

DISCUSSION PAPER

Report No. UDD-85

DETERMINANTS OF LOCATIONAL CHOICE OF MANUFACTURING FIRMS IN THE
SEOUL REGION: AN ANALYSIS OF SURVEY RESULTS

by

Kyu Sik Lee and Sang-Chuel Choe

with

Kyuee-Ha Pakk

October 1985

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

The views presented herein are those of the author(s), 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 (RPO 672-91).

Mr. Kyu Sik Lee who is a Senior Economist in the Water Supply and Urban Development Department of the World Bank directed the project.

Mr. Kyuee-Ha Pakk, a World Bank consultant, was responsible for preparing and managing the data used.

The authors would like to thank the staff members of the Korean National Bureau of Statistics, especially Mr. Joon-Yong Um, Director of Industrial Statistics Division, and Mr. Hyun Moo Shin, who participated in the data collection effort., Mrs. Eui Soon Shultz of the World Bank typed and processed the manuscript.

Research Project No.: RPO 672-91

Research Project Name: An Evaluation of Industrial Location Policies
for Urban Deconcentration

Abstract

The Industrial Location Policies Research Project (RPO 672-91) produced a series of UDD Discussion Papers in the following three categories: (1) Descriptive studies on observed location patterns and policy planning and implementation experiences; (2) theoretical development and policy simulation studies; and (3) empirical studies of the firm's location behavior.

This paper as part of the empirical studies describes the survey of 500 manufacturing establishments conducted in the Seoul region and presents most salient findings from the survey. The results show the attributes of different types of firms and their site characteristics, and reveal important factors that determine individual firms' locational choice. The paper summarizes these findings by firm size and location tenure, i.e., newly established firms, relocated firms, and mature firms, those stayed at the same location.

Table of Contents

	<u>Page</u>
List of Tables	ii
1. Introduction	1
2. Overview of Employment Location Patterns in the Region ...	3
3. Sampling Strategy and Sample Outcome	9
4. The Survey Results	14
5. Summary of Findings and Concluding Remarks	35
References	

List of Tables

	<u>Page</u>
1. Birth, Death and Relocation Rates in Seoul, Bogota, Cali, and U.S. Cities	4
2. Changes in Employment and Establishments by Ring in the Seoul Region, 1973 and 1978	7
3. Distribution of Manufacturing Employment and Establishments by Ring in the Seoul Region, 1973-1980	8
4. Sample Composition: Number of Establishments by Zone and Firm Type	11
5. Sample Composition: Number of Establishments by Zone and Industry	12
6. Sample Composition: Number of Establishments by Firm Type and Establishment Size	13
7. Plant Characteristics by Firm Type	15
8. Shipments of Output and Inputs by Firm Type	18
9. Evaluation of Present Location by Firm Type	20
10. Evaluation of Present Location by Zone	22
11. Quality of Public Infrastructure Services by Zone	23
12. Characteristics of Movers	25
13. Distance of Move by Employment Size: Seoul and Gyeonggi .	26
14. Distance of Move by Employment Size: The Seoul Region ..	27
15. Experiences after Relocation of Movers	29
16. Important Factors for Choosing Present Location	30
17. Changes in Quality of Public Services after Relocation ..	31
18. Relocation, Branch Operation, On-site Expansion of Mature Firms by Employment Size	33
19. Future Expansion and Relocation Plans by Firm Type and Employment Size	34

1. Introduction

This paper as part of the World Bank research project (RPO 672-91), "An Evaluation of Industrial Location Policies for Urban Deconcentration," presents the results from a survey of establishments conducted to study the locational choice of manufacturing firms in the Seoul region.

Using the annual manufacturing surveys compiled by the Korean National Bureau of Statistics (NBS), the location patterns of employment and their changes were extensively analyzed in another paper (Lee, 1985a); this analysis, performed in terms of births, deaths, and relocation of firms, revealed a high degree of employment location dynamics and strong evidence of the spatial decentralization of manufacturing employment in the Seoul region, as briefly described in the next section.

In order to explain these observed location patterns, a survey of manufacturing establishments was conducted in the Seoul region using the 1981 NBS manufacturing survey as the sample base. The survey questionnaire was designed to take about one hour to complete and did not require the respondents to look up their accounting books; still the questionnaire contained a large amount of information with over 400 computer readable variables. This paper will present most salient aspects of the survey results which provide the basis for understanding the changing location patterns of manufacturing employment summarized in the next section. The analysis in this paper is descriptive but the underlying theoretical framework is that of the previous studies on Bogota, Colombia (Lee, 1981; 1982a).

After a brief overview of the manufacturing employment location patterns in the region, the sampling strategy is briefly described and the sample outcome is summarized. In the rest of the paper, the survey results are presented in three categories of findings: (1) Establishment characteristics, (2) site characteristics, and (3) the factors considered to be important for the respondent's locational choice. These results are contrasted and compared among the sample establishments by establishment size, firm type (i.e., mature firms, births, and movers), and industries studied.^{1/}

The underlying theoretical framework is that a firm of particular type will locate at a site with particular attributes in such a way that the selected location is optimal to the firm in an urban area, in terms of profits, costs, or some other criteria (Lee, 1982a). The establishment characteristics include type of products, production process, building characteristics, lot size, floor space, and skill composition of workers. The site attributes include proximities to product markets and input suppliers, commuting distance, transport modes, the quality and availability of public utilities and municipal services. The survey questionnaire prepared for this study contains a section on policy instruments used by the Korean government intended to influence firms' locational choice, which was absent in the Bogota study. The results on the effectiveness of policy instruments are reported in Lee (1985a).

^{1/} The studies by Schmenner (1981) on Cincinnati and New England and by Lee (1982b) on Bogota provided the empirical framework for this study.

2. Overview of Employment Location Patterns in the Seoul Region

In the studies of employment location in the literature, changes in location patterns in an urban area were examined by decomposing changes in the stock of employment in an area by the flows of births and deaths, relocation of jobs, and stationary growth and decline of employment.^{2/} This approach by concentrating on changes at the margin is analytically attractive since it avoids possible cross-section bias. The Seoul study also followed this approach, and the survey results reported in this paper will contrast and compare the behavioral responses by this classification of firms.

According to Chun and Lee (1985), manufacturing jobs accounted for 32 percent of employment in Seoul, which comes close to the manufacturing share of about 30 percent in large U.S. cities such as Boston, Chicago, and Los Angeles. In terms of employment dynamics, however, Seoul does not resemble large old U.S. cities like New York, Boston, or Cleveland. Table 1 indicates that the annual birth rate of firms in Bogota exceeds that of all five U.S. cities compared; Phoenix, with a birth rate of 7.6 percent, comes closest to Bogota's 8.8 percent. But the birth rate of firms in Seoul is more than twice that of Bogota; it is by far the highest even after discounting for the fact that 1978 was the cyclical peak. It should be also noted that the annual birth rate is greater than the annual death rate for Seoul, Bogota, Cali, Phoenix, and New York; the opposite is true for Boston, Minneapolis, and Cleveland. Seoul's annual rate of relocation was

^{2/} Schmenner (1981), Struyk and James (1975), Leone (1971), Finn (1976), Dennis (1978), Mason (1980), and Lee (1981, 1982b, 1985a).

Table 1: BIRTH, DEATH, AND RELOCATION RATES IN SEOUL, BOGOTA, CALI, AND U.S. CITIES

	<u>Births</u>				<u>Deaths</u>				<u>Movers ^{d/}</u>			
	<u>Establish-</u>		<u>Employment</u>		<u>Establish-</u>		<u>Employment</u>		<u>Establish-</u>		<u>Employment</u>	
	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>	<u>% of Annual</u>
	<u>base</u>	<u>rate</u>	<u>base</u>	<u>rate</u>	<u>base</u>	<u>rate</u>	<u>base</u>	<u>rate</u>	<u>base</u>	<u>rate</u>	<u>base</u>	<u>rate</u>
Cleveland <u>a/</u>	9.97	3.22	2.59	0.86	14.07	4.49	7.75	2.52	13.83	4.41	5.77	1.89
Minneapolis- St. Paul <u>a/</u>	12.29	3.94	6.17	2.02	18.00	5.67	11.25	3.62	15.93	5.05	8.28	2.69
Boston <u>a/</u>	6.10	1.99	1.30	0.43	13.40	4.28	8.00	2.60	9.80	3.17	4.70	1.54
Phoenix <u>a/</u>	24.40	7.55	12.10	3.88	20.20	6.32	5.30	1.74	8.90	2.88	4.70	1.54
New York <u>b/</u>	10.21	4.98	3.95	1.96	7.56	3.71	3.55	1.76	11.45	5.57	1.24	0.62
Bogota <u>c/</u>	52.38	8.79	31.96	5.70	27.01	4.90	12.61	2.40	19.12	3.56	16.59	3.12
Cali <u>c/</u>	43.13	7.44	24.48	4.48	26.88	4.88	11.27	2.16	18.33	3.42	10.40	2.00
Seoul <u>d/</u>	-	19.71 <u>e/</u>	-	11.55 <u>e/</u>	-	14.43 <u>e/</u>	-	10.26 <u>e/</u>	-	3.74 <u>f/</u>	-	1.86 <u>f/</u>
Seoul Region <u>d/</u>	-	22.75 <u>e/</u>	-	13.11 <u>e/</u>	-	13.57 <u>e/</u>	-	8.59 <u>e/</u>	-	4.85 <u>f/</u>	-	3.00 <u>f/</u>

a/ From R. Struyk and F. James, Intrametropolitan Employment Location, Lexington Books, 1975; covered 1965-68 period (1965 was the base year).

b/ From R. Leone, Location of Manufacturing Activity in the New York Metropolitan Area, 1971; covered 1967-69 period (1967 was the base year).

c/ From Lee (1982b), covered 1970-1975 period (1970 was the base year).

d/ Seoul is the area within the city limit; the Seoul region includes Gyeonggi province where Seoul is located.

e/ Rates for 1977-1978 with 1977 as the base year.

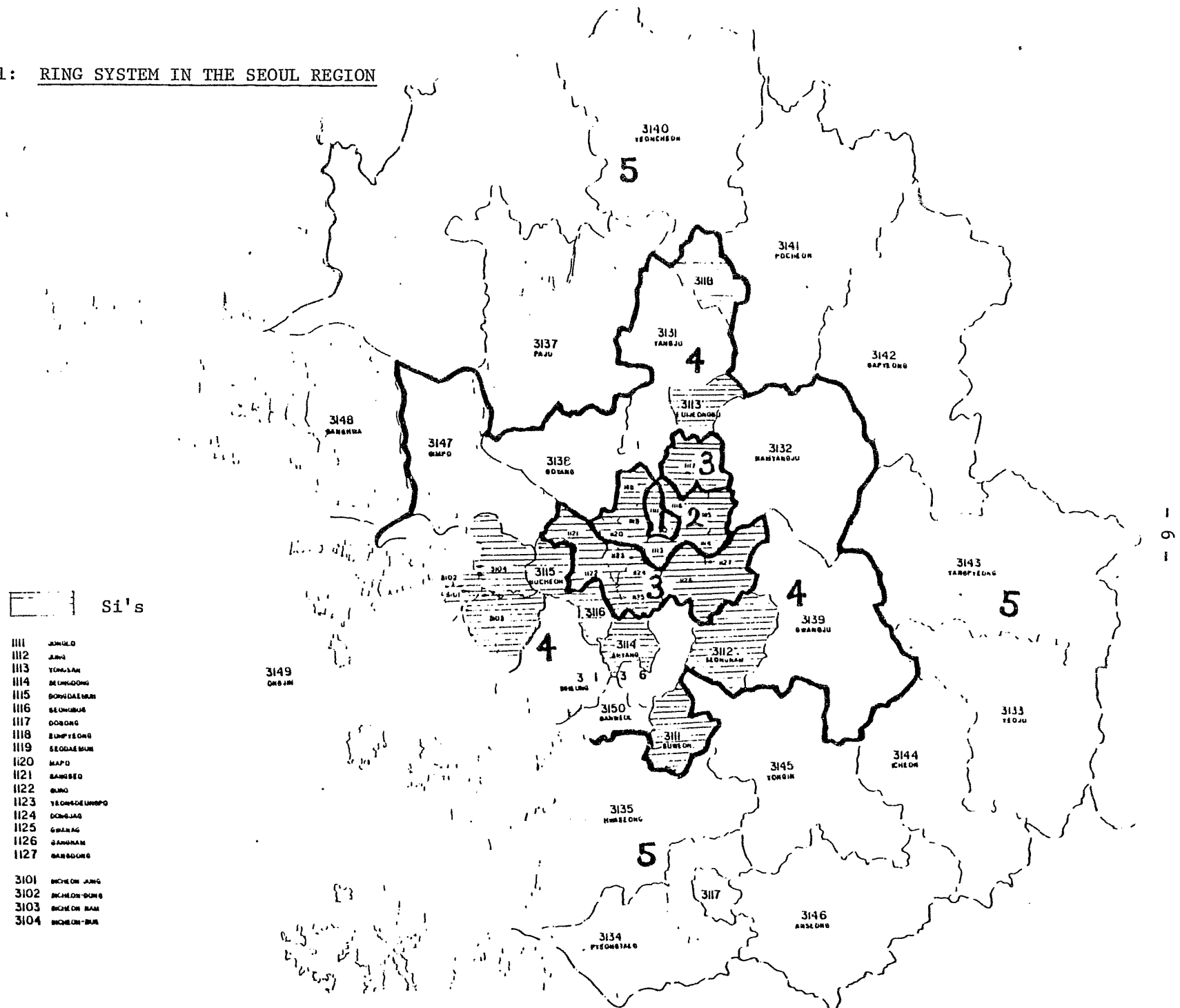
f/ The annual average for 1978-1981 as percent of the base year number of establishments and employment respectively.

comparable to those of other cities. In all cases, the activity rates in terms of establishments are greater than the rates based on employment. This indicates that the marginal firms are small ones which have a greater propensity to move, to start up and close down business.

The Seoul region in this study includes Seoul and Gyeonggi province where Seoul is located. Seoul has 17 districts called Gu; Gyeonggi has 9 cities (Si's) and 19 counties (Gun's) including Banweol, a new industrial district. For analyzing changes in employment location patterns, these 45 subareas are aggregated into five "rings," three in Seoul and two in Gyeonggi (see Figure 1). Ring 1 is the Central Business District (CBD); Ring 2 includes Gu's in old Seoul to the north of the Han river, except for the northmost Gu that belongs to Ring 3 which includes all Gu's in South Seoul (south of the river). Ring 4 has Banweol and 8 cities except Songtan, a newly elevated Si, near the southern border of the province, and Ring 5 includes all outlying Gun's.

Table 2 shows the strong decentralization of manufacturing employment in the Seoul region. During 1973-1978, the CBD (Ring 1) experienced a net loss of manufacturing jobs at an annual rate of -7.6, but manufacturing employment grew at an accelerating rate as the distance from the city center increases. The annual growth rate of employment in Ring 5 was 34 percent! This resulted from a steady movement of manufacturing firms outward as they grew larger and needed more space. Moreover, the evidence shows that small new firms tended to locate in the central area where various externalities were readily available, and the birth of large new firms tended to take place in the outer areas of the city. In Rings 2 and 3 the annual growth rate of employment was much smaller than that of establishments while the opposite was true for Rings 4 and 5.

Figure 1: RING SYSTEM IN THE SEOUL REGION



Si's

- 1111 JANGIL
- 1112 JUNG
- 1113 YONGJAM
- 1114 SEUNGDOONG
- 1115 DONGDAEMUN
- 1116 SEONGBUK
- 1117 DOBONG
- 1118 EUMYEONG
- 1119 SEODAEJUM
- 1120 MAPD
- 1121 SANGSO
- 1122 GUMHONG
- 1123 YEONGDEUNGPO
- 1124 DONGJANG
- 1125 GUMHONG
- 1126 SANGNAM
- 1127 BANGSOONG
- 3101 INCHEON JUNG
- 3102 INCHEON GONG
- 3103 INCHEON NAM
- 3104 INCHEON BUK

Table 2: CHANGES IN EMPLOYMENT AND ESTABLISHMENTS^{a/} BY RING
IN THE SEOUL REGION, 1973 AND 1978

	1973		1978		Annual Average Growth Rate (%)
	Number	%	Number	%	
<u>Employment</u>					
Ring 1	45,224	7.8	30,381	3.0	-7.6
Ring 2	162,403	28.0	167,960	16.3	0.7
Ring 3	202,289	34.8	340,826	33.1	11.0
Ring 4	155,351	26.8	425,000	41.2	22.3
Ring 5	15,577	2.7	67,136	6.5	33.9
Total	580,844	100.0	1,031,328	100.0	12.2
<u>Establishments</u>					
Ring 1	1,567	19.0	1,144	8.8	-6.1
Ring 2	2,786	33.7	3,091	23.8	2.1
Ring 3	1,479	17.9	3,515	27.1	18.9
Ring 4	1,829	22.1	4,248	32.7	18.4
Ring 5	608	7.4	981	7.6	10.0
Total	8,269	100.0	12,981	100.0	9.4

^{a/} Establishments with 5 or more employees.
Data Source: NBS Manufacturing Survey Files.

Source: Lee (1985a).

**Table 3: DISTRIBUTION OF MANUFACTURING EMPLOYMENT AND ESTABLISHMENTS
BY RING IN THE SEOUL REGION, 1973-1980**

	1973	1974	1975	1976	1977	1978	1979	1980
<u>Employment</u> ^{a/}								
Ring 1	7.8	5.5	6.1	4.1	3.8	3.0	3.1	3.1
Ring 2	28.0	26.9	22.5	20.4	19.3	16.3	15.2	14.8
Ring 3	34.8	34.7	34.6	36.2	34.2	33.1	32.0	30.3
Ring 4	26.8	29.9	33.3	35.0	37.7	41.2	42.2	43.4
Ring 5	2.7	3.0	3.5	4.2	5.0	6.5	7.5	8.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<u>Establishments</u> ^{a/}								
Ring 1	19.0	17.7	18.5	13.7	12.8	8.8	10.2	8.9
Ring 2	33.7	32.5	26.3	25.6	26.8	23.8	21.6	21.3
Ring 3	17.9	20.8	21.9	25.5	25.2	27.1	27.3	26.5
Ring 4	22.1	22.8	26.6	28.4	28.8	32.7	32.8	34.4
Ring 5	7.4	6.2	6.7	6.8	6.5	7.6	8.0	8.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^{a/} Establishments with 5 or more employees.
Data Source: NBS Manufacturing Survey Files.

Source: Lee (1985a).

Table 3 shows changes in location patterns of manufacturing employment by ring over a longer period, 1973-1980. The decentralization trend was remarkably consistent during the period: Rings 1, 2, and 3 (i.e., Seoul) lost employment shares while Rings 4 and 5 (i.e., Gyeonggi) gained their shares (see Lee, 1985a for more details).

3. Sampling Strategy and Sample Outcome

A sample of 499 manufacturing establishments interviewed in the survey was drawn from the 1981 manufacturing establishment survey file of the National Bureau of Statistics. The file contained 33,425 manufacturing establishments with five or more employees, of which 15,119 establishments were located in the Seoul region. In response to our request NBS included in the 1981 survey questionnaire additional questions, including the founding date of the establishment, the previous location, the date of relocation, and reasons for relocation. This information enabled us to take a random sample stratified by the following four categories: (1) location tenure, i.e., newly established firms (births), relocated firms (movers), and those stayed at the same location (mature firms) 3/; (2) firm size by employment; (3) the zone system defined by the 45 subareas of Gu's, Si's, and Gun's; and (4) the type of industries defined by the SIC codes.

In order to minimize the cost of sampling while having a sufficient number of observations for econometric estimation, we chose two two-digit industries, the textile and the fabricated metal

3/ Births are defined as those established in 1979 or thereafter; movers are those that relocated during 1979-1981; mature firms are those established before 1979 and never moved.

industries. These industries without much locational idiosyncrasy should be more amenable to policies than some other industries such as cement or steel. Moreover, both industries had a large share of establishments in the region accounting for 52.4 percent of total manufacturing. The homogeneity of firms in each industry group makes it possible to test behavioral hypotheses with sufficient degrees of freedom (in Lee, 1985b).

The second consideration given in the sampling process was to over-sample large firms so that the number of workers included in the sample could be maximized and also to over-sample those firms relocated in response to government actions such as relocation orders. Finally, an attempt was made to cover a wide geographic area in such a way that spatial analyses could be possible covering the entire region. Our target sample size was 500 with about equal shares of establishments among the three types of location tenure.

The realized sample of 499 establishments consists of 221 mature firms, 137 births, and 141 movers (see Table 4). The average size of newly established firms was smallest (Table 6). The sample coverage across zones was satisfactory; of the 45 subareas in the region, 39 were represented. The geographic distribution of the sample firms was consistent with that of the population.

In some cases the four-way stratification severely limited the possibility of drawing sample establishments from a specific population category. For example, not enough textile firms were located in certain subareas. It should be noted here that the sample was drawn from the 1981 establishment file and the survey was taken in 1983. Some firms

Table 4: SAMPLE COMPOSITION: NUMBER OF ESTABLISHMENTS BY ZONE AND FIRM TYPE

Zone	Mature	Births	Movers	Total
Ring 1	8	11	2	21
	38.10	52.38	9.52	100.00
	3.62	8.03	1.42	4.21
Ring 2	55	22	8	85
	64.71	25.88	9.41	100.00
	24.89	16.06	5.67	17.03
Ring 3	65	32	15	112
	58.04	28.57	13.39	100.00
	29.41	23.36	10.64	22.44
Ring 4	78	59	104	241
	32.37	24.48	43.15	100.00
	35.29	43.07	73.76	48.30
Ring 5	15	13	12	40
	37.50	32.50	30.00	100.00
	6.79	9.49	8.51	8.02
Total	221	137	141	499
	44.29	27.45	28.26	100.00
	100.00	100.00	100.00	100.00

Source: The Project Sample Establishment Survey.

Table 5: SAMPLE COMPOSITION: NUMBER OF ESTABLISHMENTS
BY ZONE AND INDUSTRY

Zone	Textile	Fabricated Metal	Other Manufacturing ^{a/}	Total
Ring 1	17	4	0	21
	80.95	19.05	0.00	100.00
	7.83	1.47	0.00	4.21
Ring 2	57	28	0	85
	67.06	32.94	0.00	100.00
	26.27	10.26	0.00	17.03
Ring 3	46	64	2	112
	41.07	57.14	1.79	100.00
	21.20	23.44	22.00	22.44
Ring 4	76	158	7	241
	31.54	65.56	2.90	100.00
	35.02	57.88	78.00	48.30
Ring 5	21	19	0	40
	52.50	47.50	0.00	100.00
	9.68	6.96	0.00	8.02
Total	217	273	9	499
	43.49	54.71	1.80	100.00
	100.00	100.00	100.00	100.00

^{a/} Includes the printing, the chemical, the mineral, the basic metal industries.

Source: The Project Sample Establishment Survey.

Table 6: SAMPLE COMPOSITION: NUMBER OF ESTABLISHMENTS BY FIRM TYPE AND ESTABLISHMENT SIZE

	1-4 ^{a/}	5-9	10-19	20-49	50-99	100-100	200-299	300-Over	Total
Mature	7	31	28	48	50	34	7	16	221
	3.17	14.03	12.67	21.72	22.62	15.38	3.17	7.24	100.00
	87.50	58.49	35.90	35.56	45.45	48.57	33.33	66.67	44.29
	2.86	6.97	14.39	32.19	68.34	130.12	249.14	1650.50	172.75 ^{b/}
Births	1	14	28	46	25	13	5	5	137
	0.73	10.22	20.44	33.58	18.25	9.49	3.65	3.65	100.00
	12.50	26.42	35.90	34.07	22.73	18.57	23.81	20.83	27.45
	2.00	6.14	13.32	31.80	69.84	130.23	207.00	374.80	60.38
Movers	0	8	22	41	35	23	9	3	141
	0.00	5.67	15.60	29.08	24.82	16.31	6.38	2.13	100.00
	0.00	15.09	28.21	30.37	31.82	32.86	42.86	12.50	28.26
	-	7.25	13.00	33.90	73.43	143.22	239.00	378.00	77.18
Total	8	53	78	135	110	70	21	24	499
	1.60	10.62	15.63	27.05	22.04	14.03	4.21	4.81	100.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	2.75	6.79	13.62	32.58	70.30	134.44	234.76	1225.67	114.89

^{a/} Persons.

^{b/} The bottom number in each cell is the mean employment size of firms in that cell.

Source: The Project Sample Establishment Survey.

apparently changed their line of production during this period; the final sample included nine establishments in other industries (Table 5).

As shown in Table 6, the average size of sample firms was 115 persons, which was much larger than the average size of all establishments in the Seoul region (77 persons in 1981 according to NBS). This resulted from the sample design of over-sampling large firms. In particular, it should be noted that the average firm size of births was 60 persons compared to 27 in the population. In the sample the average firm size of movers was slightly larger than that of births, but the average size of mature firms was more than twice these two groups.

4. The Survey Results

This section presents selected findings from the establishment survey in three categories: (1) Establishment characteristics, (2) site characteristics, and (3) important factors for locational choice of firms. Particular attention is given to the movers by summarizing their characteristics and the important factors that influence their choice of location. The materials are presented by comparing the three types of firms (mature, births, and movers) and by summarizing observed patterns by "ring" as the distance from the CBD increases.

Establishment Characteristics

Production plant. Table 7 shows several aspects of operational characteristics of the production plant. For the sample firms as a whole, more firms use a line-flow type production process housed in a single story plant. There are, however, interesting

Table 7: PLANT CHARACTERISTICS BY FIRM TYPE

	Mature	Births	Movers	All
<u>Production Process (% of estab.)</u>				
Line flow	42	44	50	45
Batch	23	26	18	23
Both	25	18	25	23
Other	10	12	7	9
Total	100	100	100	100
<u>Average Age of Buildings (years)</u>	13	10	6	10
<u>Land Owners (% of estab.)</u>	76	47	78	69
<u>Land for Expansion at Plant Site (% of estab.)</u>				
Sufficient	5	6	9	6
Modest	9	7	24	13
Insufficient	12	8	22	14
None	74	79	45	67
Total	100	100	100	100
<u>Number of Floor Levels (% of estab.)</u>				
One story	68	74	73	71
Two stories	20	14	20	18
Three stories	6	8	2	6
Four or more	1	2	0	1
Combination	5	2	5	4
Total	100	100	100	100
<u>Number of 8-Hour Shift (% of Estab.)</u>				
One	81	88	85	84
Two	15	10	14	14
Three	4	2	1	2
Total	100	100	100	100
<u>Average Employment Size (persons)</u>	(173)	(60)	(77)	(115)
<u>Number of Establishments</u>	221	137	141	499

Source: The Project Sample Establishment Survey.

contrasts among the three types of firms. The "birth firms"^{4/} are smaller than both movers and mature firms and more than a half of them are renters without having much land space for expansion. Compared with other two types of firms, a larger proportion of the birth firms tends to use a batch process type production technique on a single shift basis. The buildings used by the birth firms are much older than those of movers and tend to be more complex with a combination of single and multi-level structures. These plant characteristics of the birth firms represent those of places of manufacturing activities in the central area. These findings on the attributes of the birth firms are consistent with the "incubator hypothesis" which states that small new firms tend to locate in a central area where various externalities are readily available.^{5/} As expected, proportionately more movers tend to use modern (line-flow) production technology and have more land space for future expansion.

On the whole the plant characteristics of the birth firms are quite similar to those of the mature firms except that the latter are almost three times larger, and use more multi-story buildings, and more multi-shift operations than the former. It is possible that the birth firms tend to locate in the established industrial areas where mature firms operate (Lee, 1981).

Multi-plant operations. It is significant to note that only 31 firms (six percent) of the sample reported multi-plant operations; of

^{4/} For convenience, the births, i.e., newly established firms, will be called the "birth firms."

^{5/} The "incubator hypothesis" was tested in Lee (1981) for Bogota. Struyk and James (1975) tested this hypothesis for U.S. cities.

these 31 establishments, 17 were the company headquarters with their main plant and only the remaining 14 were branch plants. Five firms had two branch plants while two firms had as many as five. Of a total of 18 branches reported in the survey, six were located in Seoul, eleven in Gyeonggi and one outside the region. Only five establishments of the multi-plant firms were specializing in a portion of manufacturing process, indicating the near absence of the vertical integration of production process through branch operations. We may conclude that the manufacturing industry in Korea is dominated by single-plant operations.

Site Characteristics

Shipments and market access. In order to assess various means of input and output shipments, the questionnaire asked the percentage distribution of the value of goods shipped by different modes of transport. The use of trucks was by far the dominating means of goods shipments; Table 8 shows that 79 percent of firms use trucks for shipping all of their final products, and 85 percent of firms receive all of their inputs delivered by truck. On the average the sample firms use trucks for the shipment of about 83 percent of inputs and 88 percent of outputs. The use of trucks by movers was much greater than the other two groups, indicating better access to roads and trucking facilities in outer areas where they recently moved to.

The use of trucks has been well documented as a major explanatory factor for the decentralization trend in the U.S. cities.^{6/} Although the highway network in Korea is by no means at a scale comparable to the U.S., it seems clear that the extensive use of

^{6/} For example, Hoover and Vernon (1959), and Moses and Williamson (1967).

Table 8: SHIPMENTS OF OUTPUT AND INPUTS BY FIRM TYPE

	Mature	Births	Movers	All
<u>Output Shipped by Truck (% of estab.)</u>				
Less than 50%	1.8	0	1.4	1.2
50-74%	3.2	0	2.1	2.0
75-99%	4.5	2.2	2.8	3.4
100%	73.3	81.8	84.4	78.8
n.a.	17.2	16.1	9.2	14.6
Total	100.0	100.0	100.0	100.0
(Mean) ^{a/}	(79.4)	(83.8)	(88.5)	(83.2)
<u>Inputs Shipped by Truck (% of estab.)</u>				
Less than 50%	2.3	1.5	0.7	1.6
50-74%	1.8	0.7	3.6	2.0
75-99%	2.7	0.7	2.1	2.0
100%	81.0	84.7	90.8	84.8
n.a.	12.2	12.4	2.8	9.6
Total	100.0	100.0	100.0	100.0
(Mean) ^{a/}	(84.8)	(85.9)	(94.6)	(87.9)
<u>Outputs Sold in Seoul ^{b/} (% of estab.)</u>				
Less than 25%	14.5	11.0	17.0	14.2
25-49%	7.2	8.8	20.6	11.4
50-74%	19.5	11.0	25.5	18.8
75-100%	27.6	31.4	20.6	26.7
n.a.	31.2	38.0	16.3	28.9
Total	100.0	100.0	100.0	100.0
(Mean) ^{a/}	(42.5)	(40.4)	(43.2)	(42.1)
<u>Inputs Bought in Seoul ^{b/} (% of estab.)</u>				
Less than 25%	7.3	8.7	9.9	9.8
25-49%	8.1	5.8	6.4	7.0
50-74%	9.9	8.0	19.9	12.2
75-100%	48.0	48.9	45.4	47.5
n.a.	26.7	28.5	18.4	24.5
Total	100.0	100.0	100.0	100.0
(Mean) ^{a/}	(56.2)	(55.8)	(59.9)	(57.2)
<u>Number of Establishments</u>	221	137	141	499

^{a/} The average percent of the value of output or inputs for categories of firms.

^{b/} Includes the city of Seoul only.

Source: The Project Sample Establishment Survey.

trucks (and the decreasing importance of rail) has contributed to the decentralization trend of manufacturing employment in the Seoul region. It is remarkable to note that only one firm uses rail for shipping all of its output and six more firms for only a small portion. For the shipment of raw material inputs, however, only one firm indicated that it receives its inputs by rail, but only about 20 percent.

In large cities in developed countries, the manufacturing sector tends to be an "export" sector (Lowry, 1964). In the Seoul region on the average the sample firms export (to outside the region) only 58 percent of their outputs and import 43 percent of inputs (Table 8). The birth firms are more oriented to the local markets for both output and inputs than the other two groups. On the whole it seems difficult to classify the manufacturing industries as the export sector in Seoul. According to Schmenner (1981), in Cincinnati, for example, manufacturing firms exported between 70 to 90 percent of their output depending on the size of the firm; the mover firms with 100 or more employees in that city exported 95 percent of their outputs.

Evaluation of present location. In order to evaluate the conditions of the present location, the respondent was asked to state whether he feels very satisfied, more or less satisfied, or dissatisfied with respect to various locational attributes. Table 9 reports the percent of firms in each firm type that answered "very satisfied" with respect to each individual attribute. For example, 14 percent of the mature firms responded "very satisfied" with respect to land space at the present site. As a whole, the sample firms were "very satisfied" with highway access, proximities to suppliers and business services,

Table 9: EVALUATION OF PRESENT LOCATION BY FIRM TYPE

	<u>Mature</u>	<u>Births</u>	<u>Movers</u>	<u>All</u>
	(Percent of Establishments in Each Type)			
<u>"Very Satisfied" a/ with:</u>				
Land Space	14	9	18	14
Building Space	9	6	12	9
Cost of Land for Expansion	6	4	4	5
Availability of Skilled Workers	2	4	4	3
Availability of Unskilled Workers	2	4	5	3
Quality of Public Utilities <u>b/</u>	9	7	6	8
Quality of Municipal Services <u>c/</u>	15	15	13	14
Highway Access	24	23	18	22
Railroad Access	6	10	7	7
Proximity to Clients	10	16	3	10
Proximity to Suppliers	16	20	5	14
Amenities of Zone	24	18	26	23
Rent Payment	2	3	1	2
Cost of Skilled Workers	2	4	4	3
Cost of Unskilled Workers	3	4	3	3
Cost of Public Services	6	3	4	5
Proximity to Competitors	11	12	6	10
Land Expandability	5	3	5	4
Proximity to Business Services	15	21	8	15
Property Tax Burden	3	7	20	7
Cost of Municipal Services	9	4	10	7
Security	24	18	14	20
Recreation Facilities	5	4	1	4
Community Attitudes	13	15	9	12
Number of Establishments	221	137	141	499

a/ The questionnaire offered three possible responses: very satisfied, satisfied, not satisfied.

b/ Electricity, Water, etc.

c/ Police, fire protection, etc.

Source: The Project Sample Establishment Survey.

land space, amenities, and municipal services, while dissatisfied with the availability of both skilled and unskilled workers, and the cost of public services.

As expected, a much larger proportion of the recent movers felt "very satisfied" with land and building space than the birth and mature firms. However, only a few movers responded "very satisfied" with respect to proximities to clients, suppliers, and business services; proportionately more birth firms were satisfied with these attributes and railroad access indicating their tendency to locate in the central area.

The information in Table 9 was processed according to the zone of location (by ring) and reported in Table 10. The level of satisfaction increases with the distance from the center with respect to land and building space, highway access, amenities, and the cost of municipal services. The opposite is true for the availability of skilled and unskilled workers and the quality of municipal services; in particular, as the distance increases the level of satisfaction declines rapidly with respect to proximities to clients, suppliers, and business services, and also for recreation facilities. These findings support the hypothesis that the rapid decentralization of manufacturing jobs in the region has not been accompanied by adequate housing development and public investment for infrastructure and other urban services.

The Quality of Public Infrastructure Services was more closely evaluated in the survey. Table 11 shows the quality variations by ring in the region. For all items listed, the quality of services declines markedly as the distance from the CBD increases. This again confirms that public policies for infrastructure investment have been lagging

Table 10: EVALUATION OF PRESENT LOCATION BY ZONE

	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	All
"Very satisfied" <u>a/</u> with:						
Land Space	0	5	4	17	48	14
Building Space	0	5	5	10	25	9
Cost of Land for Expansion	0	0	0	6	25	5
Availability of Skilled Workers	5	6	1	3	0	3
Availability of Unskilled Workers	5	6	1	4	0	3
Quality of Public Utilities <u>b/</u>	0	13	6	7	13	8
Quality of Municipal Services <u>c/</u>	33	19	13	10	28	14
Railroad Access	0	6	5	7	20	7
Highway Access	0	4	27	21	65	22
Proximity to Clients	52	12	12	5	8	10
Proximity to Suppliers	67	19	17	9	18	14
Amenities of Zone	5	12	13	26	70	23
Rent Payment <u>d/</u>	0	5	0	2	-	2
Cost of Skilled Workers	5	4	2	4	0	3
Cost of Unskilled Workers	5	4	3	3	3	3
Cost of Public Services	0	7	5	3	10	5
Proximity to Competitors	14	9	9	7	25	10
Land Expandability	0	0	2	3	28	4
Proximity to Business Services	57	31	14	8	3	15
Property Tax Burden	5	2	3	14	10	7
Cost of Municipal Services	5	1	5	5	30	7
Security	33	31	15	15	35	20
Recreation Facilities	24	4	5	2	3	4
Community Attitudes	0	7	12	11	38	12
Number of Establishments	21	85	112	241	40	499

a/ The questionnaire offered three responses: very satisfied, satisfied, not satisfied.

b/ Electricity, water, etc.

c/ Police, fire protection, etc.

d/ Owners' responses included.

Source: The Project Sample Establishment Survey.

Table 11: QUALITY OF PUBLIC INFRASTRUCTURE SERVICES BY ZONE

	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	All
	(Percent of Establishments in Each Ring)					
Electricity Never Interrupted	67	57	58	35	28	47
Water Never Interrupted	71	85	83	49	15	61
Excellent Telephone Service	100	76	53	46	58	56
Excellent Telegraph Service	71	41	14	25	5	26
Excellent Garbage Collection Service ^{a/}	19	11	10	7	10	9
Excellent Fire Protection	57	58	39	25	35	36
Number of Establishments	21	85	112	241	40	499

^{a/} 178 firms responded as using municipal services.

Source: The Project Sample Establishment Survey.

behind the increasing demand for better quality services as both jobs and people move to outer areas.

Important Factors for Location Choice

Characteristics of movers. As shown in Table 12, for the majority of firms in both industries, the condition of the plant at the previous location was either cramped or worn out. Only a small number of firms had still serviceable plants. Most movers went through changes in production technology. The fabricated metal industry, however, experienced less changes in technology; as much as 22 percent of firms in this industry kept the same production method after move. In the case of the textile industry the plant relocation accompanied substantial changes in technology.

The fabricated metal industry, with less changes in production technology, was able to retain more workers after relocation than the textile industry. For all sample firms, 80 percent of employees stayed with the same establishment after relocation.

Table 13 shows that the moving distance increases with firm size.^{7/} This was true for both Seoul and Gyeonggi. Within Seoul most of small firms moved about 1 to 2 kilometers while large ones more than 5 kilometers. The average moving distance was many times longer in Gyeonggi than Seoul. The general pattern of moving distance by firm size holds when the sample firms from Seoul and Gyeonggi are pooled in Table 14.

Important Location Factors for Movers. In order to examine the experiences of the movers after relocation, the respondent was asked

^{7/} This confirms the similar findings by Moses and Williamson (1967) and Schmenner (1982).

Table 12: CHARACTERISTICS OF MOVERS

	Textiles	Fabricated Metal	Other Manufac- turing	Total
	(Percent of Establishments)			
<u>Condition of Previous Plant</u>				
Good but cramped	40	43	100	43
Good but obsolete	3	6	0	5
Still serviceable	20	7	0	10
Worn out	37	43	0	41
n.a.	0	1	0	1
Total	100	100	100	100
<u>Change in Technology After Move</u>				
Considerably	9	11	0	10
Moderately	80	66	50	70
No Change	11	22	50	20
n.a.	0	1	0	0
Total	100	100	100	100
<u>Percent of Workers Stayed After Move</u>				
Less than 50%	23	19	50	20
50-99%	49	40	0	42
100%	23	39	50	35
n.a.	5	2	0	3
Total	100	100	100	100
(Mean) <u>a/</u>	(76)	(82)	(70)	(80)
<u>Number of Establishments</u>				
	35	104	2	141

a/ Average percent of the number of workers who stayed after move.

Source: The Project Sample Establishment Survey.

Table 13: DISTANCE OF MOVE BY EMPLOYMENT SIZE:
SEOUL AND GYEONGGI

		1-24 Persons	25-99 Persons	100 or more Persons	Total
<u>Seoul</u>	1-2 km	50.0%	58.3%	-	48.0%
	3-5	30.0	-	33.3	16.0
	6-10	10.0	8.3	33.3	12.0
	11-15	10.0	8.3	33.3	12.0
	16-20	-	25.0	-	12.0
	Total (Mean in km)	100.0 (4.3)	100.0 (7.5)	100.0 (8.3)	100.0 (6.3)
<u>Number of Establishments</u>		10	12	3	25
<u>Gyeonggi</u>	1-2 km	7.4%	1.8%	-	2.6%
	3-5	3.7	1.8	-	1.7
	6-10	3.7	5.3	-	3.5
	11-15	-	10.5	3.1	6.0
	16-20	11.1	3.5	9.4	6.9
	21-25	11.1	1.8	3.1	4.3
	26-30	14.8	10.5	9.4	11.2
	31-35	11.1	10.5	9.4	10.3
	36-40	14.8	14.0	18.8	15.5
	41-50	7.4	14.0	12.5	12.1
	51-60	14.8	17.5	21.9	18.1
	61 or more		8.8	12.5	7.8
	Total (Mean in km)	100.0 (31.9)	100.0 (39.0)	100.0 (44.6)	100.0 (38.9)
<u>Number of Establishments</u>		27	57	32	116

Source: The Project Sample Establishment Survey.

Table 14: DISTANCE OF MOVE BY EMPLOYMENT SIZE
THE SEOUL REGION

Km	1-24 Persons	25-99 Persons	100 or more Persons	Total
1-2	18.9%	11.6%	-	10.6%
3-5	10.8	1.5	2.9	4.3
6-10	5.4	5.8	2.9	5.0
11-15	2.7	10.1	5.7	7.1
16-20	8.1	7.3	8.6	7.8
21-25	8.1	1.5	2.9	3.6
26-30	10.8	8.7	8.6	9.2
31-35	8.1	8.7	8.6	8.5
36-40	10.8	11.6	17.1	12.8
41-50	5.4	11.6	11.4	9.9
51-60	10.8	14.5	20.0	14.9
61 or more	-	7.3	11.4	6.4
Total	100.0	100.0	100.0	100.0
(Mean in km)	(24.5)	(33.5)	(41.5)	(33.1)
<u>Number of Establishments</u>	37	69	35	141

Source: The Project Sample Establishment Survey.

to evaluate changes in various attributes of the establishment and the plant site. Table 15 lists these attributes and reports to what extent they changed after relocation. First, we note that in terms of median percent increase after move, plant space, land space, and the commuting distance of managers increased most, each by 100 percent. Although the majority of firms experienced an increase in the input delivery distance and the product shipment distance, the median value of actual increases was small. The commuting distance of workers also did not change much. This does not mean that these distance factors were unimportant for location choice; it is more likely that these factors were so important that the firms tended to move without affecting proximities to the markets and suppliers and access to labor.

Table 16 lists a number of factors that should influence the location choice. The respondents were asked to pick three factors in the order of importance. Land price, and land and building space were most important, followed by proximities to clients and suppliers, and access to government services (which are available in Seoul). Relative to these attributes, the availability of workers, wage costs, and the quality and costs of public services were unimportant.

In Table 17, it is significant to note that the quality of public utilities and municipal services did not improve substantially after relocation for the majority of firms, which is consistent with the findings on the important location factors above. Moreover, a substantial number of firms felt that the quality of services became worse; the telephone service was affected most. Electricity, water, and sewerage showed some improvement after relocation. The overall picture implies that in the Seoul region the public infrastructure services play

Table 15: EXPERIENCES AFTER RELOCATION OF MOVERS

	Percent of Movers ^{a/}			n.a.	Median % Increase ^{b/}
	After < Before	After = Before	After > Before		
Production	18.4	6.4	69.5	5.7	18.0
Plant space	2.1	6.4	82.9	8.5	100.0
Land space	2.1	4.3	87.2	4.3	100.0
Rent Payment	2.8	5.0	13.5	78.7	20.0
Number of skilled workers	11.4	14.9	57.5	16.3	17.5
Wage of skilled workers	1.4	7.1	80.1	11.4	20.0
Number of unskilled workers	13.5	12.1	52.5	18.9	20.0
Wage of unskilled workers	0.7	7.8	73.8	17.7	20.0
Distance to work by managers	15.6	9.2	53.2	22.0	100.0
Distance to work by workers	29.3	16.3	30.5	22.8	10.0
Distance of product shipment	6.4	18.4	53.9	21.3	10.0
Distance of input delivery	6.4	14.2	57.5	22.0	30.0
Profits	38.3	9.2	33.3	19.2	0.0
Local tax payments	26.2	19.2	24.8	29.8	0.0
Cost of public services	9.2	24.8	31.2	34.8	0.0

^{a/} 141 Movers of the Sample; sum equals 100% for each item.

^{b/} Median of actual percent increase after move among all firms responded.

Source: The Project Sample Establishment Survey.

Table 16: IMPORTANT FACTORS FOR CHOOSING PRESENT LOCATION
(Percent of Movers)

Factors	Order of Importance ^{a/}		
	1st	2nd	3rd
Land space	15.6	10.6	5.0
Building space	10.6	7.8	2.8
Rent payment	2.8	2.8	1.4
Availability of skilled workers	3.6	2.1	4.3
Cost of skilled workers	0.7	-	-
Availability of unskilled workers	0.7	1.4	0.7
Cost of unskilled workers	-	-	-
Cost of public services	-	0.7	0.7
Quality of public services	0.7	0.7	4.3
Proximity of suppliers	5.0	2.1	5.0
Proximity of clients	7.1	6.4	1.4
Proximity of competitors	0.7	0.7	1.4
Highway access	2.1	2.1	4.3
Road access	-	-	-
Land expanability	1.4	0.7	0.7
Cost of lot for expansion	1.4	1.4	2.1
Proximity to business services	-	0.7	-
Property tax burden	1.4	0.7	1.4
Municipal services	-	-	-
Cost of municipal services	0.7	-	-
Security	-	-	-
Amenity of environment	1.4	2.8	2.8
Recreation facility	0.7	0.7	-
Community attitudes	-	0.7	-
Purchasing price of lot	16.3	8.5	4.3
Simpleness of lot purchase	2.1	2.8	-
Distance to Seoul	5.7	7.8	3.6
Distance of relocation	0.7	-	-
Industrial area	2.1	1.4	0.7
Access to government services	7.8	1.4	2.1
Prospect of future development	-	5.0	2.8
Other	7.1	4.3	1.4
Missing	3.6	23.4	46.8
Total	100.0	100.0	100.0

^{a/} Of 141 movers, 136 responded to 1st, 108 to 2nd, 75 to 3rd.

Source: The Project Sample Establishment Survey.

Table 17: CHANGES IN QUALITY OF PUBLIC SERVICES AFTER
RELOCATION
(Percent of Movers)

	Substantially Improved	Somewhat Improved	Unchanged	Became Worse	n.a
Electricity	16.3	31.2	46.1	5.7	0.7
Water	12.1	28.4	39.0	19.2	1.4
Fire protection	7.8	22.0	57.5	10.6	2.1
Police Service	4.2	15.6	58.9	19.9	1.4
Sewerage	11.4	34.4	31.9	22.0	0.7
Waste Removal	7.8	31.9	36.9	22.7	0.7
Road Maintenance	7.8	24.1	39.7	27.7	0.7
Telephone	6.4	19.9	30.5	42.6	0.7
Telegraph	3.6	9.9	44.0	9.2	33.3

Source: The Project Sample Establishment Survey.

an insignificant role in influencing locatioin choice of movers; it may also reflect the ineffectiveness of spatial policies intended to induce industries to certain areas.

Plans to expand and relocate should reflect the extent of the locational dynamics, i.e., the need for adjustment toward a locational equilibrium in an urban area. About a third of the mature firms in the sample indicated that they seriously considered relocation, and 12 percent considered opening branch plants (Table 18). Larger firms tend to have less propensity to move but a greater probability of starting branch operations. While only a few firms actually opened branch plants during this period, a larger number of establishments had on-site expansion.

Table 19 shows tnat for the sample establishments as a whole including all types of firms, 27 percent indicated having a plan to relocate in the next five years, which amounts to an annual relocation rate of about five percent, that is consistent with what was observed in Table 1. It is interesting to note that proportionately more recent movers showed the propensity to expand on site than mature and birth firms, but a larger proportion of the latter groups however had relocation plans compared to recent movers. The table also shows that large firms tend to expand at the same location while small firms tend to relocate, which again confirms the hypothesis that small firms operate in the central areas.

Table 18: RELOCATION, BRANCH OPERATION, ON-SITE EXPANSION
OF MATURE FIRMS BY EMPLOYMENT SIZE
(Percent of Establishments)

	Less than 25 persons	25-99 Persons	100 or more Persons	All
<u>Relocation Considered Since 1979</u>				
No	64.9	57.5	73.7	64.3
Yes	33.8	39.1	26.3	33.9
n.a.	1.3	3.4	0.0	1.8
Total	100.0	100.0	100.0	100.0
<u>Branch Considered Since 1979</u>				
No	93.5	83.9	82.5	86.9
Yes	6.5	12.6	17.5	11.8
n.a.	0.0	3.5	0.0	1.3
Total	100.0	100.0	100.0	100.0
<u>Branch Opened Since 1979</u>				
No	96.1	92.0	87.7	92.3
Yes	2.6	3.5	5.3	3.6
n.a.	1.3	4.5	7.0	4.1
Total	100.0	100.0	100.0	100.0
<u>Expanded on Present Site Since 1979</u>				
No	89.6	75.9	71.9	79.6
Yes	10.4	18.4	28.1	18.1
n.a.	0.0	5.7	0.0	2.3
Total	100.0	100.0	100.0	100.0
<u>Average Firm Size (Persons)</u>	(11)	(54)	(572)	(173)
<u>Number of Establishments</u>	77	87	57	221

Source: The Project Sample Establishment Survey.

Table 19: FUTURE EXPANSION AND RELOCATION PLANS BY
FIRM TYPE AND EMPLOYMENT SIZE
(Percent of Establishment)

	Mature	Births	Movers	All
<u>Plan to Expand Next 5 Years</u>				
No	77.4	83.2	64.5	75.4
Yes	20.8	16.1	31.2	22.4
n.a.	1.8	0.7	4.3	2.2
Total	100.0	100.0	100.0	100.0
<u>Plan to Relocate Next 5 Years</u>				
No	63.4	65.0	82.3	69.1
Yes	33.0	29.9	13.5	26.7
n.a.	3.6	5.1	4.2	
Total	100.0	100.0	100.0	100.0
<u>Number of Establishments</u>				
	221.0	137.0	141.0	499.0
	<u>Less than</u>	<u>25-99</u>	<u>100 or more</u>	<u>All</u>
	<u>25 persons</u>	<u>Persons</u>	<u>Persons</u>	
<u>Plan to Expand Next 5 years</u>				
No	86.0	73.3	62.0	75.4
Yes	12.0	24.0	34.8	22.4
n.a.	1.2	2.7	2.6	2.2
Total	100.0	100.0	100.0	100.0
<u>Plan to Relocate Next 5 Years</u>				
No	61.1	68.7	81.7	69.1
Yes	37.1	25.8	12.1	26.7
n.a.	1.8	5.5	5.2	4.2
Total	100.0	100.0	100.0	100.0
<u>Average Firm Size (Persons)</u>				
	(173)	(60)	(77)	(115)
<u>Number of Establishments</u>				
	167	217	115	499

Source: The Project Sample Establishment Survey.

5. Summary of Findings and Concluding Remarks

A survey of 499 manufacturing establishments was conducted in the Seoul region to study factors that influence the locational choice of individual firms. This paper presented selected findings from the establishment survey in order to understand and explain the observed aggregate patterns of manufacturing employment location in the region (Lee, 1985a).

The survey results revealed the following characteristics of manufacturing establishments: The industry is dominated by single-plant operations with a moderate production scale. The majority of the establishments uses a line-flow type production process housed in a single story plant and operates on a one-shift basis. The newly established firms (i.e., births) are small and tend to operate in more complex building structures; for them, a batch process type production technique is more common. Most shipments of inputs and final products are made by trucks; rail is seldom used. These characteristics of small new firms are consistent with the "incubator hypothesis" that their birth place tends to be in central areas of the city where various externalities are readily available.

The sample establishments as a whole export less than 60 percent of their products to outside the region. It would be difficult to treat the manufacturing industries in Seoul as the "export sector" in the Lowry (1964) context. The lack of multi-plant operations and the moderate production scale seem to be consistent with the local market orientation of manufacturing establishments in Seoul.

The majority of firms expressed their satisfaction with respect to highway access, proximities to suppliers and business services, while dissatisfied with the availability of workers, and the costs of public services. As expected, the level of satisfaction increases with the distance from the center with respect to land and building space, highway access, and amenities, and it decreases with respect to proximities to clients, suppliers, and business services. The quality of infrastructure services declines markedly as the distance from the CBD increases.

In general the plant relocation tends to accompany changes in production technology. Twenty percent of movers kept the same production method after relocation, however. For the majority of movers, the distance moved within Seoul was fairly short, about 1-2 kilometers; the large size firms moved longer distances. Eighty percent of workers stayed with the firm after relocation. The movers substantially increased both plant and land space at the new location and experienced a significant increase in the commuting distance of managers. For the majority of the firms, however, both input and output delivery distances and the commuting distance of production workers stayed about the same after move. Land price and land and building space were the most important factors in the firm's locational choice, followed by proximities to clients and suppliers, and access to government services. Public infrastructure services seem to play an insignificant role in influencing the firms' locational choice when they move.

Twenty-seven percent of sample firms indicated a plan to relocate within the next five years; proportionately more birth and mature firms showed the propensity to relocate than recent movers. Large firms tend to choose on-site expansion while small firms tend to relocate.

The survey findings on the individual firm behavior support the changing location patterns of employment summarized in Section 2, and provide a substantial amount of explanations for the observed patterns, in particular, the decentralization of employment in the region. It should be also noted that many of the results on Seoul are similar to those obtained by Schmenner (1982) for U.S. cities and Lee (1982b) on Bogota. Finally, the survey results are of an acceptable quality in terms of the sample composition and the stochastic properties. The econometric estimation of a model of firm location using this data set is presented in another paper (Lee, 1985b).

REFERENCES

- Chun, D.H. and K.S. Lee, (1985), "Changing Location Patterns of Population and Employment in the Seoul Region," Water Supply and Urban Development Department Discussion Paper No. UDD-65, The World Bank.
- Dennis, R. (1978), "The Decline of Manufacturing Employment in Greater London," Urban Studies.
- Firn, J. (1976), "Economic Micro Data Analysis and Urban-regional Change: The Experience of Gurie," In J.K. Swales ed. Establishment Based Research Conference Proceedings, Department of Social and Economic Research, University of Glasgow, Discussion Paper No. 22.
- Hoover, E.M. and R. Vernon (1959), Anatomy of a Metropolis, Harvard University Press.
- Lee, K.S. (1981), "Intra-urban Location of Manufacturing Employment in Colombia," Journal of Urban Economics.
- Lee, K.S. (1982a), "A Model of Intra-urban Employment Location: An Application to Bogota, Colombia," Journal of Urban Economics.
- Lee, K.S. (1982b), "Determinants of Intra-urban Location of Manufacturing Employment: An Analysis of Survey Results for Bogota, Colombia," Urban and Regional Report No. 81-3, The World Bank.
- Lee, K.S. (1985a), "An Evaluation of Decentralization Policies in Light of Changing Location Patterns of Employment in the Seoul Regions," Water Supply and Urban Development Department Discussion Paper No. UDD-60, The World Bank.
- Lee, K.S. (1985b), "A Model of Intra-urban Employment Location: An Application to Seoul Korea," Water Supply and Urban Development Department Discussion Paper (forthcoming).
- Lowry, I.S. (1964), A Model of Metropolis, The Rand Corporation, RM-4035-RC.
- Leone, R. (1971), Location of Manufacturing Activity in the New York Metropolitan Area, unpublished Ph.D. Dissertation, Yale University.
- Mason, C.M. (1980), "Industrial Decline in Greater Manchester 1966-1975: A Components of Change Approach," Urban Studies.

Moses, L. and H.F. Williamson, Jr. (1967), "The Location of Economic Activity," American Economic Review.

Schmenner, R. (1982), The Manufacturing Location Decision,
Prentice-Hall.

Struyk, R. and F. James (1975), Intrametropolitan Industrial Location,
Lexington Book.