

INDUSTRIAL AND OCCUPATIONAL EMPLOYMENT IN KOREAN URBAN REGIONS*

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This study analyzes whether there has been an uneven distribution of employment across urban areas in South Korea. Using data from the latest Korean census, we use simple correlation analysis to show that employment in a particular industry or occupation is associated with different characteristics of urban regions. Manufacturing employment is associated with wealthier, more crowded cities, which have relatively more advanced social overhead capital. The financial sector also is concentrated in large cities with more developed infrastructure. In contrast, other service industries—including wholesale and retail trades, transportation, and social services—are centered in lower income, less developed, but less crowded cities. Unlike manufacturing, social services are concentrated in urban areas with older residents. Our findings suggest that redistribution of jobs from the Seoul area cannot be achieved without investing in social overhead capital in the targeted regions.

INTRODUCTION

South Korea has sustained brisk economic growth over the past thirty years. Much has been written about the government's twin policies of export promotion and rapid industrialization.¹ Rapid development has required substantial restructuring of employment, which has had several important side effects.

Growth overall can mask lopsided development across an economy, with a high-wage industrial sector operating alongside a low-wage "traditional"

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¹For background on South Korea's development since the middle 1960s, see the collection edited by Corbo and Suh (1992); also see Balassa (1985, 1988), Cho and Koo (1983), Kim and Roemer (1979), Koo (1984), Kuznets (1988), Kwack (1990a, b), Lee and Naya (1988), Oshima (1986, 1988), Scitovsky (1990), and Song (1990).

²On dualistic economic development, see Kelley *et al.* (1972). On labor segmentation and

sector.² In the case of South Korea, unbalanced development of urban and rural areas has been well-documented.³ For example, Oshima (1986) has written that concentration of industrialization in a few urban centers made Korean rural areas more remote. Indeed, in the 1970s the government introduced some rural industrialization initiatives to achieve more balanced growth (see Song and Ryu 1992; Suh 1992). Nevertheless, growth has been uneven across industries, with the South Korean government placing particular emphasis on the advancement of heavy manufacturing and chemicals (see Corbo and Nam 1992; Suh 1992; Song 1990; Young 1992).⁴

Bai (1982) argued that the concept of uneven development must be expanded beyond a simple rural-urban dichotomy: in urban areas there should be an accounting for both "modern" and "traditional" endeavors. As a corollary, we contend that as the focus of economic activity in South Korea has shifted to cities, there has been an uneven distribution of employment across urban areas. To extend the research on unbalanced development, this study uses data from the latest South Korean census, in 1990, to examine the distribution of employment across the country's urban areas.

Balassa (1988) wrote that infrastructure has been a crucial precondition for export expansion and development of financial markets in rapidly developing Asian countries. The manufacture of traded goods and operation of financial markets require substantial social overhead capital. Therefore, we expect employment in manufacturing and finance to be concentrated more in wealthier cities with better developed social overhead capital than in lower-income urban areas with less advanced infrastructure. In contrast, transactional services—like wholesaling and retailing—and social services are likely to be relatively more prominent in less developed urban areas. Because it provides links between regions, the transportation industry is likely to represent an intermediate case, with a more balanced representation across urban areas.

Using simple correlation analysis, we show that the likelihood of employment in a particular industry or occupation is associated with different characteristics of urban regions. Consequently, policy makers who are interested in achieving more balanced economic development not only

economic development, see Taubman and Wachter (1986, pp. 1190-92).

³For example, see Bai (1982), Castañeda and Park (1992), Fields (1985), Kim and Roemer (1979), Oshima (1986, 1988), Song and Ryu (1992), and Suh (1992).

⁴Many researchers also have argued that rapid industrialization in South Korea has resulted in different employment opportunities for women and men. On female employment in Korea, see Castañeda and Park (1992), Cho and Koo (1983), Fuess and Lee (1994), Galenson (1992), and the collection edited by Yu and Phillips (1987).

must distinguish between rural and urban areas, but also must focus on the redistribution of economic activities across cities.

SAMPLE AND ESTIMATION METHOD

Detailed data on population and the distribution of employment by region and industry can be found in *Census Reports* of the South Korean government. The Republic of Korea conducts a census every five years. The most recent census was conducted in 1990, with the government publishing its *Census Report* in 1992 (see National Statistical Office 1992).

To measure the association between employment and urban regions, it is necessary to obtain measures of different regional characteristics. The *Municipal Yearbook of Korea* provides data on infrastructure and measures of social welfare spending (see Ministry of Home Affairs 1992). Another important regional characteristic is real economic activity. Since 1985 the government has collected and reported figures for gross regional product (GRP) and these data recently have been published (see National Statistical Office 1993). Data are reported for urban areas of each of the nine provinces: Kyonggi, Kangwon, Chungbuk, Chungnam, Chonbuk, Chonnam, Kyongbuk, Kyongnam, and Cheju.

GRP data are available since 1985 but some urban regions, such as Kwangju and Daejon, have been designated as special cities since then. Special cities are classified independently of the provinces in which they are located. Thus, to examine the distribution of employment across South Korea's fifteen urban regions (six special cities and urban areas of the other nine provinces), we limited our sample to 1990, using figures from the most recent census. The six special cities are listed as follows: Seoul, Pusan, Taegu, Incheon, Kwangju, and Taejon.

Because our investigation is limited to the year 1990, there are only fifteen observations in the sample. This data limitation precludes analysis using multivariate regression techniques. With a regression approach ruled out, we turn to simple correlation analysis.

The Pearson correlation coefficient, ρ , measures the linear relationship between two variables. It is simply the normalized covariance between the two variables, so $-1 \leq \rho \leq 1$. The correlation coefficient is calculated by taking the sample covariance between two variables and normalizing it with the sample standard deviations. An F-test can be performed to test the correlation between two variables. The null hypothesis is $\rho = 0$ and the test statistic is $F = [(n - 2)r^2] / (1 - r^2)$, where n is the number of observations (15) and r^2 is the square of the sample correlation coefficient (see Ramanathan

1989).

For each urban area, the proportion of employed persons working in a particular industry can be computed from the *Census Report* (National Statistical Office 1992). We then measure the correlation between the likelihood of working in an industry and various urban characteristics. These measures of association are not evidence of causality, but they can suggest whether different types of employment are related to different aspects of urban areas.

We selected a number of measures to represent characteristics of urban regions. These measures can be found in South Korea's *Census Report* and in government publications such as *Gross Provincial Domestic Product* (National Statistical Office 1993) and *Municipal Yearbook of Korea* (Ministry of Home Affairs 1992).

We group the regional variables into different categories. The first category is real economic activity in an urban area and we used two variables: 1990 gross regional product (GRP) per capita and the average yearly growth rate of per capita GRP (measured in 1985 constant prices) over the years 1985-1990.

The second grouping focuses on aspects of an urban area's population. We use the 1990 urban population to gauge city size. To illustrate the age profile of urban areas, we include the percentage of the population over the age of sixty-five years. The extent of urban poverty is represented with two measures: social welfare expenditures per capita in each area and the share of social welfare in city government expenditures.

The third set of characteristics centers on social overhead capital. These aspects relate to infrastructure, park and housing facilities, human resource development, and transportation and congestion.

The diffusion ratio of sewerage indicates the extent of structural development in a city. The share of housing in the form of apartments and the share of detached houses provide measures of urban housing stock. The number of square kilometers of park space per capita provides a measure of the area set aside for green space in an urban region.

We represent the quality of the human capital stock with the number of college students per population. For a measure of access to information sources, we use the number of library seats per capita. To gauge access to health care, we include the number of physicians per capita.

Finally, we use a number of variables to exemplify the stock of transportation capital and congestion. Length of road (in kilometers) per capita shows availability of transportation space. The number of passenger cars and number of buses per capita indicate the availability of

transportation.

ESTIMATED CORRELATION COEFFICIENTS

South Korean Urban Regions: Background

Before presenting the estimated correlation coefficients, we discuss briefly South Korea's urban regions. In 1990 Seoul was by far the largest city, 10.628 million residents, followed by the urban population of Kyonggi province, 4.078 million, and the city of Pusan, 3.798 million.⁵ Cheju province (an island south of the Korean peninsula) exhibited the smallest urban population, 321,000 persons, followed by Chungnam and Chungbuk, 467,000 and 706,000 inhabitants respectively.

Generally, the larger urban areas also exhibited relatively high output per capita. For example, Kyonggi province had the smallest percentage of residents below the official poverty line and had one of the highest per capita gross regional products, exceeding the national average by 27%. In contrast, Cheju and Chungbuk had the lowest per capita GRPs. Further, the percentage of city expenditures for social welfare spending was highest in these two provinces.

Estimation Results

Estimated correlation coefficients between proportion of workers employed in various industries and characteristics of urban areas are presented below. We focus first on manufacturing, followed by financial services, wholesaling-retailing, transportation, and then social services. Although these five industries do not represent all sectors in the South Korean economy, they account for at least seventy percent of employment in each urban region.

1. Manufacturing

As shown in Table 1, manufacturing was most concentrated in Inchon, Kyongnam, and Kyonggi (which surrounds Inchon), among the more populated urban regions. The employment shares range between 42% and 46%. Manufacturing was least likely in Cheju, Kangwon, and Kwangju, occupying between 4% and 21% of employment.

The proportion of urban employment in manufacturing is associated directly with gross regional product per capita and the growth rate of GRP

⁵Kyonggi province surrounds the cities of Seoul and Inchon. The province contains cities such as Ansong, Suwon, and Yoju.

per person; estimated correlation coefficients are 0.71 and 0.51, respectively (see Table 2). Manufacturing's share of employment is inversely related to

TABLE 1. EMPLOYMENT SHARE BY INDUSTRY FOR SOUTH KOREAN URBAN AREAS, 1990
(Unit: %)

City/ Province	Industry ^a				
	MANUF	FIN	WHOLE/ RETAIL	TRANS	SOCIAL SERVICES
<i>SPECIAL CITIES^b</i>					
Seoul	29.68	9.50	27.71	5.98	16.62
Pusan	40.04	5.09	22.18	8.73	13.95
Taegu	37.64	5.30	23.71	5.55	16.82
Inchon	45.22	5.65	19.01	6.45	12.27
Kwangju	20.61	6.71	23.67	7.37	22.56
Taejon	24.55	6.71	23.55	7.32	22.34
<i>URBAN AREAS OF PROVINCES</i>					
Kyonggi	42.84	6.23	19.99	4.81	13.72
Kangwon	13.64	5.21	24.60	8.06	22.40
Chungbuk	26.21	5.13	23.40	6.93	20.21
Chungnam	23.05	5.03	21.93	7.14	18.39
Chonbuk	21.86	5.21	23.01	7.47	22.38
Chonnam	25.07	4.57	21.47	7.34	18.70
Kyongbuk	34.65	4.15	21.24	6.38	15.85
Kyongnam	44.32	4.08	19.09	4.96	13.99
Cheju	4.89	5.07	28.13	10.40	22.04

Notes: ^aEach industry variable represents the proportion of workers in an urban area working in the designated industry. The industries under investigation are manufacturing, finance, wholesale/retail, transportation, and social services. The employment proportions are computed using census data reported by the National Statistical Office (1992, Volume 6).

^bSpecial cities are counted independently of the provinces in which they are located (see National Statistical Office 1992, Volume 6).

TABLE 2. ESTIMATED PEARSON CORRELATION COEFFICIENTS: ASSOCIATION BETWEEN PROPORTION OF WORKERS IN INDUSTRIES AND CHARACTERISTICS OF URBAN AREAS, SOUTH KOREA, 1990

Regional Characteristic	Industry ^a				
	MANUF	FIN	WHOLE/ RETAIL	TRANS	SOCIAL SERVICES
<i>Economic Activity^b</i>					
GRP/Cap	0.71**	-0.06	-0.63**	-0.67**	-0.67**
Growth (GRP/Cap)	0.51*	0.26	-0.37	-0.52**	-0.45*
<i>Population/Poverty^c</i>					
Size of Population	0.34	0.77**	0.27	-0.36	-0.39

TABLE 2. (Continued)

Regional Characteristic	Industry ^a				
	MANUF	FIN	WHOLE/ RETAIL	TRANS	SOCIAL SERVICES
Percentage of Population Aged 65 Years and Older	-0.76**	-0.16	0.33	0.48	0.76**
Social Welfare Spending/Cap	-0.50*	0.43	0.43	0.26	0.43
Share of Social Welfare Spending in City Expenditures	-0.44*	0.08	0.65**	0.51*	0.29
Social Overhead Capital ^c					
Diffusion Ratio of Sewerage	0.65**	0.61**	-0.14	-0.73**	-0.47*
Proportion of Detached Houses	-0.77**	-0.37	0.49*	0.70**	0.70**
Proportion of Apartments	0.87**	0.20	-0.59**	-0.79**	-0.68**
Area of Park Space/ Cap	0.63**	-0.41	-0.46*	-0.52**	-0.51*
College Students/ Cap	-0.51*	-0.19	0.45	0.25	0.60**
Library Seats/Cap	-0.73*	-0.31	0.27	0.51*	0.63**
Physicians/Cap	-0.47*	0.42	0.55**	0.08	0.45*
Transportation Capital/Congestion ^d					
Length of Road/Cap	-0.76**	-0.17	0.56**	0.68**	0.50*
Passenger Cars/Cap	0.22	0.58	0.34	-0.45	-0.47
Buses/Cap	-0.69**	-0.25	0.51*	0.63	0.45*

*Significant at the 10% level. **Significant at the 5% level.

Notes: ^aEach industry variable represents the proportion of workers in an urban area working in the designated industry. The industries under investigation are manufacturing, finance, wholesale/retail, transportation, and social services. The employment proportions are computed using census data reported by the National Statistical Office (1992, Volume 6).

^bGross Regional Product for each of the fifteen regions is reported by the National Statistical Office (1993).

^cThe urban population in each region can be obtained from the National Statistical Office (1992, Volume 1). All of the other regional characteristics—percentage of population over sixty-five years of age, social welfare spending per capita, the share of social welfare spending in city expenditures, the diffusion ratio of sewerage, shares of detached housing and apartments in the housing stock, area of park space, number of college students, library seats, and number of physicians—were taken from the Ministry of Home Affairs (1992).

^dLength of permanent road, number of passenger cars, and number of buses for each region are reported by the Ministry of Home Affairs (1992).

the percentage of inhabitants aged sixty-five years and older (correlation: -0.76), social welfare spending per capita (-0.50), and the share of social welfare spending in city expenditures (-0.44).

Manufacturing is directly correlated with infrastructure. The more widespread the sewerage system or the more park space per capita in urban areas, the greater is manufacturing's share of employment in a city. The estimated correlation coefficients are 0.65 and 0.63, respectively. Although manufacturing centers tend to have more social overhead capital, they also tend to be more congested. This latter observation is supported by significantly negative correlations with road space (-0.76), buses (-0.69), college students (-0.51), library seats (-0.73), and physicians (-0.47) per capita. Further, manufacturing is positively associated with apartment dwelling (0.87).

The census data also classify employment according to occupation. Occupations such as "office worker" and "production worker" are strongly correlated with manufacturing employment. Inspection of the census data shows that these two occupations are also positively correlated with an urban region's real economic activity and sewerage infrastructure and negatively related to age of the population. There is a positive correlation between the proportion of workers in "production" work and park space.

2. Finance-Insurance-Real Estate

Employment in the finance-insurance-real estate (FIRE) sector of the economy was distributed differently than in manufacturing. Whereas Kyongnam's cities exhibited one of the highest shares of manufacturing jobs, 44.32%, it had the smallest percentage of FIRE sector employment, only 4.08% (see Table 1). The capital city Seoul experienced the greatest share of FIRE sector jobs: nearly one-in-ten inhabitants of the South Korea's largest city worked in this sector. Further, financial jobs were highly concentrated in surrounding Kyonggi province. Work in the FIRE sector was also relatively prominent in other large cities, like Kwangju and Taejon. Indeed, an estimated correlation coefficient of 0.77 signifies that the financial industry's share of employment is greater in the more populated urban areas (see Table 2).

In one respect the FIRE and manufacturing sectors are similar: these industries are concentrated more in urban areas with better developed infrastructure. There is a significantly positive correlation (0.61) between FIRE's share of employment in a city and the diffusion ratio of sewerage.

3. Wholesale and Retail Trade

The prominence of wholesale-retail trade varied across urban regions. Table 1 indicates that the sector's employment share was highest in Cheju—28.13% of jobs with a population of only 0.3 million—and Seoul—27.71% of jobs in a city of nearly 11 million. Inchon, where manufacturing employment was most concentrated, experienced the smallest share of wholesale-retail workers, only 19.01%.

In contrast to manufacturing and financial services, wholesale-retail trade is significant in less wealthy, less developed, but less congested urban areas. A correlation coefficient of -0.63 shows that wholesale-retail employment is inversely related to per capita gross regional product. Further, there is a positive correlation (0.65) between employment in this sector and the share of social welfare spending in city expenditures.

Wholesaling and retailing occupies a greater share of employment in relatively uncongested areas, as indicated by the positive correlations with road space (0.56), buses (0.51), and physicians (0.55) per capita and the negative association with apartment dwelling (-0.59). But these uncrowded areas also have relatively little green space; there is a negative correlation between wholesale-retail employment and park space per capita (-0.46).

4. Transportation

The transportation sector is similar to wholesale-retail trade. The data in Table 1 indicate that Cheju had the greatest share of workers in this sector (10.40%), while Kyonggi, a major manufacturing area, had the smallest employment share (only 4.81%).

The proportion of urban workers in transportation is higher in areas with lower per capita GRP and slower growth; the estimated correlations are -0.67 and -0.52, respectively (see Table 2). Transportation employment is also more likely in cities with relatively high outlays for social welfare (correlation: 0.51).

In contrast to manufacturing and finance, transportation is centered in regions with less developed sanitation infrastructure (-0.73) and less park space per capita (-0.52). But as may be expected, transportation employment is related directly to length of road per capita (correlation: 0.68).

5. Social Services

As shown in Table 1, employment in social services was most likely in the special cities of Kwangju (22.56% of jobs) and Taejon (22.34%) and in the urban areas of Kangwon (22.40%), Chonbuk (22.38%), and Cheju (22.04%). These areas are among the lower income regions of South Korea. Indeed, the estimates in Table 2 show that there is a significantly negative

correlation between social services employment and GRP per capita (-0.67) and growth in regional product (-0.45). Further, there is a positive association (0.76) between social services employment and the percentage of older inhabitants in an urban area.

Like wholesale-retail trade, social services are concentrated in less developed urban regions. The social services share of employment is higher in areas with less sewerage infrastructure (correlation: -0.47) and comparatively little park space (correlation: -0.51).

Social services are directly correlated with the number of college students (0.60), library seats (0.63), and physicians (0.45) per capita. These correlations might reflect an association with better developed areas, but they also could show a relationship with relatively uncrowded regions. The latter possibility is consistent with the observation that social services employment is positively related to road space (0.50) and buses (0.45) per capita and inversely related to apartment dwelling (-0.68).

Census data classifying employment according to occupation show that service occupations exhibit similarities with the social services sector. There is a positive correlation with population age and social welfare spending and a negative correlation with sewerage infrastructure.

6. Summary

Manufacturing employment is associated with richer, better developed (sanitation infrastructure and parks), more crowded regions with apartment dwelling inhabitants. Production of traded goods is not the only activity distributed unevenly across urban areas. The financial sector also is concentrated in large cities with more developed infrastructure.

Whereas finance-insurance-real estate is a service sector associated with more developed urban areas, other service industries—like wholesale-retail trade, transportation, and social services—are centered in lower income, less developed, but less crowded cities. In contrast to manufacturing, which is concentrated in urban areas with relatively young inhabitants, social services are centered around urban areas with older residents.

CONCLUDING REMARKS

Unbalanced development between rural and urban areas in South Korea is well-documented. This study shows that there is also an uneven distribution of employment across urban areas in South Korea. The distribution of employment in Korean industries is significantly correlated with various characteristics of urban areas. Data limitations prevented the

application of multi-variate regression techniques, so we cannot conclude whether regional conditions caused the distribution of employment or employment patterns determined regional conditions. Nevertheless, our analysis shows that employment in manufacturing and finance is positively related to regional development, which supports Balassa's (1988) point that infrastructure is necessary for rapid development.

Policy makers in South Korea are concerned that the relatively rapid growth of Seoul and surrounding Kyonggi province may deprive other urban areas of development. Our findings suggest that redistribution of jobs from the Seoul area cannot be achieved without investing in social overhead capital in the targeted regions.

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