

Employment Location and Spatial Policies: Colombia and Korea

Kyu Sik Lee

In the next two decades the urban population in developing countries is likely to continue to grow about four times as fast as in the industrial countries. Between 1975 and 2000 the urban areas of developing countries are expected to absorb about 1 billion people. In the mid-1970s the net annual addition to the populations of Mexico City and São Paulo, for example, was over a half million each; the number was over a quarter million each in Jakarta and Seoul. By 2000 the developing world will have forty cities with 5 million or more people; twenty are expected to have more than 10 million people. Until 1950 Buenos Aires was the only city in the developing world with a population of over 5 million (World Bank 1979, p. 72).

The rapid urbanization in these countries has produced a heavy concentration of population and economic activity in a very few large urban centers. This pattern of urban concentration has generated two main policy concerns. First, it is widely believed that the largest cities in these countries are getting "too big." This belief is not usually based on evidence that negative externalities such as pollution and congestion are greater than the benefits of agglomeration economies. It is more likely that the concerns about the size of the large cities stem from the decline in the quality of life of their high-income groups, from the frustrations of planners who have experienced enormous pressure in recent years to accommodate rapid urban growth, and from a fear that large cities may experience catastrophic failure

of management. The second and perhaps more easily understood policy concern focuses on regional equity, since in most countries it is politically and socially important to maintain a balance among regions in income, opportunities for education and employment, and urban amenities. Concerns about regional equity also often underlie programs and policies that attempt to redirect population growth from large cities.

In the middle-income countries of Latin America and East Asia, including Mexico, Brazil, Venezuela, the Philippines, and Korea, policymakers have paid a good deal of attention to various ways of reducing spatial biases toward large cities. More recently, the governments of those countries have initiated specific policies to decentralize economic activity away from the largest urban center to peripheral areas or secondary cities. Policy packages using diverse instruments have been initiated and implemented with varying degrees of success (Renaud 1981; Townroe 1979). Industrial location policies tend to be the most important of the decentralization policies. This is not surprising, since "the true determinants of urbanization and spatial concentration in developing countries are found in the forces that determine the location of employment opportunities: the nature and pattern of industrialization, the pace of agricultural development, and the growth of transportation and communication networks" (World Bank 1979, p. 76). More specifically, the decentralization policies include explicit policy instruments that are intended to relocate existing industries from the large urban centers or to induce new industries to new industrial zones, secondary cities, or lagging regions.

The rationale for policies to decentralize economic activity is difficult to justify solely on economic grounds

Note: This chapter has been published in somewhat different form as "Decentralization Trends of Employment Location and Spatial Policies in *Loc Cities*," *Urban Studies*, vol. 22 (April 1985), pp. 151-62. It has been edited slightly.

because these policies are an outcome of diverse social, political, and economic objectives: interregional equity, political cohesion, national defense, and prevention of a catastrophic failure of urban management. Because decentralization policies are deemed plausible responses to this complex set of policy objectives, they are likely to be pursued in the middle-income countries, and it is extremely important to help governments select policies that are least damaging to the overall welfare of the economy.

For analytical reasons it is convenient to address employment location policies at two levels of spatial aggregation: deconcentration policies that are intended to modify employment location patterns within the capital region and decentralization policies that are intended to influence spatial patterns at the national level. The former involves a study of intrametropolitan phenomena; the latter deals with interregional issues, including the development of secondary cities and lagging regions. This chapter is confined to intrametropolitan issues.

To formulate sound spatial policies and to implement plans and programs efficiently, it is essential for policy-makers to understand the trend of employment location patterns and how firms' location behavior tends to produce a trend. In the Bogotá City Study conducted by the World Bank, analytical and empirical results were established regarding firms' location decisions, but a study of policy effects was not undertaken because explicit policy instruments were not implemented in Bogotá. Measurement of such policy effects is the focus of World Bank research on employment location policies in Korea, a country with a long history of policy experiments. This chapter reports the empirical findings from the Bogotá City Study, which had a heavy behavioral focus, and draws some policy conclusions from the Korean experience with spatial policy.

Observed Patterns of Employment Location

This section documents the employment location patterns of four major industry groups—manufacturing, commerce, finance, and services—which together account for about 85 percent of total employment in Bogotá and Cali.¹ Three main data sets are used: the 1978 household survey for both cities, the 1972 household survey for Bogotá, and the social security establishment files for Cali (1976) and Bogotá (1978). Ideally the data for the study of employment location should be based on the establishment. Although the social security files are such data sets, their coverage of small firms is poor. The 1978 household survey, which was jointly prepared by the World Bank and the Colombian National Statistics Department (DANE), had a module for obtaining informa-

tion on firms where the respondents worked. The questions covered the location of the workplace, the number of workers in the firm, the initial year of operation at the present location, the previous location (if applicable), and the type of business.

Making inferences about the characteristics of firms where the household members work on the basis of a household survey requires some justification. The household survey results can be compared ex post with the social security data regarding firm characteristics important for this study, because the household survey questionnaire asked the respondent whether his firm was affiliated with the social security system. The distributions given by the household survey regarding the firms affiliated with the social security system can therefore be compared with the corresponding distributions from the social security data. In terms of the percentage distribution of several firm characteristics—size, type of industry, and location—the two data sets are strikingly similar, which increases our confidence in inferences drawn from the household survey. Most of the analyses in this section are thus based on the information from the 1978 household survey, which covers all workers regardless of the size of the firms in which they work.

Employment shares of major sectors in Bogotá and Cali are similar to those of other cities of the world. As shown in table 8-1, the share of manufacturing employ-

Table 8-1. *Employment Share of Major Sectors in Selected Cities*
(percent)

City	Manu- facturing	Commerce	Services ^a
Bogotá, Colombia (1978)	23.6	20.3	40.9
Cali, Colombia (1978)	31.1	21.6	32.6
Seoul, Rep. of Korea (1970)	22.7	28.9	33.0
Kuala Lumpur, Malaysia (1970)	20.5	17.6	35.5
Manila, Philippines (1970)	22.1	13.8	37.3
Abidjan, Côte d'Ivoire (1970)	22.5	18.6	42.8
Tunis, Tunisia (1972)	18.9	17.5	39.2
United States, small cities (1960)	25.1	28.4	28.8
United States, large cities (1960)	30.2	32.6	24.8

a. Includes financial services.

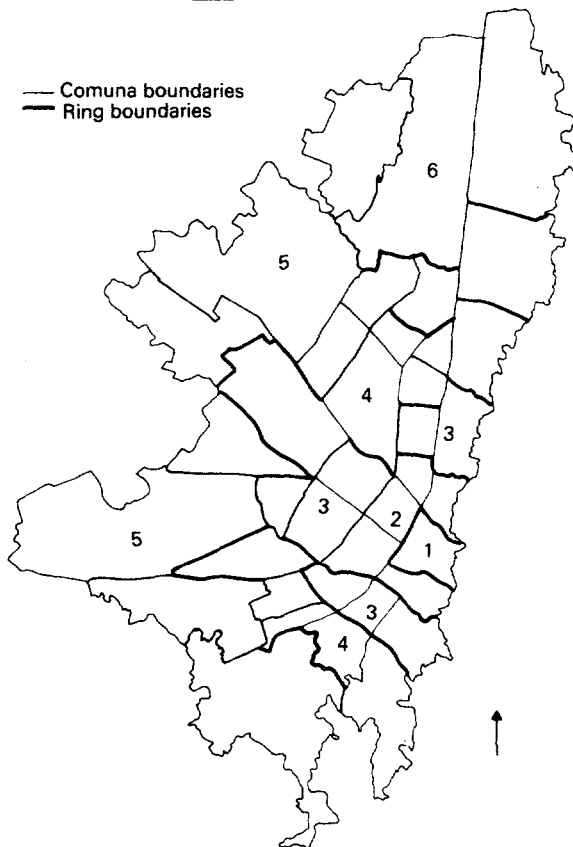
Sources: The values for Bogotá and Cali are based on the 1978 DANE household survey; those for other cities are from Renaud (1981).

ment is remarkably consistent among developing-country cities (from 20 to 25 percent). Bogotá's share of manufacturing employment falls in this range, but Cali's share, 31 percent, is similar to that of large U.S. cities. The employment shares in commerce—about 20 percent for both Bogotá and Cali—are comparable with those of other developing-country cities. Bogotá's share of employment in services (41 percent, including finance) is on the high side and Cali's 33 percent is on the low side, compared with other cities in developing countries. Bogotá's position as the nation's capital and financial center may contribute to its high share of services employment.

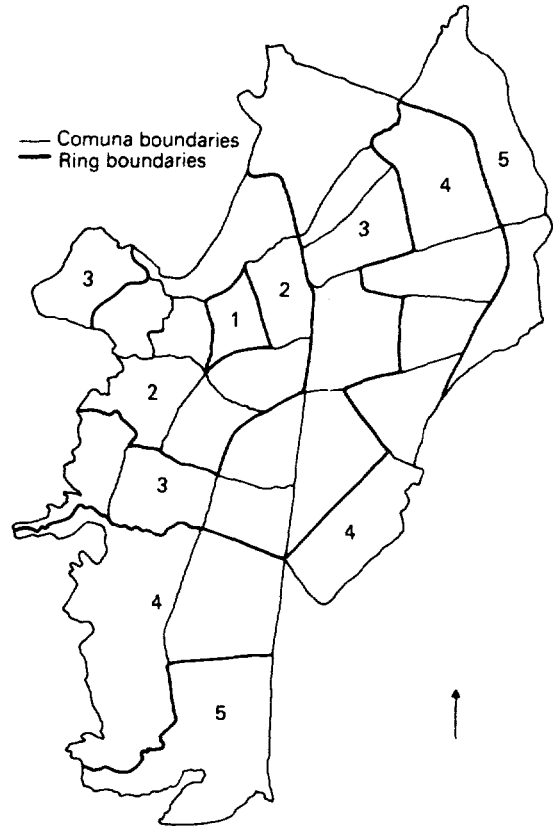
To study the spatial distribution of employment, we have devised a ring system for each city based on *comunas*, the administrative units in Colombian cities. Bogotá has thirty-eight *comunas* and Cali has twenty-eight. By aggregating *comunas* we divided Bogotá into six rings and Cali into five (maps 8-1 and 8-2). The ring system is useful for studying the relation between the spatial distribution of employment and distance from the central business district (CBD).

Table 8-2 shows the spatial distribution of employ-

Map 8-1. Bogotá: Ring System Based on Comunas



Map 8-2. Cali: Ring System Based on Comunas



ment by ring for major industry groups in Bogotá and Cali. For all employment, Cali shows a greater central tendency than Bogotá; the peak concentration is in ring 3 in Cali and in ring 5 in Bogotá. In Cali the share of employment drops markedly beyond ring 3. The CBD's share of employment is not much different in the two cities—14 percent in Bogotá and 16 percent in Cali, which is comparable to that of large U.S. cities.² The central tendency is, however, substantially different among industry groups. In both cities the concentration of employment in the central area is highest in finance, followed by commerce, services, and manufacturing. For all industry groups, however, the central area in Cali has a much larger share of employment than that of Bogotá.

To examine the changing patterns of employment location, the spatial distribution of employment for at least two points in time must be examined. For the trend analysis for Bogotá two household survey data sets are used: the 1972 household survey conducted for the Bogotá Urban Development Study, Phase II, and the 1978 DANE household survey. Like the 1978 survey, the Phase II survey contained questions about the respondent's workplace, including location, firm size, and type

of business. For Cali the social security data file for 1976 and the 1978 DANE household survey were used.

Table 8-3 reports the spatial distribution of employment in Bogotá by major industry group for 1972 and 1978. We find evidence of decentralization of total employment during the period, but the sharp decline of the CBD's share (from 23 to 14 percent) is suspect. The apparent overstatement was largely attributable to the problem with the definition of the CBD in the 1972 survey. It should be noted that the share of the CBD and ring 2 together decreased only slightly, from 36.6 percent in 1972 to 31.7 percent in 1978.³

In Bogotá the extent of employment decentralization in manufacturing is very similar to that in commerce, except that the CBD kept a larger share of employment in

commerce. The service sector also shows a clear trend of employment decentralization. The location pattern of financial establishments is different from those of other sectors in that the central tendency persisted during the six-year period. For this sector, however, it should be noted that ring 2 had a substantial gain in employment share, which reflected the shift of employment to the International Center (see note 3).

Table 8-4 shows evidence of employment decentralization in Cali on the basis of the social security data for 1976 and the 1978 household survey data. As indicated earlier, there is a strong consistency between the social security data and the subset of the 1978 household survey data which represents those individuals whose firms are affiliated with the social security system. Since

Table 8-2. Employment Distribution, by Ring and Major Industry Group, 1978
(percent)

Ring	All employment ^a	Manufacturing	Commerce	Finance	Services
<i>Bogotá</i>					
1 (CBD)	13.95	6.01	15.75	41.43	12.91
2	17.74	13.47	19.77	29.38	18.68
3	16.40	21.54	14.83	11.43	16.87
4	20.60	24.89	19.37	10.88	23.18
5	24.94	28.25	27.72	5.65	21.79
6	3.43	2.19	1.51	0.60	4.41
Location not specified	2.96	3.66	1.05	0.63	2.15
<i>Cali</i>					
1 (CBD)	16.36	9.83	25.23	67.41	14.09
2	26.16	25.71	23.68	19.69	34.57
3	32.67	39.64	31.64	4.70	30.24
4	14.37	11.81	11.84	1.57	15.26
5	2.78	1.38	4.53	0.00	2.12
Location not specified	7.66	11.62	3.08	6.64	3.73

a. Includes other sectors.

Source: DANE household survey, 1978.

Table 8-3. Changes in Employment Location, Bogotá, 1972-78
(percent)

Ring	All employment ^a		Manufacturing		Commerce		Finance		Services	
	1972	1978	1972	1978	1972	1978	1972	1978	1972	1978
1 (CBD)	23.03	13.95	18.20	6.01	19.43	15.75	42.11	41.43	22.62	12.91
2	13.61	17.74	16.07	13.47	12.18	19.77	13.69	29.38	12.74	18.68
3	14.62	16.40	18.94	21.54	13.35	14.83	6.89	11.43	15.88	16.87
4	18.80	20.60	20.27	24.89	21.83	19.37	10.00	10.88	20.74	23.18
5	18.61	24.94	21.76	28.25	21.52	27.72	14.64	5.65	17.89	21.79
6	1.67	3.43	1.04	2.19	3.42	1.51	0.55	0.60	1.88	4.41
Location not specified	9.67	2.96	3.72	3.66	8.27	1.05	12.12	0.63	8.25	2.15

a. Includes other sectors.

Sources: DANE household survey, 1978; Bogotá Urban Development Survey, Phase II, 1972.

Table 8-4. *Changes in Employment Location, Cali, 1976-78*
(percent)

Ring	All employment ^a		Manufacturing		Commerce		Finance		Services	
	1976	1978	1976	1978	1976	1978	1976	1978	1976 ^b	1978
1 (CBD)	31.51	26.19	20.19	14.94	48.38	54.97	45.68	84.90	29.15	25.34
2	37.12	27.61	34.28	27.02	34.50	24.40	16.67	15.10	55.47	32.19
3	28.40	31.33	41.40	46.27	11.09	15.65	37.55	0	14.79	16.45
4	2.95	13.82	4.09	11.03	6.03	4.97	0.11	0	0.54	24.37
5	0.03	1.05	0.05	00.70	0	0	0	0	0.06	1.65

Note: Based on employment in firms with ten or more employees.

a. Includes other sectors.

b. Excludes employment in the government sector.

Sources: DANE household survey, 1978; social security data files, 1976.

the social security files' coverage of small firms for all industry groups is poor, to increase the comparability between the two data sets table 8-4 includes only jobs in firms with ten or more employees.

For all industry groups together there is clear evidence of employment decentralization in Cali, as in Bogotá. The results reported in table 8-4 indicate that although Cali experienced employment decentralization in manufacturing and services, there is an increasing central tendency in commerce and finance. The sharp increase in the CBD's share of employment in finance during this period is obviously a result of sampling errors: the 1978 household survey must have under-sampled individuals working in financial firms, especially those located in the outer rings. Nevertheless, it is reasonable to conclude that these results do not support a decentralization trend in these two sectors in Cali.

The trend of employment decentralization having been examined, we now analyze the factors that influence changing patterns of employment location by investigating the location behavior of four groups of firms: firms that relocate (movers), newly established firms (births), defunct firms (deaths), and firms that remain at the same location but expand or contract. Evidence will be presented for the first two categories. The destinations of movers and the location patterns of births are important for understanding the changing patterns of employment location and for predicting the future spatial structure. Here we use the relevant information collected in the 1978 household survey to examine the direction of job movements and the location patterns for births.

The 1978 household survey asked when the firm began operations at its present location and what was the previous location if it had moved. On the basis of this information the origin and destination ratio was calculated for each industry group with the rings as subareas. The ratio was obtained by dividing the number of jobs moving out of an area by the number of jobs moving into that area during 1973-78.⁴

The results reported in table 8-5 indicate that in both Bogotá and Cali the CBD experienced a net loss of jobs in each industry group. The net outflow of jobs from the CBD was much greater in Bogotá than in Cali for each industry group except the service sector. In Cali all rings outside the CBD had net gains of jobs except for service employment in ring 3. Although Cali's ratio values suggest an outflow from the CBD to the other rings, within non-CBD rings the values do not indicate decentralization.

For Bogotá, the results show evidence of decentralization within the non-CBD rings, owing to relocation patterns. In Bogotá's manufacturing the ratio gradually declines as the distance from the CBD increases; rings 4 and 5, for instance, had a net gain in employment. The gain of jobs in ring 2 is also reflected in table 8-5 and indicates the growth of the International Center.

Table 8-6 reports the location patterns of jobs created by firms established during the five-year period (births). The strong regularity in the location patterns of new jobs is striking; in both Bogotá and Cali the employment share of new jobs by ring increases with the distance from the CBD for almost all industry groups except finance. This is an indication that newly established firms tend to locate in outer areas and thus contribute to the decentralization patterns. It is worth noting that in Bogotá's finance sector 43 percent of jobs created by new firms during 1973-78 were located in ring 2, a result that captures the northward shift of financial activities from the CBD to the International Center.

Behavioral Underpinnings of Location Choice in Manufacturing

The previous section summarized, with the use of various data sets, the location patterns of employment in Bogotá and Cali and their changes over time. The results reveal a high degree of employment location dynamics and strong evidence of the spatial decentralization of

employment in both cities. To understand and explain these changing location patterns, in 1978 we conducted a survey of manufacturing establishments in Bogotá using the DANE industrial directory as the sample base. The survey questionnaire was designed to take no more than one hour to complete and did not require the respondents to refer to their accounting books, but it nevertheless yielded a large amount of information with nearly 300 computer-readable variables. The survey results, which provide the basis for understanding the

changing location patterns of manufacturing employment, were reported in Lee (1982a),¹ and a model of employment location was formulated and estimated using this survey data (Lee 1982b). The remainder of this section is based on Lee (1982b).

In this study the basic premise for modeling employment location is drawn from well-established theoretical and empirical foundations in the literature on housing and residential location. Mills (1972), Solow (1972), and Muth (1969) provided the basic theoretical foundations

Table 8-5. Moving Patterns of Jobs, Measured by Origin-Destination Ratio for Rings, 1973-78

Ring	All employment ^a	Manufacturing	Commerce	Finance	Services
<i>Bogotá</i>					
1 (CBD)	2.37	2.51	3.15	3.32	1.45
2	0.66	1.54	0.45	0.33	0.87
3	1.33	1.58	1.32	1.04	1.36
4	0.55	0.76	0.51	0.06	0.58
5	0.44	0.32	0.20	2.70	0.35
6	0.59	— ^b	— ^{b,c}	— ^{b,c}	0.29
<i>Cali</i>					
1 (CBD)	1.85	1.97	1.71	1.58	2.03
2	0.68	0.70	0.61	— ^c	0.45
3	0.86	0.93	0.84	— ^{b,c}	1.21
4	0.67	0.70	— ^b	— ^{b,c}	0.33
5	3.44 ^d	— ^b	— ^c	— ^{b,c}	— ^b

Note: The origin-destination ratio is found by dividing the number of jobs moving out of a zone by the number of jobs moving into the zone.

a. Includes other sectors.

b. No firms moved into the area.

c. No firms moved out of the area.

d. Even though the ratio was high, ring 5 lost only 651 jobs and gained 189, whereas the CBD lost 9,479 and gained 5,126. The total number of jobs relocated was 28,170 in Cali and 84,755 in Bogotá.

Source: DANE household survey, 1978.

Table 8-6. Location Patterns of New Jobs, 1973-78 (percent)

Ring	All employment ^a	Manufacturing	Commerce	Finance	Services
<i>Bogotá</i>					
1	13.78	7.55	14.09	29.20	18.61
2	17.80	13.47	20.31	43.04	14.05
3	14.42	19.98	8.15	13.86	17.38
4	20.87	24.66	23.00	9.43	17.55
5	27.67	30.62	31.97	4.47	26.78
6	2.64	2.82	1.72	0.00	2.32
Location not specified	2.82	0.90	0.75	0.00	3.32
<i>Cali</i>					
1	14.70	9.27	13.61	0.00	26.27
2	25.62	19.18	24.05	60.00	30.88
3	38.33	44.95	44.76	20.00	32.99
4	13.40	22.24	11.45	0.00	5.16
5	2.60	2.29	1.97	0.00	0.00
Location not specified	5.35	2.06	4.15	20.00	4.70

a. Includes other sectors.

Source: DANE household survey, 1978.

for the economic analysis of residential location and employment location in urban areas. Theoretical and empirical work on housing and residential location has advanced rapidly,⁵ but comparable work in the field of employment location has not followed. Mieszkowski and Straszheim (1979, p. xiii) observe that "among the most important issues not covered in this volume is the relative importance of different factors in employment location and decentralization patterns within metropolitan areas, which deserves far more research. Principally because of data problems, little research has been conducted on employment locations or urban labor markets in recent years. Effective use of the censuses of employment is plagued by disclosure rules." Nevertheless, work by Leone (1971), Schmenner (1973), and Kemper (1973), followed by Struyk and James (1975), pushed back the frontier in developing an empirical basis for employment location study. Moreover, recent efforts in actual modeling of employment location and econometric estimation of such models have been promising: Hanushek and Song (1978) developed a framework for analyzing the spatial structure of employment in the Boston metropolitan area, Erickson and Wasylenko (1980) estimated a model of relocating firms in the Milwaukee metropolitan area, and Schmenner (1973, 1982) provided evidence from his econometric work on Cincinnati and New England. Carlton's work (1977, 1979) focused on the intercity location decisions of new firms.

Residential location studies usually assume that a consumer chooses a particular dwelling unit at a particular location at which he maximizes his utility, given the budget constraint. In a similar optimization framework, it is assumed that the firm, as a price taker, locates where it maximizes profits. In making the location decision, the attributes of the particular plant site and the lot size enter into the process of determining the optimum combination of inputs for production. This means that the site attributes enter directly into the firm's production function in the following way:

$$(8-1) \quad Q = f(L, X; Z)$$

where Q is output, L is lot size, X is a vector of variable inputs such as labor and plant and equipment, and Z is a vector of exogenous site characteristics.

The site characteristics are independent of lot size and represent local public goods available to that particular location. In a recent work on housing Burstein (1980) explicitly introduces local public goods into the consumer's utility function. Ellickson (1981) integrates the theory of residential location choice with that of local public goods by including in the consumer's utility function the attributes of the surrounding neighborhood and the public schools. For studies of firm location, local

public goods include the quality of public utility services such as electricity and water, the quality of municipal services such as police and fire protection, and zonal characteristics such as air quality and congestion.

The relevant cost components in calculating the optimum combination of inputs and hence in selecting a particular location are, then, wages, capital cost, input materials costs, delivery costs of inputs and output, and land rent. Following the standard theory in urban economics, a particular plant site is occupied by the firm which bids the highest price for it. The bid price depends on the attractiveness of the particular site (which in turn depends in part on the availability of local public goods) for a firm of the particular type. In locational equilibrium all firms in an urban area make the same profits and no firm has any incentive to relocate. This equilibrium configuration is an outcome of cost tradeoff calculations by individual firms, given the spatial variations of relevant costs. For example, a large manufacturing firm may choose a site in a low-rent area near the periphery to meet its need for more plant space, although delivery distance will be greater. Small firms may prefer a central location where the high rent is more than offset by externalities available for production and shipment. The high rent in the central area can also be explained by the high intensity of variable input use. The empirically observed rent gradient reflects the increasing marginal productivity of land as the distance to the CBD becomes shorter.

The stochastic specification of the model should provide a framework for predicting the probability that a firm of a particular type will occupy a site with particular attributes (Z). Since a given site will be occupied by the firm with the highest bid, the relevant random variable for determining the probability is the maximum bid made within a group of firms with similar attributes. The probability distribution of a random variable associated with the maximum bid leads to a multinomial logit specification for the firm location model.

The application of the multinomial logit method to economic research became popular with McFadden's work on travel demand studies (1973, 1976). Such a model was used to predict an individual's choice of travel mode among a finite number of alternatives—car, bus, taxi, transit, or foot—given the characteristics of the individual or household. Subsequently, the multinomial logit framework was applied to housing and residential location studies by, for example, Friedman (1975), Lerman (1977), and Quigley (1976). These studies applied the travel mode choice model to variations of residential choice models: a utility-maximizing consumer of type t chooses a house of type Z , which is analogous to the consumer's choosing a travel mode Z among several alternatives.

In his recent work Ellickson (1977, 1981) makes an important departure from the above approach and offers an alternative multinomial logit specification for the residential choice model using the bid-rent theory. According to Ellickson (1981, p. 63), "the most natural way to interpret such models is in terms of a prediction of what sort of consumer is most likely to occupy a house with a specified set of characteristics"—the probability that a house with characteristics Z will be occupied by a household of type t .⁶ Ellickson points out that his method has several advantages, such as specifying endogenously the properties of the disturbance terms (as the Weibull distribution).

Ellickson's approach is particularly relevant for modeling employment location. As discussed above, our problem is to predict the probability that, given a site with particular characteristics (Z), a firm of particular type will occupy that site. Such a site may exist at any location in an urban area, and combinations of site characteristics can produce a large number of site variations. The application of the McFadden approach requires a definition of a finite number of locations (or subareas) from which a firm of a particular type is supposed to choose. Defining alternative subareas in that fashion is arbitrary, and the subsequent analysis will tend to be descriptive rather than analytical and to suffer from the idiosyncrasy introduced by the arbitrary definition of alternative locations.

A Framework for Evaluating Policy Effects

A study of the effects of employment location policies requires a theoretical and empirical framework for testing the effectiveness of policy instruments with respect to the firm's location choice. The model described above provides such a framework. It predicts the probability that a firm of a particular type will occupy a site with particular attributes, and the site attributes are the independent variables that are subject to policy manipulations. The attributes include measures of access to output and input markets, employees' commuting distance, public services, zonal amenities, and external (or scale) economies. This means that the model can predict the incremental effects of alternative policy instruments on the likelihood that a firm will choose a particular site.

Policymakers in developing countries often attempt to relocate industries from the traditional industrial districts of a large city to outer areas or to smaller cities. The government's plans may include developing new industrial towns or estates or expanding existing ones to induce new or relocating firms to settle in a desired area. In all cases implementing such plans and programs

requires the selection of particular types of industries to occupy sites that have particular attributes. Hence, it is important for policymakers to understand the requirements of firms for attaining equilibrium at new locations and to be able to assess the level and costs of government subsidies and infrastructure investment needed to meet such requirements.

The Bogotá study described earlier did not test the effectiveness of explicit policy instruments, partly because such instruments were not implemented in that city. The behavioral underpinnings established in the study, however, provide sufficient clues regarding those policy instruments that are most appropriate for influencing the location choice of particular types of firms and for influencing aggregate location patterns.

The estimation results reported in Lee (1982b) show which independent variables (site attributes) are most important for the location choices of firms of particular types. In table 8-7 the independent variables are ranked by order of importance for each type of firm according to the values of the elasticity coefficients. For small firms in both the textile and the fabricated metal industries, accessibility to local input markets (INPUTBT), the commuting distance for production workers (WKSOUTH), and the population density of the zone of plant location (POPDENS) are important site characteristics. These three variables alone carry more than half of the total coefficient weight in the equation. Accessibility to local product markets (PRODSOLD) was the second most important variable for small fabricated metal firms, but it was not as important for small textile firms.

For large textile establishments the location quotient (LOCQT, a measure of scale economies in the zone of

Table 8-7. *Independent Variables in Firm Location Choice, by Rank, Bogotá*

Variable	Small textile	Small fabricated metal	Large textile
INPUTBT	1	1	4
WKSOUTH	2	4	7
POPDENS	3	3	8
ELECINT	4	8	2
LOCQT	5	7	1
PRODSOLD	6	2	5
ADMNORTH	7	5	3
DISTCBD	8	6	6

Note: INPUTBT, a measure of accessibility to local input markets; WKSOUTH, commuting distance for production workers; POPDENS, population density of the *comuna* where the establishment is located; ELECINT, frequency of electricity interruption; LOCQT, location quotient; PRODSOLD, a measure of accessibility to local product markets; ADMNORTH, commuting distance for administrative workers; DISTCBD, airline distance from the CBD.

Source: Lee (1982b).

plant location), the quality of electricity supply (ELECINT), and the commuting distance for administrative workers (ADMNORTH) are the three most important site attributes; together they carry more than two-thirds of the total weight in the equation. Access to local markets and population density are relatively unimportant for this group of firms.

The results for large textile firms are consistent with the findings that large firms are export-oriented and tend to locate near the periphery, where land needed for modern facilities is available at lower cost and highway access is better than in the central area (Lee 1982a). The evidence on small firms' local market orientation and their tendency to locate in high density areas is consistent with the incubator hypothesis, which was supported by a test in an earlier work (Lee 1981). The hypothesis states that small new manufacturing firms tend to locate in centralized areas that provide essential services for production and sales activities. The specific areas in Bogotá that were identified as incubator areas are not in the industrial district but are adjacent to the CBD.

From this analysis it is apparent that government policies intended to influence employment location patterns can be effective if such policies influence the site attributes which are important to firms. The analysis further suggests that different mixes of policy instruments should be considered for different groups of firms and industries.

Policy Implications

The strong decentralization of employment in Colombian cities, summarized in "Observed Patterns of Employment Location," above, is comparable to the trend observed for large U.S. cities during the past several decades (Hoover and Vernon 1959; Leone 1971). But the main goal of spatial policy in the United States regarding intrametropolitan decentralization has been quite different from that in developing countries. In the United States the main policy objective has been to reduce urban decentralization in the hope of preventing central city decay. This policy objective is based on the belief that decentralization occurs because of deteriorating conditions in the central city; there is, however, little empirical evidence to support this view. Muth (1969) attributes most decentralization to transport improvements, suburban (new town) development programs, and federal subsidies for homeownership. Muth's findings suggest that federal programs intended to reduce decentralization, such as urban renewal programs that tend to lower housing density in the central city, have expedited the trend rather than reduced it. Attempts to reverse the tide of decentralization, which

occurs because of increased population and incomes, often result in economic inefficiency, since transport improvements have reduced the central city's comparative advantage for production and other economic activities.

Large U.S. cities also have municipal fiscal problems that encourage decentralization. The high per capita tax burden in central cities in relation to the suburbs provides incentives to move to the suburbs. It has been observed that "the lower the average income level of the central city relative to its suburbs, the smaller is the central city's population, and the larger is the land area occupied by the urbanized area" (Muth 1969). Evidence from Bogotá and Cali, however, does not suggest an increasing concentration of low-income population in the central city, and there is no sign of central city decay. In fact, policies to decentralize economic activity from large cities in developing countries stem mainly from the increasing concentration of economic activity in the central city and the perceived problems of congestion and pollution as the city's population grows rapidly. Also, municipal fiscal relationships in developing countries are different from those in the United States. In Korea, for example, electric utility service charges, which are uniform nationwide, tend to subsidize central cities over outlying areas and hence encourage centralization.

The case of Korea affords a chance to look at a conscious decentralization policy. During the past decade various spatial policies to control the growth of Seoul and to disperse its population have been implemented. In 1971 the greenbelt surrounding Seoul was established. The 1977 Industrial Location Act in effect prevented new manufacturing firms from locating within Seoul and enabled the government to issue relocation orders to establishments already set up there. That same year the government initiated a ten-year comprehensive plan for redistribution of population and industry from Seoul. The plan included many policy instruments in five principal categories: the relocation of industries from Seoul; inducements for people to relocate to southern provinces; the decentralization of educational facilities; the relocation of various urban functions within the capital region and the improvement of city plan implementation, particularly in dealing with clandestine housing construction in Seoul; and tax and credit incentive schemes to aid relocating firms. Most of the instruments stipulated in the plan address the location and relocation of manufacturing establishments. A comprehensive review of employment location policies in Korea appears in Choe and Song (1982), and a theoretical analysis of policy efficiency is discussed by Murray (1982). The empirical evaluation of such policies was the main task of a recently completed World Bank project.⁷

Several other recent policy measures in Korea and Colombia are discussed below.

The incubator hypothesis mentioned earlier states that small new manufacturing firms start in central locations that provide needed services and infrastructure and then move to less central locations as they grow and require more space for expansion (Hoover and Vernon 1959). This hypothesis was tested for Bogotá on the basis of industrial directory data (Lee 1981). Data from the establishment survey conducted for the Bogotá City Study do in fact indicate that small firms start up in central locations (Lee 1982a), and the logit results summarized earlier also support this hypothesis (Lee 1982b). There is evidence that Korean firms also follow this pattern (Meyer 1981, Lee 1985). The 1977 Industrial Location Act, which prohibits new manufacturing firms within the city limits, should have restricted such incubation. A related issue is whether incubation can be replicated in new industrial estates or existing towns outside Seoul.

In 1978, as an important measure for decentralizing population and economic activity away from Seoul, the government established a new industrial town, Banweol, less than 30 kilometers distant. Although nearly 1,000 plant sites for small and medium-size firms were prepared, the occupancy rate was less than 20 percent as of 1981. Many firms that moved to Banweol suffered excess capacity and financial losses as a result of overinvestment in plant and land area (induced by the government incentive schemes), increased operating costs after relocation, and the general recession of 1980.

A case study on Banweol (Choe and Song 1982) shows that the most serious problems facing the relocated firms have been reduced accessibility to product markets and input suppliers, the unavailability of production workers, and difficulties in obtaining day-to-day business information because of poor telephone service and limited person-to-person contacts. Poor access to Seoul and Incheon is largely responsible for these problems. A related problem is the reluctance of production workers to relocate to Banweol or to commute from Seoul. Attrition of skilled workers has been high, and it is difficult for firms to replace those who quit.

That such a seemingly short distance thwarted the development of Banweol is striking. The logit analysis used to study the Bogotá data helps explain the Korean experience: small and medium-size firms prefer central locations, and accessibility to local markets and proximity to production workers are the most important site attributes for them.

In contrast to the bias against decentralization in the United States, several developing countries have tried to decentralize economic activity away from the central city. Nevertheless, the desirability of decentralization

policies on economic grounds has not been established, and little is known of their effects or their welfare implications. The key policy question is how to guard against spatial policies that are excessive in relation to prevalent trends, since excessive measures may result in serious welfare losses. The lack of empirical information on decentralization⁸ and policy effects in developing countries does not yet permit the formulation of more efficient spatial policies, but policies to decentralize population and economic activity are probably not good substitutes for better internal management of city growth. For example, the effect on air pollution or on traffic congestion of reducing the population or employment in a large city by a certain amount is likely to be small (Henderson 1980; Tolley, Graves, and Gardner 1979).

Notes

1. The material in this section is from Lee (forthcoming).
2. According to Bronitsky and others (1975), about 10 to 15 percent of total employment in large U.S. cities is in the CBD.
3. Moreover, on the basis of the two data sets, the total number of jobs in the CBD together with those in the International Center (*comuna* 81, the area directly north of the CBD) stayed almost constant during the six-year period.

<i>Comuna</i>	1972	1978
31 (CBD)	201,975	166,878
81 (International Center)	24,787	62,565
Total	226,762	229,443

4. Since the number of workers at the previous locations is estimated on the basis of the number of survey respondents, it is implicitly assumed that the number of jobs at the previous locations is the same as that at the 1978 locations. This assumption should not affect the conclusions of this study.
5. Major work in this area includes Kain and Quigley (1975), Straszheim (1974), and Ingram (1977).
6. The mathematical derivation of this result can be found in Lee (1982b).
7. "An Evaluation of Industrial Location Policies for Urban Deconcentration," RPO 672-58, RPO 672-91. See World Bank, 1984, *Abstracts of Current Studies 1984*, Washington, D.C.
8. Lee (1985) shows that in the 1970s Seoul's CBD experienced an annual net loss in manufacturing employment of 7.6 percent, while the periphery of Gyeonggi province, in which Seoul is located, gained employment at a rate of 34 percent.

Bibliography

Bronitsky, L., and others. 1975. *Urban Data Book*. U.S. Department of Transportation, Report DOT-TSC-0S5-75-45-1. Washington, D.C.: Government Printing Office.

Burstein, Nancy R. 1980. "Voluntary Income Clustering and

- the Demand for Housing and Local Public Goods." *Journal of Urban Economics*, vol. 7, no. 2 (March), pp. 175-85.
- Carlton, D. 1977. "Models of New Business Location." University of Chicago, Center for Mathematical Studies in Business and Economics, Report 7756. Chicago.
- . 1979. "Why New Firms Locate Where They Do: An Econometric Model." In William Wheaton, ed., *Interregional Movements and Regional Growth*. Washington, D.C.: Urban Institute.
- Choe, S. C., and B. N. Song. 1982. "An Evaluation of Industrial Location Policies for Urban Deconcentration in the Seoul Region." Urban Development Discussion Paper 7. World Bank, Washington, D.C.
- Ellickson, B. 1977. "Economic Analysis of Urban Housing Markets: A New Approach." R-2024-NSF. Santa Monica, Calif.: Rand Corporation.
- . 1981. "An Alternative Test of the Hedonic Theory of Housing Markets." *Journal of Urban Economics*, vol. 9, no. 1 (January), pp. 56-79.
- Erickson, R. A., and M. Wasylenko. 1980. "Firm Relocation and Site Selection in Suburban Municipalities." *Journal of Urban Economics*, vol. 8, no. 1 (July), pp. 69-85.
- Friedman, J. 1975. "Housing Location and the Supply of Local Public Services." P-5421. Santa Monica, Calif.: Rand Corporation.
- Hanushek, Eric A., and Byung Nak Song. 1978. "The Dynamics of Postwar Industrial Location." *Review of Economics and Statistics*, vol. 60, no. 4 (November), pp. 515-22.
- Henderson, J. V. 1980. "A Framework for International Comparisons of Systems of Cities." Urban and Regional Report 80-3. World Bank, Washington, D.C. Processed.
- Hoover, E. M., and R. Vernon. 1959. *Anatomy of a Metropolis*. Cambridge, Mass.: Harvard University Press.
- Ingram, G. K. 1977. *Residential Location and Urban Housing Markets*. Cambridge, Mass.: National Bureau of Economic Research.
- Kain, John F., and John M. Quigley. 1975. *Housing Markets and Racial Discrimination: A Microeconomic Analysis*. Cambridge, Mass.: National Bureau of Economic Research.
- Kemper, P. 1973. "The Location Decisions of Manufacturing Firms within the New York Metropolitan Area." Ph.D. dissertation. Yale University, New Haven, Conn. Processed.
- Lee, K. S. 1981. "Intra-Urban Location of Manufacturing Employment in Colombia." *Journal of Urban Economics*, vol. 9, no. 2 (March), pp. 222-41.
- . 1982a. "Determinants of Intra-urban Location of Manufacturing Employment: An Analysis of Survey Results for Bogotá, Colombia." Urban and Regional Report 81-3. World Bank, Washington, D.C. Processed.
- . 1982b. "A Model of Intraurban Employment Location: An Application to Bogotá, Colombia." *Journal of Urban Economics*, vol. 12, no. 3 (November), pp. 263-79.
- . 1985. "An Evaluation of Decentralization Policies in Light of Changing Location Patterns of Employment in the Seoul Region." Urban Development Discussion Paper 60. World Bank, Washington, D.C. Forthcoming in *Urban Studies*.
- . Forthcoming. "Employment Location in Colombian Cities." Water Supply and Urban Development Department, World Bank, Washington, D.C. Processed.
- Leone, R. 1971. "Location of Manufacturing Activity in the New York Metropolitan Area." Ph.D. dissertation. Yale University, New Haven, Conn. Processed.
- Lerman, S. R. 1977. "Location, Housing, Automobile Ownership and Mode to Work: A Joint Choice Model." *Transportation Research Board Record*, no. 610, pp. 6-11. Washington, D.C.: Transportation Research Board.
- McFadden, D. 1973. "Conditional Logit Analysis of Qualitative Choice Behavior." In P. Zarembka, ed., *Frontiers in Econometrics*. New York: Academic Press.
- . 1976. "The Theory and Practice of Disaggregate Demand Forecasting for Various Modes of Urban Transportation." Prepared for the Seminar on Emerging Transportation Planning Methods. U.S. Department of Transportation, Washington, D.C. Processed.
- Meyer, J. R. 1981. "Report on Proposed Korean Spatial Study." Urban and Regional Report 81-1. World Bank, Washington, D.C. Processed.
- Mieszkowski, P., and M. Straszheim, eds. 1979. *Current Issues in Urban Economics*. Baltimore, Md.: Johns Hopkins University Press.
- Mills, E. S. 1972. *Urban Economics*. Glenview, Ill.: Scott, Foresman.
- Murray, Michael P. 1982. "Here, There, Where? A Strategy for Evaluating Industrial Relocation Policies in Korea." Urban Development Discussion Paper 6. World Bank, Washington, D.C.
- Muth, R. 1969. *Cities and Housing*. Chicago: University of Chicago Press.
- Quigley, John. 1976. "Housing Demand in the Short Run: An Analysis of Polytomous Choice." *Explorations in Economic Research*, no. 3. Cambridge, Mass.: National Bureau of Economic Research. Available from University Microfilms, Ann Arbor, Mich.
- Renaud, Bertrand. 1981. *National Urbanization Policy in Developing Countries*. New York: Oxford University Press.
- Schmenner, R. 1973. "City Taxes and Industry Location." Ph.D. dissertation. Yale University. New Haven, Conn. Processed.
- . 1982. *Making Business Location Decisions*. Englewood Cliffs, N.J.: Prentice-Hall.
- Solow, R. 1972. "On Equilibrium Models of Urban Location." In Michael Parkin, ed., *Essays in Modern Economics*. London: Longman.
- Straszheim, M. R. 1974. *An Econometric Analysis of the Urban Housing Market*. Cambridge, Mass.: National Bureau of Economic Research.
- Struyk, Raymond J., and Franklin J. James. 1975. *Intrametropolitan Industrial Location*. Lexington, Mass.: Lexington Books.

Tolley, George S., Philip E. Graves, and John L. Gardner, eds.
1979. *Urban Growth Policy in a Market Economy*. New
York: Academic Press.

Townroe, D. M. 1979. *Employment Decentralization: Policy
Instruments for Large Cities in Less Developed Countries*.

Vol. 10, pt. 2 in D. R. Diamond and J. McLoughlin, eds.,
Progress in Planning. Elmsford, N.Y.: Pergamon.

World Bank. 1979. *World Development Report 1979*. New
York: Oxford University Press.