Japan's Urban System—an overview*

by

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I. Introduction

Japan is now becoming like one vast metropolitan area which is composed of a series of large, medium and small concentrations of population stretching from Hokkaido to Kyushu, and the rural areas surrounding these concentrations are becoming more and more an integrated part of the national urban system.

With over three-quarters of the population are now residents in the city area, it goes without saying that the social and economic life of Japan is vested in its cities and in the way these cities operate as an integrated system. Therefore, the analysis of the national settlement system can be limited to its urban subsystem.

According to YEATES and GARNER, two approaches can be identified in the study of urban system. [1] First, there is the study of problems relating to the spatial differentiation of cities themselves. Studies in this category are concerned with a system of cities. Second, there is the study of patterns of distribution and interaction within cities. Studies in this category are concerned with the city as a system.

The purpose of this paper is to review the recent articles on Japan's Urban System in terms of cities as systems within a system of cities and to set a guideline for further study.

II. Organization of Japan's Urban System

From the time of the first national census in 1920, the continuity of a drift of popu-

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lation from rural to urban areas has been prevailing. For half a century, two of the nation's principal regions, Tokyo and Osaka Metropolitan Areas continued to experience a net in-migration of population. The basic pattern of population movement has been the one that is essentially centripetal in character, with a concentration of migrants from rural areas in the two major metropolitan areas, where Tokyo and Osaka are primate cities. Of the two, the Tokyo Metropolitan Area has possessed the greater attraction for migrants, but its pull has become relatively much stronger particularly in the post-war period.

1. Basic Dimensions of Urban System

As far as the author's knowledge is concerned, no systematic and general research had been done into the way which Japanese cities differ from, or resemble, one another forming the study of a system of cities up until the end of the 1960's.[2] A large amount of literatures was too ready to speak of the urbanization or of the urban way of life, without appreciating the variations found both within and between cities.

In 1967, the first paper of this kind was read by YAMAGUCHI at the meeting of the Association of Japanese Geograhers. The major purpose of his study was to fill a gap in the knowledge of Japanese cities by means of developing a parsimonious set of urban functions.[3]

The study covered variables on population size and structure, population change, economic and social characteristics, and level of education. The areal data unit was mostly based on the DID's. Fifty variables and 189 cities with DID population in 1960 of 30,000 or over represented the sample. Using principal component analysis, underlying dimensions between cities were examined to test the consistency of the component in terms of the parallel sets of data. They were composed of three sets of cities grouped according to Core Region, and Southwestern and Northeastern Parts of Japan, and four sets of cities according to the population sizes of 30,000 to 50,000, 50,000 to 100,000, 100,000 to 250,000 and 250,000 or over.[4]

As far as the pivotal trial of all samples was concerned, four components were extracted from 50 variables. The first component was identified with quaternary functions or social status and the second component with industrial structure or economic base. The third component was associated with working population, or subcomponent of the first component, and the fourth component with urban centrality in reference to size

factor.

Then, a separate component analysis was carried out for each group mentioned above. The factor of quaternary functions or social status was predominant in all groups except in the case of large cities. As to the group of large cities, urban economic base came out from the first component.

All in all, the pattern was broadly similar and a study of factor loadings confirmed that the certain variables were commonly related to the two major components. These variables associated with quaternary functions are namely educational series, white-collar occupations, percentages in finance and services, and population change in the 1960-65 period. Another group of variables forming the second component, named central functions, were sex ratio, and per capita retail and wholesale sales. Significant variables were also grouped by means of the distance matrix using bonded groups, and the result revealed the fact that the quaternary functions were most alike in location habits, followed by tertiary group and urban centrality.

As far as a system of cities is concerned, cities do not cluster in the form of one unique type as compared to another unique type. Rather, on the basis of the variables examined, cities tend to be distributed, and usually the distribution involves a gradient of differences. To solve this problem, the author translated the component scores into a profile of cities so that individual cities could be identified and examined in relation to other specific cities. The profile was based on the two functional components which explained 31.4 percent of the total variance. An attempt was made to rank cities on their component indices in two arrays.

Through these indices, it was possible to compare and evaluate the degree of quaternary functions between cities. The leading group of cities consisted of six largest cities followed by four regional capitals and some suburban residential cities within Tokyo and Osaka Metropolitan Areas. Accordingly, 31 suburban residential cities were eliminated from the rank order and their indices were added to neighboring mother cities. For this reason, the original scale of index numbers was adjusted. As a result, if Tokyo's index is fixed as 100, Osaka ranked second with an index of 68 followed by Nagoya's 10.

As to an array of central functions, Tokyo had the largest standing, as was the case for quaternary functions. If Tokyo's index is set as 100, Osaka's is 50 followed by

Nagoya's 28. The leading group of cities comprised three additonal largest cities followed by four regional capitals as well as two industrial cities. In short, the degree of concentration or relative variation of the quaternany functions was more predominant than that of the central functions due to the influence originating from Tokyo and Osaka Metropolitan Areas.

2. Cross-sectional Urban Systems

HINO made a study of Japanese Urban Systems for three time periods using principal component analysis.[5] The purpose of his paper was to make an overview of the development of the Japanese urban system by means of comparing urban dimensions in 1950, 1960 and 1970. He reduced a wide array of descriptive measures of objects to a series of fundamental components through the analysis and extracted basic dimensions which should form the fundamental structure of urban system.

The cities for the 1950 analysis were 153 cities with a population of over 50,000 in their administrative areas. The cities for the 1960 and 1970 analyses were all cities with a DID population of over 30,000, and the numbers of cities were 185 in 1960 and 242 in 1970 respectively. The input variables for each of the three time periods comprised five types of data: population size and change, population structure, and social, economic and locational characteristics. The numbers of the input variables for three time periods were 34 in 1950, 50 in 1960 and 54 in 1970 respectively. The tabulation of data for cities in the three time periods were based on the city areas in 1970 for the purpose of excluding the influence of the formal expansions of the administrative areas. As a result, he found the following points which were recognized through the changes in the Japanese urban system since 1950.

First, the social status was always extracted as the first component in the three time periods, but the spatial distribution of the component scores has shown a remarkable contrast between cities located in the two metropolitan areas of Tokyo and Osaka and those cities located outside of the two areas. The white-collar workers have been concentrated in these two areas since 1950 and the concentration has also been accelerated since 1960.

This interpretation is supported by the fact that the percentage of white-collar workers in the two metropolitan areas to the nation as a whole has continuously increased

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since 1950. This concentration stands for the agglomeration of guaternary functions piled up in the largest metropolitan areas.

Secondly, the ruralism extracted as the second component in 1950 moved to the fourth component in 1960 and disappeared in 1970. This phenomenon is caused by the significant decline of agricultural workers in the city areas and shows rapid urbanization all over the country. That is, percentages in primary industry, self-employed and family workers, those of which had high positive correlation with the ruralism component in 1950, have continuously reduced their variances with the decline of agricultural workers in the city areas since 1950.

Thirdly, manufacturing activities, which were extracted as the third component in 1950 and the second component in 1960 as well as in 1970, have correlated with variables on the commercial function of DID cities in 1970. These variables are represented by percentages in wholesale and retail sales, in finance, insurance and real estate, and in services. This finding means that negative correlation between variables on manufacturing activities and those on commercial functions were strengthened by the increase of cities specialized in manufacturing and commerce after 1960. The post-war industrialization and the functional differentiation among cities located in metropolitan areas are major contributors to cause such a phenomenon.

Many cities, included in the Pacific Industrial Belt, specialize in manufacturing function and cities located outside of this belt remain to be those specializing in commercial function. On the other hand, due to the functional differentiation among cities included in the metropolitan areas, these suburban cities are split into either industrial or residential in their nature.

Finally, size factor extracted as the fourth component in 1970 was correlated with two variables on the wholesale function of cities, such as wholesale-retail ratio and per capita wholesale sales in 1970. This component indicates that differences among per capita wholesale sales become analogous to those of population size in 1970. This has been caused by the change in the structure of commodity distribution since 1960. The distribution channels were amalgamated by the policy of large manufacturing concerns, the sales network of large-scale wholesalers and the emergence of chain-stores in retail activities.

Therefore, local wholesalers established in medium to small cities stagnated their

activities after 1960, and the discrepancy between large and medium to small cities in per capita wholesale sales has been widened since then.

3. Evoluton of Urban System

GLICKMAN investigated the Japanese urban system during the period between 1950 and 1970.[6] This research originally aims at viewing a large number of metropolitan regions in their spatial, demographic and industrial dimension. His purpose of study was to view the transformation, based on rapid urbanization, from a significantly rural to a primarily urban society in terms of the system of cities.

He set out a unit of analysis by defining the "Regional Economic Cluster (REC)" which is analogous to the American Standard Metropolitan Area (SMSA) and the British Standard Metropolitan Labour Area (SMLA). A REC includes a central city and the cities, towns and villages in the central city's commuting field. The RECs are defined as follows:

(1) First, it is necessary to choose a set of central cities. There are three criteria for choosing a potential central city:

(a) The minimum poulation must be greater than 100,000 in 1970.

(b) The ratio of daytime to nighttime population must be greater than unity.

(c) Seventy-five percent of the economic households are employed in non-agricultural pursuits.

(2) The next problem concerns selecting the town, satellite cities and villages which are in the commuting fields of the central cities determined in (1) above. Four criteria are set for the classification of cities, towns and villages within regions.

(a) The number of commuters from the satellite cities, towns or villages to a central city must be greater than the absolute minimum figure of 500.

(b) The ratio of commuters in each city, town or village to a central city over total employment in each city, town or village must be greater than five percent.

(c) The town or village is classified as a part of region A if more commuters went to A than to B.

(d) Seventy-five percent of the economic households must be employed in non-agricultural pursuit.

The process of collecting and coding of data yielded 80 RECs as defined above. They consisted of a total of 903 cities, towns, and villages. There were 4 RECs in Hokkaido, 57 in Honshu, 6 in Shikoku and 13 in Kyushu. A nearly contiguous urbanized area stretched from the Kanto Plain to Kyushu Region. The total population of the 80 RECs was 67.3 percent of the 103.7 million persons in all of Japan in 1970, and 67.2 percent of all workers in the country. Within the detailed employment categories, manufacturing, and wholesale and retail involved 78.8 percent and 77.4 percent respectively of the total workers in those categories. Also, nearly 79 percent of all white-collar employees resided within the REC.

In order to enlarge the agglomeration of RECs, he defined "Standard Consolidated Area (SCA)" which consisted of three or more RECs being contiguous each other. There were 33 RECs which made up 8 SCAs of Sendai, Tokyo, Nagoya, Toyama, Osaka, Okayama, Matsuyama and Kita-Kyushu. In terms of SCAs, the heavy concentration was to be seen in Tokyo (7 RECs, pop. 22,960,400), Osaka (5 RECs, pop. 14,391,300) and Nagoya (5 RECs, pop. 5,658,200) SCAs. In total, the SCA population was 52,481,900 or 75.2 percent of the total REC population and 50.6 percent of the total population of Japan in 1970.

Then, he made some investgations concerning growth rate and industrial structure, metropolitan structure, employment and population by size of region, place of work, mega-regions and shift-share analysis. His findings are summarized to the following five points :

First, the Japanese population is highly concentrated in a relatively small area and a number of city regions. Second, the system of cities appeared to centralize between 1950 and 1970 as there was relatively faster growth in a few large population centers, especially those near Tokyo and Osaka. Third, many of the important growth centers were manufacturing-based. Fourth, within metropolitan areas there was centralization in the 1950's followed by some decentralization in the 1960's. In other words, the suburbs grew more quickly than the central cities. Finally, employment by place of work is still more heavily concentrated within metropolitan areas than employment by place of residence. In short, the Japanese urban system is in the stage of centralized decentralization or of dispersed concentration.

Although his analysis is up-to-date and practical in a comparative sense, a care should be given to the city areas used in this study. Local administrative units are not always

of the same size and shape. This fact may effect on the nature of data available particularly for commuting. It is best illustrated with reference to the cases of three regional capitals which are not included in the 8 SCAs. These situations will be discussed in the next chapter.

III. Urban Agglomeration as a System

Rapid industrial development in the 1950's proceeded on the basis of existing urban agglomerations. Tertiary industries were also concentrated in cities, and metropolitan areas attracted large population. Such a population has always focused on Tokyo and its surrounding area as a core of the national settlement system.

1. Capital Region of Tokyo

Tokyo is Japan's greatest city with a population over 11 million. It was called Edo before the Meiji Restoration and was the capital of the Tokugawa Shogunate from the early 17th century to the restoration of 1868.

Before World War II, Tokyo was a special prefecture of FU with a governor appointed by the central government. It comprised of the City of Tokyo and of many suburban towns and villages. During the war, Tokyo Prefecture and the City of Tokyo were consolidated to form a single local government of Tokyo-TO. Therefore, Tokyo's size presents a problem in definition. There is the ward area of KU-BU, which have enlarged and amalgamated many times. The city numbered 23 wards (KU) with 8,646,520 people in 1975. There is the administrative Tokyo, that is the area of the Tokyo Metropolitan Government, which provides local governmental services for the old city, with its 23 wards, as well as for the suburbs immediately around it. At the 1975 Census of Japan, it had a population of 11,673,554, having become the first city authority in the world with over 10 million population. But outside this limit, rapid population growth has already created the Tokyo Metropolitan Region having a population of approximately 25 million estimated by the Bureau of the Census in 1975.

FUKUHARA studied the system of Tokyo Metropolitan Region with using principal component analysis and cluster analysis.[7] In this study, he analyzed the basic dimensions in the change of regional system for 1955, 1960, 1965 and 1970. The study area was

made up of 162 cities, wards, towns and villages focusing on the CBD of Tokyo, and 25 variables were used for the analysis. His research findings are as follows:

First, a civic center has been formed under historical and political conditions. Due to the advantages of concentration, civic functions have been accumulated in a very small area, and some of the functions have been transferred to zones in transition or sub-centers. In this way, a civic center has continued to purify and enhance its civic functions. The node of civic center has shifted from traditional commercial and industrial functions to more advanced control functions, and this trend was conspicuous during the period of 1955-1960.

Second, the civic center is surrounded by the zones in transition where commercial, industrial and residentential function are intermingled. Surrounding these zones are sub-centers where both business and shopping districts have developed around the terminals of the suburban railways. At present, there are four sub-centers. Shinjuku and Ueno became sub-centers in 1955 followed by Shibuya in 1960 and Ikebukuro in 1970 respectively.

Third, the system of the Tokyo Metropolitan Region has thus been greatly influenced by the patterns of railway service and configuration of the area.

2. Regional Capitals of Hiroshima and Fukuoka

In Japan, the census tract data of larger cities were first published in the Population ·Census of 1970. Using these data, some studies of factorial ecology were carried out in the middle of the 1970's.

MORIKAWA has clarified the characters of Hiroshima (pop. 541,998) and Fukuoka (pop. 853,270), both of which are regional capitals in the south-western part of Japan.[8] With 42 common variables selected from the census data, he extracted some factors by applying the principal axis method of factor analysis in the two cities and drew some maps on the basis of the distribution of standardized factor scores. The result of his analysis is summarized as follows:

First, family status and socio-economic status occurred the two main factors for each city. They correspond to the general factor structure of North American cities, but the weight of the two factors is reverse in reference to the most of the cases available in American cities.

Second, high correlation between family status and socio-economic status is generally recognized in each city. However, it does not always mean the same structure of factor loadings. That is, the third and fourth factors in one city are quite different from those in another city. In Hiroshima, blue-collar workers appeared as the third and mobility status as the fourth factor, while in Fukuoka, the third factor is named as boarding area for students.

Third, the difference in the size of study areas is related to the characters of factors concerned. As the city area of Fukuoka is overbounded, the spatial variation between built-up and rural area is larger than that between core and periphery within the built-up area. On the contrary, the spatial variation in Hiroshima between its core and periphery is moderate since the city area has nearly truebounded.

Fourth, by the analysis of variance, it became clear in each city that family status factor displayed a zonal pattern, while the factor of socio-economic status had a sectorial distribution.

In Hiroshima, the distribution of blue-collar workers was closely related to that of transportation facilities and industrial establishments. The areas of high mobility were to be seen in recently developed residential zones and in the residential quarters for government officials. Meanwhile, in Fukuoka, the distribution of student boarding areas were concentrated eventually around universities and colleges.Those are rather independent factors to explain the specific situations happened in the two cities.

3. Regional Capital of Sapporo

YAMAGUCHI has deeply been concerned with the social areas of Sapporo.[9] It is the largest city north of Tokyo with a population of 1,010,122 in 1970. The purpose of his paper was to apply the technique of principal component analysis to the analysis of residential areas in the city of Sapporo.

One critical feature of this study was that it was conducted in terms of urbanized area rather than city area, since the city has been overbounded to cover a large area of rural environment. Therefore, the DID's were delineated for the first time, in the 1960 census, as an attempt to improve the urban-rural classification of the resident population. Moreover, in 1970, newly-established census tracts were delimited in a city with more than 200,000 inhabitants as a permanent statistical unit. These tracts have

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an average population size of 10,000 and are useful for the population census as well as for other statistical surveys in order to provide the basic data for the analysis of cities as systems.

The Urbanized Area of Sapporo, a study area delimited by the author, had a population of 851,116 which comprised 83.4 percent of the city population, and was made up of 83 census tracts with an average population of 10,254. The input was 60 variables obtained mainly from the 1970 census. The census yielded a wide range of information on area, population size and structure, population change, level of education, industry and occupation, household, and housing conditions. Then, the input data were reduced to a small number of urban dimensions, first two in this case.

The first component, identified as family status, accounted for 32 percent and could be described as an index of age structure and household status. The most highly correlated single variable was the proportion of population aged 0-14, some 88 percent of its variation being accounted for by this component. It should be pointed out that the family status has proven to be a major discriminating factor in the differentiation of subareas within the city, in contrast with previous studies made in other countries.

The second component accounted for 17 percent and seemed more directly associated with social status of the residents. It had highly associated with variables which appeared to be indicators of levels of education and types of occupation. The most highly correlated single variable was the proportion of persons ended in primary school, some 94 percent of its variatiom being accounted for by the component.

The observation confirmed following results: The family status dimension is distributed in a somewhat concentric fashion and the spatial pattern of the social status dimension is generally sectorial. This fact substantiates previous empirical findings.

In sum, the leading two components are clearly representative of major constructs of social area analysis even in the case of three regional capitals mentioned above, and the social space classification forms the basis for derivation of social areas in geographical space.

IV. Some Recommendations for Further Study

1. Reorganization of the Settlement System

Since the sphere of influence of cities have spread with the expansion of urban functions, the need has arisen for reorganizing the old administrative areas.

According to HONJO, the tendency toward reorganization may be observed at two levels. The author, however, would like to consider more about the additional level of rural community.[10]

(1) Inter-prefecture Level

Prefectures, as the largest units of local government, have been the major framework of the local administrative system of Japan. The administrative boundary of prefecture was generally based on feudal domains before the Meiji Restoration, although several change had been made in the course of reformation.

It has been argued that the areas of prefectures are too small in the stage of high spatial mobility in population, and their mergers have proposed from time to time. With regard to the recent discussion of the amalgamations of prefectures, it was pointed out that the local administration system should be reorganized by combining the means of consolidation and enlargement of prefectures in order to meet the expansion of metropolitan areas.

(2) Inter-municipality Level

It had been recognized that municipalities as the smallest administrative units of local government, which have been based on traditional communities, are inadequate in the stage of high spatial mobility in population. Since they are too small as administrative bodies to perform necessary services, the central government has consistently been attempting to reorganize them and enlarge their areal extent.

Reorganization took the form of amalgamation of surrounding municipalities by larger central cities. With the enactment of the Amalgamation Act of 1953, the Ministry of Internal Affairs of the Central Government decided to encourage such amalgamations far more strongly than before. Such a movement became a big problem where the regional system was undergoing a rapid transformation through industrialization. In the 1950's, the municipalities were amalgamated mainly for the purpose of improving administrative efficiency, while, in the 1960's, the amalgamations were oriented towards the reorganization of municipalities to strengthen the administrative capabilities. Examples are shown in the amalgamation of five cities in Northern Kyushu and that of three cities in Osaka Prefecture.

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(3) Rural Community Level

The prevailing tendency to agglomerate the nation's population has inevitably caused a great change in the mode of people's life in the rural areas with declining population. Consequently, rural areas will be absorbed by a great wave of urbanization, which will stimulate further the formation of new rural communities, where the places of work and residence are separated to a great extent.

The curtailment of working hours in agricultural production and the increase in employment opportunities have caused a rapid growth of part-time farmers, and the homogeneity in rural life has no longer been able to maintain. As for migratory jobs, in particular, various prolems have brought into rural life. These include not only such economic measures as securing the quality of agricultural labor force, but also such social welfare measures as maintenance of better living conditions.

In these areas where the depopulation is going on, there remains a so-called " Sparsity Problem " or excessive depopulation with upward shift of age structure. It brings a great difficulty in maintaining such fundamental conditions for community life as medical and educational services, and local activities for preventing various disasters.

As most of these sparsely-populated areas are marginal suppliers of agricultural and fishing products, it may be virtually impossible to solve these problems in the stage of prevailing urbanization. Therefore, comprehensive social development focused on reorganization of villages and their functions should be pursued to sustain a reasonable level of community life in rural areas.

2. Reconstruction of the Settlement System

Considering the contemporary urbanization in Japan, two distinct patterns can be recognized. In the major metropolitan areas of Tokyo, Osaka and Nagoya, there have been a remarkable population expansion due to natural increase rather than in-migration of population. In the regional capitals such as Sapporo, Sendai, Hiroshima and Fukuoka, both natural and social increases in population have occurred simultaneously in accordance with the development of their basic functions of economic and cultural activities for their surrounding districts, thereby resulting the large increase in total population.[11]

Since population and industry were concentrated in major metropolitam areas at the stage of high economic growth in the 1960's, these areas have now been faced with many

problems concerning land, water, noise and safety. More acute limitation caused by this high density has made construction of public utilities difficult, thereby blocking attempts to improve the living environment. Therefore, it is likely that the community development in the major metropolitan areas will be restricted to a large extent. In rural areas, however, where outflow of population is occurring, the population is both declining and aging. As a consequence, community spirit used to be a basis of the unity is also declining, and maintenance as well as improvement of the quality in living environment become even more difficult.

In order to solve these fundamental problems, the Economic Planning Agency set an economic plan for the second half of the 1970's.[12] The followings are some recommendations in terms of regional systems set in this plan:

First, regional systems throughout Japan must be improved to maintain vitalized local communities. In so doing, it is necessary to encourage dispersion of population and industry in less developed areas and to make an effort to further the development of these areas. Second, changes should not be limited in the sectors of tertiary industries and manufacturing, but quaternary functions of these sectors should be dispersed more extensively to the areas other than major metropolitan areas. If the trend toward concentration in the major urban areas continues to decline, the proportion of population between urban and rural areas would be kept almost at the same level of their magnitudes of functions.

In conclusion, continued re-evaluation of the past policy systems, including National Comprehensive Development Plans and other programs for area development of the nation, should be carried on, and associated improvements should be made to maintain the balanced development of regional systems. It is our task to reconstruct regional communities in the process of urbanization within a framework of the national settlement system.

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