

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan

Tatsuhiko Kawashima* and Noriyuki Hiraoka**

CONTENTS

- 1 Introduction
 - 2 Six Types of Spatial Systems
 - 3 Formulation of ROXY Index for Each System
 - 4 Empirical Results
 - 5 Conclusion
- Notes
References
Appendix

Abstract

Using the ROXY-index method, spatial-cycle processes are analyzed for six types of urban systems in Japan over the period from 1920 to 1990. Four of the six types of urban systems are inter-metropolitan while two are intra-metropolitan. Results for the inter-metropolitan systems show that, in the functional urban core (FUC) system, the spatial divergence of population is the tendency after World War II. In the system of surrounding areas (FUS), the convergence of population continuing from 1920 intensifies after WWII. For intra-metropolitan systems, the Tokaido system is at a more advanced stage than the Tokyo functional urban region (FUR) system, since the Tokaido system is one of the most advanced urbanizing regions in the Tokyo FUR.

Key Words

Functional urban region, ROXY index, Spatial cycle, Spatial system

* Department of Economics, Gakushuin University, 1-5-1 Mejiro, Toshima-ku, Tokyo 171, Japan :

** Research Center for Social and Public Policies of Mitsubishi Research Institute, 2-3-6 Otemachi, Chiyoda-ku, Tokyo 100, Japan. The authors are grateful to Steven Bass for his comments on earlier versions of this paper. Kawashima, meanwhile, gratefully acknowledges the research support of the Grant-in-Aid for General Scientific Research from the Ministry of Education, Science and Culture in Japan.

1 Introduction

Among useful theoretical frameworks for investigating the spatial redistribution of socio-economic activities, we have the spatial-cycle hypothesis developed by Klaassen. It argues that there exists a general tendency for the spatial redistribution process to move cyclically through four basic stages¹⁾. The ROXY-index method has been proposed as an analytical instrument for conducting quantitative tests of the spatial-cycle hypothesis and has been developed since the end of the 1970s. The results obtained through ROXY-index analyses have shown that the spatial-cycle stage for a specific time period differs depending upon the structure of the spatial system under investigation.

The primary purpose of this paper is to compare, over the seventy-year period from 1920 to 1990, the characteristics of spatial-cycle paths for six types of urban systems in Japan. The set of the six urban systems are composed of three inter-metropolitan systems, one inter-city system and two intra-metropolitan systems. Each of the six systems is defined with necessary explanations in Section 2. An explicit formulation of the ROXY index employed for the analysis of each urban system, is provided in Section 3. The results of the ROXY-index analyses are shown in Section 4, while concluding remarks are made in Section 5.

2 Six Types of spatial Systems

We use six types of spatial systems in our study. The first three are inter-metropolitan systems, the fourth one is an inter-city system, and the other two are intra-metropolitan systems. They are as follows.

(1) System of Functional Urban Regions (FUR System)

The FUR system employed in our study is identical to that used in Hiraoka (1995). In the delineation of FURs, we first set up the following criteria (c-1) through (c-3) in order to select core cities.

- (c-1) Every locality whose population is equal to or greater than 100,000 in any National Population Census published during the period from 1920 to 1990, is selected as a candidate for a core city.
- (c-2) Every locality which satisfies the above criterion and whose daytime-night time ratio of population is greater than 1.0, is selected as a core city.
- (c-3) If the distance between any two or more core cities is less than 20 km, then those core cities are regarded as composing a multiple-core city.

Once core cities are selected out of approximately 3,250 administrative localities at the level of *shi* (city), *machi* (town), and *mura* (village), every locality left out of the selection of core cities is examined to see if it satisfies the following criteria (s-1) and (s-2) for the purpose of deciding whether it has a fundamentally close association with any core city

previously selected. The locality that has a fundamentally close association with a specific core city shall be hereafter referred to as a member locality of a surrounding area of that core city. This implies that the FUR consists of a core city and its surrounding area.

- (s-1) A locality is included as a member of a surrounding area of the core city if the number of commuters from that locality to the core city is greater than 500, or if the number of commuters from that locality to the core city is greater than 25 percent of all employees living in that locality. The number of commuters is based on the National Census of 1985, in the case that each core city is eligible in 1985 or 1990. If a core city is not eligible in 1985 or 1990, the data for the latest year in which the core city is eligible is used.
- (s-2) If a locality is eligible to belong to more than one surrounding area, then that locality is included in the surrounding area whose core city accounts for the largest number of commuters from that locality among the candidate core cities.

In the application of the above criteria to the delineation of FURs, a complication arises in which one or more spatially isolated localities are eligible to be a part of an FUR or that one or more localities that are geographically situated completely within an FUR are ineligible to become a part of that FUR. For such cases, boundary adjustments have to be conducted in order to produce a set of spatially contiguous and mutually exclusive FURs.

By applying the criteria described above, we obtain the whole set of FURs for the present study. Application of the criterion (c-1) results in 214 localities being picked up as candidate core cities. Applying the criteria (c-2) and (c-3), we eventually get a set of core cities to establish 92 FURs in Japan. Meanwhile, the criteria (s-1) and (s-2) enable us to set up the surrounding areas of core cities. It should be mentioned that, as to criterion (s-1), the number of commuters in 1960 is used for the delineation of Yubari and Iizuka-Tagawa FURs, 1975 for the Iwaki FUR, and 1985 for the other FURs. Figure 1 shows the resulting geographical delineation of the 92 FURs²⁾.

(2) System of Functional Urban Cores (FUC System)

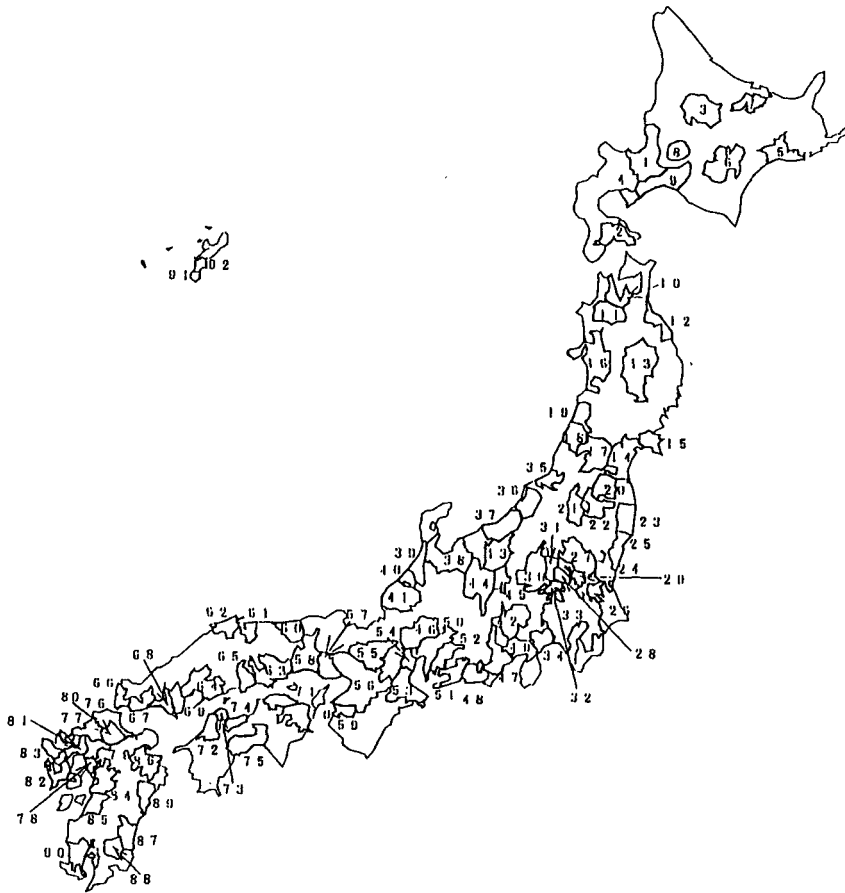
The FUC system³⁾ comprises 92 core cities of the previously delineated 92 FURs.

(3) System of Surrounding Areas (FUS System)

The FUS system⁴⁾ comprises 91 surrounding areas of our FURs except the Yubari FUR.

(4) System of Major Localities (ML System)

The ML system⁵⁾ comprises the thirty largest localities in terms of population in the 1990 National Population Census. The relationships of localities falling in the ML system with FURs are shown in Table 1. Twenty (20) localities composing the ML system accord with



1 Sapporo	20 Fukushima	37 Joetsu	56 Osaka	75 Kochi
2 Hakodate	21 Aizuwakamatsu	38 Toyama-Takaoka	57 Kobe	76 Kitakyushu
3 Asahikawa	22 Koriyama	39 Kanazawa	58 Himaji	77 Fukuoka
4 Muroran	23 Iwaki	40 Komatsu	59 Wakayama	78 Omuta
5 Kushiro	24 Mito-Katsuta	41 Fukui	60 Tottori	79 Kurume
6 Obihiro	25 Hitachi	42 Kofu	61 Yonago	80 Iizuka-Tagawa
7 Kitami	26 Tsuchiura-Tsukuba	43 Nagano	62 Matsue	81 Saga
8 Yubari	27 Utsunomiya	44 Matsumoto	63 Okayama-Kurashiki	82 Nagasaki
9 Tomakomai	28 Ashikaga	45 Ueda	64 Hiroshima-Kure	83 Sasebo
10 Aomori	29 Oyama	46 Gifu-Ogaki	65 Fukuyama-Onomichi	84 Kumamoto
11 Hirosaki	30 Maebashi-Takasaka	47 Shizuoka-Shimizu	66 Shimonoseki	85 Yatsushiro
12 Nachineohe	-Isesaki	48 Hamamatsu	67 Ube	86 Oita
13 Morioka	31 Kiryu	49 Numazu-Fuji-Mishima	68 Tokuyama	87 Miyazaki
14 Sendai	32 Kumagaya	50 Nagoya	69 Iwakuni	88 Miyakonojo
15 Ishinomaki	33 Tokyo	51 Toyohashi	70 Tokushima	89 Nobeoka
16 Akita	34 Hiratsuka-Odawara	52 Kariya-Toyota-Anjo	71 Takamatsu	90 Kagoshima
17 Yamagata	-Atsugi	53 Tsu-Matsusaka-Ise	72 Matsuyama	91 Naha
18 Tsuruoka	35 Niigata	54 Yokkaichi	73 Imabari	92 Okinawa
19 Sakata	36 Nagaoka	55 Kyoto	74 Niihama	

Figure 1 Location of FURs

Table 1 Localities in the ML System and related FURs

Code of Locality	Name of Locality	Population rank of the related FUR in 1990																				
		1	2	3	4	5	6	7	8	9	10	11	16	17	19	20	21	24	27	30	41	
13100	Tokyo-tokubetsu-ku area	C																				
14100	Yokohama-shi	S																				
27100	Osaka-shi		C																			
23100	Nagoya-shi			C																		
1100	Sapporo-shi					C																
28100	Kobe-shi						C															
26100	Kyoto-shi				C																	
40130	Fukuoka-shi							C														
14130	Kawasaki-shi	S																				
34100	Hiroshima-shi								C													
40100	Kitakyushu-shi									C												
4201	Sendai-shi										C											
12200	Chiba-shi	S																				
27201	Sakai-shi		S																			
33201	Okayama-shi									C												
43201	Kumamoto-shi															C						
46201	Kagoshima-shi																	C				
22202	Hamamatsu-shi																		C			
12204	Funabashi-shi	S																				
14209	Sagamihara-shi	S																				
27227	Higashiosaka-shi		S																			
28202	Amagasaki-shi		S																			
15201	Niigata-shi																				C	
22201	Shizuoka-shi																			C		
13201	Hachioji-shi	S																				
12207	Matsudo-shi	S																				
28201	Himeji-shi																					
42201	Nagasaki-shi																					
38201	Matsuyama-shi																					C
17201	Kanazawa-shi																					C

(Note) C: Core City
S: Locality in surrounding area

cores of FURs, and ten (10) localities correspond to the surrounding area of either the largest FUR (*i.e.*, the Tokyo FUR) or the second largest FUR (*i.e.*, the Osaka FUR).

(5) Tokyo Functional Urban Region System (Tokyo FUR System)

The Tokyo FUR system⁶ comprises a functional urban core and its surrounding area of the Tokyo FUR.

(6) Tokaido Railway-line Region in the Tokyo FUR (Tokaido System)

The Tokaido system⁷ comprises sixteen (16) localities that are member localities of the Tokyo FUR and, at the same time, are located along the Tokaido railway-line. The Tokaido railway-line, which is the oldest and the most important trunk railway-line in Japan, is one of the most crowded commuting railway-lines in the Tokyo FUR. The set of sixteen localities composing the Tokaido system is disaggregated into five localities which are included in the core of the Tokyo FUR and eleven localities which are situated in its surrounding area.

3 Formulation of ROXY Index for Each System

The ROXY index R^t in year t is generally formulated as follows when the annual growth ratio of population in subarea i is r_i^t , and weighting factor for subarea i is w_i^t .

$$R^t = \left(\frac{(\text{Weighted-average growth ratio})}{(\text{Simple-average growth ratio})} - 1 \right) \times 10^4, \quad (3.1)$$

where

$$(\text{Simple-average growth ratio}) = \frac{\sum_{i=1}^n r_i^t}{n},$$

$$(\text{Weighted-average growth ratio}) = \frac{\sum_{i=1}^n w_i^t r_i^t}{\sum_{i=1}^n w_i^t}, \text{ and}$$

n is the number of subareas in the spatial system under investigation.

In the above formulation, the weighting factor should be carefully chosen in conformity to the system in order to appropriately measure the pattern of spatial convergence or divergence in the redistribution of population. It should be noted that the sign of the ROXY-index value, positive or negative, which shows the direction of spatial convergence or divergence, differs depending upon the weighting factor you choose. The relationship of the weighting factor chosen for a spatial system and the sign for spatial convergence or divergence, is described as follows.

(1) FUR System

For the FUR system, we adopt the population of each FUR in year t as a weighting factor. The sign for convergence is positive in this formulation of the ROXY index.

(2) FUC System

For the FUC system, we adopt the population of each FUR in year t as a weighting factor. The sign for convergence is positive in this formulation of the ROXY index.

(3) FUS System

For the FUS system, we adopt the population of each FUR in year t as a weighting factor. The sign for convergence is positive in this formulation of the ROXY index.

(4) ML System

For the ML system, we adopt the population of each locality in year t as a weighting factor. The sign for convergence is positive in this formulation of the ROXY index.

(5) Tokyo FUR System

For the Tokyo FUR system, we adopt as a weighting factor the value one for the core and the value zero for the surrounding area⁹⁾. The sign for convergence is positive in this formulation of the ROXY index.

(6) Tokaido System

For this system, we employ two types of weighting factors. The first type of weighting factor is the same one as adopted for the Tokyo FUR system; one for the localities included in the core (Chiyoda-ku, Chuo-ku, Minato-ku, Shinagawa-ku and Ota-ku), and zero for the localities in the surrounding area. The other type of weighting factor is the CBD distance⁹⁾ along the Tokaido railway line. For this case, the simple-average and weighted-average growth ratios for a one-dimensional continuous-linear region are, respectively, calculated as follows¹⁰⁾:

$$(\text{Simple-average growth ratio}) = \frac{1}{d} \int_0^d r(x) dx, \text{ and} \quad (3.2)$$

$$(\text{Weighted-average growth ratio}) = \frac{1}{d^2} \int_0^d xr(x) dx, \quad (3.3)$$

where d is the maximum CBD distance along the railway line of the Tokaido system, and $r(x)$ is the annual growth ratio of population at the point with CBD distance x .

In case the Tokaido railway line runs through a locality, the annual growth ratio at the point with the CBD distance x is set equal to the annual growth ratio of the locality. In

Table 2 Localities in the Tokaido System and Their Distance from the CBD

No	Code	Locality	Code	Locality	Distance (km)	
					Minimum	Maximum
1	13101	Chiyoda-ku	13102	Chuo-ku	0.0	1.7
2	13103	Minato-ku			1.7	7.2
3	13109	Shinagawa-ku	13111	Ota-ku	7.2	11.0
4	13111	Ota-ku			11.0	17.4
5	14131	Kawasaki-ku	14132	Saiwai-ku	17.4	19.1
6	14131	Kawasaki-ku	14101	Tsurumi-ku	19.1	19.4
7	14101	Tsurumi-ku			19.4	24.0
8	14102	Kanagawa-ku			24.0	28.6
9	14103	Nishi-ku			28.6	30.8
10	14103	Nishi-ku	14106	Hodogaya-ku	30.8	31.8
11	14106	Hodogaya-ku			31.8	35.7
12	14110	Totsuka-ku			35.7	43.0
13	14115	Sakae-ku			43.0	46.5
14	14204	Kamakura-shi			46.5	48.5
15	14205	Fujisawa-shi			48.5	55.0
16	14207	Chigasaki-shi			55.0	61.8

case the railway line runs on the boundary dividing two localities, the annual growth ratio at the point with the CBD distance x is set equal to the simple-average annual growth ratio of those two localities. Table 2 shows the CBD distance of localities composing the Tokaido system. When the data on the population growth ratio for a *ku*-area is unavailable for calculating the ROXY index, the annual growth ratio of a *shi*-area which includes the *ku* is employed¹¹.

4 Empirical Results

In this section, the empirical results of ROXY index analyses on the spatial-cycle path for the six spatial systems are compared. We first compare the spatial-cycle paths among inter-metropolitan systems (*i.e.*, the FUC, FUR and FUS systems). Secondly, we compare the spatial-cycle paths among the intra-metropolitan systems (*i.e.*, the Tokyo FUR and Tokaido systems). Thirdly, we compare the results among the FUR, ML and Tokyo FUR systems, that is, among the inter-metropolitan system, inter-city system, and intra-metropolitan system.

(1) Comparison of the FUC, FUR and FUS Systems

Figure 2 shows the ROXY-index values and their marginal changes for the FUC, FUR and FUS systems in Panels (a), (b) and (c) respectively.

It can be seen from this figure that there exist two different cycles; one before World War II (WWII) and the other after WWII. The amplitude of the cycle after WWII is larger than before WWII for all three systems. It is clearly shown that, for the FUC system, the center of its cycle after WWII, which is on the negative part of the abscissa, is on the left side of that before WWII. It is also shown that, for the FUR system, the center of the cycle after WWII is on the right side of that before WWII. This would mean that for the FUC system the divergence of population is the general tendency after WWII, and that for the FUS system the convergence of population is intensified after WWII.

For the FUR system in which the population of each FUR is the sum of the population of its core and surrounding area, the divergence tendency in the FUC system and the convergence tendency in the FUS system are neutralized within the framework of the FUR system as shown in Panel (b)¹².

(2) Comparison of the Tokyo FUR and Tokaido Systems

Figure 3 shows the ROXY-index values and their marginal changes for the Tokyo FUR system in Panel (a), and Tokaido systems in Panels (b) and (c) for two types of weighting factors. The Tokaido system is one of the most advanced urbanizing region in the Tokyo FUR. Therefore, as shown in Panel (b), the spatial cycle before WWII cannot be clearly recognized. After WWII, the cycle seems to have already stepped into the second round.

For the Tokyo FUR system which includes the Tokaido system and other less-advanced urbanizing regions, the spatial cycle before WWII can not be clearly recognized either.

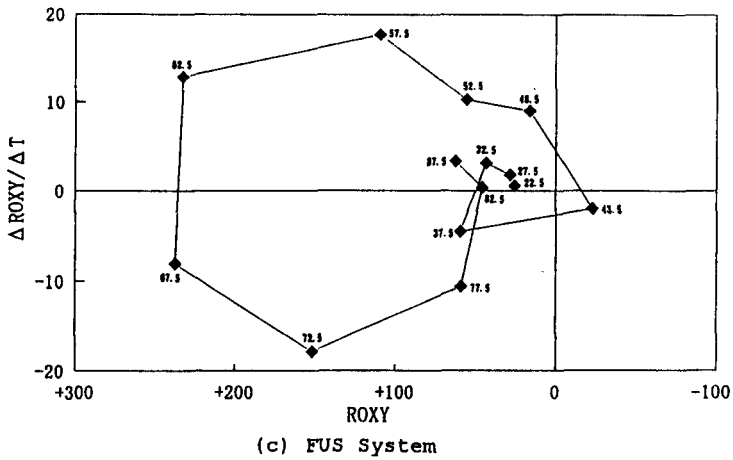
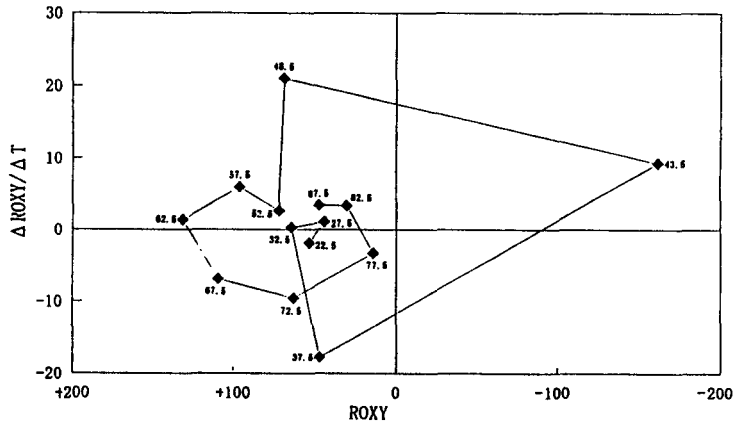
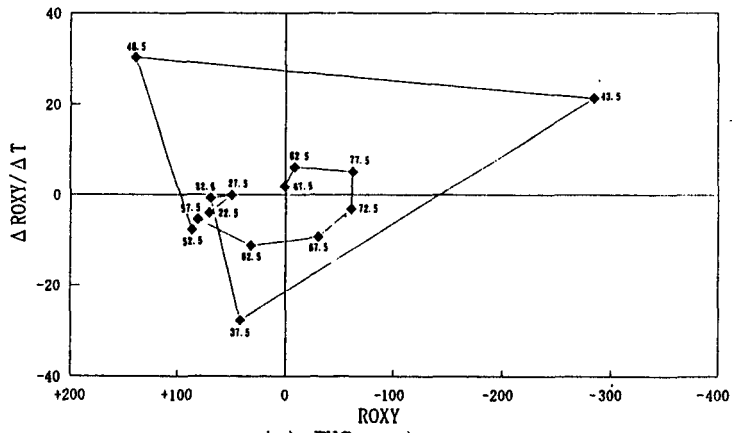
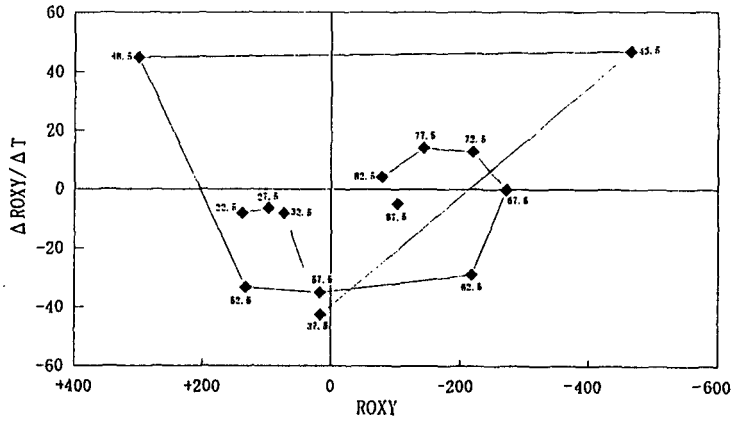
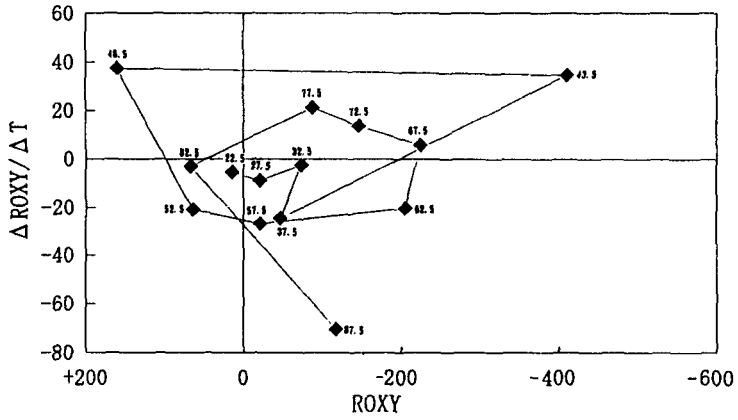


Figure 2 ROXY-index Values and Their Marginal Changes for the FUC, FUR and FUS Systems

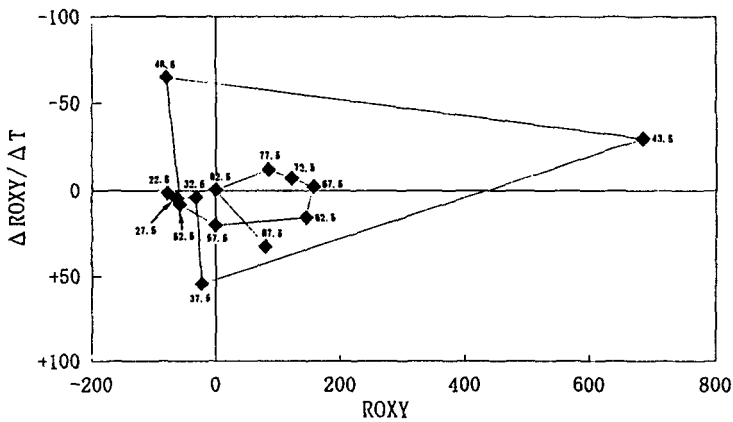
ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)



(a) Tokyo FUR system

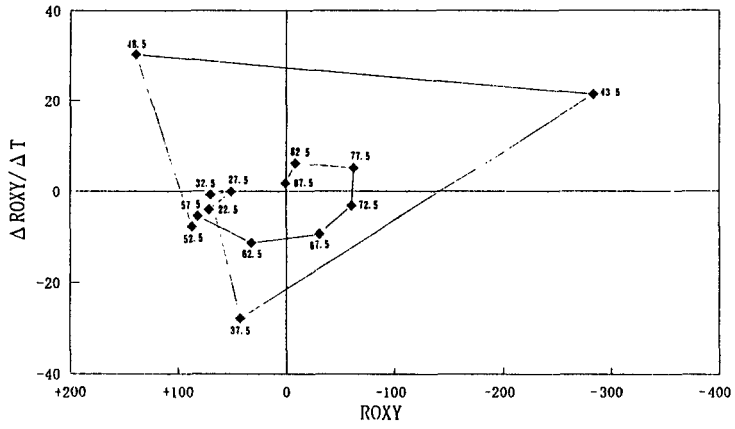


(b) Tokaido system weighted in the same way as the Tokyo FUR system

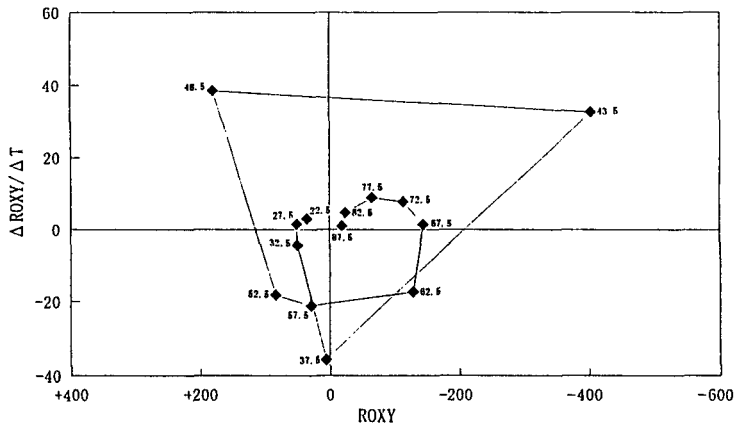


(c) Tokaido system weighted by CBD distance

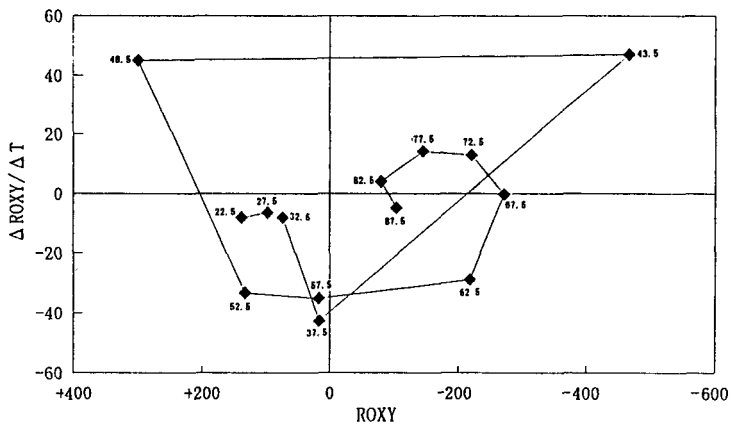
Figure 3 ROXY-index Values and Their Marginal Changes for the Tokyo FUR and Tokaido Systems



(a) FUC system



(b) ML System



(c) Tokyo FUR System

Figure 4 ROXY-index Values and Their Marginal Changes for the FUC, ML and Tokyo FUR Systems

After WWII, however, the cycle lags in the second round toward the end of the 1980s.

In case the CBD distance is used as weighting factor, the trajectory shown in Panel (c) is similar to that in Panel (b). The difference is that values of the ROXY index show a convergence tendency before WWII in Panel (c) as opposed to a divergence tendency as shown in Panel (b).

(3) Comparison of the FUR, ML and Tokyo FUR Systems

Figure 4 shows the ROXY-index values and their marginal changes for the FUR, ML and Tokyo FUR systems in Panels (a), (b) and (c) respectively¹³⁾. Since, as shown in Table 1, the ML system overlaps with both an inter-metropolitan system (*i.e.*, the FUC system) and intra-metropolitan systems (*i.e.*, Tokyo FUR and Osaka FUR), empirical results in Panel (b) show a mixed shape for the FUC system and the Tokyo FUR system.

5 Conclusion

In this study, values of the ROXY index for six urban systems have been calculated for the period 1920 through 1990, and compared with each other. As to inter-metropolitan systems (*i.e.*, the FUC, FUR and FUS systems), the FUC system shows the general tendency of the divergence of population after WWII, while the FUS system shows the general tendency of the convergence of population continuing from 1920 which is still more intensified after WWII.

For intra-metropolitan systems (*i.e.*, the Tokyo FUR and Tokaido systems), the Tokaido system is on a more advanced stage than the Tokyo FUR system along the spatial-cycle path. The reason for this would be that the Tokaido system is one of the most-advanced urbanizing regions in the Tokyo FUR.

For the ML system, empirical results show a mixed shape for the FUC system and the Tokyo FUR system. The reason for this would be that the ML system overlaps with both inter- and intra-metropolitan systems as shown by Table 1.

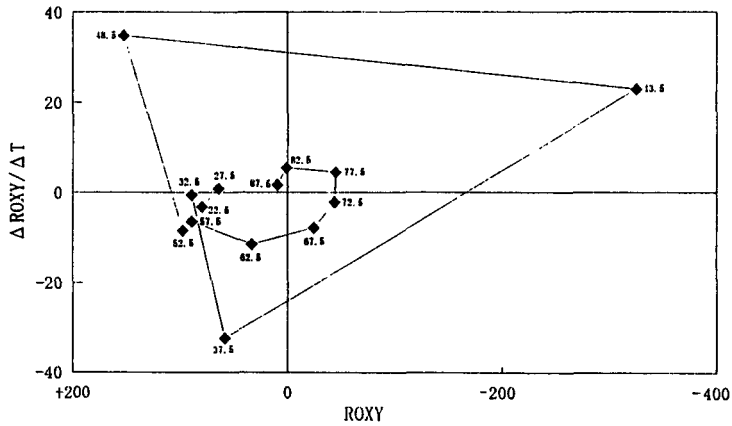
In addition to the aforementioned, it can also be pointed out that, depending on the system, one complete spatial cycle seems to occur in a 30 to 50 year period.

Notes

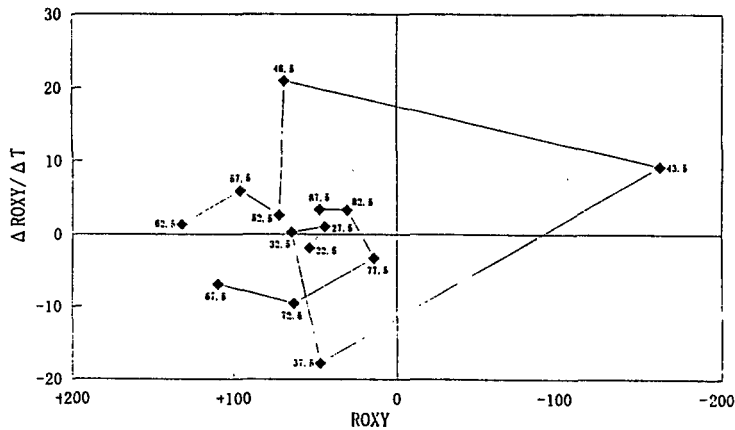
- 1) For discussion on the spatial-cycle hypothesis, see for example Kawashima (1987).
- 2) See Appendix A for the localities included in each FUR, Appendix B for the population of each FUR, and Appendix C for the rank in population for each FUR through 1920 to 1990.
- 3) See Appendix D for the population of each core through 1920 to 1990.
- 4) Since Yubari FUR has no surrounding area, the number of elements of the FUC system turns out to be 91. See Appendix E for the population of each surrounding area through 1920 to 1990.
- 5) See Appendix F for the population of each major locality through 1920 to 1990.

- 6) See Appendix G for the population of the core and surrounding area of the Tokyo FUR through 1920 to 1990.
- 7) See Appendix H for the population of each locality in the Tokaido system through 1920 to 1990.
- 8) This type of ROXY index is investigated in detail by Hiraoka (1995).
- 9) Among the examples of ROXY-index analyses using the CBD distance as weighting factor are Kawashima (1986a,1986b,1986c), Kawashima and Hiraoka (1993a, 1993b, 1994), and Hiraoka and Kawashima (1993, 1994). Issues stemming from the use of the ROXY index having the CBD distance or reverted CBD distance as weighting factor for a region along a railway line, are examined in Hiraoka and Kawashima (1994).
- 10) Derivation of the simple-average growth ratio and weighted-average growth ratio for a one-dimensional continuous-linear region is shown in Hiraoka and Kawashima (1993, 1994).
- 11) Kawasaki-ku and Saiwai-ku are included in Kawasaki-shi, while Tsurumi-ku, Kanagawa-ku, Nishi-ku, Hodogaya-ku and Sakae-ku are included in Yokohama-shi.
- 12) Panel (a) in Figure N-1 shows the result obtained when we use the population of each core as a weighting factor for the FUC system, while Panel (c) shows the result obtained when we use the population of each surrounding area as a weighting factor for the FUS system. The discussion in Subsection (1) of Section 4 can hold for these figures too.
- 13) Panels (a) and (c) of Figure 4 are identical to Panel (a) in Figure 2 and Panel (a) in Figure 3 respectively.

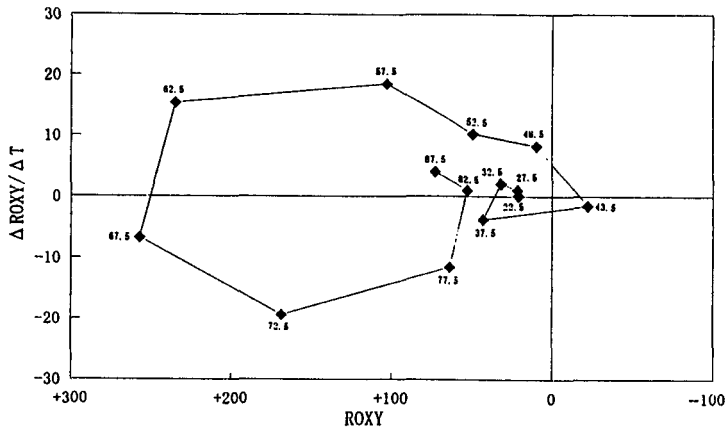
ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)



(a) FUC system



(b) FUR system



(c) FUS System

Figure N-1 ROXY-index Values and Their Marginal Changes for the FUC, FUR and FUS Systems
(Weighing Factors: Core Population for the FUR System, and Surrounding Area Population for the FUS System)

References

- Hiraoka, N., 1995, "Urban Spatial-cycle Stages of Functional Urban Regions in Japan and the Coupled Oscillation Hypothesis," *Interdisciplinary Information Sciences*, Vol.1, No.2, pp.199-220, Tohoku University, Sendai, Japan.
- Hiraoka, N., and T. Kawashima, 1993, "Mathematical Characteristics of ROXY Index (II): Periods of Intra-metropolitan Spatial-cycle Paths and Theoretically-ideal Formulations of ROXY Index," *Gakushuin Economic Papers*, Vol.30, pp.317-422.
- Hiraoka, N., and T. Kawashima, 1994, "Mathematical Characteristics of ROXY Index (III): Functional Relationship between 'Theoretically-ideal ROXY Index with CBD Distance Used as Weighing Factor' and 'That with Reversed CBD Distance,'" *Gakushuin Economic Papers*, Vol.30, pp.451-478.
- Hiraoka, N., and T. Kawashima, 1995, "Mathematical Characteristics of ROXY Index (V): Comparison of the ROXY Index with Other Major Yardsticks Measuring Convergence and Divergence," *Gakushuin Economic Papers*, Vol.32, pp.81-101.
- Kawashima, T., 1986a, "Speed of Suburbanization: ROXY Index Analysis for Intra-metropolitan Spatial Redistribution of Population in Japan," *Gakushuin Economic Papers*, Vol.22, pp.243-304.
- Kawashima, T., 1986b, "People Follow Jobs in Japan?: Suburbanization of Job Markets," *Gakushuin Economic Papers*, Vol.23, pp.157-183.
- Kawashima, T., 1986c, "Spatial Cycle Race 1985: ROXY Index Analysis of the 1985 Population Census for Three Railway-line Regions in the Tokyo Metropolitan Area," *Gakushuin Economic Papers*, Vol.23, pp.53-70.
- Kawashima, T., 1987, "ROXY Index Analysis of Population Changes in Japan for 1960-1985: Spatial (De)centralization and (De)concentration," *Gakushuin Economic Papers*, Vol.24, No.3, pp.11-39.
- Kawashima, T., and N. Hiraoka, 1993a, "Centralization and Suburbanization: ROXY Index Analysis for Five Railway-line Regions in Tokyo Metropolitan Area," *Gakushuin Economic Papers*, Vol.30, pp.203-230.
- Kawashima, T., and N. Hiraoka, 1993b, "Mathematical Characteristics of ROXY Index (I): Distance and Reversed Distance Used as Weighing Factors," *Gakushuin Economic Papers*, Vol.30, pp.255-297.
- Kawashima, T., and N. Hiraoka, 1994, "Aged Population in Spatial Cycles" ROXY Index Analysis for Chuo-line Region in Tokyo Metropolitan Area," *Gakushuin Economic Papers*, Vol.31, pp.13-35.

Appendix A Core Cities and Other Member Localities of FURs

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
1	Sapporo	1100	Sapporo-shi	1203 1217 1224 1231 1301 1302 1303 1305 1423	Otaru-shi Ebetsu-shi Chitose-shi Eniwa-shi Hiroshima-cho Ishikari-cho Tobetsu-cho Atsuta-mura Namporo-cho
2	Hakodate	1202	Hakodate-shi	1334 1335 1336 1337 1339	Kikonai-cho Kamiiso-cho Ono-cho Nanae-cho Toi-cho
3	Asahikawa	1204	Asahikawa-shi	1452 1453 1454 1455 1456 1458 1459	Takasu-cho Higashikagura-cho Toma-cho Pippu-cho Aibetsu-cho Higashikawa-cho Biei-cho
4	Muroran	1205	Muroran-shi	1230 1233	Noboribetsu-shi Date-shi
5	Kushiro	1206	Kushiro-shi	1661 1666 1668	Kushiro-cho Akan-cho Shiranuka-cho
6	Obihiro	1207	Obihiro-shi	1631 1637 1638 1643 1644	Otofuke-cho Memuro-cho Nakasatsunai-mura Makubetsu-cho Ikeda-cho
7	Kitami	1208	Kitami-shi	1548 1549 1551	Tanno-cho Kunneppu-cho Rubeshibe-cho
8	Yubari	1209	Yubari-shi		
9	Tomakomai	1213	Tomakomai-shi	1578 1579	Shiraoi-cho Hayakita-cho
10	Aomori	2201	Aomori-shi	2301 2302 2304 2305 2364	Hiranai-machi Kanita-machi Yomogita-mura Tairadate-mura Namioka-machi
11	Hirosaki	2202	Hirosaki-shi	2204 2341 2342 2343	Kuroishi-shi Iwaki-machi Soma-mura Nishimeya-mura

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
11	Hirosaki			2361 2362 2363 2365 2366 2367 2368 2381	Fujisaki-machi Owani-machi Onoe-machi Hiraka-machi Tokiwa-mura Inakadate-mura Ikarigaseki-mura Itayanagi-machi
12	Hachinohe	2203	Hachinohe-shi	2207 2403 2410 2442 2444 2445 2446 2447 2448 2449 3207 3502 3505	Misawa-shi Momoishi-machi Shimoda-machi Gonohe-machi Nagawa-machi Nambu-machi Hashikami-machi Fukuchi-mura Nango-mura Kuraishi-mura Kuji-shi Taneichi-machi Ono-mura
13	Morioka	3201	Morioka-shi	3205 3206 3301 3303 3304 3305 3306 3307 3321 3322 3323 3342	Hanamaki-shi Kitakami-shi Shizukuishi-cho Iwate-machi Nishine-cho Takizawa-mura Matsuo-mura Tamayama-mura Shiwa-cho Yahaba-cho Tonan-mura Ishidoriya-cho
14	Sendai	4201	Sendai-shi	4203 4204 4206 4207 4208 4209 4211 4321 4322 4323 4324 4361 4362 4401 4404 4406 4421 4422 4423 4424	Shiogama-shi Furukawa-shi Shiroishi-shi Natori-shi Kakuda-shi Tagajo-shi Iwamuma-shi Ogawara-machi Murata-machi Shibata-machi Kawasaki-machi Watari-co Yamamoto-cho Matsushima-machi Shichigahama-machi Rifu-cho Taiwa-cho Osato-cho Tomiya-machi Ohira-mura

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
14	Sendai			4444 4461 4462 4463 4501 4503 4504 4566 7561	Shikama-cho Matsuyama-machi Sambongi-cho Kashimadai-machi Wakuya-cho Kogota-cho Nango-cho Naruse-cho Shinchi-machi
15	Ishinomaki	4202	Ishinomaki-shi	4561 4562 4563 4564 4565 4567 4581 4582 4602	Kahoku-cho Yamoto-cho Ogatsu-cho Kanan-cho Mono-cho Kitakami-machi Onagawa-cho Oshika-cho Tsuyama-cho
16	Akita	5201	Akita-shi	5205 5206 5341 5361 5362 5363 5364 5365 5366 5367 5381 5382 5405 5421 5422 5427	Honjo-shi Oga-shi Kotooka-machi Gojome-machi Showa-machi Hachirogata-machi Iitagawa-machi Tenno-machi Ikawa-machi Wakami-machi Kawabe-machi Yuwa-machi Iwaki-machi Kamioka-machi Nishisemboku-machi Kyowa-machi
17	Yamagata	6201	Yamagata-shi	6206 6207 6208 6210 6211 6213 6301 6302 6321 6322 6324	Sagae-shi Kaminoyama-shi Murayama-shi Tendo-shi Higashime-shi Nanyo-shi Yamanobe-machi Nakayama-machi Kahoku-cho Nishikawa-machi Oe-machi
18	Tsuruoka	6203	Tsuruoka-shi	6423 6424 6425 6426 6427 6441	Fujishima-machi Haguro-machi Kushibiki-machi Mikawa-machi Asahi-mura Atsumi-machi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
19	Sakata	6204	Sakata-shi	6421 6422 6461 6462 6463 6464	Tachikawa-machi Amarume-machi Yuza-machi Yawata-machi Matsuyama-machi Hirata-machi
20	Fukushima	7201	Fukushima-shi	7210 7301 7302 7303 7304 7305 7306 7307 7308 7309 7321 7326	Nihonmatsu-shi Kori-machi Date-machi Kunimi-machi Yanagawa-machi Hobara-machi Ryozen-machi Tsukidate-machi Kawamata-machi Iino-machi Adachi-machi Towa-machi
21	Aizuwakamatsu	7202	Aizuwakamatsu-shi	7208 7362 7381 7403 7407 7421 7422 7424 7441 7442 7443	Kitakata-shi Shimogo-machi Kittaizu-mura Shiokawa-machi Bandai-machi Aizubange-machi Yugawa-mura Kawahigashi-machi Aizutakada-machi Hongo-machi Niitsuru-mura
22	Koriyama	7203	Koriyama-shi	7207 7322 7323 7324 7342 7343 7408 7521 7524 7527	Sukagawa-shi Otama-mura Motomiya-machi Shirasawa-mura Kagamiishi-machi Iwase-mura Inawashiro-machi Miharu-machi Ogoe-machi Funehiki-machi
23	Iwaki	7204	Iwaki-shi	7541 7542	Hirono-machi Naraha-machi
24	Mito-Katsuta	8201 8213	Mito-shi Katsuta-shi	8209 8216 8301 8302 8305 8306 8307 8308 8309 8321	Nakaminato-shi Kasama-shi Tsunezumi-mura Ibaraki-machi Uchibara-machi Johoku-machi Katsura-mura Gozenyama-mura Oarai-machi Tomobe-machi

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
24	Mito-Katsuta			8322 8323 8341 8342 8343 8344 8345 8361 8401 8402	Iwama-machi Nanakai-mura Tokai-mura Naka-machi Urizura-machi Omiya-machi Yamagata-machi Kanasago-mura Asahi-mura Hokota-machi
25	Hitachi	8202	Hitachi-shi	8212 8214 8215 8362 8363 8381	Hitachiota-shi Takahagi-shi Kitaibaraki-shi Suifu-mura Satomi-mura Juo-machi
26	Tsuchiura-Tsukuba	8203 8220	Tsuchiura-shi Tsukuba-shi	8486 8481 8484 8466 8485 8205 8210 8211 8304 8441 8442 8443 8448 8461 8462 8463 8464 8465 8502 8503 8522 8523	Oho-machi Tanidabe-machi Toyosato-machi Sakura-mura Tukuba-machi Ishioka-shi Shimotsuma-shi Mitsukaido-shi Minori-machi Edosaki-machi Miho-mura Ami-machi Sakuragawa-machi Dejima-mura Tamari-shi Yasato-machi Chiyoda-mura Niihari-mura Akeno-machi Makabe-machi Chiyokawa-mura Ishige-machi
27	Utsunomiya	9201	Utsunomiya-shi	9209 9205 9207 9211 9301 9303 9304 9342 9343 9344 9345 9361 9362 9384 9385	Mooka-shi Kanuma-shi Imaichi-shi Yaita-shi Kaminokawa-machi Kamikawachi-mura Kawachi-machi Mashiko-machi Motegi-machi Ichikai-machi Haga-machi Mibu-machi Ishibashi-machi Shioya-machi Ujiiie-machi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
27	Utsunomiya			9386 9387 9401 9402	Takanezawa-machi Kitsuregawa-machi Minaminasu-machi Karasuyama-machi
28	Ashikaga	9202	Ashikaga-shi	9204 9421	Sano-shi Tanuma-machi
29	Oyama	9208	Oyama-shi	9203 9302 9363 9365 8206 8207	Tochigi-shi Minamikawachi-machi Kokubunji-machi Ohira-machi Shimodate-shi Yuki-shi
30	Maebashi-Takasaki- Isesaki	10201 10202 10204	Maebashi-shi Takasaki-shi Isesaki-shi	10206 10208 10209 10210 10211 10301 10302 10303 10304 10305 10306 10321 10322 10323 10324 10341 10342 10343 10344 10345 10361 10363 10384 10401 10422 10461 10462 10463 10464 11211	Numata-shi Shibukawa-shi Fujioka-shi Tomioka-shi Annaka-shi Kitatachibana-mura Akagi-mura Fujimi-mura Ogo-machi Miyagi-mura Kasukawa-mura Haruna-machi Kurabuchi-mura Misato-machi Gumma-machi Komochi-mura Onogami-mura Ikaho-machi Shinto-mura Yoshioka-mura Shin-machi Yoshii-machi Kanra-machi Matsuida-machi Azuma-mura(Agatsuma-gun) Akabori-machi Azuma-mura(Sanami-gun) Sakai-machi Tamamura-machi Honjo-shi
31	Kiryu	10203	Kiryu-shi	10205 10207 10307 10308 10309 10481 10482 10483 10484 10501	Ota-shi Tatebayashi-shi Niisato-mura Kurohone-mura Azuma-mura(Seta-gun) Ojima-machi Nitta-machi Yabutsukahon-machi Kasakake-mura Omama-machi

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
31	Kiryu			10523 10524 10525	Chiyoda-machi Oizumi-machi Ora-machi
32	Kumagaya	11202	Kumagaya-shi	11206 11218 11363 11401 11402 11403 11405 11406 11407 11408 11422	Gyoda-shi Fukaya-shi Nagatoro-machi Osato-mura Konan-machi Menuma-machi Okabe-machi Kawamoto-machi Hanazono-machi Yorii-machi Minamikawara-mura
33	Tokyo	13100 13202 13203	Tokyo-tokubetsu-kubu Tachikawa-shi Musashino-shi	8204 8208 8217 8445 8482 8483 8541 8542 8543 8561 8563 8564 8219 9364 9366 11201 11203 11204 11205 11208 11209 11210 11212 11213 11214 11215 11216 11217 11219 11220 11221 11222 11223 11224 11225 11226 11227 11228 11229 11230	Koga-shi Ryugasaki-shi Toride-shi Kukizaki-machi Ina-machi Yawahara-mura Sowa-machi Goka-mura Sanwa-machi Moriya-machi Fujishiro-machi Tone-machi Ushiku-shi Nogi-machi Fujioka-machi Kawagoe-shi Kawaguchi-shi Urawa-shi Omiya-shi Tokorozawa-shi Hanno-shi Kazo-shi Higashimatsuyama-shi Iwatsuki-shi Kasukabe-shi Sayama-shi Hanyu-shi Konosu-shi Ageo-shi Yono-shi Soka-shi Koshigaya-shi Warabi-shi Toda-shi Iruma-shi Hatogaya-shi Asaka-shi Shiki-shi Wako-shi Niiza-shi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
33	Tokyo			11231	Okegawa-shi
				11232	Kuki-shi
				11233	Kitamoto-shi
				11234	Yashio-shi
				11235	Fujimi-shi
				11236	Kamifukuoka-shi
				11237	Misato-shi
				11238	Hasuda-shi
				11239	Sakado-shi
				11240	Satte-shi
				11301	Ina-machi
				11304	Fukiage-machi
				11322	Oi-machi
				11324	Miyoshi-machi
				11326	Moroyama-machi
				11327	Ogose-machi
				11328	Tsurugashima-machi
				11329	Hidaka-machi
				11341	Nomegawa-machi
				11342	Ranzan-machi
				11343	Ogawa-machi
				11348	Hatoyama-machi
				11421	Kisai-machi
				11424	Kitakawabe-machi
				11425	Otone-machi
				11442	Miyashiro-machi
				11445	Shiraoka-machi
				11446	Shobu-machi
				11461	Kurihashi-machi
				11462	Washinomiya-machi
				11464	Sugito-machi
				11465	Matsubushi-machi
				11466	Yoshikawa-machi
				11468	Showa-machi
				12200	Chiba-shi
				12203	Ichikawa-shi
				12204	Funabashi-shi
				12206	Kisarazu-shi
				12207	Matsudo-shi
				12208	Noda-shi
				12210	Mobara-shi
		12211	Narita-shi		
		12212	Sakura-shi		
		12216	Narashino-shi		
		12217	Kashiwa-shi		
		12219	Ichihara-shi		
		12220	Nagareyama-shi		
		12221	Yachiyo-shi		
		12222	Abiko-shi		
		12224	Kamagaya-shi		
		12225	Kimitsu-shi		
		12227	Urayasu-shi		
		12228	Yotsukaido-shi		
		12303	Sekiyado-machi		
		12305	Shonan-machi		
		12322	Shisui-machi		

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
33	Tokyo			12323	Yachimata-machi
				12324	Tomisato-machi
				12326	Shiroi-machi
				12327	Inzai-machi
				12329	Sakae-machi
				12402	Oamishirasato-machi
				12481	Sodegaura-machi
				12325	Inba-mura
				12328	Motono-mura
				13201	Hachioji-shi
				13204	Mitaka-shi
				13205	Ome-shi
				13206	Fuchu-shi
				13207	Akishima-shi
				13208	Chofu-shi
				13209	Machida-shi
				13210	Koganei-shi
				13211	Kodaira-shi
				13212	Hino-shi
				13213	Higashimurayama-shi
				13214	Kokubunji-shi
				13215	Kunitachi-shi
				13216	Tanashi-shi
				13217	Hoya-shi
				13218	Fussa-shi
				13219	Komae-shi
				13220	Higashiyamato-shi
				13221	Kiyose-shi
				13222	Higashikurume-shi
				13223	Musashimurayama-shi
				13224	Tama-shi
				13225	Inagi-shi
				13226	Akigawa-shi
				13302	Hamura-shi
				13303	Mizuho-machi
				13305	Hinode-machi
				13306	Itsukaichi-machi
				14100	Yokohama-shi
				14130	Kawasaki-shi
				14201	Yokosuka-shi
				14204	Kamakura-shi
				14205	Fujisawa-shi
				14207	Chigasaki-shi
				14208	Zushi-shi
				14209	Sagamihara-shi
				14210	Miura-shi
				14213	Yamato-shi
		14215	Ebina-shi		
		14216	Zama-shi		
		14218	Ayase-shi		
		14301	Hayama-machi		
		14421	Shiroyama-machi		
		14424	Fujino-machi		

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
34	Hiratsuka-Odawara-Atsugi	14203 14206 14212	Hiratsuka-shi Odawara-shi Atsugi-shi	14211 14214 14217 14321 14341 14342 14361 14362 14363 14364 14366 14382 14383 14384 14401 14402 22205	Hadano-shi Isehara-shi Minamiashigara-machi Samukawa-machi Oiso-machi Ninomiya-machi Nakai-machi Oi-machi Matsuda-machi Yamakita-machi Kaisei-machi Hakone-machi Manatsuru-machi Yugawara-machi Aikawa-machi Kiyokawa-mura Atami-shi
35	Niigata	15201	Niigata-shi	15206 15207 15209 15220 15221 15301 15302 15303 15304 15306 15307 15308 15309 15321 15323 15324 15341 15344 15345 15346 15347 15348 15349 15350 15361 15384	Shibata-shi Niitsu-shi Kamo-shi Shirone-shi Toyosaka-shi Yasuda-machi Kyogase-mura Suibara-machi Sasakami-mura Toyouura-machi Seiro-machi Kajikawa-mura Shiunji-machi Kosudo-machi Yokogoshi-mura Kameda-machi Iwamuro-mura Yoshida-machi Maki-machi Nishikawa-machi Kurosaki-machi Ajikata-mura Katahigashi-mura Tsukigata-mura Tagami-machi Mikawa-mura
36	Nagaoka	15202	Nagaoka-shi	15208 15211 15215 15364 15401 15402 15403 15404 15421 15441 15502	Ojiya-shi Mitsuke-shi Tochio-shi Nakanoshima-machi Koshiji-shi Mishima-machi Yoita-machi Washima-mura Yamakoshi-mura Kawaguchi-machi Oguni-machi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
37	Joetsu	15222	Joetsu-shi	15217 15521 15522 15525 15526 15541 15542 15543 15544 15546 15547 15548 15549 15550 15561 15562	Arai-shi Yasuzuka-machi Uragawara-mura Oshima-mura Maki-mura Kakizaki-machi Ogata-machi Kubiki-mura Yoshikawa-machi Nakago-mura Myoko-mura Itakura-machi Kiyosato-mura Sanwa-mura Nadachi-machi No-machi
38	Toyama-Takaoka	16201 16202	Toyama-shi Takaoka-shi	16203 16204 16205 16206 16207 16208 16209 16301 16302 16321 16322 16323 16342 16361 16362 16363 16364 16381 16382 16383 16384 16405 16408 16422	Shimminato-shi Uozu-shi Himi-shi Namerikawa-shi Kurobe-shi Tonami-shi Oyabe-shi Osawano-machi Oyama-machi Funahashi-mura Kamiiichi-machi Tateyama-machi Nyuzen-machi Yatsuo-machi Fuchu-machi Yamada-mura Hosoiri-mura Kosugi-machi Daimon-machi Shimo-mura Oshima-machi Shogawa-machi Fukuno-machi Fukuoka-machi
39	Kanazawa	17201	Kanazawa-shi	17207 17208 17323 17324 17342 17343 17344 17345 17346 17347 17348 17361 17362 17363	Hakui-shi Matto-shi Tatsunokuchi-machi Kawakita-machi Mikawa-machi Tsurugi-machi Nonoichi-machi Kawachi-mura Yoshinodani-mura Torigoe-mura Okuchi-mura Tsubata-machi Takamatsu-machi Nanatsuka-machi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
39	Kanazawa			17364 17365 17383 17385	Unoke-machi Uchinada-machi Shio-machi Oshimizu-machi
40	Komatsu	17203	Komatsu-shi	17206 17321 17322	Kaga-shi Neagari-machi Terai-machi
41	Fukui	18201	Fukui-shi	18203 18205 18206 18207 18302 18321 18322 18323 18361 18362 18363 18364 18365 18366 18381 18382 18401 18421 18422 18423 18424 18425 18426	Takefu-shi Ono-shi Katsuyama-shi Sabae-shi Miyama-cho Matsuoka-cho Eiheiji-cho Kamishihi-mura Mikuni-cho Awara-cho Kanazu-cho Maruoka-cho Harue-cho Sakai-cho Imadate-cho Ikeda-cho Nanjo-cho Asahi-cho Miyazaki-mura Echizen-cho Koshino-mura Ota-cho Shimizu-cho
42	Kofu	19201	Kofu-shi	19203 19205 19207 19301 19302 19303 19304 19305 19321 19322 19323 19324 19325 19326 19327 19328 19342 19343 19344 19345 19361 19362 19363	Enzan-shi Yamanashi-shi Nirasaki-shi Kasugai-cho Makioka-cho Mitomi-mura Katsunuma-cho Yamato-mura Isawa-cho Misaka-cho Ichinomiya-cho Yatsushiro-cho Sakaigawa-mura Nakamichi-cho Ashigawa-mura Toyotomi-mura Mitama-cho Ichikawadaimon-cho Rokugo-cho Shimobe-cho Masuho-cho Kajikazawa-mura Nakatomi-cho

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
42	Kofu			19381 18382 19383 19384 19385 19386 19387 19388 19389 19390 19391 19401 19402 19403 19405 19409	Ryuo-cho Shikishima-cho Tamaho-cho Showa-cho Tatomi-cho Hatta-mura Shirane-machi Ashiyasu-mura Wakakusa-cho Kushigata-machi Kosai-machi Futaba-cho Akeno-mura Sudama-cho Nagasaka-cho Mukawa-mura
43	Nagano	20201	Nagano-shi	20207 20211 20213 20216 20501 20502 20522 20541 20543 20581 20582 20583 20584 20585 20586 20587 20588 20589 20601	Suzaka-shi Nakano-shi Iiyama-shi Koshoku-shi Kamiyamada-machi Ooka-mura Togura-machi Obuse-machi Takayama-mura Shinshushin-machi Toyono-machi Shinano-machi Mure-mura Samizu-mura Togakushi-mura Kinasa-mura Ogawa-mura Nakajo-mura Toyota-mura
44	Matsumoto	20202	Matsumoto-shi	20212 20215 20424 20441 20443 20444 20445 20446 20447 20448 20449 20450 20451 20461 20462 20463 20464 20465 20466	Omachi-shi Shiojiri-shi Narakawa-mura Akashina-machi Shiga-mura Honjo-mura Sakakita-mura Omi-mura Sakai-mura Ikusaka-mura Hata-machi Yamagata-mura Asahi-mura Toyoshina-machi Hotaka-machi Nagawa-mura Azumi-mura Azusagawa-mura Misato-mura

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
44	Matsumoto			20467 20481 20482 20483	Horigane-mura Ikeda-machi Matsukawa-mura Yasaka-mura
45	Ueda	20203	Ueda-shi	20208 20324 20326 20341 20342 20343 20345 20346 20349 20521	Komoro-shi Tateshina-machi Kitamimaki-mura Maruko-machi Nagato-machi Tobu-machi Sanada-machi Takeshi-mura Aoki-mura Sakaki-machi
46	Gifu-Ogaki	21201 21202	Gifu-shi Ogaki-shi	21205 21207 21209 21211 21213 21301 21302 21303 21304 21322 21341 21342 21361 21362 21381 21382 21383 21384 21401 21402 21403 21404 21405 21421 21422 21423 21424 21425 21426 21441 21442 21443 21461 21463 21502	Seki-shi Mino-shi Hashima-shi Minokamo-shi Kakamigahara-shi Kawashima-cho Ginan-cho Kasamatsu-cho Yanaizu-cho Hirata-cho Yoro-cho Kamiishizu-cho Tarui-cho Sekigahara-cho Godo-cho Wanouchi-cho Ampachi-cho Sunomata-cho Ibigawa-cho Tanigumi-mura Ono-cho Ikeda-cho Kasuga-mura Kitagata-cho Motosu-cho Hozumi-cho Sunami-cho Shinsei-cho Itonuki-cho Takatomi-cho Ijira-mura Miyama-cho Horado-mura Mugegawa-cho Tomika-cho
47	Shizuoka-Shimizu	22201 22204	Shizuoka-shi Shimizu-shi	22209 22212 22214 22383	Shimada-shi Yaizu-shi Fujieda-shi Yui-cho

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
47	Shizuoka-Shimizu			22401 22402 22425	Okabe-cho Oigawa-cho Kanaya-cho
48	Hamamatsu	22202	Hamamatsu-shi	22211 22213 22216 22217 22218 22461 22481 22482 22483 22484 22485 22501 22502 22503 22505 22521 22522 22523	Iwata-shi Kakegawa-shi Fukuroi-shi Tenryu-shi Hamakita-shi Mori-machi Asaba-cho Fukude-cho Ryuyo-cho Toyoda-cho Toyooka-mura Kami-mura Maisaka-cho Arai-cho Yuto-cho Hosoe-cho Inasa-cho Mikkabi-cho
49	Numazu-Fuji-Mishima	22203 22210 22206	Numazu-shi Fuji-shi Mishima-shi	22207 22215 22220 22321 22325 22326 22341 22342 22361 22381 22382 19366 19367	Fujinomiya-shi Gotenba-shi Susono-shi Izunagaoka-cho Kannami-cho Nirayama-cho Shimizu-cho Nagaizumi-cho Shibakawa-cho Fujikawa-cho Kambara-cho Nambu-cho Tomizawa-cho
50	Nagoya	23100 23219	Nagoya-shi Komaki-shi	23203 23204 23205 23206 23208 23215 23216 23217 23218 23220 23222 23223 23224 23226 23228 23229 23302 23303 23304	Ichinomiya-shi Seto-shi Handa-shi Kasugai-shi Tsushima-shi Inuyama-shi Tokoname-shi Konan-shi Bisai-shi Inazawa-shi Tokai-shi Obu-shi Chita-shi Owariasahi-shi Iwakura-shi Toyoake-shi Togo-cho Nisshin-cho Nagakute-cho

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
50	Nagoya			23341	Nishibiwajima-cho
				23342	Toyoyama-cho
				23343	Shikatsu-cho
				23344	Nishiharu-cho
				23345	Haruhi-cho
				23346	Kiyosu-cho
				23347	Shinkawa-cho
				23361	Oguchi-cho
				23362	Fuso-cho
				23381	Kisogawa-cho
				23401	Sobue-cho
				23402	Heiwa-cho
				23421	Shippo-cho
				23422	Miwa-cho
				23423	Jimokuji-cho
				23424	Oharu-cho
				23425	Kanie-cho
				23426	Jushiyama-mura
				23427	Tobishima-mura
				23428	Yatomi-cho
				23429	Saya-cho
				23430	Tatsuta-mura
				23431	Hachikai-mura
				23432	Saori-cho
				23441	Agui-cho
				23442	Higashiura-cho
				23446	Mihama-cho
				23447	Taketoyo-cho
				21204	Tajimi-shi
				21208	Mizunami-shi
				21210	Ena-shi
				21212	Toki-shi
				21214	Kani-shi
				21323	Nanno-cho
				21521	Mitake-cho
				21523	Kaneyama-cho
				21541	Kasahara-cho
				24205	Kuwana-shi
				24301	Tado-cho
				24302	Nagashima-cho
				24303	Kisosaki-cho
24322	Inabe-cho				
24324	Toin-cho				
51	Toyohashi	23201	Toyohashi-shi	23207	Toyokawa-shi
				23214	Gamagori-shi
				23221	Shinshiro-shi
				23581	Horai-cho
				23601	Otowa-cho
				23602	Ichinomiya-cho
				23603	Kozakai-cho
				23604	Mito-cho
				23621	Tahara-cho
				23622	Akabane-cho
				22221	Kosai-shi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
52	Kariya-Toyota-Anjo	23210 23211 23212	Kariya-shi Toyota-shi Anjo-shi	23202 23209 23213 23225 23227 23482 23521 23522 23523 23541 23543 23544 23566	Okazaki-shi Hekinan-shi Nishio-shi Chiryu-shi Takahama-shi Kira-cho Miyoshi-cho Fujioka-cho Obara-mura Asuke-cho Shimoyama-mura Asahi-cho Inabu-cho
53	Tsu-Matsusaka-Ise	24201 24204 24203	Tsu-shi Matsuzaka-shi Ise-shi	24211 24213 24381 24382 24383 24384 24402 24403 24404 24405 24406 24407 24421 24422 24441 24442 24443 24444 24461 24462 24463 24464 24466 24468 24470 24525	Toba-shi Hisai-shi Kawage-cho Geino-cho Misato-mura Ano-cho Karasu-cho Ichishi-cho Hakusan-cho Ureshino-cho Misugi-mura Mikumo-cho Iinan-cho Iitaka-cho Taki-cho Meiwa-cho Odai-cho Seiwa-mura Tamaki-cho Futami-cho Obata-cho Nansei-cho Orniya-cho Misono-mura Watarai-cho Isobe-cho
54	Yokkaichi	24202	Yokkaichi-shi	24207 24210 24321 24323 24325 24341 24342 24343 24344 24361	Suzuka-shi Kameyama-shi Hokusei-cho Daian-cho Fujiwara-cho Komono-cho Kusu-cho Asahi-cho Kawagoe-cho Seki-cho
55	Kyoto	26100	Kyoto-shi	26204 26206 26207 26208	Uji-shi Kameoka-shi Joyo-shi Muko-shi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
55	Kyoto			26209	Nagaokakyo-shi
				26303	Oyamazaki-cho
				26322	Kumiyama-cho
				26342	Tanabe-cho
				26343	Ide-cho
				26344	Ujitawara-cho
				26361	Yamashiro-cho
				26381	Keihoku-cho
				26401	Sonobe-cho
				26402	Yagi-cho
				26403	Tamba-cho
				26404	Hiyoshi-cho
				25201	Otsu-shi
				25202	Hikone-shi
				25204	Omihachiman-shi
				25206	Kasatsu-shi
				25207	Moriyama-shi
				25301	Shiga-cho
				25321	Ritto-cho
				25342	Chuzu-cho
				25343	Yasu-cho
				25361	Ishibe-cho
				25362	Kosei-cho
		25381	Azuchi-cho		
		25403	Notogawa-cho		
56	Osaka	27100	Osaka-shi	27201	Sakai-shi
		27209	Moriguchi-shi	27202	Kishiwada-shi
		27218	Daito-shi	27203	Toyonaka-shi
		27223	Kadoma-shi	27204	Ikeda-shi
		27227	Higashiosaka-shi	27205	Suita-shi
				27206	Izumiotsumi-shi
				27207	Takatsuki-shi
				27208	Kaizuka-shi
				27210	Hirakata-shi
				27211	Ibaraki-shi
				27212	Yao-shi
				27213	Izumisano-shi
				27214	Tondabayashi-shi
				27215	Neyagawa-shi
				27216	Kawachinagano-shi
				27217	Matsubara-shi
				27219	Izumi-shi
				27220	Minoo-shi
				27221	Kashiwara-shi
				27222	Habikino-shi
				27224	Settsu-shi
				27225	Takaishi-shi
				27226	Fujiidera-shi
		27228	Sennan-shi		
		27229	Shijonawate-shi		
		27230	Katano-shi		
		27231	Osakasayama-shi		
		27301	Shimamoto-cho		
		27321	Toyono-cho		
		27322	Nose-cho		

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
56	Osaka			27341	Tadaoka-cho
				27361	Kumatori-cho
				27362	Tajiri-cho
				27366	Misaki-cho
				27367	Hannan-cho
				27381	Taishi-cho
				27382	Kanan-cho
				27383	Chihayaakasaka-mura
				27385	Mihara-cho
				24206	Ueno-shi
				24208	Nabari-shi
				24482	Shimagahara-mura
				24501	Aoyama-cho
				26210	Yawata-shi
				26362	Kizu-cho
				26363	Kamo-cho
				26364	Kasagi-cho
				26366	Seika-cho
				26367	Minamiyamashiro-mura
				28202	Amagasaki-shi
				28204	Nishinomiya-shi
				28206	Ashiya-shi
				28207	Itami-shi
				28214	Takarazuka-shi
				28217	Kawanishi-shi
				28219	Sanda-shi
				28301	Inagawa-cho
				28665	Tannan-cho
				29201	Nara-shi
				29202	Yamatotakada-shi
				29203	Yamatokoriyama-shi
				29204	Tenri-shi
				29205	Kashihara-shi
				29206	Sakurai-shi
				29207	Gojo-shi
				29208	Gose-shi
				29209	Ikoma-shi
				29342	Heguri-cho
				29343	Sango-cho
				26344	Ikaruga-cho
				26345	Ando-cho
				29361	Kawanishi-cho
				29362	Miyake-cho
				29363	Tawaramoto-cho
				29381	Ouda-cho
				29383	Haibara-cho
				29384	Murou-mura
				29401	Takatori-cho
				29402	Asuka-mura
				29421	Shinjo-cho
		29422	Taima-cho		
		29423	Kashiba-cho		
		29424	Kammaki-cho		
		29425	Oji-cho		
		29426	Koryo-cho		
		29427	Kawai-cho		

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
56	Osaka			29442 30203 30343	Oyodo-cho Hashimoto-shi Kudoyama-cho
57	Kobe	28100	Kobe-shi	28203 28210 28213 28215 28218 28321 28341 28343 28381 28382	Akashi-shi Kakogawa-shi Nishiwaki-shi Miki-shi Ono-shi Yokawa-cho Yashiro-cho Tojo-cho Inami-cho Harima-cho
58	Himeji	28201	Himeji-shi	28208 28211 28212 28216 28220 28422 28441 28442 28443 28444 28445 28461 28462 28463 28464 28481 28501 28502 28503 28504 28521 28522 28523 28524 28621	Aioi-shi Tatsuno-shi Ako-shi Takasago-shi Kasai-shi Yumesaki-cho Kanzaki-cho Ichikawa-cho Fukusaki-cho Kodera-cho Okawachi-cho Shingu-cho Ibogawa-cho Mitsu-cho Taishi-cho Kamigori-cho Sayo-cho Kozuki-cho Nanko-cho Mikazuki-cho Yamasaki-cho Yasutomi-cho Ichinomiya-cho Haga-cho Ikuno-cho
59	Wakayama	30201	Wakayama-shi	30202 30204 30301 30302 30303 30321 30322 30323 30324 30325 30326 30341 30361 30363	Kainan-shi Arida-shi Shimotsu-cho Nokami-cho Misato-cho Uchita-cho Kokawa-cho Naga-cho Momoyama-cho Kishigawa-cho Iwade-cho Katsuragi-cho Yuasa-cho Kibi-cho

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
60	Tottori	31201	Tottori-shi	31301 31302 31303 31321 31322 31323 31324 31325 31326 31327 31328 31341 31342 31343 31362	Kokufu-cho Iwami-cho Fukube-son Koge-cho Funaoka-cho Kawahara-cho Hatto-cho Wakasa-cho Mochigase-cho Saji-son Chizu-cho Ketaka-cho Shikano-cho Aoya-cho Tomari-son
61	Yonago	31202	Yonago-shi	31204 31381 31382 31383 31384 31385 31386 31387 31388 31402 31403 31404 32206 32322	Sakaiminato-shi Saihaku-cho Aimi-cho Kishimoto-cho Hiezu-son Yodoe-cho Daisen-cho Nawa-cho Nakayama-cho Hino-cho Kofu-cho Mizokuchi-cho Yasugi-shi Hakuta-cho
62	Matsue	32201	Matsue-shi	32203 32208 32301 32302 32303 32304 32305 32306 32307 32308 32361 32362 32363 32401	Izumo-shi Hirata-shi Kashima-cho Shimane-cho Mihonoseki-cho Higashiizumo-cho Yakumo-mura Tamayu-cho Shinji-cho Yatsuka-cho Daito-cho Kamo-cho Kisuki-cho Hikawa-cho
63	Okayama-Kurashiki	33201 33202	Okayama-shi Kurashiki-shi	33204 33208 33209 33211 33301 33303 33305 33321 33322 33323	Tamano-shi Soja-shi Takahashi-shi Bizen-shi Mitsu-cho Takabe-cho Kamogawa-cho Seto-cho Sanyo-cho Akasaka-cho

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
63	Okayama-Kurashiki			33324 33325 33344 33345 33346 33361 33362 33363 33401 33423 33427 33428 33441 33442 33443 33444 33445 33461 33503 33663	Kumayama-cho Yoshii-cho Yoshinaga-cho Saeki-cho Wake-cho Ushimado-cho Oku-cho Osafune-cho Nadasaki-cho Hayashima-cho Yamate-son Kiyone-son Funao-cho Konko-cho Kamogata-cho Yorishima-cho Satosho-cho Yakage-cho Mabi-cho Kumenan-cho
64	Hiroshima-Kure	34100 34202	Hiroshima-shi Kure-shi	34211 34212 34302 34304 34307 34309 34310 34311 34312 34313 34314 34323 34324 34325 34327 34328 34329 34330 34361 34366 34367 34381 34382 34385 34386 34402 34408 34422 34423 34424 34213	Otake-shi Higashihiroshima-shi Fuchu-cho Kaita-cho Kumano-cho Saka-cho Etajima-cho Ono-cho Kurahashi-cho Shimokamagari-cho Kamagari-cho Ono-cho Yuki-cho Saiki-cho Miyajima-cho Nomi-cho Okimi-cho Ogaki-cho Kake-cho Chiyoda-cho Toyohira-cho Yoshida-cho Yachiyo-cho Koda-cho Mukaihara-cho Kurose-cho Kochi-cho Akitsu-cho Yasuura-cho Kawajiri-cho Hatsukaichi-shi
65	Fukuyama-Onomichi	34207 34205	Fukuyama-shi Onomichi-shi	34204 34208 34444	Mihara-shi Fuchu-shi Mukaishima-machi

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
65	Fukuyama-Onomichi			34481 34482 34501 34524 34541 34544 33205 33207 33481	Utsumi-machi Numakuma-machi Kannabe-machi Shinichi-machi Yuki-machi Sanwa-machi Kasaoka-shi Ibara-shi Yoshii-cho
66	Shimonoseki	35201	Shimonoseki-shi	35422 35441 35442 35443 35444	Sanyo-cho Kikugawa-cho Toyota-cho Toyoura-cho Hohoku-cho
67	Ube	35202	Ube-shi	35203 35209 35403 35421	Yamaguchi-shi Onoda-shi Ajsu-cho Kusunoki-cho
68	Tokuyama	35205	Tokuyama-shi	35206 35207 35210 35214 35342 35343 35345 35361	Hofu-shi Kudamatsu-shi Hikari-shi Shinnanyo-shi Yamato-cho Tabuse-cho Kumage-cho Kano-cho
69	Iwakuni	35208	Iwakuni-shi	35212 35321 35322 35323 35324 35325 35326 35327 35328 35329	Yanai-shi Waki-cho Yuu-cho Kuga-cho Hongo-cho Shuto-cho Nishiki-cho Obatake-cho Mikawa-cho Miwa-cho
70	Tokushima	36201	Tokushima-shi	36202 36203 36204 36301 36321 36341 36342 36361 36362 36401 36402 36403 36404 36405 36406	Naruto-shi Komatsushima-shi Anan-shi Katsuura-cho Sanagouchi-son Ishii-cho Kamiyama-cho Nakagawa-cho Hanoura-cho Matsushige-cho Kitajima-cho Aizumi-cho Itano-cho Kamiita-cho Yoshino-cho

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
70	Tokushima			36407 36421 36422 36441 36442 36443 36466	Donari-cho Ichiba-cho Awa-cho Kamojima-cho Kawashima-cho Yamakawa-cho Anabuki-cho
71	Takamatsu	37201	Takamatsu-shi	37202 37203 37204 37301 37302 37303 37304 37305 37306 37307 37308 37341 37342 37343 37361 37362 37363 37381 37382 37383 37384 37385 37386 37402 37403 37404 37405	Marugame-shi Sakaide-shi Zentsuji-shi Hiketa-cho Shirotori-cho Ochi-cho Tsuda-cho Okawa-cho Shido-cho Sangawa-cho Nagao-cho Miki-cho Mure-cho Aji-cho Shionoe-cho Kagawa-cho Konan-cho Ayakami-cho Ryonan-cho Kokubunji-cho Ayauta-cho Hanzan-cho Utazu-cho Manno-cho Kotohira-cho Tadotsu-cho Chunan-cho
72	Matsuyama	38201	Matsuyama-shi	38210 38211 38361 38362 38401 38402 38403 38404 38405	Iyo-shi Hojo-shi Shigenobu-cho Kawauchi-cho Masaki-cho Tobe-cho Hirota-mura Nakayama-cho Futami-cho
73	Imabari	38202	Imabari-shi	38212 38341 38342 38343 38344 38345 38346	Toyo-shi Asakura-mura Tamagawa-cho Namikata-cho Onishi-cho Kikuma-cho Yoshiumi-cho
74	Niihama	38205	Niihama-shi	38206 38302 38321	Saijo-shi Doi-cho Komatsu-cho

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
75	Kochi	39201	Kochi-shi	39204 39205 39206 39307 39321 39322 39323 39324 39325 39326 39327 39344 39361 39362 39381 39383 39385 39402 39403 39410	Nankoku-shi Tosa-shi Susaki-shi Geisei-mura Akaoka-cho Kagami-cho Tosayamada-cho Noichi-cho Yasu-cho Kahoku-cho Yoshikawa-mura Otoyo-cho Kagami-mura Tosayama-mura Ino-cho Haruno-cho Gohoku-son Sakawa-cho Ochi-cho Hidaka-mura
76	Kitakyushu	40100	Kitakyushu-shi	40204 40213 40214 40215 40381 40382 40383 40384 40401 40402 40403 40621 40622 40623 40624 40641 40643 40642 40644 44203	Nogata-shi Yukuhashi-shi Buzen-shi Nakama-shi Ashiya-machi Mizumaki-machi Okagaki-machi Onga-cho Kotake-machi Kurata-machi Miyata-machi Kanda-machi Saigawa-machi Katsuyama-machi Toyotsu-machi Shiida-machi Tsuiki-machi Yoshitomi-machi Shinyoshitomi-mura Nakatsu-shi
77	Fukuoka	40130	Fukuoka-shi	40209 40216 40217 40218 40219 40220 40221 40305 40341 40342 40343 40344 40345 40347	Amagi-shi Ogori-shi Chikushino-shi Kasuga-shi Onojo-shi Munakata-shi Dazaifu-shi Nakagawa-machi Umi-machi Sasaguri-machi Shime-machi Sue-machi Shingu-machi Koga-machi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
75	Kochi	39201	Kochi-shi	39204	Nankoku-shi
77	Fukuoka			40348 40349 40362 40363 40364 40404 40443 40444 40461 40462 40463	Hisayama-machi Kasuya-machi Fukuma-machi Tsuyazaki-machi Genkai-machi Wakamiya-machi Miwa-machi Yasu-machi Maebaru-machi Nijo-machi Shima-machi
78	Omuta	40202	Omuta-shi	40562 40581 43204 43367 43368	Yamato-machi Takata-machi Arao-shi Nankan-machi Nagasu-machi
79	Kurume	40203	Kurume-shi	40207 40210 40211 40212 40481 40482 40483 40501 40503 40521 40522 40523 40543 40544 40561 40563 41342 41343 41344 41345	Yanagawa-shi Yame-shi Chikugo-shi Okawa-shi Yoshii-machi Tanushimaru-machi Ukiha-machi Kitano-machi Tachiarai-machi Jojima-machi Oki-machi Mizuma-machi Tachibana-machi Hirokawa-machi Setaka-machi Mitsuhashi-machi Nakabaru-cho Kitashigeyasu-cho Mine-cho Kamimine-cho
80	Iizuka-Tagawa	40205 40206	Iizuka-shi Tagawa-shi	40208 40421 40422 40423 40424 40425 40426 40427 40428 40601 40602 40603 40604 40605 40606 40607 40608 40609	Yamada-shi Keisen-machi Inatsuki-machi Usui-machi Kaho-machi Chikuho-machi Honami-machi Shonai-machi Kaita-machi Kawara-machi Soeda-machi Kanada-machi Itoda-machi Kawasaki-machi Akaike-machi Hojo-machi Oto-machi Aka-mura

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
75	Kochi	39201	Kochi-shi	39204	Nankoku-shi
81	Saga	41201	Saga-shi	41204 41206 41301 41302 41303 41304 41305 41321 41322 41323 41324 41325 41326 41361 41362 41363 41364 41422 41423 41424 41425 41426	Taku-shi Takeo-shi Morodomi-cho Kawasoe-machi Higashiyoka-cho Kubota-cho Yamato-cho Kanzaki-machi Chiyoda-cho Mitagawa-cho Higashisefuri-son Sefuri-mura Mitsuse-machi Ogi-machi Mikatsuki-cho Ushizu-cho Ashikari-cho Kitagata-machi Omachi-cho Kohoku-machi Shiroishi-cho Fukudomi-machi
82	Nagasaki	42201	Nagasaki-shi	42204 42205 42301 42302 42304 42305 42306 42307 42308 42309 42315 42342 42366	Isahaya-shi Omura-shi Koyagi-cho Iojima-cho Nomozaki-cho Sanwa-cho Tarami-cho Nagayo-cho Togitsu-cho Kinkai-cho Sotome-cho Imori-cho Chijiwa-cho
83	Sasebo	42202	Sasebo-shi	42310 42311 42322 42323 42388 42389 42390 42391 42392 42393	Seihi-cho Saikai-cho Kawatana-cho Hasami-cho Emukae-cho Shikamachi-cho Kosaza-cho Saza-cho Yoshii-cho Sechibaru-cho
84	Kumamoto	43201	Kumamoto-shi	43206 43208 43210 43211 43322 43341 43342 43343	Tamana-shi Yamaga-shi Kikuchi-shi Uto-shi Shiranui-machi Jonan-machi Tomiai-machi Matsubase-machi

Appendix A Core Cities and Other Member Localities of FURs (Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
75	Kochi	39201	Kochi-shi	39204	Nankoku-shi
84	Kumamoto			43344 43345 43346 43347 43364 43384 43385 43401 43403 43404 43405 43406 43407 43430 43431 43432 43441 43442 43443 43444	Ogawa-machi Toyono-mura Chuo-machi Tomochi-machi Gyokuto-machi Kao-machi Ueki-machi Shichijo-machi Ozu-machi Kikuyo-machi Koshi-machi Shisui-machi Nishigoshi-machi Kugino-mura Choyo-mura Nishihara-mura Mifune-machi Kashima-machi Mashiki-machi Kosa-machi
85	Yatsushiro	43202	Yatsushiro-shi	43461 43462 43463 43464 43465 43466 43481	Sakamoto-mura Sencho-machi Kagami-machi Ryuhoku-machi Miyahara-machi Toyo-machi Tonoura-machi
86	Oita	44201	Oita-shi	44202 44206 44341 44361 44362 44363 44364 44381 44421 44422 44423 44425 44426 44427 44428	Beppu-shi Usuki-shi Hiji-machi Notsuharu-machi Hasama-machi Shonai-cho Yufuin-cho Saganoseki-machi Notsu-machi Mie-machi Kiyokawa-mura Asaji-machi Ono-machi Chitose-mura Inukai-machi
87	Miyazaki	45201	Miyazaki-shi	45208 45301 45302 45303 45381 45382 45383 45401 45402	Saito-shi Kiyotake-cho Tano-cho Sadowara-cho Takaoka-cho Kunitomi-cho Aya-cho Takanabe-cho Shintomi-cho
88	Miyakonojo	45202	Miyakonojo-chi	45341	Mimata-cho

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)
Appendix A Core Cities and Other Member Localities of FURs(Continued)

No.	Name of FUR	Core of FUR		Surrounding area of FUR	
		Code	Name of locality	Code	Name of locality
75	Kochi	39201	Kochi-shi	39204	Nankoku-shi
88	Miyakonojo			45342 45343 45344 45345 46463 46464	Yamanokuchi-cho Takajo-cho Yamada-cho Takasaki-cho Takarabe-cho Sueyoshi-cho
89	Nobeoka	45203	Nobeoka-shi	45206 45421 45426 45427	Hyuga-shi Kadogawa-cho Kitakata-cho Kitagawa-cho
90	Kagoshima	46201	Kagoshima-chi	46205 46210 46214 46301 46302 46321 46345 46361 46362 46363 46364 46365 46366 46367 46368 46441 46442 46443 46450	Kushikino-shi Ibusuki-shi Tarumizu-shi Yoshida-cho Sakurajima-cho Kiire-cho Kawanabe-cho Ichiki-cho Higashiichiki-cho Ijuin-cho Matsumoto-cho Koriyama-cho Hiyoshi-cho Fukiage-cho Kinpo-cho Kajiki-cho Aira-cho Kamo-cho Hayato-cho
91	Naha	47201	Naha-shi	47205 47208 47210 47328 47329 47341 47343 47344 47345 47346 47347 47348 47349 47350	Ginowan-shi Urasoe-shi Itoman-shi Nakagusuku-son Nishihara-cho Tomigusuku-son Kochinda-cho Gushikami-son Tamagusuku-son Chinen-son Sashiki-cho Yonabaru-cho Ozato-son Haebaru-cho
92	Okinawa	47211	Okinawa-shi	47202 47203 47322 47323 47324 47325 47326 47327	Ishikawa-shi Gushikawa-shi Yonagusuku-son Katsuren-cho Yomitan-son Kadena-cho Chatan-cho Kitanakagusuku-son

Appendix B Population of FURs (FURs are arranged in the order of population at 1990)

No.	Name of FUR	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
33	Tokyo	6,355,850	7,316,559	8,531,697	9,805,191	11,239,839	9,568,285	11,172,003	13,536,749	16,008,664	19,120,214	22,165,352	24,908,173	26,483,892	27,970,346	29,420,554
56	Osaka	3,426,334	3,982,818	4,544,247	5,425,715	6,085,710	4,795,624	5,386,989	6,282,269	7,327,858	8,797,537	10,075,474	11,032,245	11,436,841	11,793,746	12,013,470
50	Nagoya	1,529,660	1,755,929	1,939,866	2,216,060	2,493,647	2,289,733	2,517,945	2,859,915	3,278,923	3,773,989	4,203,623	4,601,116	4,812,714	4,980,918	5,146,744
55	Kyoto	1,158,724	1,295,803	1,454,654	1,613,146	1,629,191	1,647,245	1,747,909	1,853,229	1,934,328	2,085,116	2,283,938	2,512,582	2,672,147	2,789,667	2,861,101
57	Kobe	979,644	1,068,023	1,178,036	1,334,898	1,432,130	1,053,180	1,201,382	1,364,311	1,524,612	1,668,326	1,818,488	1,988,724	2,073,824	2,155,045	2,246,179
1	Sapporo	334,726	411,532	461,508	511,743	526,741	615,654	694,147	836,244	972,841	1,192,728	1,405,689	1,668,650	1,872,247	2,035,511	2,186,324
77	Fukuroka	505,233	547,479	609,437	669,483	706,081	810,362	898,721	1,021,316	1,105,380	1,218,854	1,382,127	1,623,726	1,820,574	1,967,826	2,112,804
64	Hiroshima-Kure	774,367	835,029	892,516	986,413	1,048,801	995,970	1,053,803	1,126,665	1,180,196	1,298,064	1,400,886	1,566,401	1,629,900	1,790,584	1,840,281
14	Sendai	526,497	582,836	643,584	697,336	714,861	883,621	950,257	1,000,027	1,035,016	1,085,065	1,175,808	1,321,474	1,442,952	1,537,479	1,621,920
76	Kitakyushu	742,621	788,169	891,100	1,017,337	1,212,883	1,081,748	1,225,871	1,388,663	1,494,217	1,501,494	1,484,441	1,523,904	1,587,605	1,577,849	1,621,920
63	Okayama-Kurashiki	747,246	764,148	800,083	843,398	845,599	1,008,480	1,043,949	1,082,292	1,097,992	1,128,242	1,228,735	1,346,700	1,408,663	1,454,094	1,472,284
30	Macheshi-Takasaki-Iseasaki	659,646	706,909	754,121	774,555	789,969	988,076	986,921	994,849	977,439	1,021,856	1,063,747	1,137,151	1,203,346	1,255,446	1,295,705
46	Fukuoka	564,522	604,673	634,548	660,708	684,522	800,363	835,615	928,959	918,572	916,990	1,072,013	1,159,347	1,222,013	1,263,849	1,287,096
52	Kariya-Toyota-Anjo	340,188	378,028	403,447	433,599	459,658	564,083	589,994	611,669	641,601	727,111	870,522	993,132	1,086,633	1,163,660	1,242,716
34	Hiratsuka-Odawara-Atsugi	310,188	337,802	352,382	378,191	398,658	510,479	524,763	559,245	593,196	689,836	806,735	952,560	1,061,160	1,157,915	1,242,245
47	Shizuoka-Shimizu	408,409	456,898	498,337	540,880	570,779	634,219	685,090	746,706	771,838	805,907	853,363	917,811	973,545	1,024,729	1,067,398
48	Hamaatsu	456,458	492,971	532,797	575,680	593,581	660,200	695,678	746,706	771,838	805,907	853,363	917,811	973,545	1,024,729	1,067,398
38	Toyama-Takaoka	651,358	672,010	699,368	710,833	740,610	881,776	911,096	926,104	939,871	936,208	948,271	991,518	1,025,600	1,041,008	1,045,466
84	Kanamoto	532,960	567,103	598,200	616,817	600,141	762,204	787,465	826,963	828,677	827,681	842,210	883,348	954,129	1,006,573	1,038,296
35	Niigata	504,802	536,239	573,535	600,545	631,701	755,272	782,555	803,740	815,278	835,475	875,419	907,429	962,506	993,771	1,011,402
58	Himeji	517,242	525,472	545,937	563,761	606,630	731,523	751,076	769,044	786,264	830,243	875,419	907,429	962,506	993,771	1,011,402
27	Utsunomiya	454,242	483,690	508,592	529,039	530,677	696,628	705,876	706,826	695,102	705,435	744,500	821,883	883,555	934,074	978,301
49	Nuazu-Fuji-Mishima	320,513	344,987	370,304	396,445	430,631	537,925	557,014	595,193	631,027	697,271	773,272	754,284	814,370	846,156	851,940
90	Kazoshima	466,592	490,099	518,968	535,126	530,638	642,845	670,740	697,740	685,988	693,102	703,272	754,284	814,370	846,156	851,940
71	Takanao	500,871	520,702	544,712	557,379	541,962	673,488	698,321	705,187	694,724	691,964	709,610	762,919	800,398	823,712	828,568
65	Fukuyama-Onomichi	471,768	490,128	504,501	522,169	516,501	632,852	648,174	654,837	660,016	675,910	729,183	781,749	797,215	809,108	803,045
82	Nagasaki	372,955	390,608	408,202	418,474	446,109	475,959	529,503	582,911	618,229	630,684	649,430	690,470	720,789	740,699	746,367
24	Mito	328,995	348,181	372,161	388,093	398,658	504,687	517,665	528,254	534,066	548,166	577,712	630,129	675,217	709,480	729,738
51	Toyoohashi	308,730	329,931	355,653	361,651	369,517	450,620	472,297	497,459	513,431	552,074	585,415	634,982	670,292	702,628	726,699
39	Kanazawa	367,677	372,448	377,444	384,362	381,071	455,626	477,401	493,449	507,639	531,626	561,631	622,756	668,323	701,178	725,316
86	Oita	330,837	361,490	377,119	390,979	393,916	502,055	511,741	532,944	532,795	544,349	567,675	629,797	672,620	699,709	707,192
53	Tsu-Matsusaka-Ise	473,830	491,991	514,621	523,456	523,170	603,303	620,515	630,830	621,479	623,075	632,107	660,365	677,738	693,392	699,005
91	Naha	237,801	229,838	239,966	249,788	242,478	—	254,540	336,244	403,619	452,062	490,992	570,851	617,119	665,351	698,876
70	Tokushima	460,682	476,776	499,580	511,649	505,500	596,248	615,574	617,394	606,793	599,901	601,504	630,353	658,479	673,768	679,202
59	Kakayama	387,624	415,536	445,116	466,782	464,478	490,432	507,862	529,826	541,226	581,608	617,446	646,199	662,204	665,184	660,198
41	Fukui	455,922	453,070	471,211	500,249	497,556	557,272	582,230	583,588	587,103	591,140	590,826	616,943	636,450	654,958	658,707
28	Tsushima-Tsukuba	331,493	350,251	369,774	378,780	385,091	488,351	486,426	484,194	459,404	454,050	467,485	514,558	580,214	620,971	658,516
79	Kurume	412,093	440,243	464,660	483,625	479,541	566,770	589,742	614,768	607,836	596,384	607,396	630,238	630,813	644,645	644,645
43	Nagano	393,052	409,345	426,972	434,365	438,252	542,802	547,406	543,119	535,459	535,888	545,475	569,889	583,005	607,558	614,884
42	Kofu	404,719	419,544	447,740	454,860	456,738	558,293	597,893	551,471	532,773	520,315	523,916	544,698	567,438	593,500	610,640
72	Matsuyama	249,571	268,143	279,572	277,899	278,263	345,613	365,778	367,634	402,232	454,873	506,946	549,756	578,819	596,218	600,552
13	Horioaka	233,394	255,660	278,343	299,716	314,524	365,061	398,918	429,921	450,131	458,920	469,618	504,213	547,803	575,076	590,752
54	Tokkai-ichi	249,782	263,106	276,692	285,864	300,967	367,573	381,063	390,888	409,285	444,919	473,360	518,822	543,705	564,714	588,758
75	Kochi	366,168	379,128	398,645	395,359	390,541	467,227	481,737	486,956	487,506	531,253	556,857	574,065	572,865	574,065	572,865
17	Yamagata	367,172	398,595	424,695	437,589	438,081	524,669	534,241	525,038	519,456	508,888	509,245	522,679	547,416	561,280	566,810
31	Kiryu	242,568	254,663	271,353	303,121	340,096	400,052	406,167	407,854	399,790	408,979	433,878	469,417	501,265	533,295	539,703

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)

Appendix B (Continued)

No.	Name of FIR	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
16	Akita	277,169	293,470	309,699	323,646	327,712	383,644	418,479	440,054	447,400	446,340	455,580	475,953	502,541	512,620	513,778
22	Koriyama	242,816	262,532	286,453	302,818	311,762	384,200	396,899	406,822	407,538	409,984	420,469	442,133	467,138	484,248	499,325
87	Miyazaki	190,242	202,415	227,407	234,122	237,424	306,878	324,649	337,354	345,236	344,646	357,473	392,719	434,882	457,597	472,077
32	Kumagaya	217,549	230,333	237,894	243,968	249,774	315,791	316,734	322,447	318,507	331,269	355,408	385,275	413,878	442,741	465,752
20	Fukushima	282,528	299,538	313,301	322,976	324,934	388,211	402,451	411,017	406,011	407,202	414,465	430,776	448,289	456,835	461,988
44	Matsumoto	282,655	297,996	313,907	317,504	319,358	387,688	390,431	387,362	385,776	384,870	392,358	413,496	433,217	447,159	454,514
11	Saga	312,797	320,378	322,081	326,773	327,645	432,850	445,210	462,556	451,591	424,410	407,799	408,080	423,937	432,737	434,544
12	Hachinohe	162,261	175,203	191,830	212,470	227,074	275,595	304,313	336,069	367,572	376,358	389,482	407,111	425,040	430,940	428,857
3	Asahikawa	161,553	175,969	195,261	204,451	200,265	239,479	263,832	297,455	320,478	345,869	362,253	378,547	409,393	418,216	410,073
68	Tokuyama	213,139	220,159	225,946	247,255	272,192	310,555	322,240	351,759	333,356	344,521	360,393	392,246	407,130	414,782	408,236
29	Oyama	189,716	201,720	211,942	217,416	220,255	290,255	289,984	289,139	283,668	293,011	317,419	349,807	373,007	389,366	403,210
2	Hakodate	204,896	229,663	269,232	290,011	278,949	307,156	328,178	343,651	342,298	349,937	360,438	378,408	395,494	395,722	383,456
62	Matsue	248,900	257,086	270,352	279,176	278,626	322,569	334,399	343,232	338,603	332,671	333,985	343,795	361,118	372,127	375,314
23	Iwaki	222,763	219,335	228,925	247,286	273,198	331,222	358,185	368,714	361,544	348,134	340,318	342,893	355,775	364,314	369,725
67	Iibe	173,159	187,184	204,775	224,032	271,850	292,535	319,105	336,684	344,132	319,062	312,358	327,966	344,494	361,489	366,863
36	Nagaoka	277,706	291,013	301,790	309,541	319,606	350,360	361,089	361,113	357,623	354,690	351,227	354,895	362,478	364,614	364,298
80	Iizuka-Tagawa	365,128	358,439	385,072	398,936	473,561	508,579	577,948	590,747	551,303	419,369	361,262	365,160	364,678	370,219	384,144
25	Hitachi	175,504	179,637	188,379	202,451	244,467	266,990	278,703	295,674	323,460	332,414	331,631	336,937	344,383	351,939	350,816
66	Shimonoseki	206,748	228,102	238,742	254,384	281,079	286,676	307,942	336,956	344,335	342,507	338,098	345,540	348,987	348,546	338,633
83	Sasebo	218,567	233,476	269,523	323,202	361,675	345,076	379,700	417,715	410,148	356,665	339,277	340,970	343,564	344,167	337,184
10	Anomori	138,445	155,418	171,546	191,376	193,951	211,346	235,855	260,887	272,118	281,292	294,737	317,112	340,554	346,125	336,472
11	Hirosaki	190,460	211,358	228,893	246,596	254,889	299,660	318,329	333,281	332,545	323,351	321,068	325,527	338,204	336,055	329,629
92	Okinawa	101,970	97,358	100,103	101,676	97,033	179,949	196,901	209,915	216,898	238,963	267,567	273,961	278,585	281,593	
28	Ashtaka	175,270	187,382	191,959	205,650	208,294	245,176	248,675	246,915	244,341	248,071	256,192	267,567	273,961	278,585	281,593
61	Yonago	179,439	189,000	196,350	197,293	198,157	241,117	247,420	256,279	251,715	248,515	248,297	259,070	272,487	277,765	275,803
78	Omura	202,930	215,646	228,691	238,119	275,893	297,522	336,293	347,099	345,890	325,751	297,188	290,578	290,763	289,542	275,564
45	Iieda	194,906	200,557	210,536	206,452	204,868	256,652	254,609	246,966	240,954	237,896	238,584	246,146	256,480	264,429	269,648
37	Joetsu	247,569	252,797	257,427	258,869	265,353	312,183	309,414	305,856	295,325	284,255	269,078	263,463	264,335	263,585	258,396
6	Obihiro	71,818	75,259	94,440	109,633	109,865	134,705	143,979	174,507	181,622	195,585	207,501	219,106	237,346	250,259	253,419
60	Tottori	193,569	197,305	203,296	203,647	200,610	237,930	244,532	250,077	244,126	235,793	231,803	235,653	243,508	249,296	252,139
21	Aizuwakamatsu	188,890	204,507	211,420	222,203	220,593	264,735	266,888	269,816	263,201	252,390	242,059	239,537	245,287	248,233	248,328
5	Kushiro	57,836	65,724	79,116	88,009	105,694	108,410	135,989	165,177	194,728	218,458	223,520	239,858	250,479	252,519	245,220
15	Ishinomaki	126,837	137,427	150,561	161,437	168,296	214,199	224,575	225,787	225,482	220,519	221,164	226,400	232,153	234,174	230,493
88	Miyakonojo	144,455	158,829	173,942	181,328	181,472	227,308	236,968	242,965	235,410	220,967	208,502	223,369	223,602	226,174	226,177
89	Nobeoka	94,305	99,111	110,060	146,024	150,201	158,104	176,754	194,180	200,333	200,786	206,457	217,955	226,195	226,511	219,204
102	Kita	102,825	109,322	117,910	132,443	149,051	188,598	200,039	205,895	207,305	203,996	202,739	210,615	213,573	216,575	213,703
4	Niigama	75,798	70,739	77,404	88,592	135,707	138,171	154,767	173,048	201,221	227,200	238,137	242,935	241,407	229,402	207,933
4	Murotan	142,758	147,642	154,974	157,922	160,124	203,860	216,302	211,572	213,247	207,919	212,466	214,120	210,808	205,857	
69	Iwakuni	125,417	123,533	124,585	129,248	130,504	160,448	160,448	162,349	164,969	168,318	176,621	188,020	196,855	202,772	201,230
40	Konashi	124,732	135,192	142,586	147,234	146,140	176,194	185,430	186,584	185,950	184,968	188,502	198,910	203,470	205,328	201,200
73	Iwabari	28,635	31,357	32,303	33,686	36,536	46,411	56,320	69,899	84,082	106,433	128,145	161,409	182,369	188,174	188,821
19	Sakata	133,659	139,723	146,892	149,564	147,949	179,529	185,421	184,317	176,342	170,361	168,870	173,832	171,552	169,280	
85	Yatsushiro	108,334	115,905	118,673	124,747	126,168	164,776	172,873	182,190	182,274	173,634	166,735	164,857	168,229	167,371	163,493
18	Tsuruoka	135,430	139,989	146,046	151,568	151,828	178,613	183,060	188,610	178,133	168,933	162,037	158,731	161,809	161,147	159,103
7	Kiitani	48,924	48,448	56,489	62,253	66,124	82,330	90,076	98,843	105,692	110,154	113,002	118,932	129,787	133,254	131,266
8	Yubari	51,022	48,657	51,924	42,473	64,945	82,055	99,448	107,244	107,883	85,071	69,871	50,131	41,715	31,665	20,969

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)

Appendix D Population of Cores

No.	Name of PUR	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
1	Sapporo	144,651	194,750	227,779	264,326	281,778	342,133	393,770	487,446	615,684	821,272	1,010,177	1,240,613	1,401,757	1,542,979	1,671,742
2	Hakodate	162,246	183,273	219,494	235,559	224,214	239,600	252,756	267,945	271,172	281,029	292,286	307,453	320,154	319,194	307,249
3	Asahikawa	106,468	120,106	134,344	139,373	135,759	164,230	184,242	214,479	239,636	271,930	297,189	320,526	352,619	363,631	359,071
4	Muroran	56,062	50,040	55,855	65,095	107,628	96,722	110,443	123,533	145,679	161,252	162,059	158,715	150,199	136,208	117,855
5	Kushiro	41,646	47,176	58,576	65,204	73,831	73,521	93,357	119,536	150,624	174,105	191,948	206,840	214,694	214,541	205,639
6	Obihiro	25,095	27,614	38,557	47,910	48,815	61,912	67,552	92,442	100,915	117,253	131,568	141,774	153,861	162,932	167,384
7	Kitami	25,314	27,316	32,812	36,235	38,186	47,277	52,596	59,437	66,932	74,841	82,727	91,519	102,915	107,281	107,247
8	Yubari	51,022	48,657	51,824	42,473	64,945	82,055	99,448	107,244	107,883	85,071	69,871	50,131	41,715	31,665	20,969
9	Tomakomai	17,565	19,928	20,987	21,946	23,918	30,760	39,226	51,319	62,384	81,812	101,573	132,477	151,967	158,061	160,118
10	Aomori	101,086	116,895	130,059	146,030	147,955	153,138	173,907	197,812	210,883	224,433	240,063	264,222	287,594	294,045	287,808
11	Hirotsuki	86,944	92,647	100,048	108,107	109,615	131,959	139,784	147,107	150,702	151,624	157,330	164,911	175,330	176,082	174,704
12	Hachinohe	63,706	71,311	79,529	90,682	99,768	117,806	133,263	149,938	174,348	189,387	208,801	224,366	238,179	241,430	241,057
13	Morioka	64,001	75,022	85,073	92,589	98,781	116,701	127,878	157,441	176,987	196,036	216,223	229,114	235,469	235,434	235,434
14	Sendai	190,013	221,709	252,017	278,761	284,132	331,570	380,217	414,775	459,876	520,059	598,950	709,326	827,353	877,324	918,398
15	Ishinomaki	43,657	48,613	55,763	60,965	65,566	84,441	85,939	89,881	93,688	98,240	106,681	115,085	120,689	122,674	121,976
16	Akita	104,141	115,102	122,973	130,507	134,896	161,348	173,029	190,202	203,661	216,607	235,873	261,246	284,863	296,400	302,362
17	Yamagata	116,797	128,709	139,688	145,018	144,567	174,595	180,579	183,763	188,560	193,737	204,127	219,773	237,041	245,158	249,487
18	Tsuruoka	68,758	71,894	75,691	79,416	77,220	92,644	95,968	98,589	98,512	95,615	95,136	95,932	98,751	100,200	99,889
19	Sakata	63,109	67,373	71,538	73,260	72,146	89,752	93,724	96,740	97,675	95,986	96,072	97,723	102,600	101,392	100,811
20	Fukushima	121,613	134,106	141,859	149,719	152,095	179,911	189,626	201,375	205,435	213,412	227,455	246,535	262,837	270,762	277,528
21	Aizuwakamatsu	63,699	70,459	73,814	77,588	77,186	92,262	93,667	97,885	99,546	102,239	104,065	108,650	114,528	118,140	119,080
22	Koriyama	109,004	122,081	136,501	145,420	152,843	185,924	195,798	206,049	213,825	223,236	241,726	264,628	286,461	301,673	314,642
23	Iwaki	210,550	207,707	216,740	234,717	260,653	313,785	340,260	351,440	345,663	333,861	327,164	330,213	342,074	350,569	355,812
24	Mito	87,722	99,564	109,218	115,294	120,377	142,798	152,231	166,850	182,666	197,588	240,543	277,949	308,187	331,748	344,793
25	Miichi	63,337	65,000	75,400	80,294	129,119	115,143	121,086	135,368	161,226	179,703	193,210	202,383	204,586	206,074	202,141
26	Tsuchiura-Tsukuba	98,836	106,269	113,747	115,536	119,263	154,661	153,395	154,002	147,463	151,544	161,607	185,229	223,063	247,672	270,867
27	Utsunomiya	123,772	140,951	148,144	156,241	154,603	201,015	211,211	227,094	239,007	265,696	301,231	344,420	377,746	405,375	426,795
28	Ashi-kaga	98,572	107,103	112,591	125,622	127,556	143,149	147,073	146,573	146,209	156,374	162,559	165,756	167,656	167,656	167,656
29	Oyama	52,182	55,517	57,979	58,957	60,572	82,144	82,908	83,785	83,481	90,658	105,374	120,290	127,226	134,217	142,262
30	Maebashi-Takasaki-Iseaki	284,833	296,239	324,135	337,562	345,546	404,311	420,075	433,897	440,636	474,681	518,016	559,469	592,327	621,544	638,660
31	Kiryu	109,653	116,301	129,655	157,899	186,153	203,264	207,914	209,207	207,153	216,339	231,403	244,967	256,004	264,937	266,247
32	Maatzaya	55,300	60,107	64,019	66,882	69,261	85,619	87,914	94,252	98,168	109,575	120,841	131,485	136,806	143,496	152,124
33	Tokyo	3,373,706	4,134,166	5,023,910	5,947,988	6,862,269	4,301,344	5,821,434	7,140,361	8,512,299	9,172,309	9,094,958	8,924,157	8,631,478	8,639,921	8,455,474
34	Hiratsuka-Odawara-Atsugi	143,634	160,951	165,204	177,626	188,582	232,310	243,819	285,823	285,893	346,550	410,196	478,109	537,152	591,531	636,650
35	Niigata	148,064	166,698	186,010	196,435	218,761	261,945	281,676	301,001	325,018	356,302	383,919	423,188	457,785	475,630	486,907
36	Nagaoka	101,746	110,465	117,482	121,825	129,433	128,610	135,366	143,604	148,254	148,254	159,542	119,318	120,410	123,418	130,659
37	Joetsu	88,893	92,567	95,735	96,146	97,219	115,743	113,552	117,069	116,942	119,318	120,410	123,418	127,842	130,659	130,116
38	Toyama-Takaoka	239,151	253,841	270,046	281,422	304,920	332,418	355,189	373,921	392,674	411,040	428,940	459,764	480,110	469,907	496,720
39	Kanazawa	206,125	214,981	224,028	231,125	230,911	266,483	283,863	289,911	313,114	335,830	361,382	395,268	417,684	430,481	442,868
40	Konatsu	70,743	68,639	68,317	68,317	72,111	87,302	89,589	88,507	91,163	95,884	100,273	104,329	106,041	106,075	106,075
41	Fukui	135,808	137,174	148,126	166,737	170,214	155,730	175,109	183,275	193,858	205,501	215,137	231,364	240,962	250,261	252,743
42	Kofu	88,809	103,100	117,172	123,243	122,306	125,140	139,037	154,501	160,963	172,457	182,669	193,879	196,262	202,405	200,626
43	Nagano	168,375	178,085	189,516	193,607	194,647	243,046	248,653	253,430	257,071	269,160	285,355	306,637	324,360	336,973	347,026
44	Maizumi-to	105,098	114,541	123,728	125,078	124,663	148,401	150,091	155,663	158,183	166,927	175,049	185,595	192,985	197,340	200,715
45	Ueda	71,929	73,534	77,306	77,479	76,792	95,661	95,554	94,384	94,275	96,539	99,499	105,151	111,540	116,178	119,435
46	GiFu-Ogaki	206,916	214,268	231,937	284,336	296,892	311,538	337,377	383,530	427,153	484,470	520,683	549,146	553,508	557,653	558,605
47	Shizuoka-Shimizu	245,854	283,081	313,283	347,427	371,514	395,640	435,683	492,265	544,156	601,358	651,344	690,001	699,917	710,528	713,719
48	Hanamaatsu	172,815	198,199	223,339	256,775	270,956	292,793	281,521	324,542	357,098	392,632	432,221	468,884	490,824	514,131	534,620
49	Numazu-Fuji-Mishima	163,250	181,085	196,143	219,382	236,764	291,280	307,211	332,180	362,769	407,055	447,818	487,768	504,058	525,780	432,980

Appendix D (Continued)

No.	Name of PUR	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
50	Nagoya	703,447	868,171	1,017,821	1,209,105	1,442,319	1,008,931	1,193,780	1,457,936	1,740,563	1,996,307	2,115,659	2,177,185	2,191,135	2,229,665	2,279,234
51	Toyohashi	131,909	148,102	168,215	169,726	171,963	169,594	185,984	202,985	215,515	238,672	258,547	284,585	304,273	322,142	337,982
52	Kariya-Toyota-Anjo	90,420	113,942	125,078	133,986	150,105	197,659	205,193	214,728	230,566	282,897	379,172	453,973	511,094	553,573	594,713
53	Tsu-Matsusaka-Ise	222,163	239,264	255,640	264,448	263,866	282,988	296,394	310,807	313,988	324,723	336,260	353,388	364,993	373,031	380,066
54	Yokkaichi	107,554	117,954	125,111	134,710	145,505	156,475	167,810	179,454	195,974	218,981	229,234	247,001	255,442	263,001	274,180
55	Kyoto	726,788	851,572	978,769	1,108,275	1,118,634	1,031,679	1,119,697	1,219,226	1,284,818	1,365,007	1,419,165	1,461,059	1,479,218	1,461,103	
56	Osaka	1,875,029	2,246,002	2,623,374	3,219,415	3,571,769	1,924,265	2,354,781	2,939,858	3,501,441	3,890,475	3,899,303	3,736,167	3,590,905	3,581,485	3,568,249
57	Kobe	746,534	818,602	915,216	1,058,033	1,134,436	693,971	820,956	986,313	1,113,937	1,216,614	1,288,901	1,360,565	1,367,390	1,410,834	1,477,410
58	Himeji	189,977	212,292	230,491	252,119	248,815	225,081	243,520	265,244	285,155	328,657	365,267	369,717	400,802	401,352	396,553
59	Wakayama	71,452	77,541	80,391	80,461	80,461	95,168	100,222	107,463	107,350	108,823	113,151	122,312	131,060	137,060	142,467
60	Tottori	58,154	65,099	69,887	70,660	72,038	87,537	91,404	97,735	99,737	103,985	109,096	116,332	127,374	131,453	
61	Yonago	69,786	73,469	78,760	82,534	81,825	94,111	97,307	103,771	106,476	110,534	118,005	127,440	135,568	140,005	142,956
62	Matsue	410,732	429,703	453,896	491,184	482,409	552,539	581,652	622,716	654,048	707,412	815,216	905,226	949,550	986,111	1,008,423
63	Okazama-Kurashiki	468,800	526,856	581,251	669,841	625,448	555,448	616,622	696,180	768,020	882,379	981,480	1,095,286	1,133,948	1,270,606	1,302,428
64	Hiroshimaa-Kure	147,984	156,367	161,860	166,361	164,209	191,448	199,114	206,601	218,766	238,083	289,043	329,714	346,030	360,261	365,612
65	Fukuyama	137,352	156,958	166,181	180,269	204,998	188,159	206,057	233,436	246,941	254,376	258,425	266,583	268,957	289,169	282,635
66	Shimonoseki	66,048	76,922	90,059	102,678	132,667	126,720	146,891	160,020	166,632	158,986	152,935	161,969	168,958	174,729	175,053
68	Tokuyama	53,959	56,062	57,946	68,584	75,934	73,289	77,603	82,712	87,382	93,472	98,520	106,967	111,469	112,638	110,900
69	Inakuni	44,982	47,931	54,311	59,256	65,955	75,651	79,439	90,607	100,346	105,931	106,116	111,069	112,525	111,833	109,530
70	Tokushima	139,609	148,752	157,705	166,824	163,633	159,298	177,363	182,642	203,326	213,328	223,451	239,281	249,343	257,884	263,356
71	Takamatsu	145,565	157,471	169,650	178,482	175,843	189,274	211,302	229,475	243,538	257,716	274,367	298,999	316,661	326,999	329,684
72	Matsuyama	146,836	161,432	172,392	171,651	169,474	198,409	215,083	241,000	262,044	290,662	322,902	367,323	401,703	426,658	443,322
73	Izabari	59,685	68,372	74,862	78,752	78,417	84,467	92,587	96,654	100,082	104,470	111,125	119,726	123,234	125,115	123,114
74	Niihama	48,154	52,808	59,709	72,395	86,569	106,665	115,058	120,863	125,688	125,155	126,033	131,712	132,339	132,184	129,149
75	Kochi	111,900	122,890	137,663	141,487	143,572	151,923	166,531	184,728	200,817	222,791	248,121	280,962	300,822	312,241	317,069
76	Kitakyushu	433,325	471,241	563,349	669,392	818,950	622,417	736,895	868,392	986,778	1,042,688	1,042,620	1,058,442	1,065,078	1,056,402	1,026,455
77	Fukuoka	242,741	277,219	324,225	375,557	401,894	416,322	487,885	591,868	682,365	769,176	871,717	1,002,201	1,088,588	1,160,440	1,237,062
78	Omura	121,133	130,002	138,758	147,028	177,034	166,438	191,978	201,737	205,766	193,875	175,143	165,969	163,000	159,424	150,453
79	Kurume	105,003	116,231	128,819	137,940	138,253	145,650	159,794	177,330	181,644	185,740	194,186	204,482	216,972	222,847	228,347
80	Iizuka-Tagawa	123,659	126,652	136,553	141,220	163,461	172,274	196,425	207,553	199,924	156,105	139,885	136,890	140,365	141,595	140,831
81	Saga	79,580	82,296	86,312	90,269	89,151	115,499	118,964	126,432	129,888	134,575	143,454	152,258	163,765	168,252	169,963
82	Nagasaki	232,194	245,306	260,618	267,668	296,244	254,954	300,522	349,121	387,910	411,733	447,083	449,194	447,091	449,382	444,599
83	Sasebo	147,917	161,173	186,836	234,231	256,359	206,072	227,736	263,884	262,484	247,069	247,898	250,729	251,187	250,633	244,677
84	Kumamoto	90,998	212,998	233,425	250,854	246,276	293,081	315,645	367,208	382,913	415,507	449,254	488,166	525,662	555,719	579,306
85	Yatsushiro	50,495	54,708	59,827	65,246	65,246	85,501	91,055	99,412	103,488	102,511	101,966	103,691	108,194	108,790	108,133
86	Oita	122,152	135,962	140,751	144,624	146,406	177,389	186,136	200,204	207,151	226,417	260,564	320,237	360,478	390,096	408,501
87	Miyazaki	71,231	80,295	85,243	102,441	105,203	129,700	142,137	156,886	166,360	182,869	202,861	234,346	264,855	279,114	287,352
88	Miyakonojo	71,053	79,105	88,116	90,687	90,687	111,539	116,487	122,760	121,497	118,582	114,799	118,289	129,009	132,098	130,153
89	Nobeoka	45,478	51,167	58,223	68,179	92,725	88,968	103,986	116,762	122,527	124,000	128,292	134,521	136,598	136,502	136,624
90	Kagoshima	176,665	202,703	217,487	233,316	240,280	241,592	269,560	314,011	334,643	371,129	403,340	456,827	505,360	530,581	536,752
91	Naha	100,127	98,319	105,345	111,344	109,923	109,497	108,673	171,694	223,060	257,199	276,394	295,006	295,778	303,674	304,836
92	Okinawa	16,913	16,005	16,346	16,398	15,569	27,212	34,550	53,270	66,653	77,702	82,776	91,341	94,851	101,210	105,845
Total		18,205,737	20,746,001	23,505,593	26,589,178	29,001,391	24,896,768	28,312,727	32,777,616	36,575,669	39,717,371	41,784,904	43,841,002	44,978,671	46,277,466	46,643,136

ROXY-index Analysis on the Spatial-cycle Path for Six Spatial Systems in Japan (Kawashima, Hiraoka)

Appendix E Population of Surrounding Areas

No.	Name of FIR	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
1	Sapporo	190,075	216,782	233,729	247,417	244,963	273,521	300,371	348,798	357,157	371,456	395,512	428,037	470,490	492,532	514,582
2	Hakodate	42,650	46,390	54,735	54,452	54,735	67,556	73,422	75,706	71,126	68,908	68,152	70,955	75,330	76,528	76,207
3	Asahikawa	55,085	55,893	60,917	65,078	64,506	75,249	79,590	82,976	80,842	73,939	65,064	58,021	54,584	51,002	51,002
4	Muroran	19,716	20,689	21,549	23,497	28,079	41,489	44,324	49,515	55,542	65,948	76,078	84,220	91,208	93,194	90,078
5	Kushiro	16,190	16,548	20,540	22,805	31,863	44,829	45,641	49,104	44,353	41,572	33,018	35,785	37,978	39,581	39,581
6	Obihiro	46,723	47,645	55,883	61,723	61,050	72,793	76,327	82,065	86,707	78,342	75,933	77,332	83,485	87,327	86,035
7	Kitami	23,610	21,429	23,677	26,018	27,938	35,053	37,480	39,406	38,760	35,313	30,275	27,413	26,872	25,973	24,019
9	Tomakomai	11,070	11,429	11,739	12,618	15,651	17,980	21,698	24,621	26,572	28,932	30,402	30,113	30,113	28,703	28,703
10	Komori	37,359	38,523	41,487	44,970	45,996	58,208	61,948	63,075	61,235	56,859	54,674	52,960	52,960	48,684	48,684
11	Hirosaki	111,516	118,689	128,845	138,489	145,274	167,700	178,545	186,174	181,843	171,727	163,460	160,616	162,874	159,973	154,925
12	Hachinohe	98,555	103,892	112,301	121,808	127,306	157,789	171,050	186,131	193,224	186,971	180,981	182,745	186,861	189,510	187,900
13	Morioka	169,393	180,638	193,270	207,127	215,743	248,360	271,400	292,690	281,953	262,890	259,733	219,707	217,678	216,220	211,416
14	Sendai	336,484	361,127	391,567	418,575	430,729	528,051	570,040	585,252	575,140	565,006	576,858	612,148	650,916	680,144	706,534
15	Ishinomaki	83,180	86,814	94,798	100,452	102,700	129,758	138,814	135,886	131,784	122,279	114,483	111,315	111,454	111,500	108,517
16	Akita	173,028	178,368	186,726	193,139	192,816	232,296	245,450	249,852	243,739	229,733	219,707	214,707	217,678	216,220	211,416
17	Yamagata	250,375	269,886	285,007	292,571	293,514	350,074	353,662	341,275	330,896	315,151	305,118	302,906	310,375	316,122	317,323
18	Tsuruoka	66,672	68,095	70,355	72,152	74,608	85,969	87,092	90,021	81,821	73,318	66,901	62,799	62,058	60,947	59,214
19	Sakata	70,550	72,350	75,354	76,304	75,803	89,777	91,697	90,911	86,642	80,356	74,289	71,242	70,160	68,449	68,449
20	Fukushima	160,915	165,432	171,442	173,257	172,839	208,300	212,825	209,635	200,576	193,790	187,010	184,241	185,452	186,073	184,370
21	Aizuwakamats	125,191	134,048	137,606	141,605	143,407	172,473	173,201	171,931	163,655	150,151	137,994	130,887	130,759	130,093	129,248
22	Koriyama	133,812	140,451	149,952	157,398	158,919	198,276	201,101	200,773	193,713	186,748	176,743	177,505	180,687	182,575	184,683
23	Iwaki	12,213	11,628	12,185	12,569	12,545	17,437	17,925	15,881	14,253	13,154	12,680	13,701	13,745	13,745	13,913
24	Mito	239,273	248,617	262,943	272,890	278,281	361,899	365,434	361,404	351,400	340,568	337,169	352,180	367,030	377,732	384,945
25	Hirachi	112,167	114,637	112,979	110,157	115,348	151,847	157,017	160,302	162,234	152,711	138,421	139,554	139,787	148,965	148,679
26	Tsuchiura-Tsukuba	232,657	243,982	256,027	263,244	265,828	333,690	333,031	330,192	331,941	302,506	305,878	329,329	357,151	373,299	387,649
27	Utsunomiya	330,470	342,739	360,448	372,798	376,074	495,611	494,655	479,734	458,095	439,739	443,289	477,463	505,809	528,689	551,506
28	Ashtikaga	76,698	80,279	83,963	80,028	80,598	102,027	101,342	98,132	97,812	100,188	105,208	108,205	110,929	113,907	113,907
29	Dyama	137,534	146,203	153,963	158,459	159,683	208,111	207,076	205,354	200,187	202,353	212,045	229,517	245,781	255,149	260,948
30	Maebashi-Takasaki-Iseaki	394,813	410,670	429,986	436,993	444,423	563,765	566,846	560,952	536,803	538,165	545,731	577,682	611,019	633,902	657,045
31	Kiryu	132,915	138,362	141,698	145,222	153,943	196,788	198,256	196,647	192,637	192,640	202,457	224,450	245,261	268,358	273,456
32	Gunagaya	162,249	170,226	173,875	177,286	180,513	230,172	228,820	228,195	220,339	221,694	234,567	253,790	277,072	299,245	313,628
33	Tokyo	2,982,144	3,182,393	3,507,787	3,867,207	4,377,570	5,266,941	5,650,569	6,396,388	7,496,365	9,992,905	13,070,394	15,984,016	17,852,414	19,330,425	20,965,080
34	Hiratsuka-Odawara-Atsugi	166,554	176,851	187,178	200,565	210,076	278,469	283,422	307,303	343,286	396,539	474,451	524,008	566,384	605,596	605,596
35	Niigata	356,738	369,541	387,525	402,110	412,920	483,327	500,879	502,739	490,260	479,173	476,170	484,241	518,141	525,305	525,305
36	Nagaoka	175,960	180,548	184,298	187,716	190,173	221,750	225,723	217,509	209,369	199,938	188,965	183,153	182,219	180,858	178,360
37	Joetsu	158,676	160,230	161,692	162,723	168,134	196,440	195,862	188,787	178,783	147,197	525,168	519,331	531,754	545,490	551,101
38	Torana-Takaoka	412,207	418,169	429,322	429,411	435,690	549,358	555,907	552,183	547,197	525,168	519,331	531,754	545,490	548,746	548,746
39	Kanazawa	161,552	157,467	153,416	153,237	150,160	189,133	193,538	193,538	194,525	195,796	200,249	227,488	250,639	270,687	282,448
40	Komatsu	54,674	54,894	56,268	58,363	58,363	73,161	75,359	73,842	75,014	77,155	80,937	87,747	92,526	96,731	97,627
41	Fukui	320,114	315,296	323,085	333,512	327,342	401,542	410,313	400,313	393,245	385,639	375,689	385,479	395,488	404,697	405,964
42	Kofu	315,910	316,444	330,568	331,617	334,432	433,153	418,846	396,970	371,810	347,858	341,247	350,819	369,176	391,095	410,014
43	Nagano	224,677	231,260	243,456	240,758	243,605	298,756	289,689	278,388	266,728	260,120	263,252	269,645	270,585	267,858	267,858
44	Matsumoto	177,557	183,457	190,179	192,426	194,695	239,287	240,340	231,699	227,593	219,943	217,309	227,901	241,132	249,819	253,798
45	Ueda	122,977	127,023	133,230	128,973	128,136	160,991	159,055	152,582	146,679	141,357	139,085	140,995	144,940	148,251	150,213
46	Gifu-Okazaki	357,606	363,405	372,611	376,332	387,630	488,825	498,238	484,909	491,599	511,620	551,334	610,201	668,505	706,196	728,491
47	Shizuoka	162,555	173,817	185,054	193,453	198,265	238,579	249,407	257,652	263,432	273,387	288,767	315,436	343,164	360,640	374,106
48	Hamaatsu	283,643	294,772	309,458	318,905	322,625	407,407	414,157	422,164	414,740	413,275	421,142	448,927	482,721	510,598	532,778
49	Numazu-Fuji-Mishima	157,263	163,902	172,161	177,063	183,867	246,645	249,803	263,013	268,258	290,216	324,510	363,516	389,344	408,914	533,856
50	Nagoya	826,213	867,758	922,045	1,006,965	1,051,328	1,280,802	1,323,565	1,401,979	1,538,257	1,777,682	2,087,964	2,423,931	2,621,579	2,751,523	2,867,510

Appendix E (Continued)

No.	Name of FUR	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
51	Toyohashi	176,821	181,829	187,438	191,925	197,554	281,026	286,313	294,474	297,916	313,402	326,868	350,397	366,019	380,486	388,717
52	Kariya-Toyota-Anjo	249,768	264,086	278,369	299,613	309,553	366,234	384,801	396,941	411,035	444,214	491,350	537,159	575,539	610,387	648,003
53	Tsu-Matsusaka-Jse	251,667	252,727	258,981	259,008	259,284	320,315	324,121	320,023	307,491	298,352	295,847	306,977	313,645	320,361	318,939
54	Yokkaichi	142,228	145,152	151,581	155,362	155,362	211,098	213,253	213,434	213,317	225,938	244,126	271,821	288,263	301,713	314,578
55	Kyoto	431,936	444,231	475,885	504,871	510,557	615,566	628,112	634,003	649,510	720,109	864,773	1,051,523	1,199,082	1,310,449	1,399,998
56	Osaka	1,551,305	1,736,816	1,920,873	2,206,300	2,513,941	2,871,339	3,032,208	3,342,411	3,826,417	4,907,062	6,176,171	7,296,058	7,845,936	8,212,261	8,445,221
57	Kobe	233,110	249,421	262,820	276,865	297,694	359,209	380,428	398,000	410,675	451,712	529,387	628,159	706,434	744,211	768,769
58	Himeji	339,288	334,696	343,778	350,043	367,095	460,917	464,764	459,709	451,744	456,580	467,066	495,644	534,417	563,432	563,645
59	Wakayama	197,647	203,244	214,625	214,663	215,663	285,351	284,942	284,582	285,071	252,951	262,179	256,482	261,402	263,832	263,645
60	To-Tori	122,117	122,966	125,755	120,129	142,762	182,372	144,310	142,584	136,776	126,970	118,652	113,341	112,448	112,236	109,672
61	Yonago	121,285	123,901	126,463	126,633	126,119	153,590	156,016	158,544	151,978	144,530	139,201	140,738	145,113	144,350	144,350
62	Matsue	178,714	183,627	191,592	196,642	196,801	228,458	237,092	239,461	232,127	222,137	215,980	216,355	225,550	232,122	232,358
63	Okayama-Kurashiki	356,516	334,445	346,187	352,214	363,190	455,941	462,297	459,576	443,944	420,830	413,519	440,474	459,113	467,983	463,861
64	Hiroshima-Kure	305,567	308,173	311,265	316,572	322,398	440,522	437,721	430,485	412,176	415,665	419,406	471,135	495,952	519,978	537,853
65	Fukuyama	323,774	333,761	342,641	355,808	352,292	441,404	449,060	448,236	441,250	437,827	440,140	452,035	451,185	448,847	437,433
66	Shimonoseki	69,396	71,144	72,561	74,115	76,081	98,517	101,885	103,520	97,394	88,131	79,673	78,947	80,030	79,185	75,988
67	Ibe	107,111	110,262	114,716	121,354	139,183	165,815	172,214	176,664	177,500	160,076	158,423	165,987	175,536	186,760	191,810
68	Tokuyama	159,180	164,097	168,000	178,671	196,258	240,306	244,637	249,047	245,974	251,049	261,873	285,279	295,661	302,144	297,336
69	Iwakuni	97,776	96,711	100,663	98,666	96,295	124,473	124,421	125,695	117,226	107,316	101,803	101,397	101,595	98,975	96,327
70	Tokushima	321,073	328,024	341,875	344,825	341,867	436,950	438,211	424,752	403,467	386,573	376,153	391,072	409,136	415,884	415,846
71	Takamatsu	355,252	363,231	375,062	378,897	366,119	484,214	487,019	475,712	451,186	434,248	435,243	463,920	483,737	496,713	498,864
72	Matsuyama	102,735	106,711	107,180	106,248	108,789	147,204	109,695	146,634	140,186	133,360	131,971	139,623	148,053	152,161	152,886
73	Izumi	65,047	66,820	67,724	68,482	67,723	91,727	92,843	89,930	85,868	80,468	77,377	79,184	80,236	80,213	78,116
74	Niigata	54,671	56,514	58,201	60,048	62,482	81,933	84,981	85,032	81,617	78,841	76,706	78,903	81,234	84,391	84,554
75	Kochi	254,268	256,238	280,982	253,872	246,969	309,036	310,696	302,914	280,920	284,165	249,365	250,291	256,035	261,824	255,796
76	Kitakyushu	309,296	316,928	327,751	348,145	393,733	459,311	488,976	520,271	507,439	458,806	441,821	465,462	502,527	521,447	515,465
77	Fukuoka	262,482	270,260	285,212	293,926	304,187	394,040	410,842	429,448	423,015	449,678	510,410	621,525	731,986	807,386	875,742
78	Omura	81,797	85,644	89,933	91,091	98,859	131,084	144,315	145,362	140,124	131,876	122,045	124,609	127,763	130,118	125,111
79	Kurume	307,090	324,012	335,841	343,685	343,288	421,120	429,948	437,438	426,192	410,644	404,268	402,914	413,266	418,966	416,298
80	Iizuka-Tagawa	241,469	231,787	248,519	257,716	310,100	386,305	381,523	383,194	351,379	263,264	221,377	218,270	224,313	228,624	223,313
81	Saga	233,207	238,082	235,769	236,504	238,494	317,351	326,246	336,124	321,703	289,835	264,345	255,822	260,172	264,485	264,581
82	Nagasaki	140,761	145,302	147,584	150,806	149,865	221,005	228,981	233,790	230,319	218,951	222,347	240,276	273,698	291,317	301,768
83	Sasebo	70,650	72,303	82,687	88,971	105,316	139,004	151,964	153,831	147,664	109,596	91,379	90,241	92,377	93,534	92,507
84	Kumamoto	341,572	354,105	364,775	365,963	353,865	469,123	471,920	471,755	445,764	412,174	392,856	395,182	428,467	450,854	458,990
85	Yatsushiro	57,839	61,197	58,846	61,501	60,667	78,980	81,618	82,778	78,786	71,123	64,869	61,166	60,035	58,581	55,358
86	Oita	208,685	225,528	236,368	246,355	247,510	324,666	325,605	332,740	325,644	317,932	307,091	309,560	312,142	309,613	298,691
87	Miyazaki	119,011	122,120	132,164	131,681	132,212	177,178	182,512	180,468	178,876	161,777	154,612	158,373	170,027	178,483	184,725
88	Miyakonojo	73,402	79,724	85,824	89,143	90,765	115,769	120,481	120,257	113,913	102,385	93,061	93,213	94,360	95,526	96,024
89	Nobeoka	48,827	47,944	51,837	56,845	57,476	69,136	72,768	77,418	77,806	76,786	78,165	83,434	88,597	90,130	88,580
90	Kagoshima	279,927	287,396	301,471	301,910	290,358	401,253	401,180	383,729	351,345	321,973	298,932	297,457	309,010	315,654	315,088
91	Naha	137,674	131,519	134,561	138,444	132,555	141,739	145,867	164,550	180,559	189,872	213,698	217,845	231,941	261,677	301,640
92	Okinawa	85,057	81,353	83,757	85,278	81,444	105,987	118,653	126,679	128,848	132,213	134,122	147,622	160,139	173,220	180,963
Total		21,017,166	21,920,435	23,150,980	24,334,589	25,558,744	31,491,063	32,591,980	33,862,047	35,083,495	38,431,877	43,286,945	49,000,911	53,040,760	56,002,289	58,630,507

Appendix F Population of Major Localities

Code	Name of Locality	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
13100	Tokyo-tokubetsu-ku area	3,358,530	4,109,640	4,987,030	5,896,008	6,778,971	4,177,837	5,385,071	6,969,104	8,310,027	8,893,094	8,840,942	8,646,520	8,351,893	8,354,615	8,163,573
14100	Yokohama-shi	579,448	595,148	704,517	796,579	968,089	814,376	951,186	1,143,683	1,375,705	1,788,907	2,238,253	2,621,771	2,773,674	2,992,926	3,220,331
27100	Osaka-shi	1,786,653	2,135,257	2,477,983	3,022,446	3,300,714	1,614,632	2,015,350	2,547,036	3,011,563	3,156,222	2,980,487	2,778,987	2,648,180	2,636,249	2,623,801
23100	Nagoya-shi	677,452	842,835	991,833	1,182,837	1,415,117	971,374	1,157,263	1,420,572	1,687,093	1,995,430	2,036,053	2,079,740	2,087,902	2,116,381	2,154,793
1100	Sapporo-shi	144,651	194,750	227,779	284,326	281,778	342,133	393,770	487,446	615,684	821,272	1,010,177	1,240,613	1,401,757	1,542,979	1,671,742
28100	Kobe-shi	746,534	818,602	915,216	1,058,033	1,134,436	693,971	820,956	986,311	1,113,937	1,216,614	1,288,901	1,360,585	1,367,390	1,410,834	1,477,410
26100	Kyoto-shi	726,788	851,572	978,769	1,108,275	1,118,634	1,031,679	1,119,697	1,219,226	1,284,818	1,365,007	1,419,165	1,461,059	1,473,065	1,479,218	1,461,103
40130	Fukuoka-shi	242,741	277,219	324,225	375,557	401,894	416,322	487,885	591,868	682,365	769,176	871,717	1,002,201	1,088,588	1,160,440	1,237,062
14130	Kawasaki-shi	84,995	112,949	148,166	191,702	300,779	252,926	319,229	445,524	632,980	854,874	973,497	1,014,951	1,040,802	1,088,624	1,173,603
34100	Hiroshima-shi	284,316	330,206	361,995	402,972	422,117	357,426	416,307	485,244	557,988	657,366	746,287	852,611	899,399	1,044,118	1,085,705
40100	Kitakyushu-shi	433,325	471,241	563,349	669,392	818,950	622,417	736,895	868,392	986,778	1,042,688	1,042,620	1,058,442	1,065,078	1,056,402	1,026,455
4201	Sendai-shi	169,227	199,939	228,112	253,637	258,878	298,413	346,391	380,297	425,272	480,925	545,065	615,473	664,868	857,335	918,398
12201	Chiba-shi	88,767	100,362	110,690	120,777	130,790	172,510	185,546	215,526	258,729	339,974	482,304	659,372	746,430	788,930	829,455
27201	Sakai-shi	155,647	181,325	200,198	237,581	268,815	251,130	273,434	315,208	371,502	466,412	594,367	750,688	810,106	818,279	807,765
33201	Okayama-shi	253,810	288,840	284,886	305,715	298,278	312,779	336,033	364,658	387,484	417,908	460,542	513,471	545,765	572,479	593,730
43201	Kumamoto-shi	190,988	212,998	233,425	250,854	246,276	293,081	315,645	357,208	382,913	415,507	449,254	488,166	525,662	555,719	579,306
46201	Kagoshima-shi	176,665	202,703	217,497	233,316	240,280	241,592	269,560	314,011	334,643	371,129	403,340	456,827	505,360	530,502	536,752
22202	Hamaatsu-shi	172,815	198,199	223,339	256,775	270,956	252,793	281,521	324,542	357,098	392,632	432,221	468,884	490,824	514,131	534,620
12204	Funabashi-shi	34,048	40,774	46,546	54,380	61,495	95,326	100,134	114,921	135,038	223,969	325,426	423,101	479,439	506,966	533,270
14209	Sagamihara-shi	27,016	28,176	30,047	30,464	37,874	61,534	68,898	83,841	101,655	163,381	278,326	377,398	439,300	482,778	531,542
27227	Higashiosaka-shi	56,762	73,577	101,782	142,076	191,513	209,602	228,691	262,872	318,000	443,081	500,173	524,750	521,558	522,805	518,319
28202	Amaoaki-shi	78,281	99,481	120,902	173,051	274,231	232,941	278,973	335,165	405,594	500,472	553,696	545,783	523,650	508,115	498,999
15201	Niigata-shi	148,064	166,698	186,010	198,435	218,781	261,945	281,676	301,001	325,018	356,302	383,919	423,188	457,785	475,630	486,097
22201	Shizuoka-shi	165,555	190,428	208,698	234,654	246,962	245,923	275,284	316,488	350,897	382,799	416,378	446,952	458,341	468,362	472,196
13201	Hachioji-shi	78,668	86,693	95,344	106,000	110,975	120,463	131,408	148,061	164,544	207,655	253,407	322,580	387,178	426,654	466,347
12207	Matsudo-shi	23,922	27,604	30,561	33,617	37,073	61,161	59,813	68,509	86,372	160,001	253,591	344,558	400,863	427,473	456,210
28201	Himeji-shi	177,954	190,773	202,159	213,718	239,535	270,606	286,312	309,335	334,520	373,653	408,353	436,086	446,256	452,917	454,360
42201	Nagaoka-shi	232,194	245,306	280,618	267,668	296,244	254,954	300,522	349,121	387,910	411,733	427,083	450,194	447,091	449,382	444,599
38201	Matsuyama-shi	146,836	161,432	172,392	171,651	169,474	198,409	215,083	241,000	262,044	290,662	322,902	367,323	401,703	426,658	443,322
17201	Kanazawa-shi	206,125	214,981	224,028	231,125	230,911	266,493	283,863	299,911	313,114	335,830	361,382	395,268	417,684	430,481	442,868

Appendix G Population of Core and Surrounding Areas in the Tokyo FUR

	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
Subarea															
Core	3,373,706	4,134,166	5,023,910	5,947,984	6,862,269	4,301,344	5,521,434	7,140,361	8,512,299	9,127,309	9,094,958	8,924,157	8,631,478	8,639,921	8,455,474
Surrounding area	2,982,144	3,182,393	3,507,787	3,857,207	4,377,570	5,266,941	5,650,569	6,396,388	7,496,365	9,992,905	13,070,394	15,984,016	17,852,414	19,330,425	20,965,080
Total	6,355,850	7,316,559	8,531,697	9,805,191	11,239,839	9,568,285	11,172,003	13,536,749	16,008,664	19,120,214	22,165,352	24,908,173	26,483,892	27,970,346	29,420,554

Apeendix H Population of Localities in the Tokaido System

Code	Name of Locality	1920	1925	1930	1935	1940	1947	1950	1955	1960	1965	1970	1975	1980	1985	1990
13101	Chitoda-ku	217,629	184,920	188,699	197,284	186,783	89,681	110,348	122,745	116,944	93,067	74,185	61,656	54,801	50,493	39,472
13102	Chuo-ku	289,827	225,379	239,546	261,205	244,046	139,179	161,925	171,316	161,299	128,024	103,850	90,087	82,700	79,973	68,041
13103	Minato-ku	330,004	320,541	322,487	337,333	336,312	164,966	216,120	254,592	267,024	241,861	223,978	209,492	201,257	194,591	158,499
13109	Shinagawa-ku	121,092	232,477	311,652	366,194	419,508	219,562	288,624	373,341	427,859	423,278	396,027	366,390	346,247	357,732	344,611
13111	Ota-ku	78,507	151,975	245,409	348,872	531,679	313,684	400,327	568,498	706,219	755,535	734,990	691,337	661,147	662,814	647,914
14130	Kawasaki-shi	84,985	112,949	148,166	191,702	300,779	252,926	319,229	445,524	632,980	854,874	973,497	1,014,951	1,040,802	1,088,624	1,173,603
14131	Kawasaki-ku	—	—	—	—	—	—	—	—	—	—	251,906	216,569	199,148	193,954	200,056
14132	Saiwai-ku	—	—	—	—	—	—	—	—	—	—	155,549	148,756	138,585	137,306	142,320
14100	Yokosuka-shi	154,249	160,799	183,962	227,791	239,520	228,124	250,533	279,132	287,309	317,411	347,576	389,557	421,107	427,116	433,358
14101	Tsurumi-ku	—	53,575	81,229	113,985	172,614	142,445	170,890	201,058	230,413	255,796	256,403	242,808	231,477	237,083	250,100
14102	Kanagawa-ku	—	—	—	—	130,929	85,541	107,159	142,805	172,222	196,518	207,319	213,645	201,794	201,062	205,510
14103	Nishi-ku	—	—	—	—	66,612	66,494	85,351	100,515	104,257	104,350	97,906	89,015	80,539	78,858	76,978
14106	Hodogaya-ku	—	—	—	—	—	—	—	—	—	138,469	166,766	177,092	179,860	184,013	195,795
14110	Totsuka-ku	—	—	—	—	—	—	—	—	—	155,844	248,694	339,417	402,239	213,451	238,536
14115	Sakae-ku	—	—	—	—	—	—	—	—	—	—	—	—	—	117,838	123,766
14204	Kamakura-shi	29,692	34,403	42,206	47,681	56,598	81,277	85,391	91,328	98,617	118,329	139,249	165,552	172,629	175,495	174,307
14205	Fujisawa-shi	35,058	40,185	45,134	50,800	59,279	90,971	96,880	109,101	124,601	175,183	228,978	265,975	300,246	328,387	350,330
14207	Chigasaki-shi	20,543	23,057	24,912	27,255	31,876	46,409	50,112	56,895	68,054	100,081	129,621	152,023	171,016	185,030	201,675