30
Jecheon	10	5.35	5.01

Cities	*V29*	*V30*	*V31*
Hanam	1	5.16	4.95
Kunpo	1	5.54	5.47
Uiwang	1	5.72	5.15
Chungmu	35	5.17	5.20
Taebaek	9	5.10	4.91
Donghae	10	5.16	5.13
Seogwipo	9	5.39	5.27
Jeongju	9	4.89	4.87
Youngju	10	5.05	5.05
Kimcheon	41	4.85	5.08
Pyungtaek	4	5.29	5.14
Songtan	9	5.51	5.17
Migeum	1	3.94	5.03
Sokcho	27	5.00	5.33
Kwacheon	4	5.25	5.99
Dongducheon	9	5.10	5.07
Dongkwang.	1	4.21	5.46
Onyang	4	5.22	5.14
Kongju	4	4.92	5.00
Yeocheon	4	6.51	5.56
Namwon	9	4.87	4.93
Samcheonpo	34	4.89	5.05
Kyoungsan	1	5.62	5.25
Osan	1	5.37	5.25
Daecheon	4	5.12	5.00
Seosan	1	4.90	5.12
Naju	9	4.84	4.92
Kimje	1	4.79	4.83
Milyang	1	4.97	5.04
Sangju	4	5.04	5.01
Youngcheon	9	4.92	5.14
Jangseungpo	1	5.19	5.15
Jeomchon	4	5.26	5.09
Samcheok	4	5.66	5.14

APPENDIX 2 Factor Scores (Oblique)

Cities	*Pop. Size*	*SES*	*Size*	*E.C.*	*F/D*	*P.I.*	*U/A*	*M/D*	*C/Y*
Seoul	10627790	1.31	3.36	.28	-.61	-.06	.36	.45	-1.09
Busan	3797566	.09	1.75	-.63	.07	-.51	-.22	-1.34	-1.07
Daegu	2228834	.18	1.60	-.20	-.22	.28	-.25	.14	-1.35
Incheon	1818293	.55	1.51	-1.16	.11	.14	1.22	.22	.34
Kwangju	1144695	-.03	1.20	.60	.13	.06	-.30	.81	-.62
Daejeon	1062084	.41	1.22	.54	.08	.03	-.45	.19	-.55
Ulsan	682978	.41	1.21	-1.46	-1.04	.18	-1.31	.08	1.47
Bucheon	667777	.21	1.32	-1.14	-.53	.07	-.16	1.63	.52
Suwon	644968	.59	1.31	-.27	-.34	-.30	-.50	.75	.30
Seongnam	540764	-.79	.45	-.55	-.87	.46	.16	1.36	-.39
Jeonju	517104	.41	.98	.38	1.07	-.46	.23	-.27	-.14
Cheongju	497429	-.16	.98	-.07	.94	-.37	-.59	.36	-.74
Masan	496639	-.63	1.70	-.41	.17	-.47	-.82	.08	-.79
Anyang	480668	.68	1.17	-.74	-.31	.09	.56	1.26	.92
Kwangmyung	328803	.78	.81	-.48	-.01	.54	1.55	2.38	.62
Changwon	323138	1.30	.32	-1.92	-.66	.07	-.78	1.42	1.42
Pohang	318595	.79	1.20	-.48	-.53	.11	-1.39	-.67	1.18
Jinju	258365	-.30	1.10	.18	.35	.00	-.96	-.65	-.76
Mokpo	253423	-1.12	1.07	1.08	.94	-.53	.32	-.02	.98
Ansan	252157	1.44	-.31	-2.27	-.50	.44	-.86	2.92	.59
Jeju	232687	-.02	.70	.98	-.62	-.36	-.88	-.04	-.75
Kusan	218216	-.30	.97	.43	1.09	-.68	.24	-1.16	1.29
Uijeongbu	212368	-.28	.14	.10	-.95	.20	-.09	.75	-.33
Cheonan	211382	-.50	.41	-.18	.58	-.53	-.68	-.13	-.26
Kumi	206101	.37	.40	-2.23	.14	-.51	-.54	1.51	-.98
Iri	203401	.20	.57	-.05	1.11	-.64	.84	.00	-.10
Chuncheon	174153	.58	.58	.06	-.21	.01	.16	-.58	-2.18
Yeosu	173164	-.41	.66	.87	.36	.02	.71	-.22	1.41
Wonju	173013	.17	.11	.76	-.47	-.07	-.30	-.41	-.35
Suncheon	167209	-.31	.38	1.30	1.27	-.76	-.55	.14	1.06
Kangneung	152605	.00	.33	.94	-.08	.04	-.63	-.36	-1.11
Kyoungju	141895	.20	-.14	.37	-.37	-.36	-.14	-1.05	-1.40
Chungju	129994	-.24	-.17	.45	-.46	-.08	.00	-.58	-.22
Jinhae	120207	-.18	.22	-.05	-.71	.28	.63	-.88	-.14
Andong	116932	-.61	.29	1.00	.02	.24	.08	.27	-2.04
Kuri	109418	-.87	-.27	-.37	-1.04	.20	.35	1.68	-.49
Siheung	107190	.56	-1.20	-1.30	.38	-.11	1.87	.61	1.09
Kimhae	106166	.14	-.49	-1.45	-1.19	-.17	.14	-.26	-.06

Cities	*Pop. size*	*SES*	*Size*	*E.C.*	*F/D*	*P.I.*	*U/A*	*M/D*	*C/Y*
Jecheon	102037	-.81	-.63	-.85	-.68	.19	.15	-.28	.31
Hanam	101278	-1.10	-1.18	-.60	-.54	-.02	.64	1.40	.16
Kunpo	99956	1.11	-.05	-1.78	-.01	.45	1.94	2.08	1.69
Uiwang	96892	1.62	-.59	-.36	.44	-.68	.55	1.25	1.63
Chungmu	92159	-.63	.34	.74	-.79	.01	-.44	-1.05	1.17
Taebaek	89770	-1.01	-.29	-.11	.62	7.57	-.18	-1.03	.85
Donghae	89162	-.40	-.68	.46	-.68	.48	1.11	-1.32	.12
Seogwipo	88292	-.31	-.38	1.09	-.53	-.31	-.30	-.33	-.75
Jeongju	86850	-1.59	-1.04	1.01	.93	-1.31	-.14	.06	.14
Youngju	84355	-.67	-.61	.86	-.52	.35	.27	.07	-1.09
Kimcheon	81349	-.32	-.35	.01	-.94	-.34	-.35	-1.63	-.77
Pyungtaek	79238	.09	-.65	.84	-.80	.08	-.35	1.68	-.49
Songtan	77460	.13	-.40	-.28	-1.34	-.18	.69	.11	-.53
Miguem	74688	.78	-.86	-1.25	2.54	.76	1.31	-.51	.34
Sokcho	73796	-.18	-.63	.61	-.87	-.13	.15	-1.53	-.69
Kwacheon	72328	5.67	-.46	3.00	-.24	-.08	.01	1.45	.02
Dongducheon	71448	-.79	-.66	-.63	-.64	-.05	.62	-.77	-.19
Dongkwangyang	70118	1.40	-2.10	-1.13	4.23	.27	-4.79	.65	1.43
Onyang	66379	-.37	-.74	.05	.37	-.01	.26	-.86	-.40
Kongju	65195	-.60	-.74	1.44	.75	-.52	-.51	.15	-1.35
Yeocheon	63802	1.39	-.69	-.85	-1.29	-.21	.34	.64	2.92
Namwon	63121	-1.40	-.88	1.00	1.47	-.67	.64	.45	.22
Samcheonpo	62824	-.68	-.48	.43	.46	-.35	1.13	-2.16	-.03
Kyoungsan	60524	.39	-.70	-1.51	-.54	.62	-.35	-.28	-2.16
Osan	59492	.07	-.63	-1.30	.38	-.39	1.13	.01	.15
Daecheon	56922	-1.25	-.81	1.17	.46	-.15	-.26	.35	.74
Seosan	55930	-.71	-1.30	1.45	-2.26	-1.20	-2.18	-.29	.81
Naju	55306	-1.53	-1.03	.17	2.29	-1.02	.76	-1.12	.54
Kimje	55136	-1.39	-1.80	.89	2.10	-.72	.87	-.46	-.44
Milyang	52995	-.70	-1.03	.29	.10	-.37	-.31	-1.17	-.18
Sangju	51875	-.32	-1.56	.74	.15	.09	1.61	-.97	-.92
Youngcheon	48890	-.14	-1.25	-.18	.04	-.11	1.23	-1.39	-.97
Jangseungpo	48614	.37	-.58	-1.76	-.74	.51	-2.49	-.01	2.06
Jeomcheon	47802	-.54	-.90	.97	-.98	1.23	.34	-.66	.46
Samcheok	41673	-.19	-1.11	.75	-1.10	-.23	-.11	-1.41	-.41

APPENDIX 3 Differences at the 14 to 16 Group Level

The thirteen clusters extracted on the basis of 13 group solution have been described. For the sake of completeness it is worth noting what happens with respect to the separation of the groups at the 15 and 16 group level.

1) At stage 14, Seosan is separated from the C3, Coastal Growing Centres, to form a cluster of single member (see Table 4.3). This town is differentiated from the others in the group C3 since it has an inclination toward service functions (F1 Economic Character score :1.45) rather than manufacturing. The remaining towns have more of a concentration on manufacturing (F1 average score :-1.23)

2) The C6 cluster, or Major Manufacturing Centre group, is divided into two group at step 15. The groups are differentiated by two main characteristics , Economic Character and Children / Young Adult axis. A group composed of Ansan, Kumi, and Changwon, has a greater concentration in manufacturing (F1 mean score : -2.14) whereas the other group, composed of Yeocheon, Kwangmyung, Kunpo and Uiwang, has manufacturing function values – although they are still high relative to other South Korean Centres – and also has high proportions of children (F6 Children/ Young Adult score :+1.7). The addition of this detail at the 15 cluster level does not add a great deal to the description of the South Korean urban system. Given the smaller loss in fusion values at 15 (cf. to 13) and addition of a single town cluster the 13 group solution was considered the more general and more appropriate to interpret.

3) At the 16 group level there is another split in a very clear group, Seoul and its satellites. Seoul is separated from the rest of the group (C1) to form a single cluster. Seoul has much higher scores on the S.E.S. (1.31) and Size (3.36) axes than the remaining satellites. It also has different economic characteristics. Its factor scores on

the Economic Character and Primary Industry are 0.28 and -0.06 respectively, meaning that it is more multi-functional in its economy. In contrast, the satellites are more concentrated in secondary industries (mean factor score on the Economic Character : -0.83).

Since all three of the clusters affected by the 13 to 16 extraction process combine together at the 5 cluster level, it is concluded that the detailed splits described above add little to the generality of the overall results, so the 5 and 13 clusters seem to provide more appropriate generalizations of the data.

APPENDIX 4 The Results of Cluster Analysis – SPSS Output

Data Information

73 unweighted cases accepted.
0 cases rejected because of missing value.

Euclidean measure used.

Agglomeration Schedule using Ward Method

Stage	Clusters Combined Cluster 1	Cluster 2	Coefficient	Stage Cluster 1st Appears Cluster 1	Cluster 2	Next Stage
1	53	73	.344256	0	0	11
2	29	33	.691056	0	0	8
3	5	6	1.085027	0	0	26
4	10	36	1.531069	0	0	20
5	21	31	1.998528	0	0	36
6	11	26	2.468439	0	0	52
7	57	68	2.950867	0	0	38
8	29	46	3.459687	2	0	14
9	12	24	3.984464	0	0	25
10	8	14	4.545598	0	0	27
11	49	53	5.122381	0	1	54
12	69	70	5.705446	0	0	46
13	47	60	6.319669	0	0	29
14	29	50	6.937539	8	0	36
15	39	72	7.556519	0	0	37
16	34	55	8.190675	0	0	23
17	13	18	8.828960	0	0	25
18	19	28	9.485660	0	0	31
19	27	32	10.163217	0	0	44
20	10	23	10.844121	4	0	49
21	7	17	11.555498	0	0	47
22	38	51	12.271849	0	0	49
23	34	45	12.991142	16	0	42
24	35	48	13.718795	0	0	34
25	12	13	14.477390	9	17	40
26	3	5	15.236591	0	3	45
27	8	9	16.012024	10	0	39
28	37	63	16.791277	0	0	43
29	47	64	17.597567	13	0	51
30	66	67	18.413269	0	0	51
31	19	22	19.244003	18	0	32
32	19	30	20.173487	31	0	52
33	16	20	21.124495	0	0	48
34	35	58	22.091686	24	0	50
35	15	41	23.081289	0	0	55
36	21	29	24.074329	5	14	50
37	39	43	25.109354	15	0	57
38	57	61	26.152817	7	0	42
39	4	8	27.260130	0	27	56
40	2	12	28.439482	0	25	45
41	42	59	29.621281	0	0	55
42	34	57	30.871979	23	38	46
43	37	40	32.153877	28	0	53
44	27	62	33.492100	19	0	58
45	2	3	34.843296	40	26	64

Agglomeration Schedule using Ward Method (CONT.)

	Clusters Combined			Stage Cluster 1st Appears		Next
Stage	Cluster 1	Cluster 2	Coefficient	Cluster 1	Cluster 2	Stage
46	34	69	36.268536	42	12	54
47	7	71	37.711681	21	0	60
48	16	25	39.239243	33	0	59
49	10	38	40.837528	20	22	62
50	21	35	42.469063	36	34	58
51	47	66	44.109100	29	30	63
52	11	19	45.771755	6	32	63
53	37	52	47.503719	43	0	62
54	34	49	49.247078	46	11	57
55	15	42	51.234249	35	41	59
56	1	4	53.270149	0	39	61
57	34	39	55.397198	54	37	69
58	21	27	57.668694	50	44	64
59	15	16	60.369278	55	48	61
60	7	65	63.114788	47	0	67
61	1	15	66.361694	56	59	65
62	10	37	69.825035	49	53	65
63	11	47	73.531914	52	51	71
64	2	21	77.361458	45	58	69
65	1	10	81.715401	61	62	67
66	54	56	86.294304	0	0	68
67	1	7	91.119148	65	60	70
68	44	54	96.603516	0	66	70
69	2	34	103.322304	64	57	71
70	1	44	110.483147	67	68	72
71	2	11	117.883980	69	63	72
72	1	2	132.101898	70	71	0

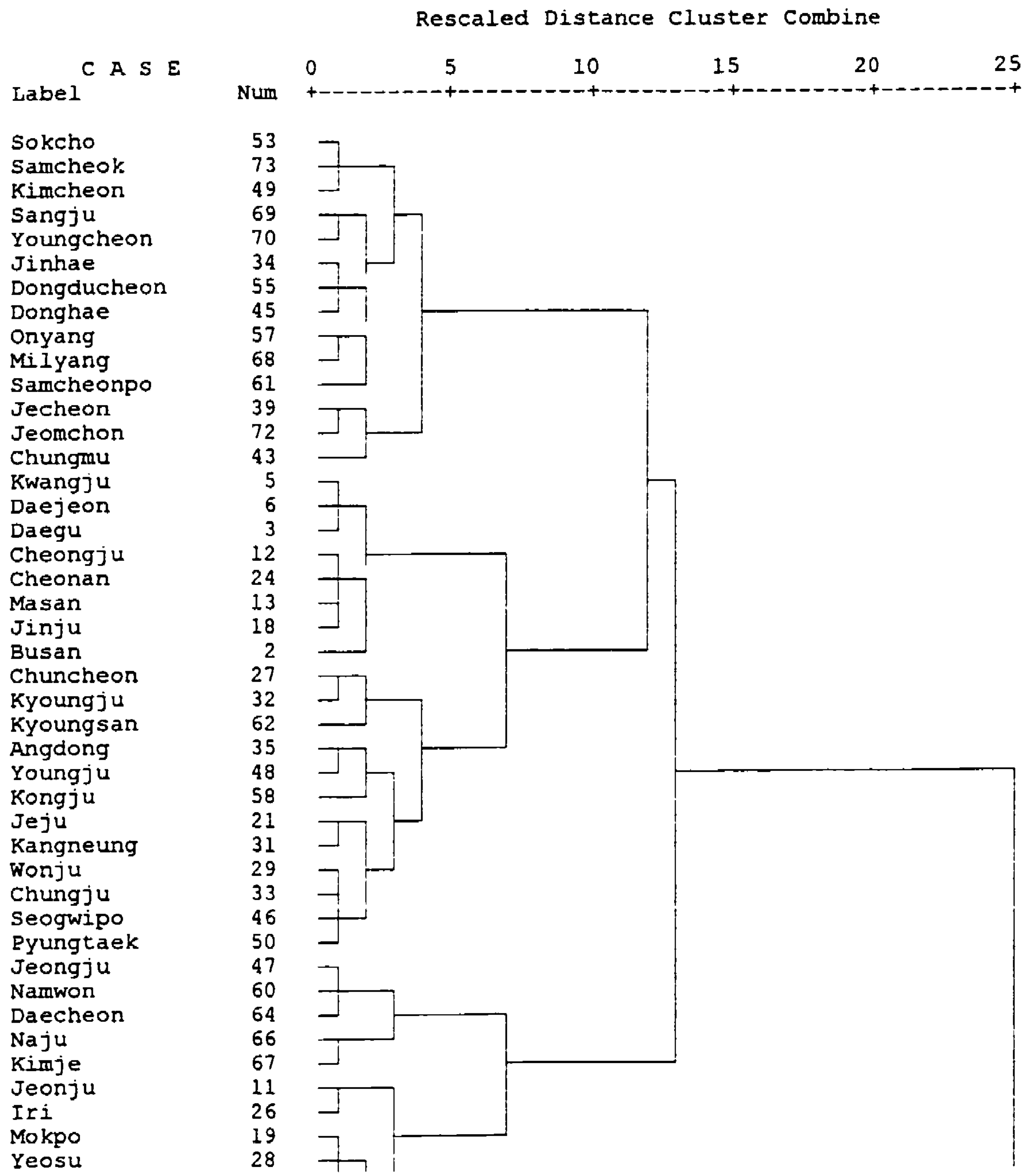
Cluster Membership of Cases using Ward Method

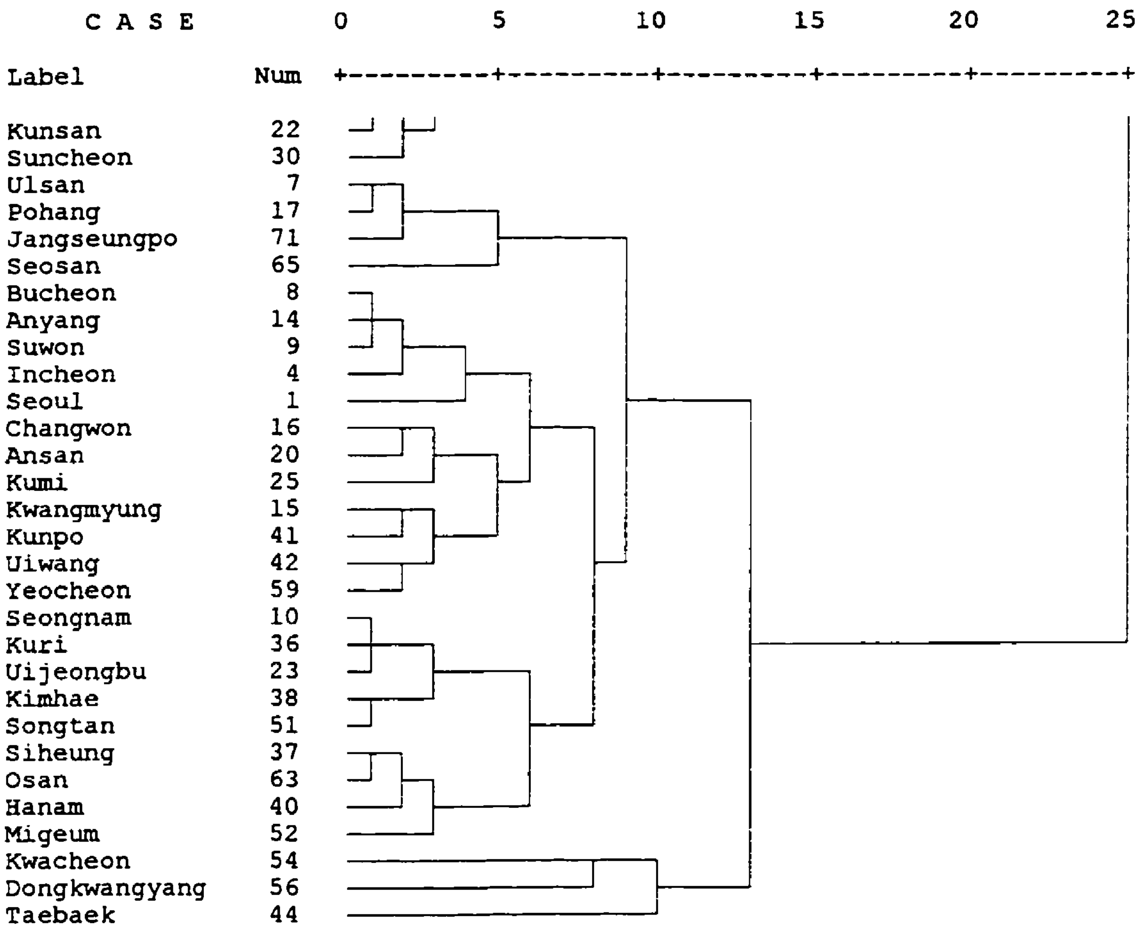
Label	Case	15	14	13	12	11	10	9	8	7	6	5
		Number of Clusters										
Seoul	1	1	1	1	1	1	1	1	1	1	1	1
Busan	2	2	2	2	2	2	2	2	2	2	2	2
Daegu	3	2	2	2	2	2	2	2	2	2	2	2
Incheon	4	1	1	1	1	1	1	1	1	1	1	1
Kwangju	5	2	2	2	2	2	2	2	2	2	2	2
Daejeon	6	2	2	2	2	2	2	2	2	2	2	2
Ulsan	7	3	3	3	3	3	3	3	3	3	1	1
Bucheon	8	1	1	1	1	1	1	1	1	1	1	1
Suwon	9	1	1	1	1	1	1	1	1	1	1	1
Seongnam	10	4	4	4	4	4	4	4	1	1	1	1
Jeonju	11	5	5	5	5	5	5	5	4	4	3	3
Cheongju	12	2	2	2	2	2	2	2	2	2	2	2
Masan	13	2	2	2	2	2	2	2	2	2	2	2
Anyang	14	1	1	1	1	1	1	1	1	1	1	1
Kwangmyung	15	6	6	6	1	1	1	1	1	1	1	1
Changwon	16	7	6	6	1	1	1	1	1	1	1	1
Pohang	17	3	3	3	3	3	3	3	3	3	1	1
Jinju	18	2	2	2	2	2	2	2	2	2	2	2
Mokpo	19	5	5	5	5	5	5	5	4	4	3	3
Ansan	20	7	6	6	1	1	1	1	1	1	1	1
Jeju	21	8	7	7	6	6	6	2	2	2	2	2
Kunsan	22	5	5	5	5	5	5	5	4	4	3	3
Uijeongbu	23	4	4	4	4	4	4	4	1	1	1	1
Cheonan	24	2	2	2	2	2	2	2	2	2	2	2
Kumi	25	7	6	6	1	1	1	1	1	1	1	1
Iri	26	5	5	5	5	5	5	5	4	4	3	3
Chuncheon	27	8	7	7	6	6	6	2	2	2	2	2
Yeosu	28	5	5	5	5	5	5	5	4	4	3	3
Wonju	29	8	7	7	6	6	6	2	2	2	2	2
Suncheon	30	5	5	5	5	5	5	5	4	4	3	3
Kangneung	31	8	7	7	6	6	6	2	2	2	2	2
Kyoungju	32	8	7	7	6	6	6	2	2	2	2	2
Chungju	33	8	7	7	6	6	6	2	2	2	2	2
Jinhae	34	9	8	8	7	7	7	6	5	5	4	4
Angdong	35	8	7	7	6	6	6	2	2	2	2	2
Kuri	36	4	4	4	4	4	4	4	1	1	1	1
Siheung	37	10	9	9	8	4	4	4	1	1	1	1
Kimhae	38	4	4	4	4	4	4	4	1	1	1	1
Jecheon	39	9	8	8	7	7	7	6	5	5	4	4
Hanam	40	10	9	9	8	4	4	4	1	1	1	1
Kunpo	41	6	6	6	1	1	1	1	1	1	1	1
Uiwang	42	6	6	6	1	1	1	1	1	1	1	1
Chungmu	43	9	8	8	7	7	7	6	5	5	4	4
Taebaek	44	11	10	10	9	8	8	7	6	6	5	5

Cluster Membership of Cases using Ward Method (CONT.)

		Number of Clusters										
Label	Case	15	14	13	12	11	10	9	8	7	6	5
Donghae	45	9	8	8	7	7	7	6	5	5	4	4
Seogwipo	46	8	7	7	6	6	6	2	2	2	2	2
Jeongju	47	12	11	11	10	9	5	5	4	4	3	3
Youngju	48	8	7	7	6	6	6	2	2	2	2	2
Kimcheon	49	9	8	8	7	7	7	6	5	5	4	4
Pyungtaek	50	8	7	7	6	6	6	2	2	2	2	2
Songtan	51	4	4	4	4	4	4	4	1	1	1	1
Migeum	52	10	9	9	8	4	4	4	1	1	1	1
Sokcho	53	9	8	8	7	7	7	6	5	5	4	4
Kwacheon	54	13	12	12	11	10	9	8	7	7	6	5
Dongducheon	55	9	8	8	7	7	7	6	5	5	4	4
Dongkwangyang	56	14	13	13	12	11	10	9	8	7	6	5
Onyang	57	9	8	8	7	7	7	6	5	5	4	4
Kongju	58	8	7	7	6	6	6	2	2	2	2	2
Yeocheon	59	6	6	6	1	1	1	1	1	1	1	1
Namwon	60	12	11	11	10	9	5	5	4	4	3	3
Samcheonpo	61	9	8	8	7	7	7	6	5	5	4	4
Kyoungsan	62	8	7	7	6	6	6	2	2	2	2	2
Osan	63	10	9	9	8	4	4	4	1	1	1	1
Daecheon	64	12	11	11	10	9	5	5	4	4	3	3
Seosan	65	15	14	3	3	3	3	3	3	3	1	1
Naju	66	12	11	11	10	9	5	5	4	4	3	3
Kimje	67	12	11	11	10	9	5	5	4	4	3	3
Milyang	68	9	8	8	7	7	7	6	5	5	4	4
Sangju	69	9	8	8	7	7	7	6	5	5	4	4
Youngcheon	70	9	8	8	7	7	7	6	5	5	4	4
Jangseungpo	71	3	3	3	3	3	3	3	3	3	1	1
Jeomchon	72	9	8	8	7	7	7	6	5	5	4	4
Samcheok	73	9	8	8	7	7	7	6	5	5	4	4

Dendrogram using Ward Method

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Seosan 65
Bucheon 8
Anyang 14
Suwon 9
Incheon 4
Seoul 1
Changwon 16
Ansan 20
Kumi 25
Kwangmyung 15
Kunpo 41
Uiwang 42
Yeocheon 59
Seongnam 10
Kuri 36
Uijeongbu 23
Kimhae 38
Songtan 51
Siheung 37
Osan 63
Hanam 40
Migeum 52
Kwacheon 54
Dongkwangyang 56
Taebaek 44

IMAGE EVALUATION
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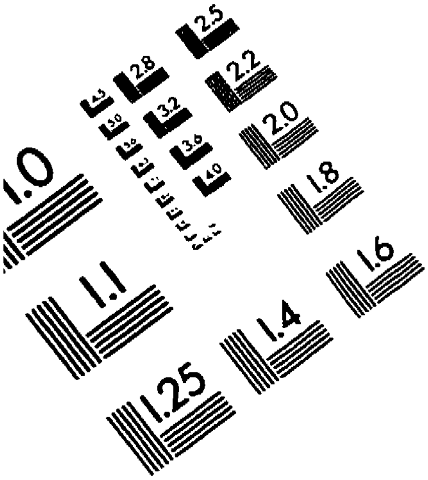

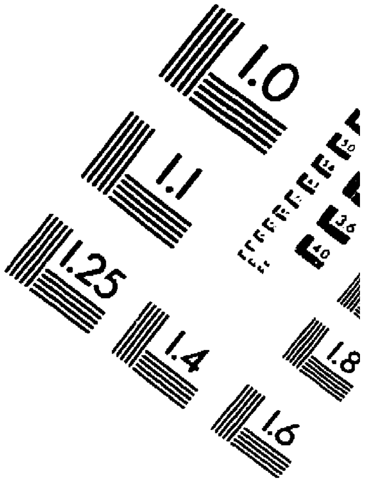

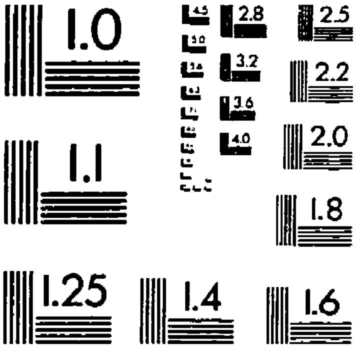

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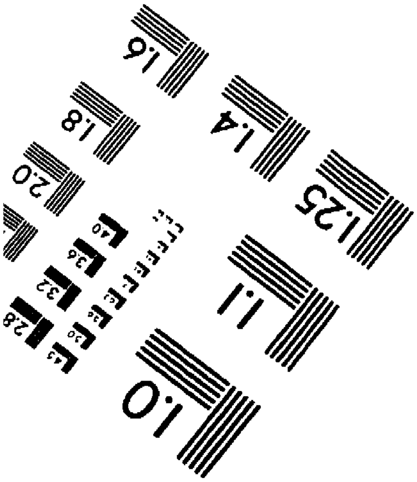

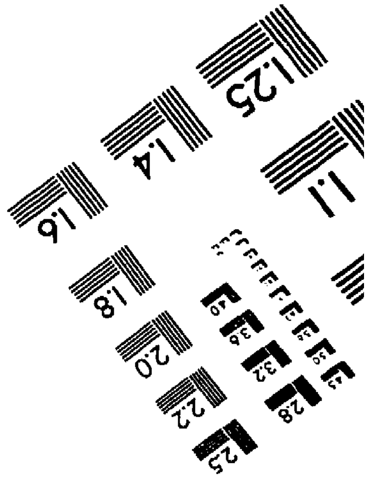

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