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GROWTH OF SMALL AND INTERMEDIATE CITIES IN KOREA, 1975-1980

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The reversal of population migration from metropolitan areas to nonmetropolitan areas in Korea, even though it is incipient, has been accompanied by the decentralization of sustenance organization from metropolitan areas. This paper examines the urban growth of 33 small and intermediate Korean cities during 1975-1980 from the ecological perspective. Using the multiple regression analysis, population growth of a city is measured by variables such as industrial structure, distance from a metropolitan city, and educational level of residents in a corresponding city.

At the present development stage in Korea, those cities whose industrial structure is more specialized in the transformative sector rather than other sectors have grown more rapidly. The closeness to a metropolitan city and the educational level of residents for each city strongly influence urban growth of small cities.

INTRODUCTION

The primacy of a capital city is typical in developing countries which have experienced rapid urbanization in the twentieth century. Unlike the industrialization of developed countries in the nineteenth century, developing countries have adopted advanced technologies from developed countries. Given the limited resources of capital and entrepreneurship, developing countries have taken an advantage of agglomeration of economies on a capital city in which infrastructures for industry are relatively well developed. As a result, developing countries have emphasized efficiency of economic development as a policy objective and have pursued the primacy of a capital city. In terms of a balanced urban system, the primate urban system has raised some arguments among scholars.

In this regard, Korea was no exception. During the process of the rapid economic growth and urbanization, an inevitable polarization of spatial pattern emerged. The primacy of the capital city created a deep disparity among regions. Such regional disparity has produced a massive rural to urban migration. Due to the huge influx of migration into Seoul since 1960, Seoul alone

absorbed 73 percent of total net rural-urban migration during 1966-1970. Even though net in-migration rate to Seoul between 1970 and 1975 fell below the national average rate, Seoul accounted for 36 percent of total net urban in-migration (Chung 1984).

Seoul has grown so large in population and its national share of modern economic activities that problems in the urban structure and function have resulted. For example, there are the diseconomies of scale in Seoul itself and the excessive outflow of qualified labor forces from small and intermediate cities. In an attempt to slow the expansion of Seoul and to distribute economic activities more equally in small and intermediate cities, the Korean government has pursued a number of policies such as Tax Reduction Control Law and Local Government Tax Law, along with the Local Industrial Development Law. Land Use Regulations were the primary mechanism for a balanced pattern of urbanization and economic development. Due to a combination of incentives and regulations, the decentralization of population and economic activities from Seoul has been proceeding, which is different from the more spontaneous metropolitan decentralization that has been going on in the U.S.

From the early 1970's, there has been a substantial drift of economic activities and population from Seoul to other cities. Since 1975, the net migration rate for Seoul has decreased until the late 1980s. Thirteen of the 20 largest cities grew faster than Seoul during 1970-1980. Along with the decreasing rate of population growth, the proportion of value added by manufacturing for Seoul decreased by 65.7 percent during 1968-1978: 33.5 percent in 1968 and 21 percent in 1978 (Rondinelli 1984). Moreover, Kyonggi Province, surrounding Seoul, shows population growth in absolute number during 1975-1980. The satellite cities of Seoul experienced rapid growth, absorbing 22 percent of all net-migration. On the other hand, the promotion of development in the southeast areas resulted in Pusan and the cities of South Kyongsang Province absorbing 22 percent of all urban in-migration.

Such a decentralization of metropolitan population has been accompanied by significant changes in the organizational structure of nonmetropolitan cities. This drastic change occurred in the secondary sector in the 1970's. The proportion of employment in manufacturing activities increased to 55 percent among intermediate cities and to 40 percent among small cities during this decade. Similarly, the employment in service and commerce declined in most urban centers. For cities with a population above 200,000, the employment in the tertiary sector decreased from 43 percent in 1960 to 22 percent in 1980. However, the tertiary sector is still prominent in the smaller cities with a population of less than 100,000 (Rondinelli 1984).

Nevertheless, little attention has been given to the dynamics of growth in

the secondary cities, even though studies of urban growth in small and intermediate cities can contribute to the development of a balanced urban system. This paper examines the growth of small and intermediate Korean cities during 1975-1980 from the ecological perspective. The focus is on the analysis of the industrial structure, which is the main force underlying the growth of nonmetropolitan areas. At the same time, this paper emphasizes the role of ecological variables in explaining a population redistribution and the processes of social and spatial organization. On the other hand, most researchers conclude that urbanization in developing countries is mainly due to the "tertiary sector growth" rather than to the "industrialization". This paper questions whether or not this conclusion is really applicable to every developing country.

HYPOTHESES

While the turnaround of population migration from metropolitan to nonmetropolitan areas has been a prevalent phenomenon during the 1970's in western countries, it did not commence until the mid-1970's in Korea. The shift of migration into nonmetropolitan areas has produced a diverse and dynamic redistribution of population. For analyzing the dynamics of nonmetropolitan growth, the ecological perspective is appropriate because it has contributed to the understanding of social system growth and development in terms of the process of expansion (Kasarda 1978). In light of the fact that a population will tend to redistribute itself through its vital process and through migration to achieve a better balance or an equilibrium between population size and life chance (Hawley 1956), human ecology is concerned with how populations organize themselves in adapting to their environments. The main theme of ecological perspective is that the change in population distribution occurs in reaction to the change in the sustenance organization brought about by the technology and environmental change (Gibbs 1964; Sly 1972; Wardwell and Gilchrist 1980). In this sense, redistribution of the employment opportunities to nonmetropolitan areas has been a determinant of population growth in nonmetropolitan areas (Berry and Kasarda 1977). Therefore, it is generally accepted that population redistribution is an adaptive response to the organizational change.

As an ecological variable inducing population change, organizational change is represented as a change in the means by which a population supports itself. In the light of the sustenance organization as an explanatory

variable, an examination of industrial and occupational features of the area's labor forces is the most powerful way of ascertaining the sustenance function to community (Hauser 1956; Frisbie and Poston 1975). Moreover, not merely the "number" of new sustenance opportunities but also the "structure" of sustenance organization influences the urban growth. On the basis of these studies, the industrial sectors of each city can be represented as the sustenance organization in this paper.

It is commonly accepted that there is a close relationship between urban growth and industrial sectors. However, the role of each industry sector in urban growth depends on the economic development of each community or each country. In periods of a rapid industrialization, manufacturing sector as an export-base industry has a multiplier effect in creating new job opportunities (Pred 1966; Ranis 1973; Tyler 1976; Renaud 1979). New local demands created by the manufacturing activities themselves and by the purchasing power of their labor forces have some potentials for creating the sequential employment opportunities in other sectors. Therefore, cities specializing in manufacturing activities grew rapidly during this period.

Even though the service sectors also play an important role in urban growth, these activities do not generate much income outside the city which they are serving. However, the labor intensive manufacturing sector in the urban areas, under the strong drive for export, attracts a large number of low wage workers and provides a strong incentive for in-migration from other areas (Renaud 1979). Thus, regardless of population size, the annual population growth of each city is more highly correlated with the increase in the secondary sector than with the increase in tertiary sector during 1970-1975 (Min 1982). In this regard, the secondary sector, rather than the tertiary sector, is most likely to have greater multiplier impact upon the expansion of the local and regional economy. On the basis of this framework, the first hypothesis is that those cities specializing in manufacturing activities will show higher population growth than will other cities.

As an important determinant of urban growth at the level of a small and an intermediate city, proximity to a metropolitan area is closely related to population growth. Nonmetropolitan cities adjacent to a metropolitan area have an advantage of access to the opportunities for employment and consumption of goods and services available in a metropolitan area. Moreover, the ecological expansion of nonmetropolitan areas is simply a spillover of metropolitan population into adjacent nonmetropolitan cities. Likewise, as an expansion of organization starts from the organizational nucleus through progressively smaller or more distant subcenters, it influences the cities adjacent to a central city stronger and earlier than other cities (Berry and Kasar-

da 1977). In this view, a status of adjacency is regarded as an essential factor for an accurate characterization in growth of nonmetropolitan areas (Wardwell and Gilchrist 1980). In light of this framework, the physical closeness of a small city to a metropolitan city is crucial to the urban growth.

In developing countries, the change of population and sustenance organization in nonmetropolitan areas must be understood in a context of the metropolitan areas. Population growth in a peripheral area is responsive to an increase in organization functions of its central city. Thus, without a large amount of investments, nonmetropolitan areas adjacent to metropolitan areas would be the recipients of relocating metropolitan residents and industries in the process of expansion and decentralization of metropolitan areas (Hawley 1956; Kasarda 1972).

Under the particular condition of developing countries, the physical closeness of a city to the metropolitan areas is essential to the growth of small and intermediate cities. Furthermore, in terms of the fact that "distance" is regarded as a physical obstacle to migration (Lee 1968), it is much easier and cheaper to redistribute population and industries into the adjacent cities from a metropolitan area. Therefore, the second hypothesis is that, due to the advantage of location, those cities adjacent to the metropolitan areas show a higher population growth than do other cities.

An educational facility is an important determinant for the growth of intermediate and small cities. It is commonly accepted that those cities with colleges and universities tend to grow rapidly because the availability of higher education is an important incentive to population growth. To provide the background for understanding the importance of education among the determinants of rural out-migration, the aspiration for higher education should be understood in the Korean social context. Along with their prevalence for educational opportunities, most Korean parents, regardless of their positions or incomes, devote themselves to providing for their children's education. Most Korean parents want to upgrade their status through the achievement or social status of their children, especially their sons. Having a high aspiration for childrens' education causes parents to move into a city where the good education facilities and qualities are available (Yu 1976; Lee and Berringer 1978).

On the basis of the Korean attitude toward education, those cities providing the better and higher educational institutions have a great potential for pulling the migrants and grow very rapidly. Also, the availability of higher education is closely related to the high educational level of residents in a city. Residents of cities having more and better high educational institutions, compared with people of cities having fewer or none, can get more chances of

having higher education with less cost and easy acessibility. In this sense, the educational level of residents in cities having higher educational institutions is higher than that of residents in other cities. Therefore, those cities whose residents' educational level is higher will grow more rapidly than other cities.

Furthermore, the research centers of universities or colleges can participate in the technology development. As Thompson (1965) pointed out, the capability of adopting new innovations in a certain area depends on the proportion of the diversity of skilled labors and highly research-oriented manpower among its labor forces. Those cities having more highly educated people than other cities can easily adopt the new innovations. At the same time, they will grow rapidly as centers of a massive inmigration because, in the process of adopting the innovation, the change and the increase of ideas, people, and production occur (Pedersen 1979). In those respects, as the final hypothesis, those cities with a high educational level of residents grow more rapidly than other cities.

DATA

The analysis of determinants of the growth of Korean small and intermediate cities during 1975-1980 is the main purpose of this paper. The growth of those cities can be represented by population change which is closely related to an ecological complex — organization, population itself, environment, and technology. Each of the four variables may serve as either a dependent or an independent variable and also is functionally interdependent or reciprocally causal. The industrial structure, the propinquity to metropolitan areas, and the proportion of residents who finished at least high school in intermediate and small cities will be used as independent variables. Population growth rate in each corresponding city will be regressed on these variables.

Before the analysis of this subject, a city should be understood in the Korean context because the definition of city varies among countries. According to the Korean Census, a city is defined as a place having urban service facilities such as universities, general hospitals, and transportation network, and having more than 50,000 population. The Korean urban system consists of 40 cities including 2 special cities (Seoul and Pusan) in 1980. Five of forty cities (Changwon, Gumi, Donghae, Jecheon, and Youngju), which are excluded from this analysis, were promoted to a city status after 1975. Under the present Korean urban system, as Seoul and Pusan still play a role of bipolar growth centers as metropolitan cities in urban function, these two

cities are excluded from this analysis. Jeju is also excluded because of the difficulties in measuring the physical distance from a particular metropolitan city. Therefore, the unit of analysis for which the variables of this paper are measured is 32 Korean intermediate and small cities. The data on population for each city is taken from the Korean Population and Housing Census, 1975 and 1980, as shown in Table 1.

As a dependent variable, the population growth rate of each city during 1975-1980 is derived from the exponential function under the assumption that population growth is continuous. The population growth rate is calculated in the following manner:

$$P_2 = P_1 e^{rn} \qquad r = \frac{1n(P_2/P_1)}{n}$$

where p_1 is the number of population in 1975.
p_2 is the number of population in 1980.
r is the annual population growth rate.
n is the difference in years between two studied years.

The population growth rate of each city during 1975-1980 calculated on the basis of the formula is shown in Table 1.

In predicting population change of each city, the industrial structure is the most important variable because a population will redistribute in response to the change of industrial structure. The characteristic of industrial structure for each city is measured by the "Location Quotient" (LQ) value of each industry for each city. Data are taken from the 15 percent Sample Survey of the Korean Population and Housing Census, 1975. First, to determine the LQ value, the industry of each city is divided into six sectors on the basis of the six-sector model of Browning and Singelmann (1978). This model has a characteristic of dividing the tertiary sector into four subdivisions because of heterogeneity in the tertiary sector. Under the traditional three-sector model supported by the Fisher-Clark's framework, it is difficult to know whether to expect an increase in all services with a rise of per capita income or an increase in only certain kinds of services (Singelmann 1978). This kind of analytical problem, posed by the heterogeneous characteristic of the tertiary sector, is more peculiar in developing countries than in developed countries. The Browning and Singelmann six-sector model contains six sectors such as extractive, transformative, distributive service, producer service, social service, and personal service. The corresponding industries in the Korean Census are shown in Table 2.

After classifying the industrial structure of each city, the Location Quotient of each industry for each city, relative to the whole country, is calculated.

TABLE 1. POPULATION SIZE AND POPULATION GROWTH RATE FOR EACH CITY DURING 1975-1980

City	Population Size		Population Growth Rate
	1975	1980	
Seoul	6,879,649	8,336,756	.196
Pusan	2,450,977	3,160,276	.254
Daegu	1,309,454	1,607,458	.205
Incheon	797,140	1,084,730	.308
Kwangju	606,503	727,627	.182
Daejeon	504,215	651,642	.256
Masan	371,415	386,773	.041
Jeonju	311,291	366,997	.165
Seungnam	272,293	376,447	.324
Ulsan	252,353	418,415	.506
Suwon	223,746	310,757	.328
Mokpo	192,857	221,757	.140
Cheungju	192,487	252,985	.273
Jinju	154,606	202,753	.271
Gunsan	154,158	165,318	.070
Chuncheon	140,394	155,214	.100
Anyang	136,761	253,541	.617
Jeju	135,026	167,546	.216
Pohang	134,258	201,355	.405
Yeosu	130,434	161,009	.211
Wonju	120,192	136,861	.131
Iri	116,821	136,961	.219
Bucheon	109,173	221,475	.707
Kyeungju	108,367	221,475	.119
Euijeungbu	108,245	133,263	.208
Suncheon	107,966	114,223	.056
Chungju	104,955	113,138	.075
Jinhae	103,578	112,098	.079
Cheonan	96,686	120,618	.221
Andong	95,328	102,024	.068
Gangreung	84,895	116,024	.320
Sokcho	71,438	65,793	-.082
Kimcheoen	67,438	72,229	.075
Chungmu	66,807	75,531	.123
Samcheonpo	59,712	64,723	.081
Changwon		111,691	
Gumi		105,449	
Donghae		104,370	
Jecheon		85,557	
Youngju		77,890	

Source : The Korean Population and Housing Census, 1975 and 1980.

TABLE 2. THE SIX-SECTOR KOREAN INDUSTRIAL STRUCTURE

Sector	Standard Industry Classification Code
1. Extractive Sector	
·agriculture, forestry, hunting, and fishery	111 to 130
·mining	210 to 290
2. Transformative Sector	
·manufacturing	311 to 314, 321 to 323 331, 332, 341, 342 351 to 356, 361, 362 369, 371, 372, 390 381 to 385
·electricity, gas, and water	410, 420
·construction	511, 512, 521 to 529
3. Distributive Service Sector	
·wholesale and retail trade	611 to 614, 621 to 629, 631
·transportation, storage, and communication	712 to 720
4. Producer Service Sector	
·financial institutions and insurance	810, 820
·real estate	831
·legal and business service	840
·engineering and architecture service	850
5. Social Service	
·public administration and defence	910
·medical and health service	920
·hospital	933
·education	931, 932
·welfare and religious service	934
·nonprofit organization	935, 939, 942
6. Personal Service	
·entertainment and recreation service	941
·repair and drinking	951
·laundry and dry cleaning	952
·households service	953
·miscellaneous personal service	960

Source : The Korean Population and Housing Census, 1975.

The cities whose LQ value in the studying industry is greater than one are more specialized than the nation in the studying industry. At the present stage of Korean development, the LQ value of the regional export-base industries including manufacturing activities is expected to be greater than one. Therefore, those cities whose LQ value is greater than one in the transformative sector grow more rapidly than other cities. The LQ value of each industrial sector for each city is calculated in the following manner:

$$LQ_{iR} = \frac{E_i E_R}{E_I / E_N}$$

where LQ_{iR} is the LQ of industry i for city R.
E_i is the number of employees in industry i for city R
E_R is the total number of employees for city R.
E_I is the number of employees in industry i for the whole country.
E_N is the total number of employees for the whole country.

Based on this formula, the LQ value of each industry of each city is shown in Table 3.

As the second explanatory variable, the distance of each city from metropolitan cities is closely related to the urban growth of small and intermediate cities. In terms of the similarities and linkages of the human and physical characteristics of each city, Korea is divided into five zones — Seoul, Pusan, Kwangju, Daejeon, and Jeju (Ministry of Construction 1982). Among 32 intermediate and small cities, eleven cities belong to the Pusan Zone, ten cities to the Seoul Zone, seven cities to the Daejeon Zone, four cities to the Kwangju Zone shown in Table 4.

On the basis of the classification of cities into four zones, the closeness of each city to a particular metropolitan city is determined by its socioeconomic and geographical relationship with a metropolitan city. The closeness to a metropolitan city is indicated by the distance from each city to Seoul for those cities which belong to either the Seoul Zone or the Daejeon Zone. The distance between Pusan and those cities belonging to the Pusan Zone and the Kwangju Zone represents their closeness to Pusan. Even though the Pusan Zone and the Kwangju Zone adjoin each other, these two zones were nearly separated and had little communication because there is a mountain range between the two zones. Moreover, even though the Kwangju Zone is located the farthest from Seoul, it communicated with Seoul rather than with Pusan before the construction of the Namhae Highway which connects Pusan and Kwangju. With the opening of the highway, the Kwangju Zone became actively communication to the Pusan Zone. For estimating the closeness between each city and a metropolitan city, the distance of each city from a metropolitan city is measured along with the main transportation network. The distance of each city from a metropolitan city is shown in Table 5.

Finally, the proportion of residents who finished at least their high school in each city will be used as an explanatory variable for estimating the population growth. Data about the educational level of residents are taken from the 15 percent Sample Survey, Korean Population and Housing Census, 1975. Table 6 shows the proportion of residents finishing at least high school in

TABLE 3. LOCATION QUOTIENT VALUE OF INDUSTRY FOR CITY, 1975

City	Industrial Sector					
	Ext	Tra	Dis	Pro	Soc	Per
Incheon	.12	3.05	.94	1.00	1.00	.75
Suwon	.18	2.59	1.06	1.00	.33	1.00
Seungnam	.18	2.73	1.29	1.00	.67	1.00
Euijeungbu	.16	2.00	1.59	1.00	1.17	3.00
Anyang	.10	3.18	.94	1.00	.83	1.00
Bucheon	.16	3.09	.82	1.00	.83	.75
Chuncheon	.24	1.32	1.82	2.00	2.83	2.25
Wonju	.57	.91	1.53	1.00	3.00	1.75
Gangreung	.57	.91	1.70	2.00	2.50	1.50
Sokcho	.90	.55	1.59	1.00	1.67	1.50
Cheungju	.22	2.27	1.18	2.00	2.00	1.25
Chungju	.65	1.00	1.65	1.00	1.50	1.50
Deajeon	.08	2.23	1.65	2.00	1.50	1.75
Cheonan	.45	1.91	1.35	1.00	1.17	1.25
Jeonju	.31	1.36	1.76	2.00	1.17	1.75
Gunsan	.39	1.68	.02	1.00	1.50	1.50
Iri	.43	1.59	1.53	1.00	2.00	1.50
Kwangju	.22	1.82	1.53	2.00	2.17	2.00
Mokpo	.35	1.09	2.12	2.00	2.17	2.00
Yeosu	.45	1.09	2.06	2.00	1.50	2.00
Suncheon	.92	.59	1.47	1.00	1.50	1.75
Daegu	.04	3.00	1.18	1.00	1.00	1.25
Pohang	.18	2.23	1.76	1.00	1.17	1.50
Kyeungju	.81	.82	1.65	1.00	1.50	1.25
Kimcheon	.55	1.23	1.65	2.00	1.67	1.50
Andong	.41	1.23	1.76	2.00	2.33	1.75
Masan	.12	3.23	.82	1.00	.67	.75
Jinju	.39	1.36	1.82	2.00	2.00	.75
Chungmu	.59	1.27	1.53	2.00	1.50	1.25
Jinhae	.29	1.14	1.41	1.00	.50	1.50
Samcheonpo	.96	.95	1.18	.40	1.33	1.25
Ulsan	.22	2.95	.94	1.00	.67	.75

Source : The 15 Percent Sample Survey of the Korean Population and Housing Census, 1975.

each city.

ANALYSIS

The multiple regression model will be used to account for the variation of

TABLE 4. ZONES OF KOREAN URBAN SYSTEM

Zone	Cities
Seoul	Seoul, Incheon, Suwon, Seungnam, Anyang, Euijeungbu, Bucheon, Gangreung, Sokcho, Chuncheon, Wonju
Pusan	Pusan, Ulsan, Masan, Jinhae, Samcheonpo, Jinju, Chungmu, Daegu, Andong, Pohang, Kimcheon, Kyeungju
Daejeon	Daejeon, Cheonan, Jeonju, Iri, Gunsan, Cheungju, Chungju
Kwangju	Kwangju, Suncheon, Yeosu, Mokpo
Jeju	Jeju

Source : Ministry of Construction, *Second Comprehensive National Physical Development Plan, 1982-1991*, 1982.

TABLE 5. DISTANCE OF EACH CITY FROM A METROPOLITAN CITY (in km)

from SEOUL to		from PUSAN to	
Bucheon	10.4	Sokcho	291.4
Seungnam	12.0	Ulsan	54.8
Anyang	15.0	Masan	62.5
Euijeungbu	23.0	Kyeungju	68.7
Incheon	29.5	Jinhae	76.5
Suwon	31.2	Pohang	98.7
Cheonan	83.5	Jinju	99.0
Chuncheon	86.0	Chungmu	128.5
Cheongju	119.7	Samcheonpo	131.0
Wonju	121.5	Daegu	138.3
Daejeon	152.3	Suncheon	171.3
Chungju	189.7	Kimcheon	201.6
Iri	217.6	Yeosu	211.3
Gangreung	228.4	Andong	238.3
Jeonju	230.9	Kwangju	255.7
Gunsan	239.6	Mokpo	297.3

Source : The Central Mapping Corporation, *Main Road Network in Korea*, 1985.

the population growth rate in each city because this analysis is suited for analyzing the collective and separate effects of two or more independent variables on a dependent varable (Pedhazur 1982). It is expected that the proportion of residents who finished at least high school, the transformative sector, the distributive service sector, the producer service sector, and the social service sector will have negative effects on urban growth of those cities.

Table 7 shows the descriptive statistics of each variable. The evident result is that the average LQ value of the transformative sector is the highest among those of industrial sectors. Moreover, cities whose population growth rate is

TABLE 6. PROPORTION OF RESIDENTS IN EACH EDUCATIONAL LEVEL FOR KOREAN CITY, 1975

City	1	2	3	4	5	Total
Incheon	.09	.14	.38	.23	.16	1.00
Suwon	.10	.14	.31	.26	.19	1.00
Seungnam	.12	.12	.16	.37	.22	1.00
Euijeungbu	.11	.17	.37	.21	.14	1.00
Anyang	.09	.13	.38	.24	.16	1.00
Bucheon	.10	.13	.37	.22	.18	1.00
Chuncheon	.13	.17	.29	.22	.19	1.00
Wonju	.16	.20	.32	.17	.15	1.00
Gangreung	.17	.18	.32	.17	.16	1.00
Sokcho	.14	.21	.37	.17	.11	1.00
Cheungju	.13	.16	.34	.20	.17	1.00
Chungju	.15	.20	.36	.16	.13	1.00
Daejeon	.11	.17	.35	.20	.17	1.00
Cheonan	.14	.17	.39	.19	.11	1.00
Jeonju	.13	.19	.31	.18	.19	1.00
Gunsan	.14	.19	.34	.17	.16	1.00
Iri	.15	.17	.30	.21	.17	1.00
Kwangju	.12	.18	.33	.22	.15	1.00
Mokpo	.13	.21	.29	.27	.17	1.00
Yeosu	.16	.20	.33	.17	.14	1.00
Sucheon	.17	.21	.34	.16	.12	1.00
Daegu	.10	.14	.37	.23	.16	1.00
Pohang	.12	.15	.29	.21	.23	1.00
Kyeungju	.22	.19	.32	.15	.12	1.00
Kimcheon	.16	.19	.35	.17	.13	1.00
Andong	.16	.19	.32	.20	.13	1.00
Masan	.11	.13	.24	.40	.12	1.00
Jinju	.15	.18	.32	.20	.15	1.00
Chungmu	.18	.19	.34	.16	.13	1.00
Jinhae	.12	.18	.25	.21	.24	1.00
Samcheonpo	.22	.20	.35	.15	.08	1.00
Ulsan	.12	.15	.25	.22	.26	1.00

Note : 1; No education.

2 ; Attend elementary school or not finish elementary school.

3 ; Finish elementary school or attend junior high school or not finish junior high school.

4 ; Finish junior high school or attend senior high school or not finish senior high school.

5 ; Finish senior high school or higher degree.

Source : The 15 Percent Sample Survey of Korean Population and Housing Census, 1975.

higher than .300 — Bucheon (.701), Anyang (.617), Ulsan (.506), Pohang (.405), Suwon (.328), Seungnam (.324), Incheon (.308) — present higher LQ value in the transformative sector. These empirical statistics support our hypothesis that Korean small and intermediate cities which have grown rapidly are more specialized in the transformative sector than in other service sectors.

For the analysis of the relationship between two variables, the Pearson product-moment correlation matrix is presented in Table 8. The strongest correlation among independent variables appears in the negative relationship between the extractive sector and the transformative sector. This empirical result is considered as characteristic of urban industrial structure. The more residents engage in the transformative sector, the less they engage in the extractive sector. Also, the transformative sector holds a strong negative correlation with the social service sector. It has been the experience of Western countries that a high proportion of the secondary activities in industrial structure has been transformed into the social service sector among tertiary activities. This result may be interpreted as the Korean social change toward a welfare state similar to developed coutries.

Another finding shows the strong negative correlation between the distance from a metropolitan city and the transformative sector. This outcome illustrates that most transformative activities in Korea are located in cities surrounding metropolitan cities. Because metropolitan cities are the largest consumer markets, those cities adjacent to metropolitan cities have advantages in marketing and producing goods, such as inexpensive transportation cost, rapid information gathering, and easily obtained financial assistance. Also, the educational level of residents holds quite a strong negative relation with the extractive sector. This result supports the interpretation that people engaged in the extractive sector are more likely to be unskilled and low-educated.

Conversely, a strong positive correlation appears in the relation between the producer service sector and the social service sector. The relation between the producer service sector and the distributive sector is also strongly positive. In addition, the distribution sector is quite strongly positively related to the social service sector. This reciprocal correlation among three variables confirms that development of the producer service sector causes the successive expansion of business-related service sectors. Also, the distributive service sector holds the positive correlation with the personal service sector. This result may stem from the close association between the retail trade with the personal service sector in Korea. In other words, even though the retail trade has been transformed into a modern enterprise, small-sized trades managed

TABLE 7. DESCRIPTIVE STATISTICS AND CORRELATION COEFFICIENT OF EACH VARIABLE

Variable	Mean	Standard Dev.	Pearson Product Moment	Partial Corr.
Population Growth	.214	.170		
Distance	134.9	86.84	−.553*	−.279
Prop. of Higher Educ	.158	.040	.445*	.483*
Extractive Sector	.382	.258	−.565*	.332
Transformative Sector	1.762	.843	.696*	.496*
Distributive Serv. Sector	1.416	.427	−.287**	.255
Producer Serv. Sector	1.356	.517	−.131	.120
Social Serv. Sector	1.480	.665	−.367*	.194
Personal Serv. Sector	1.445	.499	−.421*	−.019

*P < .05, **P < .10.

Source : The 15 Percent Sample Survey of Korean Population and Housing Census, 1975.

only by a family's labor force are still dominant in the retail trade.

For measuring the strength of the relationship between an independent variable and a dependent variable, the correlation coefficients are represented in Table 7. To figure out the compounding effects of other variables on the correlation coefficient of each variable, the Pearson product-moment correlation coefficient is calculated along with its partial correlation coefficient. As hypothesized, the distance of a city from a metropolitan city has a significant and strongly negative association with the population growth shown by the Pearson product-moment correlation coefficient. When other variables are controlled, the strength of the association is quite diminished.

Nevertheless, this empirical result supports the idea that urban growth for Korean small cities is an extension of an expansion for metropolitan cities. As a good example, Kwangju, which was once designated as the growth pole for developing the southwestern areas in Korea, shows much lower population growth (.182), compared to the population growth of similar sized cities. Above all, the location of this city, which is far away from two metropolitan cities, is a major obstacle to the growth of city. Moreover, Sokcho, which is located the farthest from Seoul, lost population during this period. Therefore, in the context of developing countries, the rapid growth of cities adjacent to metropolitan cities is a desirable phenomenon for saving limited capital and resources. However, each city should have its own industrial infrastructure for its continuous development and for the balanced development in the whole country.

As the second independent variable, the proportion of residents who finished at least high school is strongly and positively associated with the

TABLE 8. PEARSON PRODUCT-MOMENT CORRELATION MATRIX OF INDEPENDENT VARIABLES

	Dis	Edu	S1	S2	S3	S4	S5	S6
Dis	1.000							
Edu	−.125	1.000						
S1	.424	−.579	1.000					
S2	−.631	.326	−.819	1.000				
S3	.379	−.057	.255	−.583	1.000			
S4	.455	.140	−.132	−.257	.545	1.000		
S5	.556	−.146	.333	−.597	.489	.532	1.000	
S6	.415	−.009	.104	−.492	.523	.315	.471	1.000

Note : S_1 ; Extractive Sector
S_2 ; Transformative Sector
S_3 ; Distributive Service Sector
S_4 ; Producer Service Sector
S_5 ; Social Service Sector
S_6 ; Personal Service Sector

Source : The 15 Percent Sample Survey of Korean Population and Housing Census, 1975.

population growth of each city in both coefficients. Moreover, the strength of association in the partial correlation increases slightly. As a typical case, even though Masan, the Free Export Industrial Complex, shows the highest LQ value in the transformative sector among 32 cities, the population growth rate is only .041 during this period. The condition for urban growth in Masan is better than in other cities except for its low proportion of residents finishing at least high school (.12). The low value in the educational variable may result from the development of Masan as the center of light industry and processing industry, which does not require the highly qualified labor forces. There is not a strong emphasis on completion of a high school education. This finding confirms our hypothesis: the high school education. This finding confirms our hypothesis: the high correlation between the educational level of city residents and the urban growth of small cities.

Among industrial structures, the transformative sector indicates the strongest positve and significant relationship with the population growth for each city. When other variables are controlled, the strength of association is slightly diminished. The negative and significant Pearson product-moment correlation coefficients of industrial sector changed into the positive and non-significant partial correlation coefficients, except the transformative and the personal service sectors. This result strongly supports our hypothesis. The population growth rate in each city is more highly correlated with the specialization in the transformative sector than in any service sector.

TABLE 9. REGRESSION COEFFICIENT OF EACH VARIABLE

Variable	Normal Regression	Standard. Regression
Distance	−4.86E-04	−.249
Proportion of Higher Education	1.913*	.447*
Extractive Sector	.475	.721
Transformative Sector	.251*	1.246*
Distributive Service Sector	.094	.236
Producer Service Sector	.040	.121
Social Service Sector	.043	.169
Personal Service Sector	−.006	−.017
Constant	−.888	
R Square	.659	
F Significance	.0006	

*P < .05.
Source : The 15 Percent Sample Survey of Korean Population and Housing Census, 1975.

Therefore, this is a clear deviation from the current urban growth in developing countries whose rapid urban growth is closely related to the growth of the traditional tertiary sector (Bairoch and Limbor 1968; U.N. 1966, 1973; Amin 1976). This observation is not supported in the context of Korean urban growth during 1975-1980. Even though the ratio of employment in the tertiary sector is increasing at the national level, most of the increases in the tertiary sector are due to the contributions of rural towns rather than to those of small cities. The direct shift from the agricultural labor forces into the unskilled tertiary ones is a characteristic of the sectoral transformation for rural towns. Among service sectors, the personal service sector, mainly consisting of the small trades, is strongly and negatively associated with the annual population growth rate. When other variables are controlled, the strength of the relationship is quite diminished. This characteristic of the tertiary sector in Korea is more similar to that in developed countries than in developing countries.

The results from the least square regression analysis are presented in Table 9. The R square value, reflecting the overall accuracy of the prediction equation, is quite high (.659). This implies that those independent variables included in the equation explain 66 percent of the variation of the population growth rate in each city. On the other side, predication accuracy in absolute units is measured by the standard error of estimate for the regression equation which can be interpreted as the standard deviation of residuals. Thus, the average population growth rate deviates from the actual scores by .115 units on the population growth rate scale. Also, this model as a whole is

statistically significant (the level of significance of the F value is .0006).

Among eight independent variables, the distance of each city from a metropolitan city and also the personal service sector have a negative influence on the population growth rate while others positively influence the annual population growth rate. In light of statistical significance, only the proportion of residents finishing at least high school and the transformative sector are significant at the .05 level. The former variable has the strongest positive effect on the population growth rate in the normal regression coefficient. Even though the regression coefficient of this variable is standardized, the influence of this variable on the population growth rate is still quite strong.

In terms of the standardized coefficient, the transformative sector has the strongest effect on the population growth in each city. However, its standardized coefficient, which is greater than one, indicates multicollinearity between the transformative sector and the extractive sector. The high interrelation among independent variables suggests that there is a reason to doubt the reliability of the relative importance indicated by partial correlation coefficients. Thus, the use of only one of the variables in the highly correlated set is recommended when extreme multicollinearity exists (Kim and Kohout 1975). If the extractive sector whose standard error is greater than that of the transformative sector is omitted, we can expect to get more reliable parameter estimates.

The extractive sector indicates quite a strong but insignificant effect while other sectors have weak and insignificant effects on the population growth rate in each city. These empirical results can be summarized into three main facts. First of all, all industrial sectors except the personal service sector have positive effects on the population growth rate, indicating the significance of the sustenance organization in the urban growth for each city. This fact strongly supports the importance of the ecological perspective in analyzing the redistribution of population in reaction to the change of sustenance organization. Secondly, the extractive sector shows a positive yet insignificant effect on the population growth for each city. It is commonly accepted, however, that a role of the extractive sector has diminished as urban growth has proceeded. This finding can be interpreted as the limitation of my sample because only cities are examined in this analysis. In other words, a large portion of the extractive sector of cities consisting of the processing industries related to the productive activities results in the positive effect of the extractive sector on the population growth. When small towns are included, the result may be different. Thirdly, at the present stage of Korean economic development, the transformative sector, rather than other sectors, has a much stronger influence on the population growth rate in each city.

Finally, the distance of each city from a metropolitan city has a negatively weak and insignificant effect on the population growth rate in the normal regression coefficient while the standardized coefficient shows a quite strong negative effect. However, Gangreung, Daegu, and Iri are deviant cases that are farther away than the average distance from a metropolitan city (134.85 km) and mark higher population growth rates than the average population growth rate (.214). Gangreung is the fourth farthest city away from Seoul. However, on the basis of the tourist resources in the Youngdong Region, Gangreung has grown rapidly as a center of the Youngdong Tourist Resort Region. Daegu, as another growth center of the Pusan Zone, emphasizes the development of its own specialized industries, such as textiles and electronic goods. Owning to its continuous rapid growth, Daegu was promoted to Special City status after 1980. Iri, designated as the Free Export Industrial Complex, is the leading industrial center in the southwestern Daejeon Zone. The development of light industry in Iri induces the migration from the surrounding rural areas.

DISCUSSION AND CONCLUSION

Korea is a country which experienced rapid social, economic, and demographic changes during the 1970's. The higher population growth of nonmetropolitan areas than metropolitan ones in Korea was a typical change during this period. Furthermore, it is expected that the primate urban system is gradually changing into a balanced urban system in the nation as a whole. The redistribution of population into small and intermediate cities has been accompanied by the decentralization of sustenance organization from metropolitan cities. Thus, this phenomenon is explained well by the interaction of factors in an ecological complex.

Among independent variables, the industrial structure of each city is closely related to the population growth rate. This result coincides with the previous studies (Hauser 1956; Frisbie and Poston 1976) which regard the industrial sector as the most influential factor in population growth. Moreover, at the present Korean economic development stage, the transformative sector, rather than the service sector, is much more closely associated with the population growth in small cities. Additionally, the service sector in Korea shows specialization in the business-oriented and producer service sector based on the development of the transformative sector. Therefore, Korean urbanization is proceeding through the industrialization of economic struc-

ture. The Korean government adopted the manufactured-export expansion for solving employment problems during the rapid modernization. Owing to the successful government policy, the rapid expansion of employment was created by the fast-growing labor intensive manufacturing sector and was reinforced by the resultant expansion in the service sector.

In this regard, Korean urbanization represents a divergence from the current pattern of sectoral change for urban areas in the Third World. The latter's development pattern differs from the Western experience of industrialization because of its different socioeconomic, political, technological conditions. Modernization of developing countries tends to be the "tertiary sector growth" rather than the "industrialization". Because of the imported high level of technology and the high capital-labor ratio, a substantial increase in the manufacturing output creates only a small increase in the manufacturing labor forces. In this sense, the urban growth in developing countries is supposed to be more closely related to the tertiary sector than to the secondary sector.

One finding is that the high educational level of residents strongly influences urban growth in Korea. In light of the fact that the application of technology helps a population in adapting to and modifying its environment (Berry and Kasarda 1977), cities with higher educational level of residents have an advantage in adapting to their environment and further attracting migrants. Thus, the high correlation between urban growth and educational level of residents may be an indirect influence of technological development on population as well as the outcome of Korean people's high aspiration toward education.

For an environment variable, the closeness of a city to a metroplitan city positively influences urban growth. The rapid growth of cities adjacent to metropolitan cities is the extension of the functional expansion of metropolitan areas, which is the important concept of the ecological perspective. In this empirical study, this variable is not statistically significant, which can be attributed by two facts. Such an insignificant result is due to the small number of cases for measuring the influence of adjacency to a metropolitan city on population growth. On the other hand, the rapid urban growth of nonadjacent cities to a metropolitan city is supposed to be confined to cities in developed countries. Nevertheless, as the rapid growth of Gangreung shows, a city having its own specialized function for development can grow rapidly without depending on metropolitan cities. Therefore, we can forecast the potential growth of nonadjacent cities to metropolitan cities if they have their own specialized urban function for their self-development.

Judging from this empirical evidence, it is expected that Korean urban

growth is gradually proceeding toward a balanced urban system. However, the observation period of five years is too short and the stage of migration reversal is too incipient for generalizing this finding as the characteristic of Korean nonmetropolitan growth. Nevertheless, we can forecast the continuously diverse and dynamic growth of small and intermediate cities based on the sectoral transformation into specialization in the productive activities.

For further research about urban growth of nonmetropolitan cities in Korea, I suggest including towns as well as small cities in the analysis. There are some towns that do not have a city status, even though they qualify for it, because of complex administrative conditions. This could solve the limitation of a small number of observation cases. Thus, the analysis including towns can become more comprehensive and significant in empirical results for a balanced urban system.

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