

DISCUSSION PAPER

Report No.: UDD-89

SPATIAL DISTRIBUTION OF INDUSTRIES
AND IMPORTANT LOCATION FACTORS IN THE SEOUL REGION

by

Sang-Chuel Choe and Byung-Nak Song

November 1985

Water Supply and Urban Development Department
Operations Policy Staff
The World Bank

The views presented herein are those of the authors, and they should not be interpreted as reflecting those of the World Bank.

Dr. Sang-Chuel Choe, Dean of the Graduate School of Environmental Studies, Seoul National University, was the Local Director of the Industrial Location Policies Research Project. Dr. Byung-Nak Song is a Professor of Economics at Seoul National University. The authors would like to thank Dr. Kyu-Sik Lee, the Project Director, for his encouragement and support in preparing this paper. His contribution through this research project to the understanding of intrametropolitan location problems and policies in Korea has been instrumental for making a turning point of Korea's industrial location policies and for the creation of the Industrial Location Study Group in Korea.

Research Project No.: RPO 672-91
Research Project Name: An Evaluation of Industrial Location Policies for Urban Deconcentration

Abstract

This paper has been prepared as part of the World Bank's Industrial Location Policies Research Project (RPO 672-91). The main purpose of this study is to identify the locational forces that influence the manufacturing industry in the Seoul region where more than 45 percent of industrial establishments are located and industrial movement has been taking place most actively. The paper begins with the analysis of changing spatial distribution of manufacturing establishments and employment and documents spatial variations of location characteristics; then it shows certain regularities observed between the changing distribution of industries and spatial variations in location factors, and develops hypothetical postulations for further empirical analysis.

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Part I. Introduction

The spatial redistribution of population and industry has been a crucial developmental issue in Korea since the early 1960's. The high primacy rate of Seoul, regional disparities and associated regional rivalry detrimental to national integrity, and the concern about national security have given the government a strong impetus in taking action toward solving the nation's spatial imbalance, and in particular toward the dispersal of industry from Seoul and its surrounding areas to the other parts of the nation. Throughout the relatively short but compressed history of these decentralization efforts, industrial location policies and programs have been highlighted as being of major importance.

The reasons for choosing an industrial location program as the strategic means for spatial redistribution are well known. The Korean experience draws a particular attention because policies have been heavily enforced and implemented. There are very few countries aside from Korea which have actually brought in and implemented an industrial location program for spatial distribution. There is an increasing awareness by policy makers and academicians of the need to evaluate the multi-dimensional consequences of industrial

location policies and their impacts on the overall regional development. ^{1/}

In the first phase of the present study, Choe and Song reviewed the historical evolution of Korea's industrial location policies and their policy instruments, attempting to make some qualitative evaluations of the effectiveness of policy instruments. It also highlighted the current policy situation and identified further research needs. However, the findings were only intended to serve as a historical and institutional basis for the empirical formulation of policy analysis. ^{2/}

This study's primary purpose is to contribute to the knowledge and understanding of locational forces acting on the manufacturing industry in the Seoul region where 45.2 percent of industrial establishments is located and industrial movement has been taking place most actively. Another rationale for choosing the Seoul region is that industrial location policies that have evolved in Korea centered around the attempts to move the manufacturing industry from Seoul and its adjacent areas to peripheral areas. Locational forces are revealed most clearly at the time of industrial movement, whether in the case

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- ^{1/} (1) Office of the Minister Without Portfolio, A Study on policy Effectiveness of the Population Redistribution Plan from the Seoul Metropolitan Region, 1979, (in Korean)
- (2) Won-Yong Kwon, "A Study of Economic Impact of Industrial Relocation: A Case Study, Urban Studies, No. 18, 1981, and Sam Ock Park, Locational Change in Manufacturing: A Conceptual Model and Case Studies, Ph. D. dissertation submitted to University of Georgia, Athens, 1981.
- ^{2/} Sang-Chuel Choe and Byung-Nak Song, An Evaluation of Industrial Locational Policies for Urban Deconcentration in Seoul Region, Report No. UDD-7, Water Supply and Urban Development Department, The World Bank, 1982

of relocating existing plants to new sites or opening of branches away from parent plants. To this end, the present study begins with the analysis of the changing spatial distribution of manufacturing establishments and employment and the moving patterns of manufacturing establishments by geographical delineation of distance, direction, and development zoning. The next part touches upon the definitional and taxonomic issues of location characteristics by sub-regions in the Seoul Region. The final section attempts to observe a certain regularities between the changing distribution of industries and spatial variations in location characteristics, with the expectation of generating a set of broad hypotheses for further empirical analysis.

Part II. Changing Spatial Distribution of Industries

1. Stage of Industrial Development and Overall Locational Changes

The beginning of the period of rapid industrial growth in Korea is usually dated from 1963 when the economic growth rate marked about 9 percent at the beginning of the First-Five year Economic Plan. The economic growth rate was on the average only about 3 percent in the preceding years. Most Korean firms around 1963 were of the small size and also of the single proprietorship type. Location or relocation of these small firms was only a minor economic issue. As the economy and industries continued to grow rapidly, location and relocation became an important issue, from the point of view of both the rapidly expanding individual firms and the regional distribution of industries.

In the late 1960s continuous industrialization started to create various problems associated with industrialization, namely, rapid urbanization, congestion, pollution, shortage of infrastructure facilities, and the need for development of industrial sites. Thus, the spatial distribution of industries in Korea emerged as a national issue in the late 1960s.

For the discussion of the pattern and stage of industrial development,

we follow the framework suggested by Chenery and Taylor ^{3/}. They classified industries according to the stage of development as 'early industries', 'middle industries', and 'late industries'. Early industries are those producing foods, textile, wood products and leather goods with income elasticities of demand of usually 1.0 or less and which provided the essential demands of developing countries at an earlier stage of development. Middle industries are those producing rubber products, nonmetallic minerals, and chemicals and petroleum refining. Finished products of these industries usually have income elasticities of 1.2 - 1.5.

Their share of gross national product increases rapidly until income reaches about \$400-\$500 (1976 prices), but relatively little thereafter. Late industries are clothing, printing and publishing, basic metals, paper and paper products, and metal products, which have high income elasticities and continue to grow faster than GNP up to the highest GNP levels.

In Korea the period 1963-73 appears to be the stage of early industries. During this period early industries such as textiles, plywood, etc., led the growth of the economy and dominated the pattern of industrial location. Because plywood and other wood products industries relied on foreign countries for both raw materials and

^{3/} H.B.Chenery and L. Taylor, "Development Patterns: Among Countries and Over Time", The Review of Economics and Statistics, Vol. A, No. 4 (Nov. 1968) pp. 409-412

markets, international ports such as Incheon and Busan played a crucial role in the location of these industries. Thus, most export-oriented, and large wood products companies during this period were located in either Busan or Incheon. There is no doubt that for location of heavy and bulky products such as plywood, transportation plays a dominant role. However, for the location of light, export-oriented industries such as textiles, both international ports and large domestic markets such as Seoul and Busan appear to have played an important role. Such industries were usually located in the Seoul-Incheon region and the Busan region. Wood products industries locate very close to ports, whereas textile industries need not locate so close. However, many wood product industries in the 1970's and 1980's manufactured furniture for domestic markets and tended to locate closer to markets such as Seoul and Busan.

The period of growth for middle industries such as chemicals in Korea were the years 1971-1977. Although the year 1972 is the year officially declared as the starting point for heavy industries, the rapid growth of heavy industries did not occur until 1977 when the so-called Middle-East boom boosted by construction exports necessitated the rapid development of heavy industries. Thus, the growth of industries during the years 1972-77 can be said to have been dominated by middle industries. For the development and location of middle industries many industrial estates such as the Ulsan and Changweon industrial complex were created.

Late industries such as machinery and metallic products started to grow rapidly from 1977 with the rapid growth of the economy and as the rapid expansion of construction exports to the Middle East necessitated the rapid development of various types of construction equipment. The other major factor that promoted the rapid development of heavy industries may be the nation's self-reliant defense policy, which resulted in the industrial development of various defense equipment and machinery. As the Busan region or the coastal industrial complex along the south-eastern coast zone was considered the most favorable industrial location for heavy and defense industries, the development of those industries may mark the turning-point in the location and spatial distribution pattern of Korean industries.

Prior to the era of heavy industries, Seoul and the Seoul region were the only areas for most Korean firms to locate. However, with the growth of heavy and defense industries, the south-eastern coastal region emerged as the second largest industrial area. From these facts we may find that industrial location in countries, such as Korea, undergoing a very rapid transformation of economic structure, is greatly dictated by the changing pattern of industrial structure itself.

So far, we have glanced through the macro-structural change of Korea's industrialization and its locational adaptation of early, middle and late industries. In summary, the Seoul region and the south-eastern coastal region have been the locational embryos of Korea's industrial development. Especially, the Seoul region has experienced a drastic

structural and spatial change and is still very much in the process of change. Thus, as part of the on-going World Bank-SNU study on the Seoul region this paper is devoted to the descriptive analysis of changing pattern of industrial composition and location in the Seoul region.

2. Locational Changes of Manufacturing Industries in the Seoul Region

A. Seoul versus Gyeonggi

According to the 1981 manufacturing survey, about 45 percent of 2.1 million Korean manufacturing workers were located in the Seoul region. The share of manufacturing employment in Seoul in 1981 was 21.2 percent while 23.8 percent worked its peripheral region, Gyeonggi province, as shown in Table 1. In 1973 the same figures were 33.7 percent and 14.1 percent respectively. The national share of manufacturing employment in Seoul has therefore substantially decreased since 1973. Gyeonggi province shows the opposite pattern. The annual growth rates of manufacturing employment between 1973-1981 were 0.7 percent for Seoul and 14.0 percent for Gyeonggi province.^{4/}

^{4/} For more detailed analysis, see Dong-Hoon Chun and K.S. Lee. Changing Location Patterns of Population and Employment in the Seoul Region, WSUDP, The World Bank, Discussion Paper No. UDDD 65, 1985.

Table 1. Changes in Manufacturing Employment in the Seoul Region, 1973-1981.

	1973			1978			1981			Annual Average Growth Rate (%) ('73-'81)
	Number	%		Number	%		Number	%		
Seoul	409,916	70.6 ^x	33.7 ^{**}	539,192	52.3	25.1	433,493	47.1	21.2	0.7
Gyeonggi	170,844	29.4	14.1	492,136	47.7	22.9	486,526	52.9	23.8	14.0
Incheon	67,825	11.7		166,576	16.2		148,391	16.1		10.3
Suwon	15,746	2.7		33,838	3.3		34,766	3.8		10.4
Seongnam	12,118	2.1		43,217	4.2		40,214	4.4		16.2
Euijeongbu	5,862	1.0		11,788	1.1		6,865	0.7		2.0
Anyang	20,616	3.6		40,184	3.9		31,361	3.4		5.4
Bucheon	7,147	1.2		45,012	4.4		44,394	4.8		25.6
Banwol	-	-		-	-		13,451	1.5		-
Subtotal	129,314	22.2		340,615	33.0		319,442	34.7		12.0
Rest of Gyeonggi	41,614	7.2		151,521	14.7		167,084	18.2		19.0
SMR Total	580,844	100.0	47.8	1,031,328	100.0	48.0	920,019	100.0	45.0	5.9
Korea Total	1,216,389		100.0	2,150,971		100.0	2,044,269		100.0	6.7

x % of SMR Total, ** % of Korea Total

Data Source: Economic Planning Board, NBS, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

SMR- Seoul Metropolitan Region, i.e., Seoul and Gyeonggi

The annual growth rate of Seoul's manufacturing employment, 0.7 percent, is much lower than the national average of 6.7 percent, and the growth rate of manufacturing employment in Gyeonggi province is almost twice as high as the national average. This indicates a drastic change in the spatial distribution of manufacturing employment between the central city and the periphery. Seoul's share of manufacturing employment in the Seoul region decreased between 1973 and 1981 from 70.6 percent to 47.1 percent. This change is matched by the rapid increase in the share of manufacturing employment in Gyeonggi province from 29.4 percent to 52.9 percent during the same period.

Of the 52.9 percent of manufacturing employment, seven cities (Incheon, Suwon, Seongnam, Euijeongbu, Anyang, Bucheon and Banwol) in Gyeonggi province amounts to 34.7 percent. The rest of Gyeonggi province shares about 18.2 percent. Although the share of manufacturing employment in the rest of Gyeonggi province is as low as 18.2 percent, it shows an increasing trend. The same figure for 1973 was only 7.2 percent as shown in Table 1.

The number of manufacturing establishments in the Seoul region was 15,119 in 1981. The shares of Seoul and Gyeonggi were 57.9 percent and 42.1 percent respectively. The comparison between the shares of manufacturing employment and establishments indicates that Seoul has relatively smaller firms than Gyeonggi province does.

Table 2. Changes in Number of Establishments in the Seoul Region, 1973-1981.

	1973			1978			1981			Annual Average Growth Rate (%) ('73-'81)
	Number	%		Number	%		Number	%		
Seoul	5,832	70.5*	25.0**	7,752	59.7	26.0	8,753	57.9	26.2	5.2
Gyeonggi	2,437	29.5	10.5	5,229	40.3	17.5	6,366	42.1	19.0	12.8
Incheon	610	7.4		1,458	11.2		1,421	9.4		11.1
Suwon	245	3.0		247	1.8		233	1.5		-0.6
Seongnam	73	0.9		350	2.7		459	3.0		25.8
Euijeongbu	122	1.5		175	1.4		146	1.0		2.3
Anayang	139	1.7		299	2.3		290	1.9		9.6
Bucheon	145	1.8		604	4.7		875	5.8		25.2
Banweol	-	-		-	-		178	1.2		
Subtotal	1,334	16.3		3,133	24.2		3,602	23.8		13.2
Rest of Gyeonggi	1,103	13.3		2,096	16.1		2,764	18.3		12.2
SMR Total	8,269	100.0	35.5	12,981	100.0	43.5	15,119	100.0	45.2	7.8
Nation Total	23,293		100.0	29,864		100.0	33,431			4.6

SMR-Seoul Metropolitan Region, i.e., Seoul and Gyeonggi

* % of SMR Total, ** % of Korea Total

Source : Economic Planning Board, NBS, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

The size of firms in Seoul and Gyeonggi were about the same in 1973, but became substantially different in 1981. This may indicate that larger firms moved from Seoul to Gyeonggi province while small firms continue doing business in Seoul.

As shown in Table 3, the types of manufacturing industries located in the Seoul region as of 1981 are (in descending order of share of employment), textiles and leather (30.1%), fabricated metals (30.0%), chemicals (9.3%), food beverages and tobacco (7.1%), paper and publishing (6.4%), nonmetallic (4.5%), wood and wood products (3.7%), and other manufacturing (6.0%). Of these industries, textiles, paper and publishing, and food and beverages are relatively more concentrated in Seoul. But the level of concentration is not very substantial. Industries such as fabricated metals, non-metallic products and metals are relatively more concentrated in Gyeonggi province than is Seoul. Two industries, textile and fabricated metal, are the largest employers accounting close to 60 percent of total manufacturing. This was true for Seoul, Gyeonggi as well as Korea as a whole. It should be noted that the relative share of textile increased in Seoul while that of fabricated metal declined, indicating the fabricated metal industries shifted locations from Seoul to Gyeonggi.

B. Southward versus Northward

One special feature of industrial movement in the Seoul region can be described as the southwards movement. This has been facilitated by

Table 3. Structure of Manufacturing Industries in the Seoul Region

	1973			1978			1981		
	Seoul	Gyeonggi	Korea	Seoul	Gyeonggi	Korea	Seoul	Gyeonggi	Korea
Food & Beverage	8.9	8.2	11.7	7.7	5.1	7.9	8.1	6.3	8.4
Textile & Leather	30.7	31.8	34.1	30.1	25.0	32.1	35.2	25.6	32.0
Wood	1.1	9.3	4.4	1.7	6.4	3.8	1.6	5.6	3.1
Paper & Publishing	8.1	5.4	4.9	7.3	3.5	4.1	9.7	3.6	4.4
Chemical	11.2	7.5	12.1	11.0	9.0	12.1	9.3	9.4	12.8
Nonmetal	2.5	5.9	3.5	2.9	6.2	4.4	2.5	6.3	4.5
Metal	2.4	4.6	3.3	2.3	4.0	4.1	2.1	3.4	4.3
Fabricated Metal	26.5	21.2	20.7	30.8	35.9	28.1	25.3	34.0	26.6
Other	8.8	6.2	4.8	6.2	4.9	3.6	6.3	5.8	3.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note : Employment of establishments with 5 or more employees

Source : EPB, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978 and 1981.

the extensive transport network developed in the southern part of the Seoul region. The relocation of population and economic activities from northern Seoul, that is north of Han River, to southern Seoul was considered to be the government's policy objective throughout 1970s.

However, the southward redistribution of population and industries became active in the late 1970s. When the plan for developing a new capital city was announced by the government in 1977, which is withdrawn for the time being, both businessmen and government officials started to consider seriously the relocation of population and industries from the northern to the southern parts in the Seoul region. Thus, southern rural counties such as Hwasung, Yongin, Pyeongtaeg, Siheung were considered to be good locational choices for manufacturing industries.

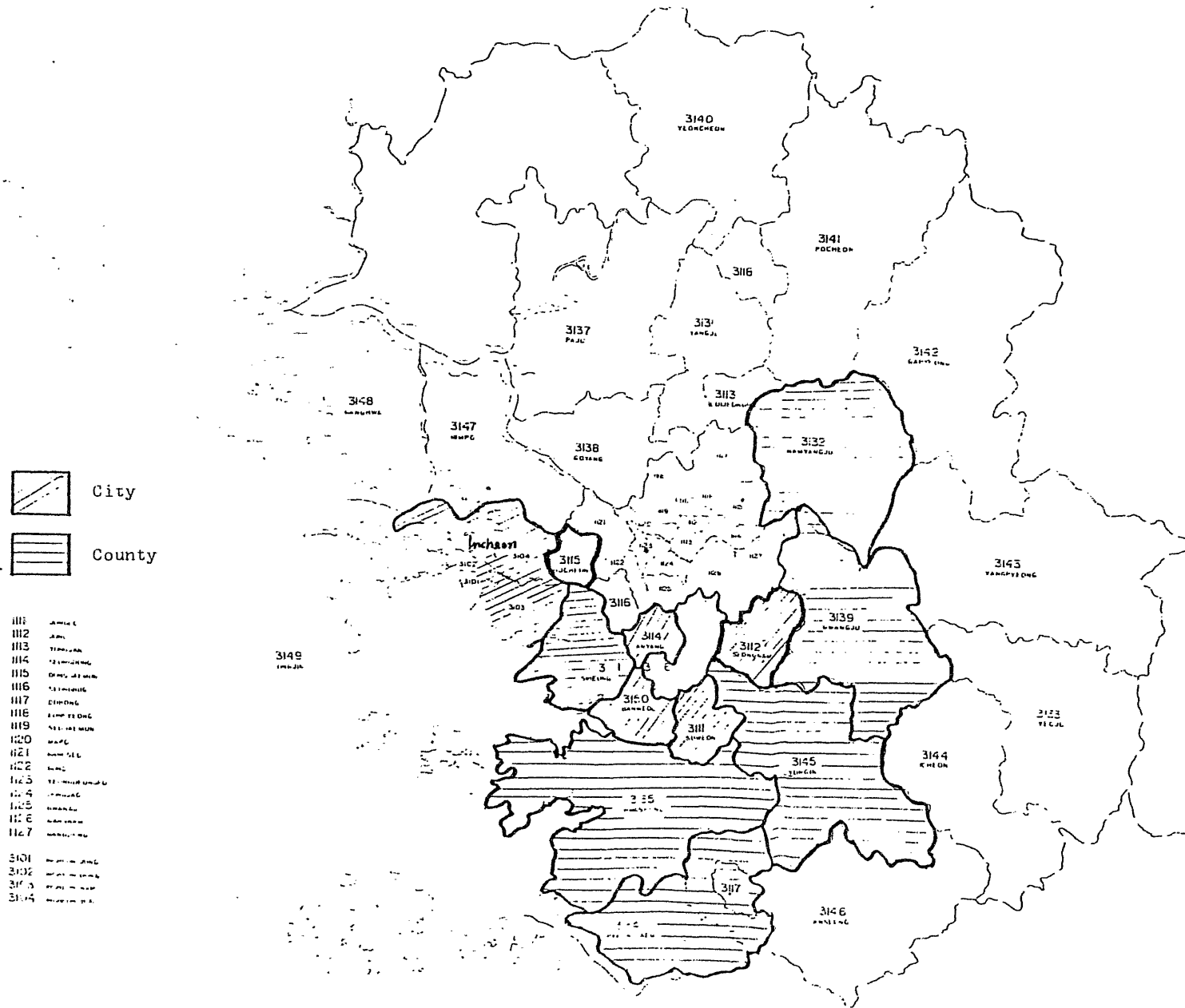
The manufacturing employment in Gyeonggi province is heavily concentrated in seven satellite cities of Seoul (Incheon, Bucheon, Seongnam, Anyang, Suwon, Euijeongbu, and Banwol) and six counties (Siheung, Hwasung, Yongin, Namyangju, Gwangju, and Pyeongtaeg). The share of manufacturing employment in those localities amounted to about 47 percent of total Gyeonggi province in 1981. Together with Seoul, these localities whose administrative boundaries are mostly bordered by Seoul share about 94.3 percent of total manufacturing workers of the Seoul region (Map 1 and Table 4). This fact may indicate the extreme importance of accessibility to the location of manufacturing

Table 4. Location Indicators for Major Cities and Counties in the Seoul Region

	Manufacturing Employment (1,000 persons)						Manufacturing Establishment					
	1973	(%)	1978	(%)	1981	(%)	1973	(%)	1978	(%)	1981	(%)
1. Cities												
Seoul	409.9	(70.6)	539.2	(52.3)	433.5	(47.1)	5,832	(70.5)	7,752	(59.7)	8,753	(57.9)
Incheon	67.8	(11.7)	166.6	(16.2)	148.4	(16.1)	610	(7.4)	1,458	(11.2)	1,421	(9.4)
Suweon	15.7	(2.7)	33.8	(3.3)	34.8	(3.8)	245	(3.0)	247	(1.9)	233	(1.5)
Seongnam	12.1	(2.1)	43.2	(4.2)	40.2	(4.4)	73	(0.9)	350	(2.7)	459	(3.0)
Anyang	20.0	(3.5)	11.8	(1.1)	31.4	(3.4)	139	(1.7)	299	(2.3)	290	(1.9)
Bucheon	7.1	(1.2)	45.0	(4.4)	44.4	(4.8)	145	(1.8)	604	(4.7)	875	(5.8)
Banweol	-	(-)	-	(-)	13.4	(1.5)	-	(-)	-	(-)	178	(1.2)
2. Counties												
Namyangju	-	(-)	19.8	(1.9)	16.7	(1.8)	-	(-)	249	(1.9)	281	(1.9)
Hwasung	5.0	(0.9)	24.4	(2.4)	23.8	(2.6)	92	(1.1)	186	(1.4)	247	(1.6)
Siheung	8.7	(1.5)	39.2	(3.8)	29.8	(3.2)	148	(1.8)	309	(2.4)	245	(1.6)
Gwangju	3.6	(0.6)	9.7	(0.9)	11.3	(1.2)	61	(0.7)	138	(1.1)	220	(1.5)
Yongin	2.4	(0.4)	20.2	(2.0)	22.7	(2.5)	39	(0.5)	162	(1.2)	244	(1.6)
Pyeongtaeg	1.8	(0.3)	4.5	(0.4)	8.5	(0.9)	133	(1.6)	111	(0.9)	116	(0.8)
3. Rest of Gyeonggi	26.9	(4.6)	73.9	(7.2)	61.1	(6.6)	752	(9.1)	1,116	(8.6)	1,557	(10.3)
4. Seoul & Gyeonggi	580.8	(100.0)	1,031.3	(100.0)	920.0	(100.0)	8,269	(100.0)	12,981	(100.0)	15,119	(100.0)

Source: EPB, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

Map 1. Concentration of Industries in the Seoul Region.



industries in the Seoul region. Other localities such as Hwasung, Yongin, Pyeongtaeg and Suweon which are not adjacent to Seoul are also characterized by extremely good accessibility to Seoul as will be further explained later. For instance, Suweon is connected to Seoul by the Seoul-Suweon rapid transit system and the Seoul-Suweon highway as well as the Seoul-Busan Expressway. Hwasung and Pyeongtaeg are connected to Seoul by both the Seoul-Busan expressway and the Seoul-Busan railroad. Yongin is also connected to Seoul by both the Seoul-Busan expressway and the Seoul-Gangreung expressway.

C. Moving Distance and Directions

In this part of the study the sub-regions are grouped by five rings and seven sectors for analytical purpose as shown in Map 2 and 3. The concept of rings is introduced to find spatial regularities in terms of distance from Seoul while the concept of sector is to permit the analysis of the directionality of industrial location. Although physical distance does not always coincide with time distance, depending on the quality of transportation route and the affordability of specific transportation mode, it is assumed that the concept of ring roughly represents time distance from Seoul.

As shown in Table 5, most rapid growth in the number of establishments has taken place in Ring IV throughout the period from 1973 to 1981. This also indicates that larger establishments in terms of employment

Map 2. Areal Delineation of Ring by Sub-Regions

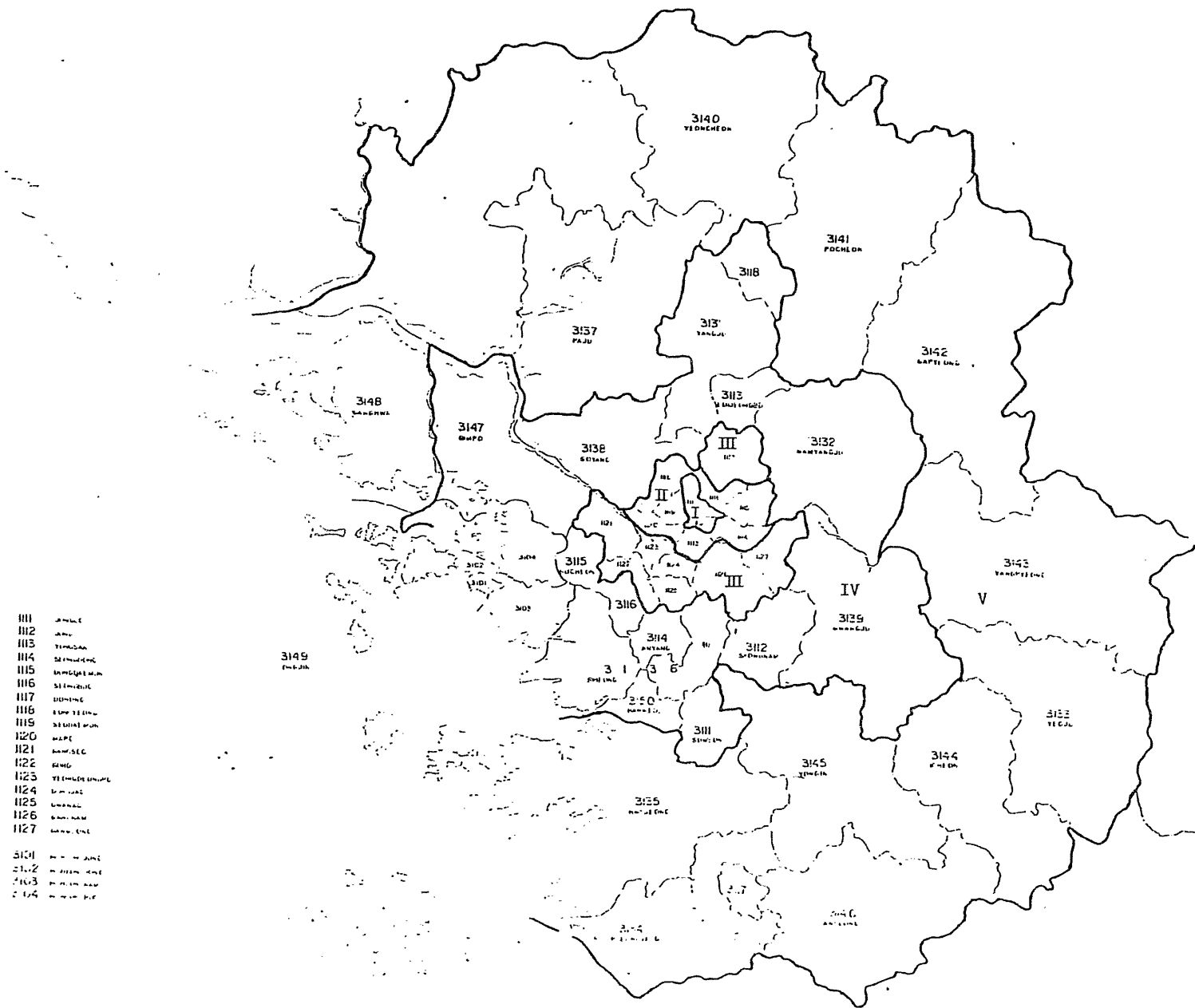


Table 5. Changing Distribution of Manufacturing Establishments and Employment by Rings

Rings	Establishment						Employment					
	1973	%	1978	%	1981	%	1973	%	1978	%	1981	%
Ring I	1,566 ** *(100.0)	(18.9)	1,144 (73.1)	(8.8)	1,398 (89.3)	(9.2)	45,224 (100.0)	(7.8)	30,381 (67.2)	(2.9)	28,985 (63.9)	(3.1)
Ring II	2,789 (100.0)	(33.7)	3,091 (110.9)	(23.8)	3,376 (121.2)	(23.8)	162,403 (100.0)	(28.0)	167,960 (103.4)	(16.3)	146,719 (90.3)	(15.7)
Ring III	1,479 (100.)	(17.9)	3,315 (237.7)	(25.5)	3,979 (269.0)	(26.3)	202,289 (100.0)	(34.8)	340,826 (168.5)	(33.0)	257,879 (127.5)	(27.7)
Ring IV	1,829 (100.0)	(22.1)	4,248 (161.3)	(32.7)	5,077 (311.5)	(33.6)	155,351 (100.0)	(26.7)	425,000 (430.9)	(41.2)	414,458 (266.8)	(44.5)
Ring V	608 (100.0)	(7.4)	981 (161.3)	(7.6)	1,287 (212.0)	(8.5)	15,577 (100.0)	(2.7)	67,136 (430.9)	(16.5)	83,647 (536.9)	(9.0)
Total	8,271 (100.0)	(100.0)	12,979 (156.9)	(100.0)	15,117 (190.0)	(100.0)	580,844 (100.0)	(100.0)	1,031,303 (177.6)	(100.0)	931,598 (160.4)	(100.0)

* % of row : 1978 and 1981 figures as percent of 1973 base.

** % of column

Source: EPB, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

Table 6. Changing Distribution of Manufacturing Establishments and Employment by Sectors

Sectors	Establishment						Employment					
	1973	%	1978	%	1981	%	1973	%	1978	%	1981	%
Sector I	1,566 *(100.0)	** (18.9)	1,144 (73.1)	(8.8)	1,398 (89.3)	(9.2)	45,224 (100.0)	(7.8)	30,381 (67.2)	(2.9)	28,895 (63.9)	(3.1)
Sector II	614 (100.0)	(7.4)	687 (111.9)	(5.3)	700 (114.0)	(4.6)	27,435 (100.0)	(4.7)	28,125 (102.5)	(2.7)	25,776 (91.6)	(2.8)
Sector III	835 (100.0)	(10.1)	1,400 (167.7)	(10.8)	1,562 (111.0)	(10.3)	52,554 (100.0)	(9.0)	73,283 (139.5)	(7.1)	64,309 (87.8)	(6.9)
Sector IV	551 (100.0)	(6.7)	990 (179.7)	(7.6)	1,213 (220.1)	(8.0)	28,091 (100.0)	(4.8)	58,614 (208.7)	(5.7)	57,605 (205.1)	(6.2)
Sector V	1,313 (100.0)	(15.9)	2,208 (168.2)	(17.0)	2,763 (208.4)	(18.3)	93,329 (100.0)	(16.1)	172,502 (184.8)	(16.7)	161,832 (173.4)	(17.4)
Sector VI	1,209 (100.0)	(14.6)	1,769 (145.6)	(13.6)	2,104 (174.0)	(13.9)	90,138 (100.0)	(15.5)	175,564 (194.8)	(17.0)	183,369 (203.4)	(19.7)
Sector VII	2,180 (100.0)	(26.4)	4,790 (219.7)	(36.9)	5,406 (247.9)	(35.8)	244,073 (100.0)	(42.0)	492,834 (201.9)	(47.8)	409,812 (167.9)	(44.0)
Total	8,268 (100.0)	(100.0)	12,979 (157.0)	(100.0)	15,118 (182.8)	(100.0)	580,844 (100.0)	(100.0)	1,031,303 (177.6)	(100.0)	931,598 (160.4)	(100.0)

* % of row: 1978 and 1981 figures as percent of 1973 base; ** % of column.

Source: EPB, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

locate in Ring IV. Ring I has experienced an absolute loss both in the number of establishments and employment. Employment loss has been more severe than establishment loss, indicating that small firms tend to stay in Ring I. Ring II shows a mixed blessing which is characterized by establishment gain and employment loss. Only Ring V has experienced most rapid growth in employment, indicating that larger firms tend to move farther away. On the whole, the evidence shows a strong decentralization of manufacturing employment in the region.

In search of a new industrial location, directional orientation seems to play important role in the Seoul region, As shown in Table 6, about 81 percent of total employment is concentrated in south and south-western sub-regions or Sector V, VI and VII. In 1973, their share of employment was 73.6 percent but had increased to 81.0 percent by 1981.

Several explanations for this trend can be found. First, the south-western sub-regions or Sector VI and VII were endowed by initially preferable conditions such as an existing port, Incheon a well-developed transportation network, and an urban corridor in which industrialists could provide agreeable living amenities such as school and mass transit to their employees. Secondly, government policies discouraged new firms to locate in other sub-regions. The location of new firms and/or even the expansion of existing plants within the northern area of the Han river were prohibited actually in 1978 by Industrial Location Act. The northern part of Seoul (Sector II and III) lacks developmental potential in terms of accessibility and is also a strategic area in the path

of North and South Korea confrontation. Therefore, Sector II and III experienced absolute or relative decline in the number of employment although a meager increase in the number of establishment was shown.

Sector IV is considered to be one of the most attractive locations having the advantage of plentiful water resources and good accessibility to railroad and arterial national highways. However, new industrial location was strongly criticized by environmentalists because the areas are an up-stream providing the portable water in-take for the 12 million inhabitants in the Seoul region. The sub-regions in Sector IV were designated as environmental conservation zones by the Seoul Metropolitan Region Development Plan of 1981. Location of new firms was thereafter strictly controlled.

Finally, in addition to the initial advantages, locational pressure for the opening of new plants and the expansion of existing plants led firms to the southern and south-western sub-regions. Industrial growth in Sector V, VI and VII has been partly encouraged by the construction of the new industrial city, Banweol and the designation of the sub-regions as a development inducement zone by the Seoul Metropolitan Region Development Plan. Although major agglomeration diseconomies like the soaring land price and the scarcity of industrial land begin to appear, one of the most important reasons for reinforcing industrial growth in Sector V, VI and VII has been the construction of Seoul-Incheon and

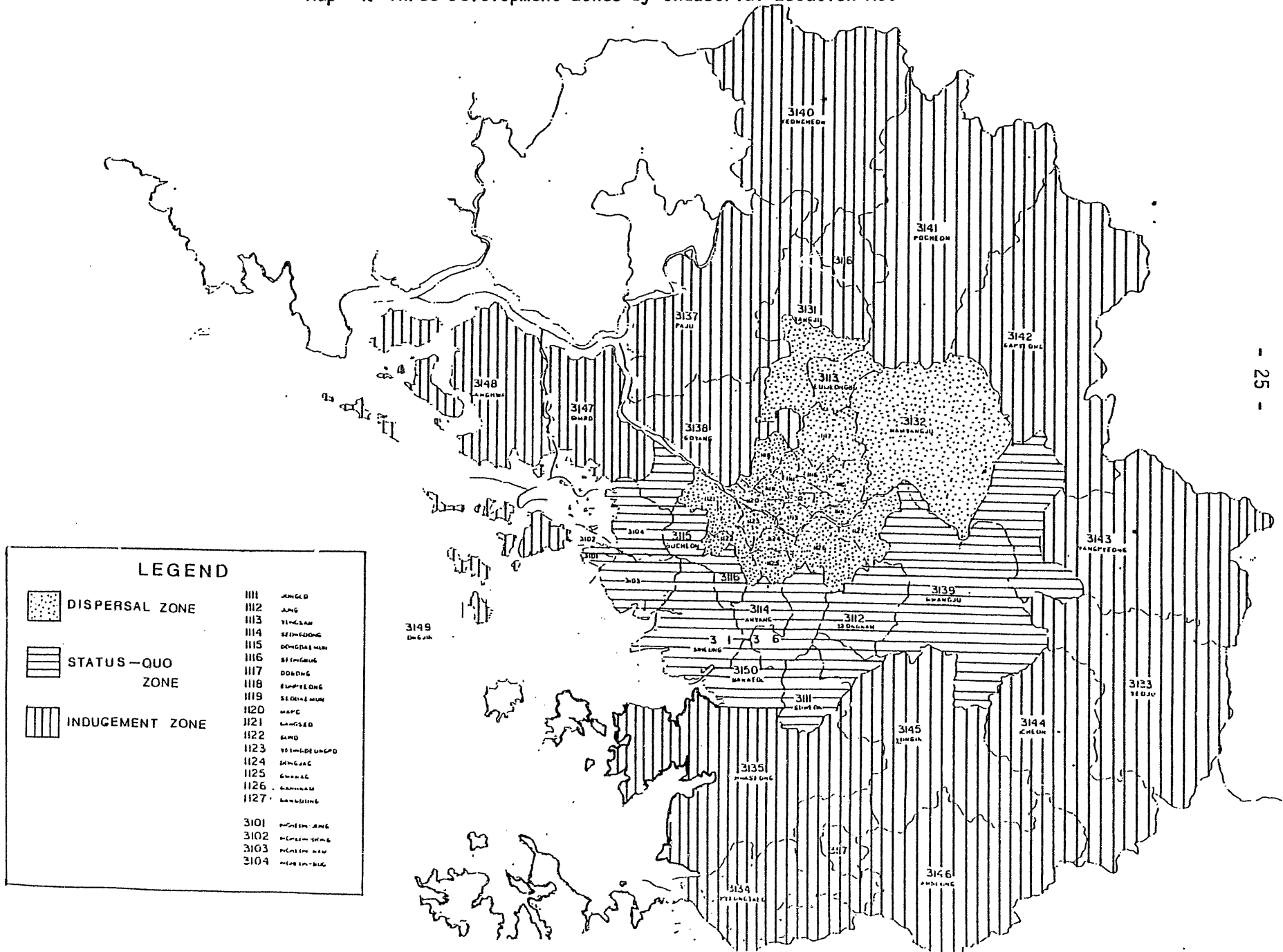
Seoul -Busan Expressways. These regions thus fell within a thirty minute traveling time from Seoul, becoming in fact a part of the City of Seoul proper. Recently, the south and south-western areas have come within the zone of commuting from Seoul due to the opening of two rapid transit lines since 1974. This will be further discussed in the following chapters.

D. Government Policies and Plans

Government policies and policy measures could have a significant impact on the search for a location before industrialists go through the direct process of choosing the final site of a new plant. Among many policies and regulatory provisions, the Industrial Location Act of 1978 by which three industrial zones, dispersal zone, status-quo zone and inducement zone as shown in Map 4, had special implications for the explanation of locational changes in the Seoul metropolitan region. However, a three-year time span was too short a time to draw a meaningful conclusion about impact on industrial location. Also it is even more difficult to separate the market driven trend of industrial spillover towards the periphery from the policy impact without an in-dept study.

The manufacturing census statistics support that to a certain extent government policies might have superficially achieved some policy objectives. As shown in Table 7, the inducement zone has experienced impressive

Map 4. Three Development Zones by Industrial Location Act



LEGEND	
	DISPERSAL ZONE
	STATUS-QUO ZONE
	INDUCEMENT ZONE
111	ANGGŎ
112	ANG
113	YONGSAN
114	SEONGGONG
115	DONGDAEMUN
116	SŎNGGŬK
117	DONGG
118	SUPYONG
119	SEONGHŬN
120	WAPŎ
121	WŬNGSŎ
122	ŬMŎ
123	YŎNGDEUNGŎ
124	ŬNGJŎK
125	ŬNGJŎK
126	ŬNGJŎK
127	ŬNGJŎK
3101	ŬNGJŎK
3102	ŬNGJŎK
3103	ŬNGJŎK
3104	ŬNGJŎK

Table 7. Changes in the Distribution of Manufacturing
Industry by Three Zones of the Industrial Location Act

Zone	Establishment			Employment		
	1973	1978	1981	1973	1978	1981
Dispersal Zone	6,147 (100.0)* (75.2)**	8,458 (137.6) (65.2)	9,557 (155.5) (64.2)	425,525 (100.0) (73.3)	581,782 (137.6) (56.4)	472,042 (110.9) (51.3)
Status-quo Zone	1,321 (100.0) (16.2)	3,410 (258.1) (26.3)	3,921 (296.8) (26.3)	135,796 (100.0) (23.4)	378,150 (278.5) (36.7)	360,610 (265.6) (39.2)
Inducement Zone	701 (100.0) (8.5)	1,113 (158.8) (8.5)	1,419 (202.4) (9.5)	19,533 (100.0) (3.4)	71,396 (365.5) (6.9)	87,347 (447.2) (9.5)
Total	8,169 (100.0) (100.0)	12,981 (158.9) (100.0)	14,897 (182.4) (100.0)	580,854 (100.0) (100.0)	1,031,328 (177.6) (100.0)	919,999 (158.4) (100.0)

* % of row

** % of column

Source: EPB, National Bureau of Statistics, Mining and Manufacturing Survey, 1973, 1978, and 1981.

growth in the number of establishments and employment while the dispersal zone has experienced an absolute decline. Of course, part of this should be attributed to the business cycle as 1980 was the worst recession year in decades. The status-quo zone has shown highest growth in the number of establishments and medium growth in employment. Although the preceding observations do not necessarily mean that government's location policies have been successful, it would not be too inaccurate to say that industrialists tend to comply with governmental policies in the initial stage of search process for new locations if other conditions are the same. It is the intention of the next phase of the present study to highlight how a variety of policy measures specified in the Industrial Location Act and other location policies have worked out in locational behavior in the real situation of the Seoul region, (Lee, 1985).

There was another recent development which is especially relevant to understanding the overall spatial and locational strategy for the Seoul region. This was the Seoul Region Development Planning Act of 1983. The Act confronts not only industrial location problem but also many other metropolitan development issues and empowers the Ministry of Construction to plan and coordinate such issues in the Seoul region. Even though the Act was enacted in 1983, the Seoul Metropolitan Region Development Plan (1982-1991) being prepared by the Korea Research Institute for Human Settlements has been widely publicized since 1981, and was formally accepted as the government's official plan in 1984.

According to the plan, the Seoul region was divided into five zones according to the range of permitted manufacturing industries as shown in Map 5, although these five zones overlap with the three zones designated by the Industrial Location Act without the necessary provisions stipulating the relationship of two kinds of zones. The development restriction zone which covers the old central part of Seoul does not permit any new location of firm or the expansion of an existing plant. The development reservation zone, environmental conservation zone and selective development zone are also subject to strong scrutiny of one kind or another before being granted an industrial permit. Only in the development inducement zone is new industrial development allowed.

As shown in Table 8, the most striking growth of manufacturing employment has occurred in the development inducement and the environmental conservation zones respectively by 592.6% and 519.6% during 1973-1981, indicating that the latter had been attracting industries as the former during this period. The development restriction zone which shares a boundary with the dispersal zone of Industrial Location Act has experienced very slow growth of 111.0%. At the first glance, it may suggest compliance with the government's policies and plans. However, we can not say anything about the impact of the 1983 Act, since the data cover up to 1981, but our results indicate the need for providing rationale for the stipulation of the five zones.

Map 5. Five Planning Zones by Seoul Metropolitan Region Development Plan.

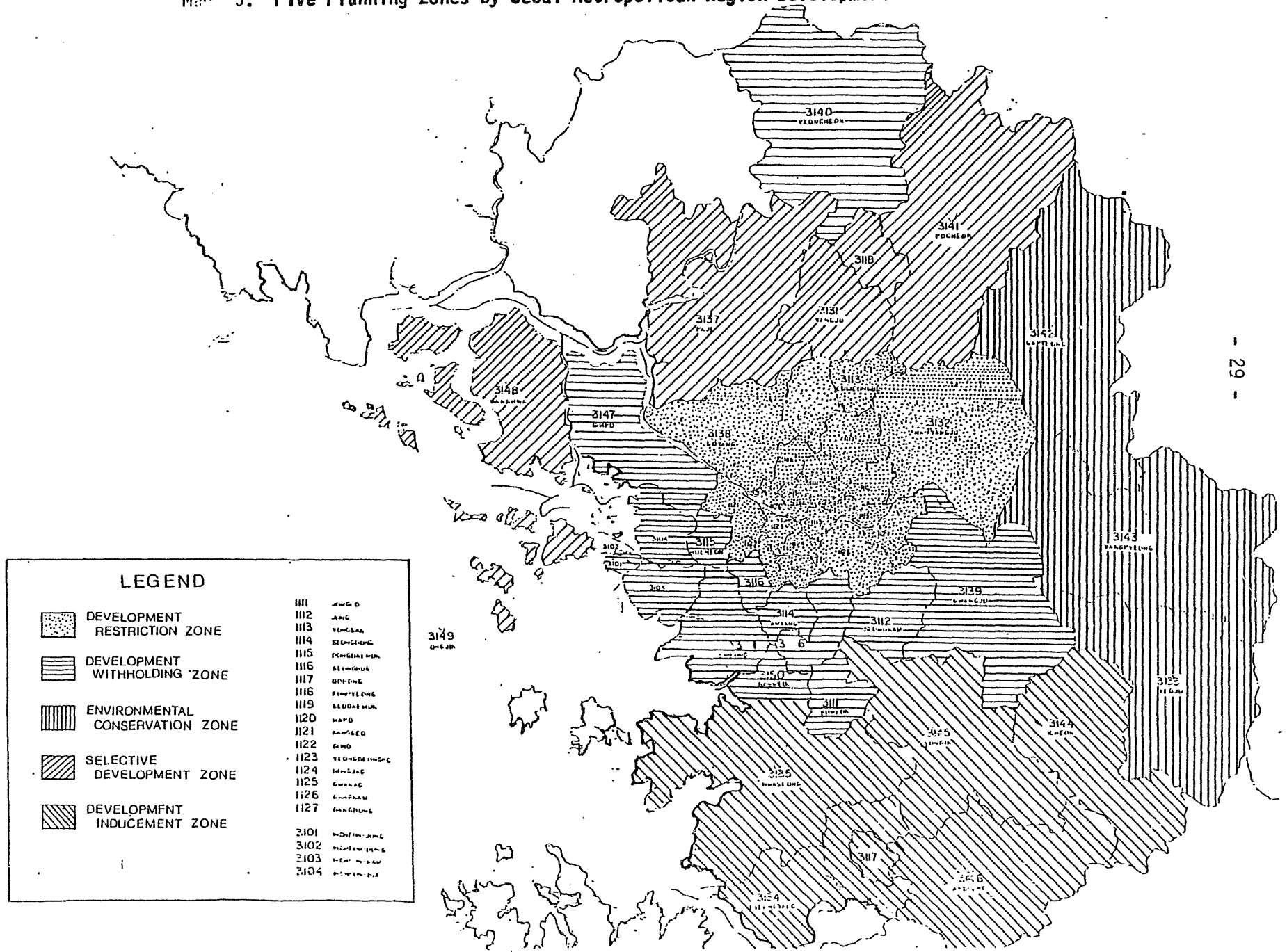


Table 8. Changes in the Distribution of Manufacturing Industry
by Five Planning Zones of the Development Plan for Seoul Region

Zones	Establishment			Employment		
	1973	1978	1981	1973	1978	1981
Development Restriction Zone	6,147 (100.0)	8,458 (137.6)	9,557 (155.4)	425,525 (100.0)	581,782 (136.7)	472,042 (111.0)
Development Reservation Zone	1,430 (100.0)	3,563 (249.2)	4,111 (287.5)	139,950 (100.0)	382,664 (273.4)	367,534 (262.6)
Environmental Censor- vation Zone	94 (100.0)	127 (135.1)	158 (168.1)	1,442 (100.0)	3,617 (250.8)	7,491 (519.5)
Selective Development Zone	145 (100.0)	250 (172.4)	281 (193.8)	3,275 (100.0)	9,124 (278.6)	9,750 (297.7)
Development Induce- ment Zone	353 (100.0)	583 (165.2)	790 (223.7)	10,662 (100.0)	54,141 (507.8)	63,182 (592.6)

Source: EPB, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

As an industrial move implies deliberate locational decisions, it is useful to consider some of the factors that influence firms' locational choice, and to assess the observed trends of the Seoul metropolitan region. Part III is an attempt to document such locational factors that might have influenced the observed patterns.

Part III. Spatial Variations in Location Characteristics

1. Classification of Location Characteristics

Industrial movement is not only an outcome of firms' response to market signals, but also an adaptive process to a variety of governmental intervention. It is not easy to disaggregate the complexity of those locational factors into operational concepts for analysis. Keeping the purpose of the present study in mind, i.e., to observe certain regularities between industrial movement and location characteristics, we have however introduced two kinds of locational determinants.

First, central and local governments have intervened to influence industrial location through a variety of policy measures. Some are indicative without necessary power for implementation while others are coercive. Some are promotional while others are punitive. Provisions for these four types of policy measures are written in a number of laws: the Industrial Location Act, the Local Industrial Development Act and the Seoul Metropolitan Region Development Act.^{5/} These laws and their associated policy directions, plans and programs should have

^{5/} Sang-Chuel Choe and Byung-Nak Song, An Evaluation of Industrial Location Policies for Urban Deconcentration in the Seoul Region, WSUDD, the World Bank Discussion Paper Report No. UDD-7, 1982, pp. 44-52.

contributed to shaping the locational terrain of manufacturing industry in the Seoul region. Each sub-region is characterized by a mixed combination of the four types of governmental intervention with different intensity and policy objectives.

Second, the degree of willingness on the part of industrialists to move or choose a new site is essential. An array of location factors can not be exhaustive. Economic theory regarding the choice of manufacturing location is usually based on profit maximization assumption. Although a theoretical inquiry into the economics of industrial location is beyond the scope of this paper, it is widely held that empirical implementation of theory is not easy.^{6/} The final location chosen may not necessarily be the result of a detailed consideration of a complete set of location factors. One factor may predominate over all the others, such as the availability of space to move into immediately. Many other considerations may be so obvious one way or another that they may be passed over without careful calculation. For many categories of industry, the choice of location can be footloose and firms may find indifferent among alternative sites based only on cost consideration.

For analytical purpose, location characteristics can be classified by the level of spatial aggregation, i.e., area-wide, site-specific, and privately provided factors. Although some of the area-wide location

^{6/} For an example of such a model, see Kyu Sik Lee, "A Model of Intraurban Employment Location: An Application to Bogota, Columbia", Journal of Urban Economics Vol.12 (Nov. 1982), pp. 263-79.

characteristics tend to be associated with national or local government programs, area differences in charges or prices for public services are quite negligible in a particular region. In this regard, the location characteristics of a region as a whole may be more important for the firm if site characteristics are location-invariant. In other words, area-wide characteristics are a sub-region's aggregate environment for industrial location, determining the general direction and the extent of the industrial movement.

Contrary to area-wide factors, site-specific location factors are generally provided by a single local government and their spillover effect beyond local jurisdiction is quite negligible. Site-specific factors usually includes the general category of local services like public utilities and socio-cultural facilities which are invested and administrated by a municipal or county government. There is still another category of location factors : private services such as restaurants, hotels, shopping facilities and banking service that largely remain within the domain of private economic activities in terms of investment and locational choice.

Another useful classification of location factors is whether they are mobile or immobile. Mobile location factors are defined by the transportability of such factors as labor forces, materials and capital, while immobile ones are featured by their lack of mobility, for example, land, mines, river, highway, and natural amenities. As mobile location factors can be transferred from elsewhere in spite of

transport costs involved, immobile ones are taken to be more crucial for the final selection of plant location for many industries.

There is yet another type of classification of location factors; the distinction between person-oriented factors and firm-oriented factors. Person-oriented factors are housing, educational institutions, drinking water, shopping facilities and so on. Firm-oriented factors include industrial building sites, industrial water, port, and industrial land. This distinction is meaningful for understanding the locational behavior of manufacturing industries. A firm is not an abstract entity of buildings and machinery but composed of employees and their families whether they are managerial or menial workers. Beyond meeting the locational requirements for a firm, locational attractiveness on the part of employees should not be underestimated.

In the Seoul region, industrialists may easily find the labor force which they need, although higher wages or some other costs such as a commuting-bus service and housing allowance are involved to recruit workers from the central city where they used to live. Except for a small number of managerial workers and qualified technicians, many workers are ready to trade-off living amenities for a job opportunity away from Seoul. In this respect, the theory of "people-to-job" may be better supported than that of "job-to-people" in the analysis of employment-residential location nexus. Locational dynamics between firm-oriented and person-oriented locational factors are to be given special attention.

Even if the difficulty of identifying location factors according to

an analytical typology can be overcome, the key issue is how to measure these factors. Various locational characteristics and their measurements are so varied that the evaluation of locational attractiveness does not always allow for a uniform scale of measurements. Locational advantages and disadvantages of a sub-region are quite often impossible to evaluate in precise quantitative terms.

Four types of measurements can be considered although they are not easily comparable in quantitative terms. They are availability, quantity, quality, and cost. In order to highlight locational aspects, the availability of a certain type of services can be translated into accessibility of such services. Accessibility then can be roughly measured by relative distance, given that the source of such a service already exists. For example, an express highway is hardly expected to go through the very plant site, but it is, in most cases, accessible through a highway interchange. In this case, the availability of an express highway can be measured by distance from the interchange to the plant. On the other hand, in the case of an advanced tele-communication network the actual availability of service and charge are more relevant than the distance. Likewise, other location factors can be measured differently.

Favorable and unfavorable location factors are not always additive. A combination of unfavorable factors may have a cumulative discounting effect, even though each factor by itself would be of minor consequence. In reality, subjective feelings among industrialists with limited

information about locational attractiveness quite often dictates location decisions. Furthermore, the information necessary for measuring locational attractiveness is seldom available and the sub-region is too large to evaluate with a single quantitative or qualitative measurement. For example the accessibility of a county or a municipality government office may greatly differ from one place to another within the same jurisdiction.

Given these analytical difficulties, the typologies of location factors and a unit of measurement are introduced in Table 9.

Table 9. Typology and Measurements of Location Characteristics

Public/Private	Typology		Measurements			
	Spatial Aggregation	Location Factors	Availability	Quantity	Quality	Cost
Public Services	Area-wide factors	Highway, Express highway, Railroad, Rapid transit, Port, Electricity, Tele-communication, Industrial water, Higher educational institution and etc.	accessibility availability affordability	length capacity acreage number of students buses dwelling units banks facilities institutions etc.	maintenance frequency comfort reliability purity prestige coverage closeness variety sophistication etc.	toll fare charge tax price tuition
	Site-specific factors	Local street, Local bus service, Drinking water, Sewerage treatment, Garbage collection, Public housing, Middle and high school, Industrial Land, Social welfare facilities, Cultural facilities, Fire and police station, Post office etc.				
Private Services		Shopping facilities, Recreation and amusement, Medical facilities Private housing, Banking service, etc.				

2. Some Quantitative Measurements and Appraisal of Locational Factors

Considering the above typology and measures, the data on the major locational characteristics have been compiled for sub-areas from existing statistics and field surveys. Profiles of locational characteristics for each sub-area are summarized in the Appendix.

As observed in the preceding discussion, the trend toward decentralization of manufacturing activity from the central city to periphery in the Seoul region has been underway. One of the most widely known premises explaining the phenomenon is push-pull theory.^{7/} It is quite clear that push and pull factors have an impact upon the movement of manufacturing establishments although the push versus pull controversy is difficult to differentiate.

Among the factors which constitute the push that forces manufacturing activity to move out into periphery must be included in the following : the soaring land price of the central city, the difficulty of securing land properly zoned for industrial use which is tightened by the increasing awareness of environmental protection, and various governmental actions toward dispersing manufacturing employment from Seoul.

^{7/} Benjamin Chinitz, "City and Suburb," in B. Chinitz ed., City and Suburb; Economics of Metropolitan Growth, Prentice Hall, 1964, pp. 5-6, and James Heilbrun, Urban Economics and Public Policy, New York; St. Martin's Press, 1981, pp.37-51.

On the other hand, there are many pull factors lying behind the trend. The main cause of dispersing manufacturing activity has unquestionably been the development of new modes of transportation. In the days when rail and waterways were the most efficient means of moving both people and goods from one place to another, it was not only natural but essential for manufacturing activity to cluster at the nodal points of these transport systems. With the advent of automobile and truck and the development of an increasingly wide-spread network of highways, the situation has been changing rapidly. Freed from their dependence on fixed line of transportation, manufacturers are able to consider other factors in choosing locations, and in many cases these other considerations lead them out of the central city into non-central city parts of a metropolitan region. Other pull factor attracting manufacturing employment into the peripheral areas of the Seoul metropolitan region is a steady rise of living amenities of the non-central city parts as compared to the central city, although it is undeniable that an absolute gap between the center and the periphery still exists. However, the introduction of rapid transit network and the integrated development of public utilities covering the entire metropolitan region like water supply and telephone system has made less difference in one place to another in the Seoul region.

In this background, four location factors among many factors in the analytical typology are highlighted in the following discussion.

A) Transportation

The largest impetus of outward industrial movement may have resulted from improved accessibility through the construction of express highways and the alignment and pavement of existing highways. Roughly 80 percent of the relocations have taken place in the sub-regions along the main route toward the south and south-west which is served by the Seoul-Busan and Seoul-Incheon express highways. Among many modes of transportation, access to a highway or an express highway has apparently played the most important determinant for industrial location. As shown in Table 10, and Map 6, about 60 percent of the industrial establishment and 72 percent of employment was located in a corridor within 20 minutes of the two express highways according to the 1981 statistics. But it should be noted that the proportions of both establishments and employment located in the less than 10 minutes area declined during 1978-1981, indicating further dispersion of industries from the highway network. Time-distance from Seoul by railroad is shown in Map 7. In a small country like Korea, the distance of railroad transportation tends to be less attractive except for single-and-bulky commodities such as coal and cement. As industries in the Seoul region are characterized by using raw materials of various origins and multiple product destinations, they are less dependent on rail transportation.

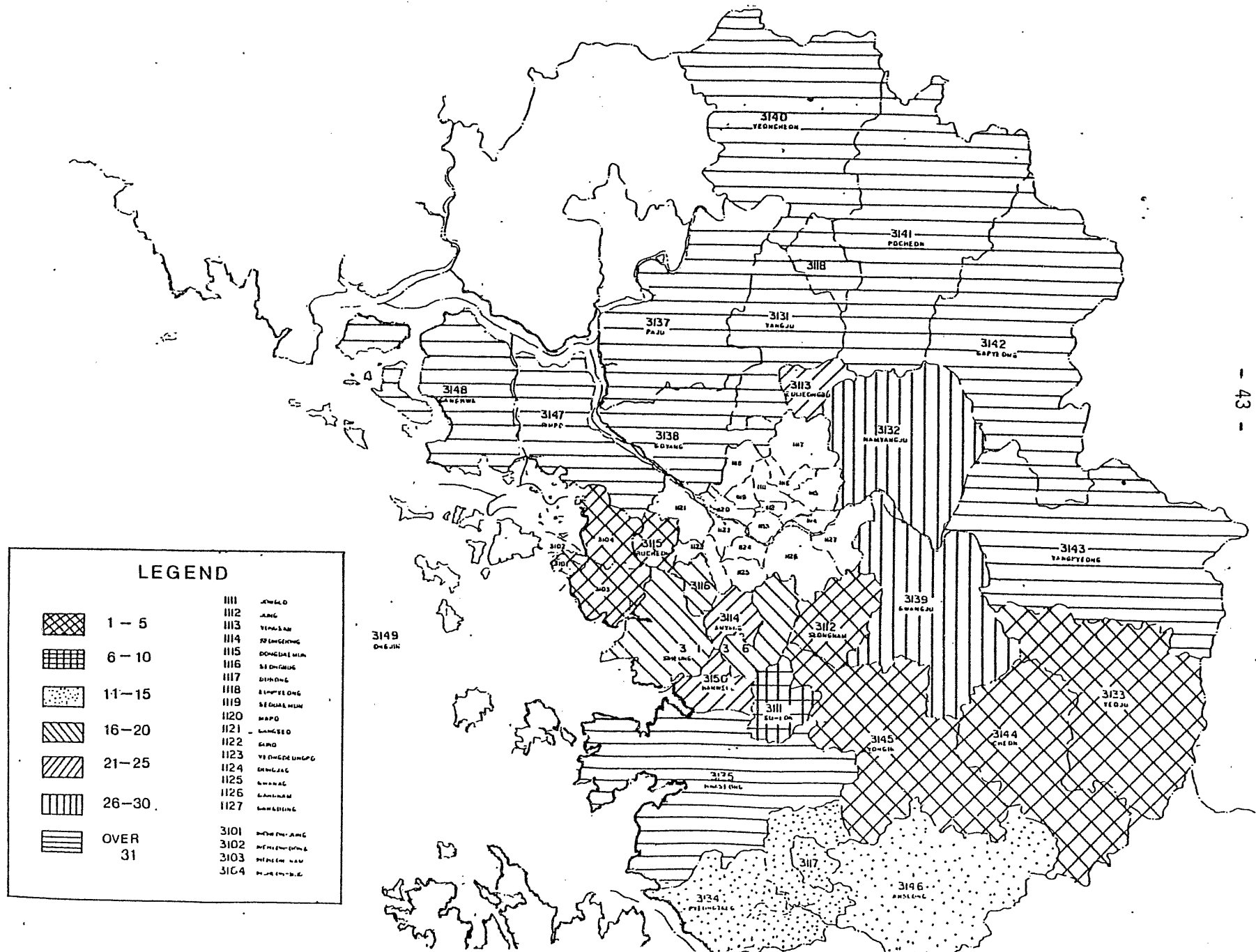
Another transportation factor in relation to industrial location is journey-to-work. As shown in Table 11 about 40% of the manufacturing

Table 10. Changes in the Distribution of Manufacturing Industry by Accessibility to Express Highway

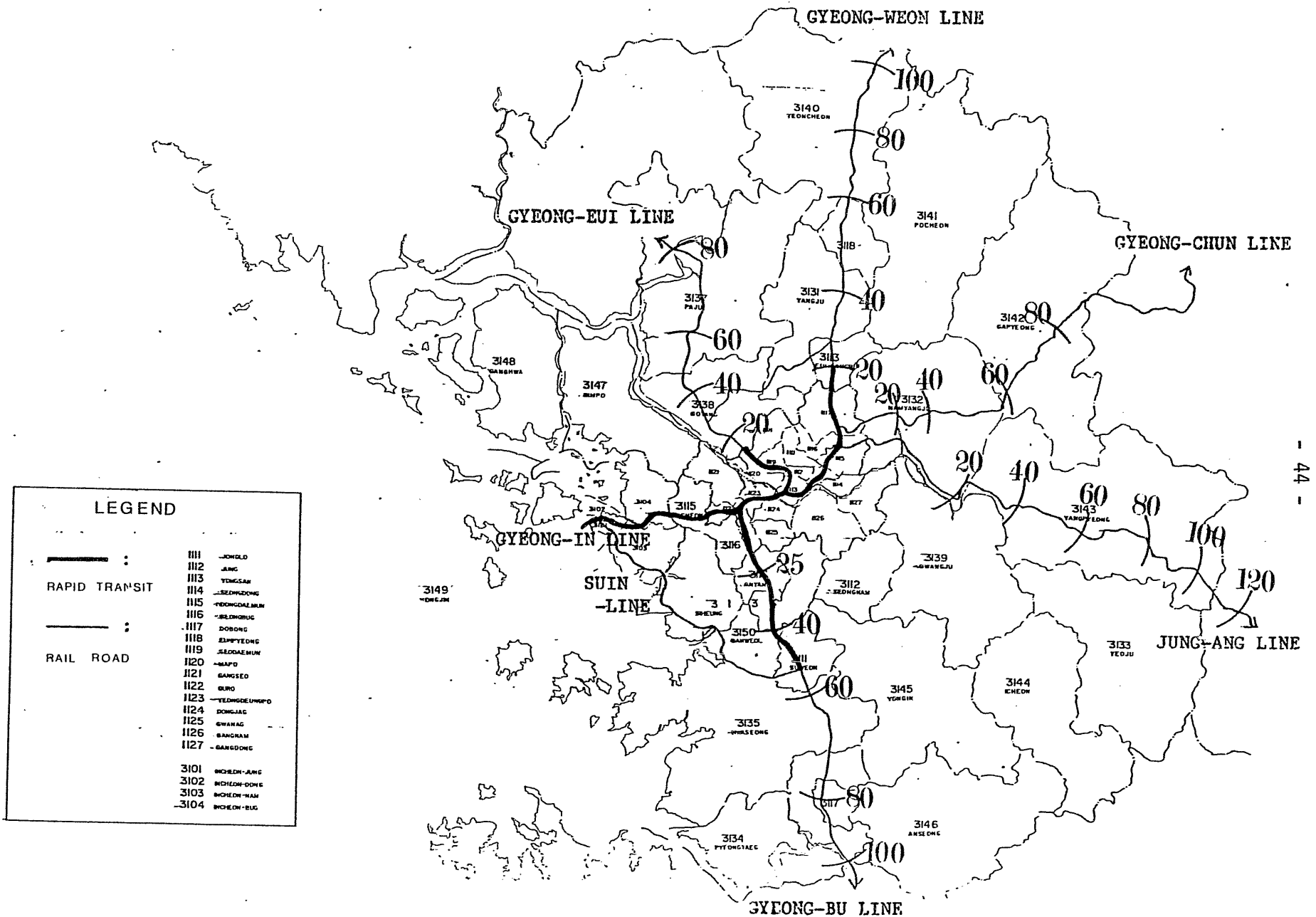
Accessibility in Minute	Establishments			Employment		
	1973	1978	1981	1973	1978	1981
1 - 10	1,183 (48.5)	2,908 (65.8)	3,398 (53.4)	106,125 (62.1)	312,415 (63.5)	299,207 (61.5)
11 - 20	331 (13.6)	495 (11.2)	447 (7.6)	11,396 (6.7)	46,554 (9.5)	48,641 (10.0)
21 - 30	322 (13.2)	866 (19.6)	1,115 (17.5)	30,127 (17.6)	81,906 (16.6)	79,684 (16.4)
31 and over	601 (24.7)	960 (21.7)	1,406 (22.1)	23,280 (13.6)	51,261 (10.4)	58,994 (12.1)
Total	2,437 (100.0)	4,419 (100.0)	6,366 (100.0)	170,928 (100.0)	492,136 (100.0)	436,525 (100.0)

Source : Economic Planning Board, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

Map 6. Accessibility to Interchange of Express Highway (Unit: Minute)



Map 7. Time Distance by Railroad (Unit: Minute)



LEGEND	
— : —	III JONGLO
— : —	III2 JANG
— : —	III3 YONGSAN
— : —	III4 SEONGNAM
— : —	III5 SEONGNAM
— : —	III6 SEONGNAM
— : —	III7 DOBONG
— : —	III8 EUMBYEONG
— : —	III9 SEODAEUM
— : —	III10 MAPO
— : —	III11 GANGSEO
— : —	III12 GURO
— : —	III13 YONGDEUNGPO
— : —	III14 DONGJAK
— : —	III15 GWANAK
— : —	III16 SANGNAM
— : —	III17 GANGDONG
— : —	3101 INCHON-ANG
— : —	3102 INCHON-DONG
— : —	3103 INCHON-NAM
— : —	3104 INCHON-BIG

Table 11. Distribution of Manufacturing Industrial Establishments and Employment
by Commuting Mode

	Establishments			Employment		
	1973	1978	1981	1973	1978	1981
City Bus Operation Zone	276 (17.6)	947 (24.5)	1,101 (26.4)	21,036 (14.9)	82,225 (20.2)	69,160 (19.6)
Rapid Transit Operation Zone	1,000 (64.0)	2,309 (59.8)	2,529 (60.7)	90,729 (64.3)	245,426 (60.3)	227,551 (62.4)
City Bus and Rapid Transit Operation Zone	287 (18.4)	608 (15.7)	535 (12.8)	29,300 (20.8)	79,338 (19.5)	68,090 (18.0)
Subtotal (A)	1,567 (100.0)	3,864 (100.0)	4,165 (100.0)	141,065 (100.0)	406,989 (100.0)	364,801 (100.0)
Seoul Region Total (B)	8,271	12,979	15,717	580,844	1,031,303	931,598
A/B	18.9	29.8	26.5	24.3	39.5	39.2

Source: EPB, National Bureau of Statistics, Mining and Manufacturing Surveys, 1973, 1978, and 1981.

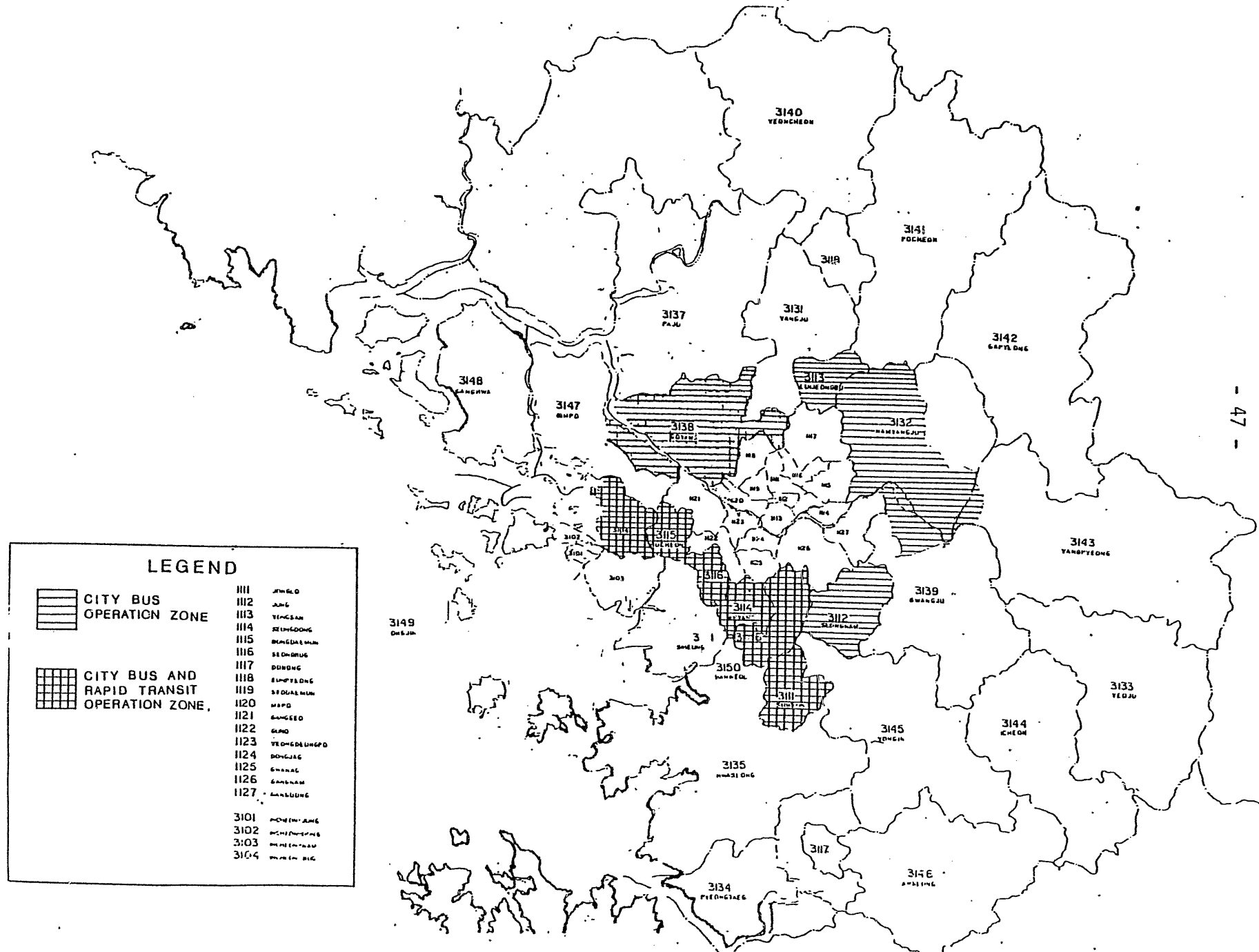
employment in the Seoul region resided in the areas which are accessible by mass transportation in 1981, especially by rapid transit along the Seoul-Suwon and Seoul-Incheon lines. Of course, the most favorable areas for industrial location, whether a new location or relocation, are areas accessible by Seoul city bus and rapid transit as shown in Map 8. In the absence of mass transportation, the critical range in commuting time from outlying areas to Seoul's CBD seems to be about 70 minutes, by a less frequent or slower local bus as shown in Map 9 .

B) Industrial Land

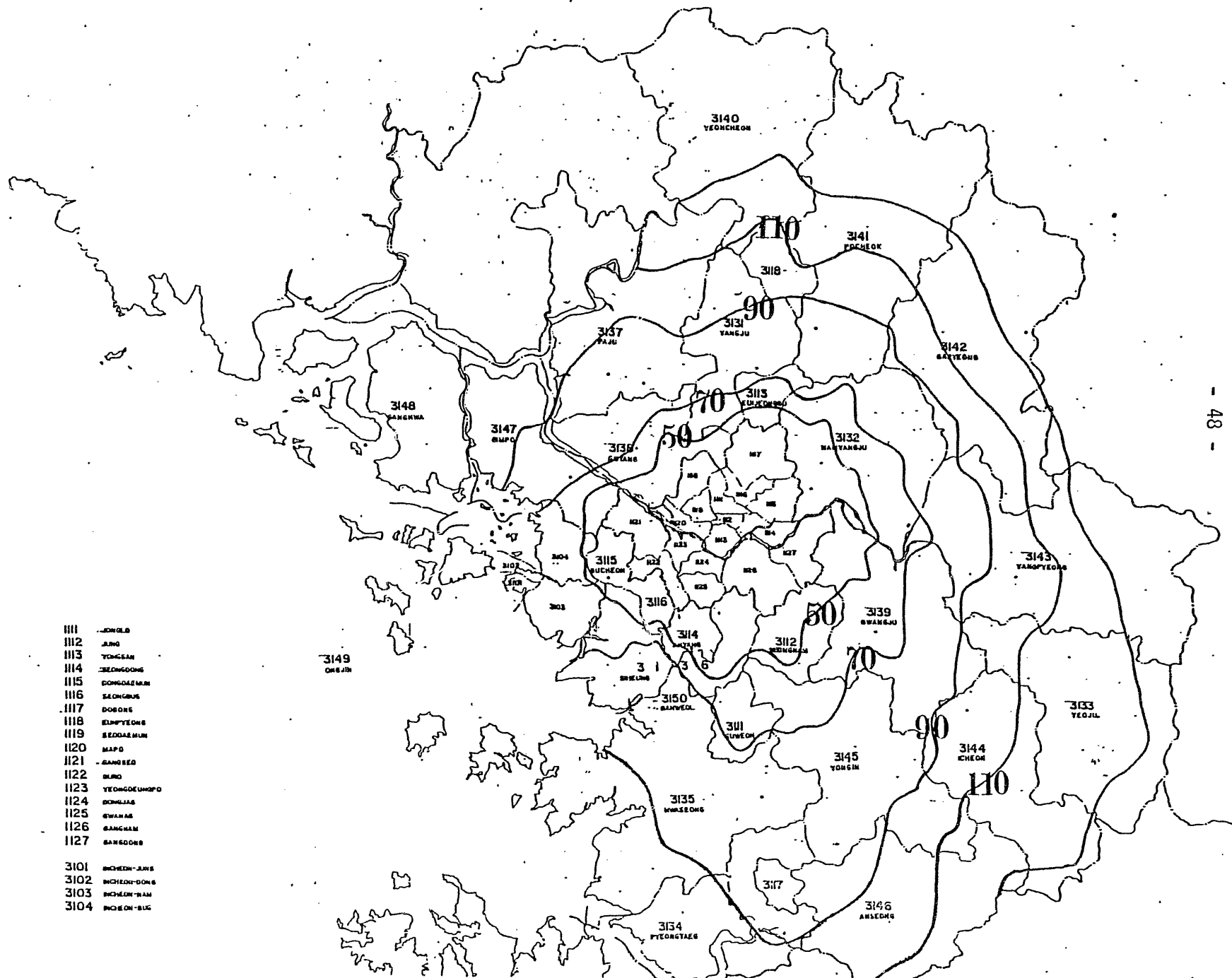
Land input as a locational factor can be characterized by two conditions : the availability of space properly prepared for industrial use, and the price of land. First, the availability of industrial land is becoming one of the most severe constraints for firms' location choice in the region. Regional and municipal land use zoning has been revised to restrict industrial use as a part of overall national decentralization policies from the Seoul region. There is no doubt that land use control has been one of the most effective means for industrial redistribution. Strict enforcement of non-conforming use works as a push factor from Seoul, while the expansion of industrial land use outside Seoul and the development of a new industrial city is intended to be instrumental in attracting new establishments.

Besides the scarcity of industrial land, the price of land is also

Map 8. Sub-regions Served by Seoul City Bus and Rapid Transit



Map 9. Time Distance from Seoul by Local Bus (Unit: Minute)



- 111 JONGGIL
- 112 JUNG
- 113 YONGSAN
- 114 SONGDOONG
- 115 GONGGALMUN
- 116 SEONGJUK
- 117 DOBONG
- 118 EUPHYEONG
- 119 SEDDAEMUN
- 120 MAPO
- 121 GANSEO
- 122 BUK
- 123 YEONGGONGPO
- 124 DONJIL
- 125 GWANAK
- 126 GANGNAM
- 127 GANSEO

- 3101 INCHEON-JUNG
- 3102 INCHEON-DONG
- 3103 INCHEON-NAM
- 3104 INCHEON-BUK

important in influencing the firm's location choice. As given in Table 13, variations in land prices are great, ranging from 400,000 won per pyeong in Seongdong in Seoul, highest in the region to 10,000 won per pyeong in Icheon. Thus the highest land price is about 40 times that of the lowest one.

Land factor in industrial location seems to have a different implication by the type of firms, i.e., relocated, newly established on-site expansion. Relocation is usually synchronized by expansion, the termination of lease and the conversion of industrial land to other intensive urban uses, such as housing and commercial premises. The land factor is even more severe for on-site expansion both in terms of space and price. Because the price of industrial land is so high in the central city, the cost of relocation is covered by selling the old site while relocating a firm in a fringe area through improved accessibility to highways.

C) Public Utilities and Telecommunications

The necessary quantity of industrial water is quite evenly available in the Seoul region either through a piped system or the on-site tapping of underground water. The price for industrial water is different from one locality to another, depending on the distance from the source of water, the cost of treatment, and local rate ordinance. The price per unit of industrial water is composed of two components, i.e., base and

Table 12. Industrial Land Price by Subregion

Geocode	Name of Areas	Average Price of Industrial Land (Unit: 1000 Won) per Pyeong		
		High	Middle	Low
1111	Jonglo	-	-	-
1112	Jung	-	-	-
1113	Yongsan	-	-	-
1114	Seongdong	400	300	270
1115	Dongdaemun	-	-	-
1116	Seongbug	-	-	-
1117	Dobong	280	-	-
1118	Eunpyeong	-	-	-
1119	Seodaemun	-	-	-
1120	Mapo	-	-	-
1121	Gangseo	200 - 300	150 - 250	150 - 200
1122	Guro	250 - 350	250	-
1123	Yeongdeungpo	350 - 400	300	-
1124	Dongjag	-	-	-
1125	Gwanag	-	-	-
1126	Gangnam	-	-	-
1127	Gangdong	-	-	-
3101	Incheon-Jung	150	80 - 120	60
3102	Incheon-Dong	130 - 150	100 - 120	-
3103	Incheon-Nam	150	100	-
3104	Incheon-Bug	120 - 150	90 - 120	-
3111	Suweon	100 - 130	80 - 100	-
3112	Seonganm	130 - 200	100 - 150	-
3113	Euijeongbu	50	30	-
3114	Anyang	120 - 170	100	-
3115	Bucheon	180 - 200	130 - 150	-
3131	Yangju	50	40	20
3132	Namyangju	-	-	-
3133	Yeoju	-	-	-
3134	Pyeongtaeg	40 - 50	25 - 40	-
3135	Hwaseong	-	-	-
3136	Siheung	-	-	-
3137	Paju	-	-	-
3138	Goyang	-	-	-
3139	Gwangju	-	-	-
3140	Yeoncheon	-	-	-
3141	Pocheon	-	-	-
3142	Gapyeong	-	-	-
3143	Yangpyeong	-	-	-
3144	Icheon	25 - 40	12 - 30	10 - 12
3145	Yongin	-	-	-
3146	Anseong	40 - 50	25 - 30	-
3147	Gimpo	60	-	-
3148	Ganghwa	-	-	-
3149	Ongjin	-	-	-
3150	Banweol	61	-	-

* Pyeong = about 3 square meters.

Source : Korea Board of Appraisal, National Land Price Survey, 1982.

incremental rates. Seoul is the most expensive place. Generally speaking, the rates of industrial water in municipalities except Suwŏn are higher than rural counties as shown in Table 13. The high prices of industrial water in the cities are largely due to their costlier construction and maintenance in urban areas than that of rural areas. The high price of Sihung is also partly explained by the fact that Sihung is the most urbanized county in the region.

Electricity is important for industrial location but location-invariant; there is excess capacity sufficient to meet a modest increase in demand in the Seoul region. Existing high voltage transmission lines for industrial use which are integrated with the region-wide and national power system do not act as a constraint for the Seoul region. Thus, the availability of electricity is not critical as a locational determinant for most types of manufacturing industries. As the price of electricity is uniform over the region and the installation of power supply lines can be easily done on the request of user, electricity is therefore not a critical deterrent for industrial location.

A good telephone system is a necessity for plant location to overcome distance friction between headquarters and subsidiaries and between sellers and buyers, especially for the industries which tend to agglomerate in and around a large metropolis. Poor telecommunication systems have been the object of complaint on the part of industrialists in some rural counties of the region. However, it would have not been a critical constraint for industrial location except for the inconveniences of longer

Table 13. Price System of Industrial Water by Sub-region.

Sub-region	Base Rate up to 200 M/T	Incremental Rate per M/T
<u>Cities</u>		
Seoul	77,970	550
Incheon	32,000	325
Suwon	19,965	180
Seongnam	36,830	280
Euijeongbu	37,660	220
Anyang	47,520	355
Bucheon	45,145	355
Gwangmyeong	37,800	325
Songtan	30,295	155
Dongducheon	26,915	155
Banweol	32,000	180
<u>Counties</u>		
Yangju	26,915	155
Namyangju	21,465	190
Yeoju	21,740	125
Pyeongtaeg	29,700	155
Hwaseong	22,685	155
Siheung	47,520	355
Paju	26,930	155
Gwangju	29,700	225
Yeoncheon	27,325	250
Pocheon	29,470	145
Gapyeong	21,920	135
Yangpyeong	26,700	165
Icheon	26,395	150
Yongin	28,465	250
Anseong	26,920	155
Gimpo	26,910	160
Ganghwa	26,915	155

waiting times and frequent interruptions. But this problem has been gradually resolved by the completion of the integrated direct dialing system covering the Seoul region.

D) Urban Services

The urban services that have the greatest effects on industrial location appear to be those related to Hirschman's social overhead capital,^{8/} namely, those related to transportation, communication, electricity and water which have been discussed in the preceding section.

While these transportation and public utilities have a direct impact on industrial location, other urban services that have had an indirect impact on industrial location in Korea appear to be housing, educational and medical services. According to the Urban Household Survey of 1983 compiled by the National Bureau of Statistics,^{9/} the importance of those urban services are ranked as housing, education, and medical services in terms of household expenditure. Urban services related to housing, education and medical services which fall into the category of urban economies have direct impacts upon the location of workers and entrepreneurs and, thereby, influence the location of industries. As Koreans place great importance on housing and education,

^{8/} See Albert O. Hirschman, The Strategy of Economic Development, Yale University Press, 1958.

^{9/} National Bureau of Statistics/Economic Planning Board, Annual Report on the Family Income and Expenditure Survey, 1983.

these two services become important determinants of the location of employees as well as employers.

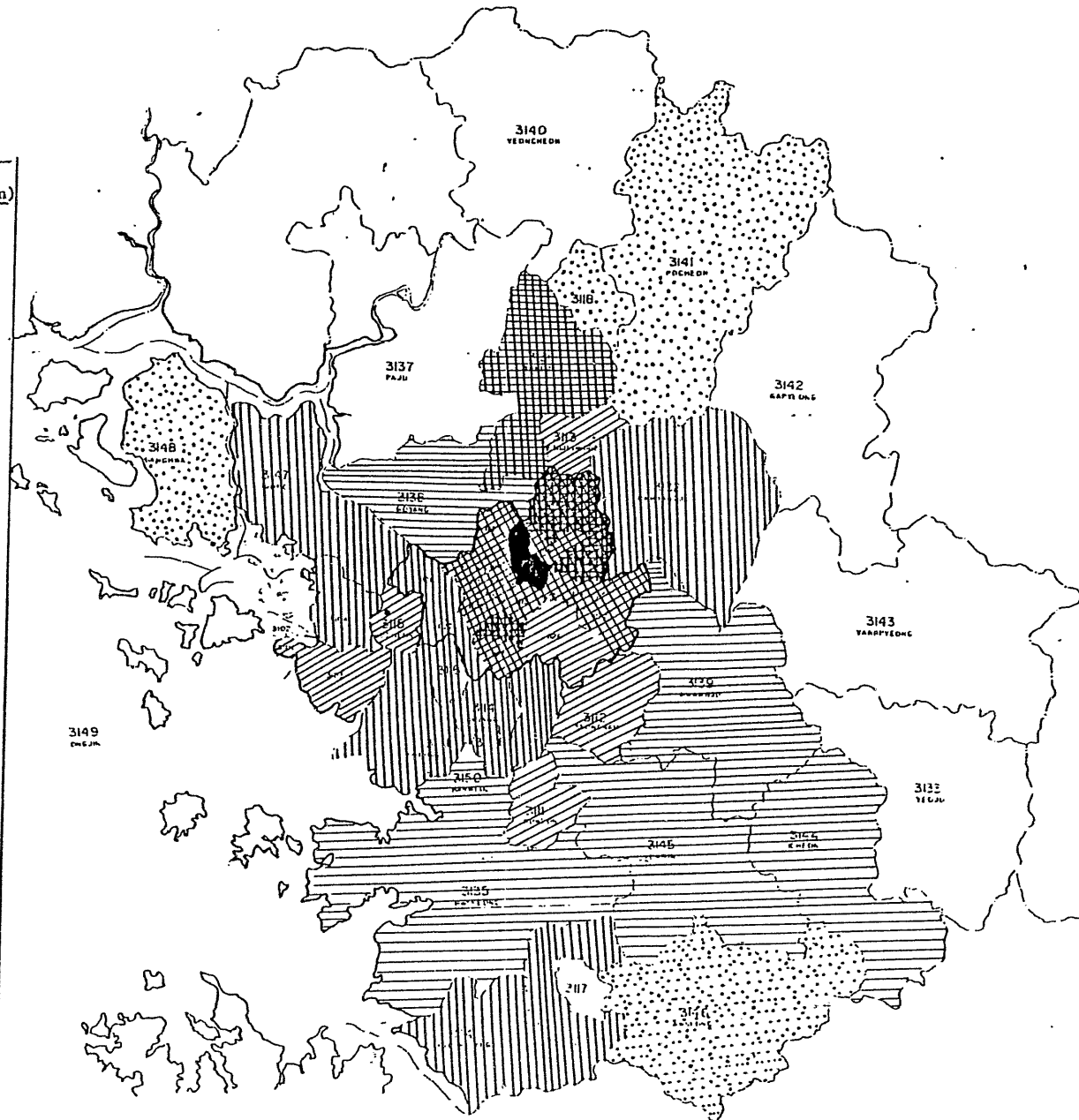
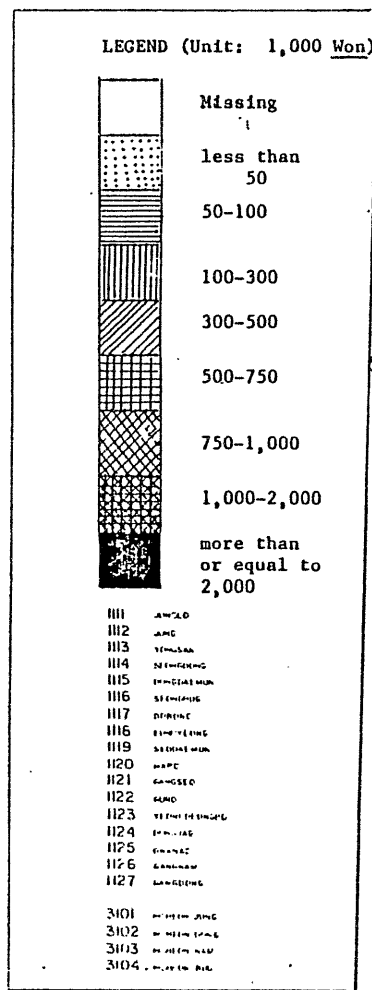
It has been attempted to quantify various urban services, both public and private, by sub-regions in the Seoul region as shown in the Appendix. The major problem in quantifying urban services appears to be the measurement of quality of urban services. The comparison indicates that large cities in the Seoul region, namely, Seoul, Incheon, and Seongnam have better urban services than other localities. This coincides with Professor Mills' findings that urban services are better in larger cities in developing countries.^{10/}

Housing problem is generally more severe in the cities and highly urbanized counties like Sihung and Namyangju. Beyond the sheer housing shortage in the number of dwelling units, the price of housing and rent is also much higher in those sub-areas comparable to the degree of differences in land price as shown in Map 10. Highest land price for housing is more than 2 million won per pyeong in Jonglo and Jung-ku, Seoul's CBD. Residential land with the price of below 300 thousand won per pyeong is not available in Seoul, resulting in the consequent rise of housing price.

Although how housing affordability and price act on industrial location is not well known in the Seoul region, housing itself as an industrial location factor can hardly be meaningful without concomitant consideration of accessibility to educational facilities for Koreans who place much higher priority on education than housing.

^{10/} See Edwin S. Mills, "Government Programs to Control Sizes of Large Cities," Paper Presented at Conference on Urbanization and National Development, East-West Center, Honolulu, Hawaii, January 25-29, 1982.

Map 10. Residential Land Price by Sub-region



Better educational institutions in terms of academic attainment are largely concentrated in the large cities like Seoul, Suwon and Anyang. This means that the two urban services i.e., housing and education are in direct conflicts in that better education is available where housing is more scarce. Therefore, their locational impacts tend to offset each other. The trade-off between the two, however, usually favors education.

Part IV. Summary of Findings and Concluding Remarks

This paper was intended to summarize the aggregate patterns of industrial distribution and to identify important locational factors contributing to the explanation of changing distribution of industries in the Seoul region. It is also hoped to draw some hypothetical postulations for further analysis in the research project.

1. Intrametropolitan Movement

The first census enumeration of industrial movement conducted by the National Bureau of Statistics in 1981^{11/} has shown how influential industrial movement has become in altering the spatial distribution of manufacturing industries. About 16 percent or 5,313 firms out of 33,431 firms in Korea experienced locational changes. However, the locational change was **highly** concentrated within the three metropolitan regions of Seoul, Busan, and Taegu, where 79 percent of industrial movement took place as shown in Table 14 .

This means that interregional or long-distance industrial movement was a phenomenon of relatively little significance. Nearly 80 percent of industrial movement had been featured by intra-metropolitan or short-distance industrial movement in Korea.^{12/} Of 5,313 firms which had relocated by 1981, 2,865 firms or 54 percent moved within the Seoul region. The Seoul region accounts for more than two thirds of industrial migration within the three metropolitan regions.

^{11/} Conducted by the National Bureau of Statistics as part of the IBRD-SNU Industrial Location Policies Research Project (IBRD RPO 0672-91)

^{12/} See, K.S.Lee (1985) for more detailed analysis of the manufacturing Census data.

Table 14. Industrial Movements in Three Metropolitan Regions

	No. of Relocated Firms	Percent	
Nation Total	5,313	100.0	
Three Metropolitan Regions	4,198	79.0	100.0
Seoul Region	2,865	53.9	68.2
Pusan Region	831	15.6	19.8
Taegu Region	502	9.5	12.0
Other Regions	1,115	31.0	

Unfortunately, very little has been known about intra-metropolitan industrial location in Korea. For the formulation and effective implementation of industrial location policies and programs more attention should be given to intra-metropolitan industrial movement and the consequences of industrial location policies in the Seoul region.

Changing location patterns of manufacturing industries in the Seoul region have been characterized by the strong trend of decentralization from center to periphery and from the north to the south. Given this general flow in the Seoul region as a whole, the industrial locations of newly created and relocated firms have selectively taken place in some localities of seven cities (Incheon, Bucheon, Songnam, Anyang, Suwon, Euijeongbu and Banweol) and six counties (Siheung, Hwasung, Yongin, Namyangju, Gwangju and Pyeongtaek) which are bordered either by the City of Seoul or are easily accessible by expressways and/or rapid transit system.

2. Push and Pull

In relation to industrial location in the Seoul region, two kinds of conditions are reinforcing the trend toward decentralization. The first

can be called the 'push factors' which are largely determined by the conditions at the place of origin. They may include a prohibitive land price for on-site expansion, difficulties of obtaining land in terms of space and proper zoning, outmoded plant and equipment at the old city locations, reinforced environmental control and legal enforcement of non-conforming uses. 'Push factors' can be classified into two kinds; natural market forces and governmental regulatory measures. For example, the former is the termination of tenure for an industrial premise and the latter is a mandatory order to relocate the plant by reason of being a public nuisance.

The second category consists of the so-called 'pull factors' which are conditioned by the attractiveness of the place of destination. An outlying area may offer relatively cheap land properly developed for industrial use. Technological advances in transportation and communication lessen the need for close proximity to markets. Changes in production technology, which demand a predominantly horizontal layout often of special design, tend to move industrial establishments from congested inner-city locations to the spacious metropolitan fringe. Governmental policies coincide with the trend of industrial dispersal and quite often reinforce it by means of various kinds of incentives such as a relocation subsidy, preferential loans, the designation of an inducement zone and the development of a new industrial city to accommodate relocated plants.

Push and pull factors do not work independently but are reinforcing. In reality, the identification of locational advantages and disadvantages is not only a complex problem but also involves a considerable degree of

uncertainty with limited information about locational characteristics. The final locational choice is usually made upon a consideration of both push and pull factors.

3. Step-wise Decision of Industrial Location

The choice of location by a firm is usually made in two steps. A firm may first choose a region for its new plant or branch and then select a site within that region.^{13/} As discussed earlier, location factors are considered first for area-wide characteristics and second for site-specific characteristics. Area-wide characteristics determine the general preference toward direction or distance of movement based on an overall evaluation of a region, while site-specific characteristics tend to influence the selection of a site to locate a plant.

In terms of area-wide characteristics, the Seoul region has been the most attractive region in Korea since the region can enjoy the externalities which Seoul with a population of ten millions may offer. The best banking services, medical facilities, higher educational institutions and cultural facilities are readily available within thirty minutes traveling distance to Seoul. Therefore, the consideration of the site-specific factors has become less critical as long as the site is within the metropolitan shadow of Seoul. Locational deficiencies caused by the lack of site-specific factors could have been simply tolerated at the cost of inconveniences and might have not led to locational disqualification. However, the availability of industrial land and water and an easy access

^{13/} D.J. Spooner, "Industrial Movement and Rural Periphery: The Case of Devon and Cornwall, "Regional Studies, Vol. 6, 1972, p. 206.

to major transportation network are assumed to be of critical importance in choosing the final site of the plant in the Seoul region. This hypothesis has been supported by the establishment survey results (Lee and Choe, 1985).

4. Push Factors - Land Constraints

The rapidly rising price of land in Seoul would have played as a strong push factor. The limited availability of industrial land properly zoned for industrial use has also played an important role in the location of new firms and the relocation of especially large firms. This may be partly supported by the fact that the size of plants located on the periphery of Seoul is larger than those located in the central part of Seoul and that the size of plants located in Gyeonggi province is larger than those located in Seoul. As shown in Table 15, the average size of employment per firm increase from 20.7 in Ring I to 81.6 in Ring IV in 1981. Firm size in terms of employment in Ring I, II and III, which constitute the boundary of the City of Seoul has consistently become smaller from 1973 to 1981, while firm size in Ring IV and V tends to increase.

Table 15. Average Firm Size by Rings

Rings	(Unit: Persons)		
	1973	1978	1981
Ring I	28.9	26.6	20.7
Ring II	58.2	54.3	43.5
Ring III	136.8	102.8	64.8
Ring IV	84.9	100.0	81.6
Ring V	25.6	68.4	65.0
Total	70.2	79.5	61.6

5. Pull Factors - Improved Accessibility

The most important pull factor for changing industrial location patterns in the Seoul region seems to be improved accessibility to Seoul. Industrial sites, which are most accessible to both the largest domestic market in the nation and the source of imported inputs via the port of Incheon, are those located along the Seoul-Incheon corridor which is merging into a megalopolis by the Seoul-Incheon expressway and the Seoul-Incheon rapid transit line.

The City of Bucheon which is located in the Seoul-Incheon corridor is one of the cities that has grown most rapidly in Korea since 1970's. Bucheon is in sharp contrast with Banweol which was created from by the government to accomodate industries to be relocated from Seoul. The growth of Banweol had been very slow up until the end of 1982. Although Banweol's growth has speeded since then, it has been hardly comparable to the growth of other cities close to Seoul like Bucheon and Anyang.

The main development axis of Seoul is characterized to a large extent by the 'east-west transport route' connecting Yeongdeungpogu-Mapogu- Jonglogu and Junggu-Dongdaemungu. As this transport route is extended to the Seoul-Incheon corridor, the whole of the Seoul region's accessibility is affected substantially by this east-west corridor. In addition to the east-west corridor, the north-south corridor connecting Seoul-Anyang-Suweon is shaping the spatial distribution of the Seoul region. These two corridors provide industrial location which are easily accessible to Seoul by expressways and rapid transit system.

The influence of the transportation factor has been significant. Its strength in Korea may be at least as great as that found in the metropolitan areas of advanced countries. This may be due to the fact that the major improvement of transportation in Korea in the 1970s has been spatially confined within the Seoul region. Thus, most of the decentralized industries tend to locate in areas close to Seoul and a few large cities.

6. Locational Differences by Industries and Size

Industrial mobility may differ among industries. In other words, certain industries are more mobile than others. As shown in Table 16, fabricated metal, machinery, and equipment industries are distinguished by the highest mobility rate of 24.4 percent as compared with 15.9 percent for the sector as a whole. The textile, apparel, and leather industries appears to be relatively immobile with a 13.2 percent. Reasons for the high mobility of the fabricated metal industry may be explained from that this industry is a rapidly growing sector and a need to relocate for expansion. The low rate of relocation for the textile, apparel, and leather industry can be explained by the fact that the industry is highly dependent on external economies which the central city location provides. Locational pressure to move for expansion depends not only on locational conditions but also on the business prospects of individual industries. Prospects for the textile, apparel, and leather industries has, in the recent past, become less bright, and potential movers have some reservations about taking the great risks associated with relocation, while fabricated

Table 16. Number of Relocated Establishments by Industries

	No. of (A) Establishments	No. of Relocated (B) Establishments	B/A (%)
Manufacturing Total	33,431	5,313 (100.0)	15.9
Food, Beverage & Tobacco	4,261	303 (5.7)	7.1
Textile, Wearing Apparel and Leather	8,488	1,120 (21.1)	13.2
Wood, Wood Products	2,294	245 (4.6)	10.7
Paper, Paper Products Printing & Publishing	2,587	534 (10.1)	20.6
Chemicals, Petroleum Coal, Rubber & Plastic	3,231	621 (11.7)	19.2
Non-metallic Mineral Products	2,626	251 (4.7)	9.6
Basic Metal	981	177 (3.3)	18.0
Fabricated Metal	7,433	1,811 (34.1)	24.4
Other Manufacturing	1,210	251 (4.7)	20.7

Source : National Bureau of Statistics, Economic Planning Board,
Mining and Manufacturing Survey, 1981.

metal, machinery, and equipment industries are preparing for a boom period ahead and therefore looking for new locations.

As generally known in the 'incubator hypothesis', industrial mobility may be different by firm size (Lee, 1985). The locational choice for large firms appears to be different from that of small firms in Korea. The locations of key industries such as petro-chemical, ship-building and steel industries have been made at the national level. Those industries which are usually more export-oriented tend to choose locations closer to international ports for the transportation of both materials and products. Seoul's share of those industries has declined with the rise in the size of Seoul. This is already supported by Henderson's observation that the share of resource-bound manufacturing appears to decline with city size and also that footloose activity, relative to resource-bound activity tends to cluster in a large metropolis.^{14/}

Small firms tend to reduce the risk associated with their relocation by remaining in their old location or by a short-distance move from a metropolis. Uncertainties of various types will be less in areas with conglomerations, through the greater availability of private, public and visual information, the wide array of external economies, and proximity to competitors and business establishments in general.^{15/}

This general observation has been substantiated by the establishment survey in this project (Lee and Choe, 1985). The direction of movement from the congested central city location to surrounding metropolitan fringe

^{14/} J.V. Henderson, "Industrial Bases and City Sizes," American Economic Review, May 1983, p. 167.

^{15/} A. Pred, Behaviour and Location: Foundations for a Geographic and Dynamic Location Theory, Part One, Land Studies in Geography Series B, 1967, p. 27.

is consistent for both small and large firms. Although technological advances in transportation and communication lessen the need for close proximity to markets, suppliers and business services, it is still true for small-and-medium size industries, which seek to minimize the risk involved in a locational decision, thereby clustering around the areas which are not too far from and not too close to the city center.

7. Urban Services and Industrial Location

Of various urban services that influence industrial location in the Seoul region, educational services, especially those related to primary education seem to have strong implications. This may be explained by the following two factors. One is that Koreans put great emphasis on the education of their children requiring primary education. As young children may not commute long distance, primary education must be provided close to where workers live. The second is the fact that because most localities in the Seoul region are within a relatively short travel distance, people heavily rely on Seoul, Incheon, or other big cities in the region for other urban services such as medical treatment and entertainment. Thus, educational services for workers' children appear to be the dominant factor influencing employment location in Korea in general.

Public services such as electricity, industrial water, communication, and many site-specific services have to be provided as part of a service package. Provision of any of these services in isolation tends to lessen the policy of effectiveness especially in the case of planned industrial

relocation as exemplified by the case of Banweol. Our analysis of the relationship between industrial location and urban services in the Seoul region indicates that large cities and localities close to large cities tend to have better urban services and to attract more manufacturing industries.

Decentralization of employee's residential location does not seem to follow industrial decentralization immediately. Because of poor public services in fringe areas, the time lag between industrial decentralization and residential decentralization is substantial. As distance from major industrial locations to Seoul is relatively short by improved accessibility, many employees working for the relocated or newly established firms tend to choose commuting from Seoul instead of moving with the firms.

One of the important reasons appears to be that employees may not always be able to minimize journey-to-work distance and tend to tolerate inconveniences and costs entailed by commuting from home to workplace for the externalities like better school and other living amenities that Seoul provide. Another reason is that more than 90 percent of the employees relies on public transportation. The fare is generally uniform and distance variation is quite negligible.

For movement of workers and their families to take place, the price and availability of housing should not also be ruled out. As Hamilton pointed out, a household may trade off longer distance from a decentralized work-place for lower price of housing in peripheral areas.^{16/} However,

^{16/} Bruce W. Hamilton, Wasteful Commuting, The Johns Hopkins University, November 1981, p. 3 and p. 21 (mimeo)

the availability of cheap housing alone seems to make little impact on industrial location in the absence of necessary services at the relocated site. In other words, the low price of housing would not be attractive enough to change the residential locations of employees unless other urban services, especially educational services, are provided. Moreover, housing means more than the provision of shelter; it is the object of real estate speculation in Korea. This means that the expected increase of housing price quite often dictates residential location. This was especially true in the period of rapid inflation.

8. Further Studies

It has been attempted to find associations between changes in location characteristics and the changing patterns of industrial movement in and around a large metropolis of Seoul. These findings should provide some implications for understanding the location behavior of industrial establishments and for what industrial location policies can be expected to accomplish.

However, this paper is limited to an aggregate analysis that hardly touches on the complexity of industrial location problems at the micro-level of individual firms. Industrial establishments can be stratified by firm types (newly created firms, firms stayed at the same location, and relocated firms), firm size (large, medium, and small) and industries, in order to identify closely which factors are contributing to locational

changes. Understanding the firms' location behavior at much disaggregated levels should provide better analytical bases for taking policy initiatives. Such analyses, both theoretical and empirical, have been conducted in this research project and presented in other project papers.

APPENDIX:

LOCATION ATTRIBUTES OF SUBAREAS BY 4-DIGIT GEOCODE

Social Welfare Facilities

Recreation Facilities

Drinking Water Supply

Industrial Water Supply

Per Capita Finance

Percent of Capital Investment

Sewerage Treatment

Garbage Disposal

Housing

Fire Prevention Services

Police Services

Universities

Junior Colleges

Educational Facilities

Cultural Facilities

Urban Street

Mass Transportation

Telecommunication Services

Banking Services

Market and Commercial Services

		Social Welfare Facilities		Recreational Facilities	
		Nursery	Employment Information Center	No. of Game Centers	No. of Movie Theatres
1111	Seoul	119	104	1,784	93
3101	Incheon	9	6	283	14
3111	Suweon	4	5	96	4
3112	Seongnam	6	3	60	5
3113	Euijeongbu	1	3	52	3
3114	Anyang	1	3	82	2
3115	Bucheon	-	1	83	2
3131	Yangju	4	1	58	3
3132	Namyangju	-	1	22	1
3133	Yeoju	3	-	8	1
3134	Pyeongtaeg	5	-	64	6
3135	Hwaseong	2	-	25	1
3136	Siheung	-	-	-	1
3137	Paju	13	1	37	3
3138	Goyang	1	-	16	2
3139	Gwangju	7	-	13	1
3140	Yeoncheon	1	-	26	2
3141	Pocheon	4	-	31	2
3142	Gapyeong	-	1	14	1
3143	Yangpyeong	1	-	8	1
3144	Icheon	-	2	12	2
3145	Yongin	-	-	25	1
3146	Anseong	2	1	25	2
3147	Gimpo	4	-	9	-
3148	Ganghwa	-	-	11	1
3149	Ongjin	-	-	5	-
3150	Banweol	-	-	-	-

		Drinking Water Supply		Industrial Water
		% of Population Served	Capacity Per Person (liter Per day)	Supply Capacity (Ton/day)
1111	Seoul	93	366.9	-
3101	Incheon	91	341.1	-
3111	Suweon	69	228.5	20,000
3112	Seongnam	85	199.2	-
3113	Euijeongbu	52	131.3	-
3114	Anyang	65	493.0	100,000
3115	Bucheon	57	341.1	-
3131	Yangju	76	89.8	-
3132	Namyangju	-	-	-
3133	Yeoju	85	99.4	-
3134	Pyeongtaeg	71	112.4	-
3135	Hwaseong	52	1,516.7	60,000
3136	Siheung	-	-	-
3137	Paju	54	94.9	-
3138	Goyang	-	-	-
3139	Gwangju	-	-	-
3140	Yeoncheon	56	173.4	-
3141	Pocheon	34	115.3	-
3142	Gapyeong	63	156.6	-
3143	Yangpyeong	49	58.1	-
3144	Icheon	69	79.2	-
3145	Yongin	-	-	-
3146	Anseong	72	139.9	-
3147	Gimpo	-	-	-
3148	Ganghwa	30	67.5	-
3149	Ongjin	-	-	-
3150	Banweol	-	-	-

		Per Capita Finance (Won)	% of Capital Investment
1111	Seoul	53,730	21.5
3101	Incheon	32,751	44.3
3111	Suweon	30,718	44.6
3112	Seongnam	29,863	39.5
3113	Euijeongbu	27,607	20.2
3114	Anyang	31,609	29.9
3115	Bucheon	32,346	25.4
3131	Yangju	43,345	24.9
3132	Namyangju	31,614	29.0
3133	Yeoju	51,386	21.7
3134	Pyeongtaeg	22,135	15.4
3135	Hwaseong	48,362	28.9
3136	Siheung	29,432	32.6
3137	Paju	41,987	29.8
3138	Goyang	32,330	21.8
3139	Gwangju	41,328	25.3
3140	Yeoncheon	55,185	30.4
3141	Pocheon	40,135	20.8
3142	Gapyeong	60,664	32.7
3143	Yangpyeong	47,733	30.3
3144	Icheon	51,543	27.7
3145	Yongin	51,547	33.1
3146	Anseong	42,954	33.8
3147	Gimpo	48,115	44.5
3148	Ganghwa	94,779	26.8
3149	Ongjin		25.0
3150	Banweol	9,480	11.9

		Sewerage Treatment	Garbage Disposal	Housing
		% of Area Served	% of Garbage Collected	% of Housing Shortage
1111	Seoul	64.8	100.0	45.9
3101	Incheon	56.0	100.0	42.6
3111	Suwon	65.0	68.0	43.6
3112	Seongnam	72.4	70.0	52.5
3113	Euijeongbu	74.8	100.0	50.2
3114	Anyang	64.6	72.0	46.2
3115	Bucheon	32.1	96.0	47.8
3131	Yangju	21.8	98.6	27.8
3132	Namyangju	21.7	100.0	42.6
3133	Yeoju	42.3	92.0	12.6
3134	Pyeongtaeg	28.6	100.0	26.8
3135	Hwaseong	35.4	98.0	17.1
3136	Siheung	33.6	100.0	45.4
3137	Paju	33.1	80.0	22.1
3138	Goyang	23.3	80.0	37.1
3139	Gwangju	10.7	71.0	29.1
3140	Yeoncheon	20.0	100.0	18.3
3141	Pocheon	14.0	80.0	14.8
3142	Gapyeong	47.8	100.0	17.6
3143	Yangpyeong	17.0	100.0	12.1
3144	Icheon	16.7	100.0	16.1
3145	Yongin	59.7	100.0	27.8
3146	Anseong	63.1	100.0	10.3
3147	Gimpo	45.5	100.0	13.5
3148	Ganghwa	50.0	96.6	6.9
3149	Ongjin	-	-	0.1
3150	Banweol	-	100.0	7.0

		Fire Prevention Services					Police Services				
		Fire Stations			No. of Fire- man per 1000 per- sons	No. of Police Stations	No. of Police Stations			No. of Police- men per 1000 per- sons	
Total	Main sta- tion	Branch Sta- tion	No. of Fire Care	Total			Head- qua- ters	police Sta- tions	Branch Sta- tion		
1111	Seoul	68	8	52	140	0.29	23		546	1.62	
3101	Incheon	11	2	9	33	0.23	59	2	10	47	0.82
3111	Suwon	4	1	3	15	0.27	18	1	-	17	0.95
3112	Seongnam	4	1	3	11	0.25	22	1	-	21	0.78
3113	Euijeongbu	3	1	2	9	0.54	21	1	12	8	2.10
3114	Anyang	3	1	2	10	0.37	25	1	13	11	1.37
3115	Bucheon	3	1	2	8	0.37	30	1	-	29	1.78
3131	Yangju	1	-	-	5	0.07	-	-	-	-	-
3132	Namyangju	3	-	-	4	0.02	12	1	9	2	1.17
3133	Yeoju	1	-	-	3	0.04	10	1	8	1	1.14
3134	Pyeongtaeg	3	-	-	11	0.05	15	1	11	3	0.94
3135	Hwaseong	1	-	-	12	0.04	19	1	16	2	1.02
3136	Siheung	4	-	-	1	0.03	-	-	-	-	-
3137	Paju	3	-	-	4	0.04	17	1	15	1	1.12
3138	Goyang	7	-	-	4	0.03	9	1	11	1	0.88
3139	Gwangju	4	1	-	4	0.04	11	1	9	1	1.08
3140	Yeoncheon	1	-	-	2	0.03	10	1	8	1	1.61
3141	Pocheon	1	-	-	4	0.03	15	1	13	1	1.31
3142	Gapyeong	1	-	-	3	0.03	7	1	5	2	1.61
3143	Yangpyeong	1	-	-	3	0.02	13	1	11	1	1.29
3144	Icheon	2	-	-	5	0.02	14	1	11	2	1.21
3145	Yongin	2	-	-	7	0.02	11	1	10	1	1.36
3146	Anseong	1	-	-	5	0.05	15	1	12	2	0.90
3147	Gimpo	1	-	-	8	0.07	10	1	8	1	1.25
3148	Ganghwa	1	-	-	5	0.05	14	1	12	1	1.91
3149	Ongjin	-	-	-	-	-	-	-	-	-	-
3150	Banweol	2	-	-	2	0.06	1	-	1	-	0.23

		Universities			Junior Colleges		
		Number	No. of Departments	No. of Students	Number	No. of Departments	No. of Students
1111	Seoul	37	1,047	172,155	20	149	20,733
3101	Incheon	2	100	11,887	6	50	11,610
3111	Suweon	3	37	8,099	3	3	1,773
3112	Seongnam	-	-	-	3	30	7,378
3113	Euijeongbu	-	-	-	1	8	1,399
3114	Anyang	-	-	-	2	10	4,540
3115	Bucheon	2	20	2,617	3	17	3,701
3131	Yangju	-	-	-	-	-	-
3132	Namyangju	-	-	-	-	-	-
3133	Yeoju	-	-	-	-	-	-
3134	Pyeongtaeg	-	-	-	-	-	-
3135	Hwaseong	-	-	-	3	20	3,785
3136	Siheung	-	-	-	-	-	-
3137	Paju	-	-	-	-	-	-
3138	Goyang	1	5	1,182	1	1	195
3139	Gwangju	-	-	-	-	-	-
3140	Yeoncheon	-	-	-	-	-	-
3141	Pocheon	-	-	-	-	-	-
3142	Gapyeong	-	-	-	-	-	-
3143	Yangpyeong	-	-	-	-	-	-
3144	Icheon	-	-	-	-	-	-
3145	Yongin	4	26	4,536	-	-	-
3146	Anseong	1	10	2,400	1	8	614
3147	Gimpo	-	-	-	-	-	-
3148	Ganghwa	-	-	-	-	-	-
3149	Ongjin	-	-	-	-	-	-
3150	Banweol	1	13	4,160	-	-	-

		Educational Facilities				Cultural Facilities		
		Middle School		High School		Citizen's Center	Museum	Stadium
		No. of Schools	No. of Classes	No. of Schools	No. of Classes			
1111	Seoul	200	6,977	164	6,212	1	12	2
3101	Incheon	33	884	31	822	1	1	5
3111	Suwon	10	277	11	307	1	-	-
3112	Seongnam	10	282	12	162	-	-	-
3113	Euijeongbu	5	123	11	146	-	-	-
3114	Anyang	9	201	7	187	-	-	-
3115	Bucheon	6	115	5	140	1	-	-
3131	Yangju	-	-	-	-	-	-	-
3132	Namyangju	10	135	7	102	-	-	-
3133	Yeoju	12	52	9	90	-	-	-
3134	Pyeongtae	17	266	13	314	-	-	-
3135	Hwaseong	15	224	11	172	-	-	-
3136	Siheung	-	-	-	-	-	-	-
3137	Paju	14	168	9	143	-	-	-
3138	Goyang	6	106	4	67	-	-	-
3139	Gwangju	6	79	5	54	1	-	1
3140	Yeoncheon	6	77	3	44	-	-	-
3141	Pocheon	11	127	5	-	-	-	-
3142	Gapyeong	5	75	4	46	-	-	-
3143	Yangpyeong	11	123	80	79	-	-	-
3144	Icheon	11	125	8	75	-	-	-
3145	Yongin	11	128	5	60	-	-	-
3146	Anseong	10	145	6	98	-	-	-
3147	Gimpo	10	97	5	72	-	-	-
3148	Ganghwa	-	-	-	-	-	-	-
3149	Ongjin	9	56	6	23	-	-	-
3150	Banweol	-	-	-	-	-	-	-

		Urban Street		Mass Transportation (Bus)			
		% of Street to Total area	% of Paved Street	Intra-urban		Interregional	
				No. of Cars	No. of Routes	No. of Cars	No. of Routes
1111	Seoul	15.49	67.3				
3101	Incheon	11.84	48.6	509	31	353	18
3111	Suwon	9.71	51.2	145	62	218	56
3112	Seongnam	12.93	48.3	52	10	-	-
3113	Euijeongbu	8.17	74.4	36	8	358	104
3114	Anyang	18.49	30.0	115	17	50	11
3115	Bucheon	7.97	77.6	54	10	-	-
3131	Yangju	4.97	74.1	-	-	-	-
3132	Namyangju		73.3	-	-	-	-
3133	Yeoju	3.99	35.0	-	-	-	-
3134	Pyeongtaeg	4.62	56.0	45	24	67	20
3135	Hwaseong	4.07	63.3	-	-	63	35
3136	Siheung	5.58	56.1	-	-	20	4
3137	Paju	2.70	83.3	-	-	141	32
3138	Goyang	4.78	70.8	-	-	53	19
3139	Gwangju	6.45	47.6	-	-	146	49
3140	Yeoncheon	2.33	17.8	-	-	-	-
3141	Pocheon	4.92	58.5	-	-	78	16
3142	Gapyeong	6.78	40.9	-	-	105	39
3143	Yangpyeong	6.09	57.0	-	-	57	35
3144	Icheon	5.19	54.5	-	-	148	68
3145	Yongin	6.64	75.0	25	16	99	47
3146	Anseong	5.01	50.0	5	9	111	31
3147	Gimpo	5.25	50.0	-	-	105	22
3148	Ugghwa	4.79	81.1	-	-	54	25
3149	Ungjin			-	-	-	-
3150	Banweol	8.30		-	-	-	-

		Tele-Communication Services									
		Post Offices				Telephone & Telegram			Telephone		
		Total	Gener- al	Spe- cial	Branch	Total	Tel. & Teleg.	Tel. & Teleg. Branch	No. of Tel. per100 per- sons	Auto- matic	Manual
1111	Seoul	129	129	-	-	32	32	-	11.80	100.0	
3101	Incheon	20	14	-	6	5	3	2	7.20	100.0	
3111	Suwon	6	2	-	4	2	1	1	8.86		
3112	Seongnam	6	4	2	-				5.02	94.1	5.9
3113	Euijeongbu	1	1	-	-				5.93	100.0	
3114	Anyang	2	2	-	-				7.00	100.0	
3115	Bucheon	3	1	2	-				5.82	100.0	
3131	Yangju	13	4	6	3				5.47	100.0	
3132	Namyangju	8	3	4	1				2.93	89.0	21.0
3133	Yeoju	11	6	3	2				4.13	100.0	
3134	Pyeongtaeg	13	5	6	2				6.52	100.0	
3135	Hwaseong	17	6	11	-				3.91	100.0	
3136	Siheung	9	6	2	1				2.01	24.0	76.0
3137	Paju	13	6	6	1				4.69	100.0	
3138	Goyang	7	5	1	1				1.98	85.0	15.0
3139	Gwangju	11	3	6	2				4.96	100.0	
3140	Yeoncheon	7	4	3	-				3.52		100.0
3141	Pocheon	13	6	6	1				3.32		100.0
3142	Gapyeong	6	5	1	-				4.21	100.0	
3143	Yangpyeong	14	6	7	1				3.33	100.0	
3144	Icheon	12	4	7	1				4.29	79.0	22.0
3145	Yongin	12	6	5	1	1		1	4.28		
3146	Anseong	13	6	7	-				3.86	100.0	
3147	Gimpo	10	4	4	2				5.39	100.0	
3148	Ganghwa	14	3	10	1				7.52	100.0	
3149	Ongjin	10	4	5	1				5.28		
3150	Banweol	1	-	-	1				-	100.0	

		Banking Service					Market and Commercial Services			
		Total	Bank of Korea	Bank of Industry	Special Bank	Commercial Bank	Total	Markets	Department Stores	Supermarkets
1111	Seoul	597	1	1	271	315	860	369	8	483
3101	Incheon	62	1	1	27	33	90	34	4	52
3111	Suwon	20	1	-	9	10	18	6	4	8
3112	Seongnam	10	-	-	7	3	31	9	2	20
3113	Euijeongbu	7	-	-	5	2	15	4	-	11
3114	Anyang	12	-	-	6	6	49	9	-	40
3115	Bucheon	7	-	-	4	3	16	4	2	10
3131	Yangju	6	-	-	5	1	12	2	-	10
3132	Namyangju	1	-	-	1	-	9	-	-	9
3133	Yeoju	1	-	-	-	-	4	3	-	1
3134	Pyeongtae	10	-	-	6	4	82	3	3	76
3135	Hwaseong	4	-	-	3	1	6	3	-	3
3136	Siheung	3	-	-	2	1	8	3	-	5
3137	Paju	4	-	-	4	-	14	8	1	5
3138	Goyang	3	-	-	3	-	1	1	-	-
3139	Gwangju	2	-	-	2	-	8	3	-	5
3140	Yeoncheon	1	-	-	1	-	1	1	-	-
3141	Pocheon	2	-	-	2	-	1	1	-	-
3142	Gapyeong	1	-	-	1	-	3	2	-	1
3143	Yangpyeong	1	-	-	1	-	2	1	-	1
3144	Icheon	2	-	-	2	-	3	3	-	-
3145	Yongin	2	-	-	2	-	3	1	-	2
3146	Anseong	3	-	-	2	1	6	1	-	5
3147	Gimpo	1	-	-	1	-	2	1	-	1
3148	Ganghwa	2	-	-	1	1	-	-	-	-
3150	Banweol		-	-			4	3	-	1

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