

No. 4

CHANGING PATTERN OF POPULATION DISTRIBUTION
IN JAPAN
AND ITS IMPLICATIONS TO DEVELOPING COUNTRIES*

November 5, 1975

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* This paper has been prepared for presentation at Symposium on Regional Development Planning in Asia to be held by the United Nations Center for Regional Development on November 7 and 8 at Nagoya, Japan.

I. INTRODUCTION

Concentration of population at a few metropolitan areas is considered as a serious problem in developing as well as developed countries. Japan is no exception! During the past thirty years after the war, the population distribution in Japan has been shifting toward greater concentration at large metropolitan areas. One of the most striking characteristics of the Japanese experience is the rapidity of the change: during the period of fast economic growth, a nearly a half of the prefectures were losing population in absolute terms due to outmigration to large metropolitan areas.

There appears to have been a change in this situation recently, however. The population registration record has revealed that none of the prefectures lost population in absolute terms during the past year.^{1/} This is a phenomenal departure from the past trend which lasted for 18 years. This change has been preceded by a gradual decline in the number of population losing prefectures since 1970. Indeed, the economy or society as a whole appears to have been undergoing substantial changes since around 1970. In terms of population distribution, some people started stating that there has been a U-turn phenomenon, implying more people started to migrate from large urban centers back to small urban centers and rural areas than vice versa. In terms of the economic growth of the economy as a whole, there has been apparent slowing down of growth rates. This change has been coincided with rapidly intensified public concern with environment and pollution. In addition, there have been a number of other significant social changes such as increased concern with distribution of income, international political and monetary disturbances during recent years.

^{1/} See Table A-1.

The purpose of this paper is, first, to examine the nature of the recent change in the pattern of population distribution in Japan and, then, to identify the factors which are responsible for the change.

Through this examination, it would be possible to ascertain to what degree and which of the behavioral knowledge we obtained before of people and the society. We can still rely on for the purpose of policy formulation.

II. THE RECENT CHANGE AND POSSIBLE CONTRIBUTION FACTORS

The annual growth rates of prefectural population varied great deal depending upon the rate of natural increase and migration (see Table A-1). The growth rate was led by Tokyo, closely followed by Osaka by 1959. Since then, neighboring prefectures of Tokyo such as Kanagawa, Saitama and Chiba become among the leaders in the Kanto Region. In the Kinki Region, Osaka was overtaken by the neighboring Nara and occasionally by Hyogo since 1969. On the losing side, most of the prefectures in the Northeast and the Western Region had been losing the share in almost every year during the period.

The results of these shifts (shown in Table A-2) can be summarized by the following:

	(%)	
	<u>Population Share</u>	
	<u>1950</u>	<u>1970</u>
Capital Region ^{1/}	15.69	23.26
Osaka and Hyogo	8.62	11.85
Six Northeast Prefectures ^{2/}	10.84	8.71
Seven Kyushu Prefectures ^{3/}	14.55	11.63

^{1/} Tokyo, Saitama, Chiba and Kanagawa.

^{2/} Aomori, Iwate, Miyagi, Akita, Yamagata and Fukushima.

^{3/} Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki and Kagoshima.

This trend of population concentration can be represented by two variables defined below:

Percentage Incremental Concentration in the Capital Region (PCI)

-- the percentage of the annual increment of population which has been absorbed within the Capital Region

comprising four Prefectures of Tokyo, Saitama, Chiba and Kanagawa,

Number of Fast Depopulation Prefectures (PC2)

- the number of the prefectures which has experienced a population growth rate more than one percentage point below the national average growth rate.

These two variables are shown graphically in Figure 1 and numerically in Table 1. They are closely related to each other with the coefficient of correlation of 0.506. Both indices show high degrees of concentrating movement during the 1960's, and taper off on either side, with the exception of 1950 and 1953 which had been very much influenced by the boom induced by the war in the Korean Peninsula. However, the two variables represent quite different phenomena: PC1 represent population concentration in a localized but significant urban region, and PC2 de-concentration of population from widely scattered prefectures. The close relationship of these two variables imply that most migration from any prefecture is directly or indirectly related to migration to the Capital Region.

Of the above described changes in the trend of population concentration, following factors are considered to be possible contributing factors to recent changes: (a) intensified concern with environment, (b) changing value in life, (c) slowing down of the economic growth, (d) diseconomies of scale in large metropolitan areas, (e) equalizing trend in income and wage levels among prefectures, (f) changing price differentials among prefectures and (g) improvement in transportation and communication.

Among the above possible factors, the first two (a and b) are considered as particularly important contributing factors as the timing of emergence of the new concern along with a new value coincided well with the start of the change in the trend of population concentration. Indeed, intensified concern with environment which started in 1969 in the U. S. A.

Table 1

Indices of Change in Population Concentration

Year	Percentage Incremental Concentration in the Capital Region	Number of Fast Depopulation Prefectures ^{1/}
	PC1 ^{2/}	PC2 ^{3/}
1952	31.3	26
53	30.3	36
54	27.0	6
55	26.9	4
1956	33.0	15
57	44.3	21
58	37.0	20
59	43.9	24
60	62.2	21
1961	75.9	22
62	86.4	24
63	64.4	22
64	62.1	24
65	61.7	28
1966	72.3	21
67	74.2	21
68	87.9	23
69	82.8	20
70	67.3	21
1971	49.7	18
72	44.7	13
73	39.1	7
74	35.4	3

Note: ^{1/} Those having a growth rate of population which is more than 1 percentage point below the national population growth rate.

Source: ^{2/} Ministry of Local Autonomy, Population and Household Statistics, 1975 (Tokyo: Ministry of Finance Printing Office, 1975).

^{3/} Table A-1.

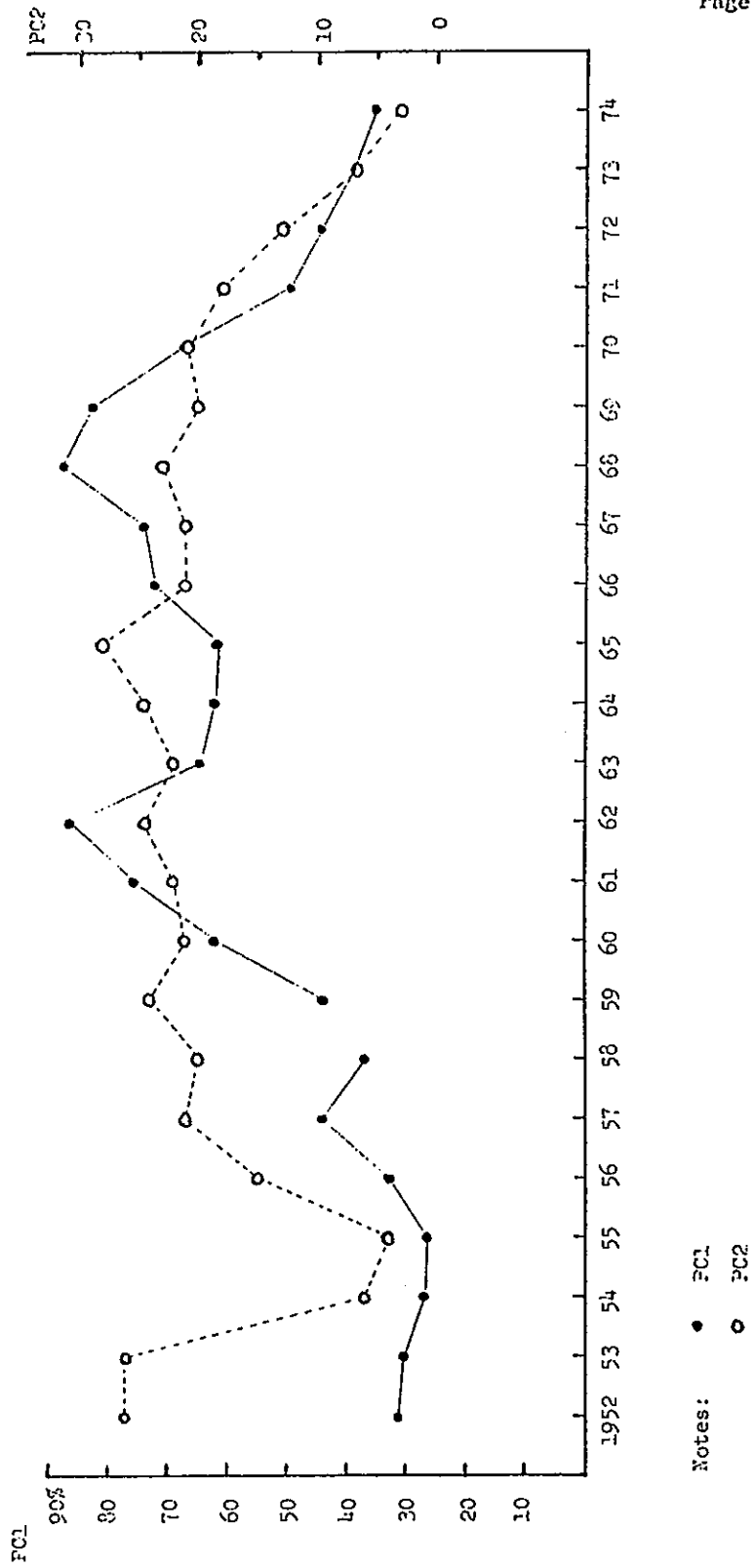


Figure 1 Trends of Population Concentration, 1952 - 1974

induced even greater concern with environment in Japan, culminating to the establishment of the Environmental Protection Agency in 1971.

Since about that time, the Government has initiated within itself an effort for development of NNW index (net national welfare) which was to represent the true national aggregative welfare by subtracting all costs associated with environmental costs.^{4/} Public opinion as represented in mass media shifted clearly from orientation to economic growth to yearning for better living even at a cost in economic growth.^{5/}

The slowing down of economic growth (c) set in in 1971 and deceleration was fast after 1973 as shown in Table 2. To some extent, the deceleration must have been due to the shift of the government policy from growth to welfare, but to greater extents it was due to external factors such as worldwide rampant inflation, revaluation and floating of yen and a multi-fold hike in the oil price. Generally, the economic growth rate is more volatile than the indices for increasing population concentration. But, at any rate, the pattern of economic growth rate resembles that of population concentration, having a plateau during the 1960's as graphically shown in Figure 2. Consequently, the economic growth is considered as an important factor which has contributed to increases in population concentration.

The above hypothesis is consistent with the empirical regularity that there are economies of scale in urbanization. This finding was made not only with respect to Japan but also with respect to a number

^{4/} The Economic Deliberation Council, an advisory body for the Prime Minister, is still elaborating on this project.

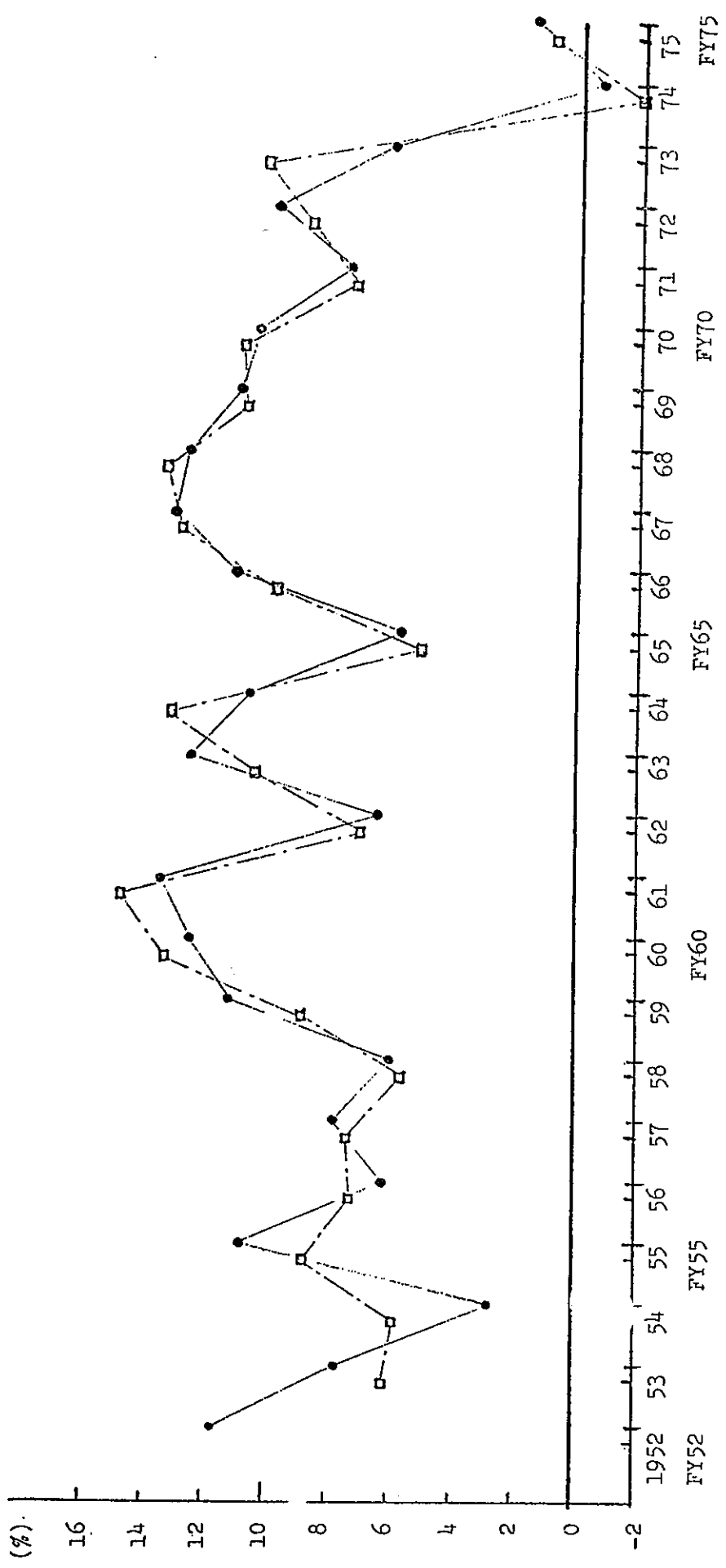
^{5/} On the public side, the Economic White Paper for fiscal 1969 stressed the seriousness of pollution problems, and that for fiscal 1972, which was subtitled "Establishment of a New Welfare Society," stressed the prevention of pollution and environmental protection and explicitly disclaimed the past economic policy which was heavily oriented to high economic growth.

Table 2
Growth Rate of GNP, 1952 - 1975

	Fiscal Year Basis	Calender Year Basis
1952	11.7	-
53	7.7	6.2
54	2.8	5.9
55	10.8	8.8
56	6.2	7.3
57	7.8	7.4
58	6.0	5.6
59	11.2	8.9
60	12.5	13.4
1961	13.5	14.4
62	6.4	7.0
63	12.5	10.4
64	10.6	13.2
65	5.7	5.1
66	11.1	9.8
67	13.1	12.9
68	12.7	13.4
69	11.0	10.8
1970	10.4	10.9
71	7.3	7.3
72	9.8	8.7
73	6.1	10.2
74	-0.6	-1.9
75 ^{1/}	1.6	1.0

Note: ^{1/} Projected.

Source: Japan Economic Planning Agency, Annual Report on National Income Statistics, 1975, Japan Ministry of Finance, Printing Bureau, 1950. for 1952 to 1973.
Japan Office of the Prime Minister, Bureau of Statistics, Monthly Statistics of Japan, August 1975 for the 1974 calender year based.
Japan Economic Research Center, Quarterly Economic Projections, Nos. 29 and 30, March and June 1975 for the 1974 fiscal year based and for projected 1975 rates.



Notes: ● Fiscal Year Basis

□ Calendar Year Basis

Source: Table 3

Figure 2 Real Growth Rate of the Japanese Economy, 1952 - 1975

of other developed and developing countries.^{6/} The recent change in the pattern of migration in Japan may imply that either economies of scale in large urban centers have been replaced by diseconomies of scale or their extent has substantially reduced. These possibilities will be examined more specifically connection with differentials in per capita income among prefectures.

Even in the absence of changes in value in life or degree of concern with environment, a reduction in economic incentives for migration to large urban centers alone may explain the recent change. Indeed, differentials in per capita personal income among prefectures has been declining since the early 1960's. Two indices have been derived for measuring the degree of income disparity among the prefectures:

Range of Income Disparity (ID1)

- the difference between the highest and the lowest indices of prefectural per capita personal income when the national average is set to 100,

Coefficient of Variation (ID2)

- the unweighted coefficient of variation of all prefectural per capita incomes.

^{6/} William Alonso, "Urban and Regional Imbalances in Economic Development," Economic Development and Cultural Change, 17 (October 1968), pp. 1-14, and "The Economics of Urban Size," Regional Science Association Papers, 26 (1971), pp. 67-83; Victor R. Ruchs, Differentials in Hourly Earnings by Region and City Size, 1959. National Bureau of Economic Research Occasional Paper, No. 101. (New York: Columbia University Press, 1967); Koichi Mera, "On the Urban Agglomeration and Economic Efficiency," Economic Development and Cultural Change, 21 (January 1973), pp. 309-324 and "Regional Production Functions and Social Overhead Capital: An Analysis of the Japanese Case," Regional and Urban Economics, 3 (May 1973), pp. 157-186, or Chapters II and IV, respectively, of Income Distribution and Regional Development. (Tokyo: University of Tokyo Press, 1975), and Daniel Shefer, "Localization Economies in SMSA'S: A Production Function Analysis," Journal of Regional Science, 13 (April 1973), pp. 55-64.

Table 3

Indices of Disparity in Per Capita Personal Income among Prefectures

Year	Range of Income Disparity ^{1/}			Coefficient of Variation ^{2/}		
	ID1 ^{3/}	ID1 ^{4/}	ID1 ^{5/}	ID2 ^{6/}	ID2 ^{7/}	ID2 ^{8/}
1955	97.3		93.9	0.19		0.18
56	102.5		99.1	0.21		0.20
57	96.7		93.3	0.21		0.20
58	94.6		91.2	0.20		0.19
59	97.1		93.7	0.20		0.19
60	97.5		94.1	0.20		0.19
1961	102.9		99.5	0.21		0.20
62	101.2		97.8	0.21		0.20
63	96.2		92.8	0.21		0.20
64	94.2		90.8	0.20		0.19
65	88.3	84.9	84.9	0.18	0.17	0.17
1966		83.2	83.2		0.16	0.16
67		80.0	80.0		0.16	0.16
68		78.5	78.5		0.15	0.15
69		78.3	78.3		0.15	0.15
70		77.9	77.9		0.16	0.16
1971		73.3	73.3		0.15	0.15
72		71.1	71.1		0.15	0.15

Notes: 1/ The difference between the highest and lowest indices of prefectural per capita personal income when the national average is set to 100.

2/ The unweighted coefficient of variation of all prefectural per capita incomes.

Source: 3/ Table 4.

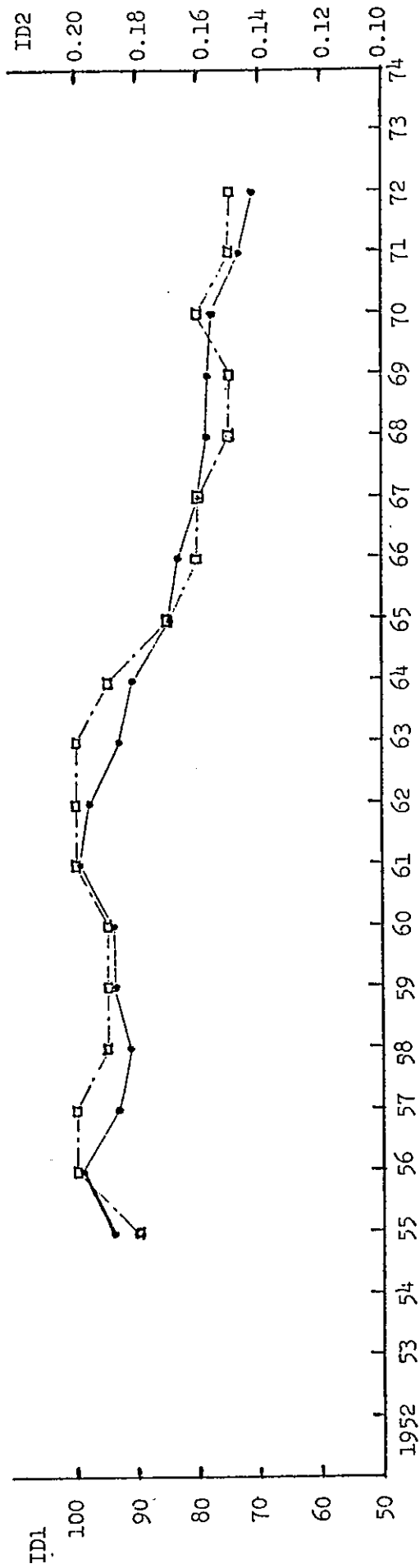
4/ Table 5.

5/ ID1 series from 1955 to 1965 adjusted to ID1 series from 1965 to 1972 through subtraction of a constant.

6/ Computed from Table 4.

7/ Computed from Table 5.

8/ ID2 series from 1955 to 1965 adjusted to ID2 series from 1965 to 1972 through subtraction of a constant.



Notes: ● ID1
 □ ID2

Source: Table 3

Figure 3 Indices of Income Disparity among Prefectures

Per capita personal incomes of prefectures are obtainable for the period from 1955 to 1972 in two different series as shown in Tables A-3 and A-4. These two series are different not only with respect to the starting date of a year but also with respect to the method of estimation and are not directly comparable. However, with adjustments, two series of indices have been developed and are contained in Table 3. Either series indicates substantial narrowing of the disparity in income levels among prefectures since the early 1960's. The two indices are shown graphically in Figure 3. This declining trend in regional income disparity is consistent with a more general finding made by Williamson with respect to developed countries.^{7/}

A narrowing trend in regional disparity is also observable in the wage level. Table 4 shows this trend for the wage level paid to graduates of junior high schools immediately after graduation. The table shows a general narrowing of disparity since 1960. A sudden reversal

Table 4

Trend in Disparity among Prefectures in the
Average First Wage Paid to Junior High School Graduates

As Percentage of Tokyo's	Number of Prefectures			
	1960	1965	1970	1972
Below 80	30	15	6	14
Below 70	12	5	0	1

Source: Economic Planning Agency, Chiiki Keizai Yoran 1968 and 1973, (Tokyo: Keizai Kikaku Kyokai, 1968 and 1973).

^{7/} J. G. Williamson, "Regional Inequality and the Process of National Development: A Description of the Patterns," Economic Development and Cultural Change, 13 (July 1965), Part 2. In this paper published 10 years ago, Japan was classified into one of the developing countries' groups having an increasing trend in regional income disparity.

of the narrowing trend in 1972 is to a lesser extent observable in the trend of per capita income disparity. As these two series move roughly in parallel, the narrowing of wage disparity is considered as a significant factor contributing to the narrowing of per capita income disparity.

Changing price differentials among prefectures (f) is a possible factor contributing to the recent change in the pattern of population concentration. However, available data indicate there has been no significant change in the consumer price index of prefectures relative to the national mean. This is shown for selected prefectures in Table 5.

Table 5

Consumer Price Index at Selected Prefectural Capitals

<u>Prefecture</u>	<u>1964</u>	<u>1966</u>	<u>1970</u>	<u>1972</u>
Hokkaido	105.0	106.1	104.3	103.9
Akita	100.6	101.3	98.7	98.0
Saitama	101.9	102.4	103.9	104.1
Tokyo	108.7	109.5	108.7	109.2
Fukui	102.0	102.9	99.5	100.6
Nagoya	105.7	104.8	105.6	105.7
Osaka	107.2	106.8	107.9	106.9
Tottori	96.8	96.2	98.5	97.8
Kochi	98.8	100.2	102.3	104.2
Fukuoka	102.9	101.3	104.3	103.7
Kagoshima	100.4	101.8	101.8	102.0
Nation	100.0	100.0	100.0	100.8

Source: Economic Planning Agency, Chiiki Keizai Yoran 1968 and 1973, (Tokyo: Keizai Kikaku Kyokai, 1968 and 1973).

As to improvements in transportation and communication among prefectures (g), obviously there must have been various kinds during the

period. It is possible to present the amount of public and private investment in this sector as a proxy for the degree of improvement in each year, but such information will not reveal much as what affects the distribution of population would be the absolute levels of transportation and communication convenience rather than annual increments. Consequently this factor will be represented by a time trend variable.

III. ANALYSIS

Before going into econometric analysis of the factors described above, the relationship of the recent change with the growth pole approach will be examined below.

In Japan, major policy inputs for development of less developed regions and promotion of growth poles were first provided in 1962 by the cabinet approval of the National Comprehensive Development Plan and the enactment of New Industrial Cities Development Act. The latter was created for implementing the growth pole strategy which is an important element in the National Comprehensive Development Plan of 1962. Thirteen areas were designated in 1964 as New Industrial Districts and six areas were designated as Industrial Development Special Zones in the same year according to the Act for Promotion of Industrial Development Special Zones enacted earlier in 1964. One New Industrial District was added in 1965 and in 1966. Growth poles in Japan can be considered as all or some of those districts and zones designated for industrial development.

These industrial development districts and zones encompass 23 prefectures, exactly a half of the total number of prefectures before joining of Okinawa, and cover 94 cities(shi) and 288 towns and villages(machi and mura). Consequently, it would be too much to expect that all of them fared well in development during the past 10 years. But, in terms of shift in the per capita personal index of prefectures from 1965 to 1972 for two groups of prefectures, those having an industrial development district or zone and those without any, those prefectures having a district or zone as a group did not fare better than those without (see Table 6). Of course, there are some success stories such as Mizushima Industrial Area in Okayama and Kajima Industrial Area in Ibaragi which must have

contributed to upward shift of the prefectural per capita income index, but such a success appears to require a particular combination of ingredients.^{1/}

The above analysis at least indicates that the government's industrial decentralization policy at selected growth poles did not materially contribute to reduction in income disparity among prefectures. In addition, it is possible to conjecture that the policy did not materially contribute to shift in the trend of population concentration.

This conjecture can be strengthened by relating the distribution of public investment with the trend in population concentration. Table 7 lists the share of selected prefectures in public investment from 1955 to 1973. Only prefectures within the Tokyo and Osaka metropolitan regions are shown. It shows that there has been no declining trend in the share of public investment made in the four-prefecture Capital Region up to 1973, despite the fact that the degree of incremental concentration of population started tapering off since 1970. Therefore, it can be stated that the change in the trend of population concentration has not been induced by a shift in the geographic distribution of investment, as far as the Capital Region is concerned. In the case of the Kinki Urban Region, the share in public investment started to decline since around 1969. But, the change toward lesser concentration on the national scale as measured by PC2 started appearing on the surface since 1966. In conclusion, it can be stated that the public policy followed rather than preceded the change in the trend of population concentration.

Now, we proceed to an econometric analysis of the trend in population

^{1/} See, for a detailed evaluation of the case of Mizushima, Fu-chen Lo, "The Growth Pole Approach to Regional Development - A Case Study of Mizushima Industrial Complex, Japan," United Nations Center for Regional Development, Nagoya, 1975.

Table 6

Shift in Per Capita Personal Income Index
from 1965 to 1972

Prefectures Having New Industrial District or Special Development Zone		Prefectures Without Either	
Prefecture	Change in Per Capita Personal Income from 1965 to 1972	Prefecture	Change in Per Capita Personal Income from 1965 to 1972
Hokkaido	-1.0	Iwate	4.4
Aomori	2.1	Yamagata	1.9
Miyagi	1.6	Tochigi	2.9
Akita	-9.5	Gunma	-0.7
Fukushima	4.1	Saitama	5.4
Ibaragi	4.6	Chiba	3.9
Niigata	-3.6	Tokyo	-10.8
Toyama	-3.8	Kanagawa	-1.0
Nagano	1.7	Ishikawa	1.7
Shizuoka	0.0	Fukui	1.9
Aichi	-2.8	Yamanashi	4.7
Hyogo	-8.0	Gifu ^{1/}	-2.2
Tottori	6.6	Mie	4.4
Shimane	-0.7	Shiga	3.8
Okayama	6.7	Kyoto	-3.3
Hiroshima	-1.1	Osaka	-11.8
Yamaguchi	-5.0	Nara	-6.4
Tokushima	3.7	Wakayama	-0.1
Ehime	3.4	Kagawa	1.7
Fukuoka	2.0	Kochi ^{2/}	-2.8
Kumamoto	-5.0	Saga	-6.0
Oita	2.1	Nagasaki	3.5
Miyazaki	-0.3	Kagoshima	3.0
Number of Prefectures with Upward Shift		11	13
Number of Prefectures Without Shift		1	0
Number of Prefectures with Downward Shift		<u>11</u>	<u>10</u>
TOTAL		23	23

Note: ^{1/} Due to the absence of the figure for 1965, the figure for 1966 was used for 1965.

^{2/} Due to the absence of the figures for 1965-67, the figure for 1968 was used for 1965.

Source: Table 5

Table 7

Shares in Public Investment of Selected Prefectures, FY1955 - FY1973

	<u>1955</u>	<u>1969</u>	<u>1965</u>	<u>1967</u>	<u>1969</u>	<u>1971</u>	<u>1973</u>
<u>Capital Region</u>							
Saitama	1.3	1.7	2.2	2.2	2.8	3.5	3.6
Chiba	2.1	2.2	3.4	3.5	4.3	4.8	4.7
Tokyo	10.8	11.7	13.0	12.5	11.5	11.1	9.9
Kanagawa	<u>2.9</u>	<u>4.1</u>	<u>5.6</u>	<u>5.3</u>	<u>5.3</u>	<u>4.9</u>	<u>5.0</u>
Subtotal	17.1	19.7	24.2	23.5	23.9	24.3	23.2
<u>Kinki Urban Region</u>							
Kyoto	2.1	2.0	1.6	1.4	1.6	1.7	1.8
Osaka	3.6	6.8	9.5	9.5	9.9	7.9	7.1
Hyogo	2.1	4.0	4.3	4.3	5.2	5.0	5.0
Nara	<u>1.2</u>	<u>1.2</u>	<u>1.0</u>	<u>0.9</u>	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>
Subtotal	9.0	14.0	16.4	16.1	17.7	15.6	14.9
<u>Nation</u>	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Economic Planning Agency, Chiiki Keizai Yoran, 1973, Keizai Kikaku Kyokai, 1973, for 1965 to 1969. Division of Regional Policy, Ministry of Local Autonomy, Statistics of Public Investment, 1975 (Gyosei Toshi Jisseki), Chihozaimu-kyokai, 1975 for 1971 and 1973. Economic Planning Agency, Chiiki Keizai Yoran, 1968, Keizai Kikaku Kyokai, 1968, for 1955 and 1960.

concentration. From the above screening of variables, the following are selected as possible contributing factors:

1. Economic Growth Rate
 - a. GR1 - fiscal year basis or
 - b. GR2 - calender year basis
2. Degree of Regional Income Disparity
 - a. ID1 - range of disparity in index, or
 - b. ID2 - coefficient of variation
3. Time Trend
 - a. T - year measured from 1952
4. Time Dummy for the 1970's
 - a. TD.

Of the above, the time trend variable would represent, among others, general improvement in transportation and communication on the national scale, and the time dummy variable the recent shift in the public opinion toward environment and welfare as opposed to economic growth. The analysis has been plagued by some irregularities in some of the time series data.^{2/} But, it was possible to obtain general characteristics of the trend of population concentration.

Among alternative equations estimated for PC1, those having some significance are contained in Table 8. Equations 1 through 3 indicate that the growth rate of the economy is a significant variable which explains the variation in the trend of population concentration. The explanatory power of the variable is most significant when the economic growth rate is lagged by about one year.

When an index of income disparity among prefectures is added to the economic growth rate, the result is not improved as shown by Equations

^{2/} Specifically, PC1 and PC2 are based on prefectural growth rates of population, some of which are based on fiscal years and others on calender years as revealed in Table A-1, and ID1 and ID2 are based on calender years from 1955 to 1964 and on fiscal years from 1965 to 1972 as revealed in Table 3.

4 and 5. The result of estimation is best when the time trend variable is added. Among Equations 6 through 9, Equation 6 is considered to be the best in terms of the t -statistics obtained and R^2 . The equation implies that there is a time trend toward greater incremental population concentration into the Capital Region (about 3 percentage point increase in PC1 which is the share in the incremental population increase of the region every year), an increase in the GNP growth rate intensifies population concentration, but a decrease in the range of income disparity index reduces the trend in population concentration. Comparing the two income disparity indices, it can be known that ID1 is a more meaningful index than ID2. This is understandable because the relative income level of Tokyo is more directly reflected in ID1, whereas ID2 is made up the income levels of all the prefectures.

The significance of the time dummy for the 1970's (TD) is tested in Equations 10 and 11. The results show that, if anything, there is a negative change in the trend of population concentration into the Capital Region as much as reducing PC1 by 20 percentage points, its statistical significance is marginal. Relative to the time trend variable (T), the contribution of this factor is much less conclusive.

Similar analysis was undertaken for PC2, the results of which are presented in Table 9. Generally, the results are less conclusive than those for PC1, but quite similar characteristics have been observed. First, the behavior of PC2 can also be explained, with significance, by GNP growth rates, the disparity in income levels among prefectures and to a lesser extent by a time trend. The contribution of the time dummy variable for the 1970's is less certain, but, if it does exist, it is exerting a negative effect to substantial outmigration from less developed prefectures.

Table 8
Estimated Equations for FCI

<u>Equation No.</u>	<u>Constant</u>	<u>GR1</u>	<u>GR2</u>	<u>ID1</u>	<u>ID2</u>	<u>T</u>	<u>TD</u>	<u>R²</u>	<u>D-W</u>	<u>Period</u>
1	/ 28.65	2.82 (2.67)						0.25	0.77	52-74
2	18.35	3.89* (3.22)						0.34	0.96	53-74
3	27.32	3.10 (3.15)						0.33	0.94	53-74
4	60.42	3.37 (2.42)		-0.38 (-0.87)				0.31	1.07	55-72
5	66.91	2.63 (1.62)			-187.11 (-0.89)			0.21	0.85	55-72
6	-142.55	2.82* (2.34)		1.54* (1.95)		3.32 (2.49)		0.55	1.18	56-72
7	-108.54		2.63* (2.15)	1.25* (1.48)		2.80 (1.93)		0.53	1.12	56-72
8	- 40.27	3.22* (3.46)			264.83* (0.89)	1.89 (1.59)		0.46	1.22	56-72
9	17.26	3.22* (2.47)				1.04 (1.48)		0.42	1.10	56-72
10	123.05	2.20 (1.34)		-0.94 (-1.45)			-20.07 (-1.30)	0.28	0.92	55-72
11	107.25	3.16* (2.41)		-0.83* (-1.42)			-20.13 (-1.62)	0.45	1.31	56-72

Notes: D-W is the Durbin-Watson statistic.
The figure in parenthesis is the t-statistic of the estimated coefficient directly above.
* indicates that the variable is lagged by 1 year.

Source: Computed from data presented in Table A-5 through the ordinary least squares method.

Table 9

Estimated Equations for PC2

<u>Equation No.</u>	<u>Constant</u>	<u>GRI</u>	<u>GR2</u>	<u>ID1</u>	<u>ID2</u>	<u>T</u>	<u>TD</u>	<u>R²</u>	<u>D-W</u>	<u>Period</u>
1	9.41	1.03 (2.74)						0.26	1.33	52-74
2	11.45		0.78 (1.94)					0.16	1.15	53-74
3	6.64	1.25* (2.69)						0.27	0.98	53-74
4	1.77	0.31* (1.04)		0.18* (1.88)				0.23	1.16	56-72
5	0.22		0.44* (1.70)	0.19* (2.03)				0.32	1.05	56-72
6	1.29	0.37* (0.29)			90.29* (2.29)			0.30	1.24	56-72
7	-0.11		0.49* (1.95)		91.72* (2.50)			0.39	1.12	56-72
8	-27.47	0.19* (0.66)		0.46* (2.40)		0.53 (1.64)		0.36	1.24	56-72
9	-23.29		0.29* (1.05)	0.41* (2.11)		0.43 (1.30)		0.39	1.12	56-72
10	-16.74	0.31* (1.14)			168.02* (2.69)	0.39 (1.55)		0.41	1.36	56-72
11	-14.12		0.40* (1.56)		153.92* (2.53)	0.31 (1.27)		0.45	1.19	56-72
12	-13.98				167.66* (2.65)	0.42 (1.69)		0.35	1.17	56-72
13	12.48	0.25* (0.83)		0.08* (0.57)			-3.32 (-1.18)	0.31	1.49	56-72
14	6.44		0.45* (1.80)		59.74* (1.29)		-2.60 (-1.12)	0.44	1.42	56-72

Notes: D-W is the Durbin-Watson statistic.

The figure in parenthesis is the t-statistic of the estimated coefficient directly above.

* indicates that the variable is lagged by 1 year.

Source: Computed from data presented in Table A-5 through the ordinary least squares method.

Among the 14 equations presented, Equations 7 and 11 are considered to be among the best. Equation 7 states that the number of fast depopulating prefectures (PC2) can be explained by the GNP growth rate and the coefficient of variation of per capita personal incomes of prefectures, both of which are lagged by one year. Either variable contributes to increasing the number of fast depopulating prefectures, as expected. Equation 11 implies that a third factor, a time trend variable, can be added as an explanatory variable, thus the list of explanatory variables becoming similar to the one for PC1. In this case, too, there appears to be a time trend of intensified population concentration. The alternative formulation as presented by Equation 12 implies that an income disparity index and a time trend alone, without a GNP growth rate, can explain PC2 to a substantial extent.

Comparing the results for PC1 with those for PC2, the following can be stated:

- (1) The economic growth rate intensifies population concentration, but its impact is statistically more conclusive for population concentration into the Capital Region.
- (2) Income disparity among prefecture contributes to the intensification of population concentration, and the added concentration in the Capital Region is more responsive to ID1, the range of income disparity index, while the depopulation from less developed prefectures is more responsive to ID2, the coefficient of variation of prefectural per capita personal incomes.
- (3) There has been a consistent time trend for intensified population concentration throughout the observed period.
- (4) An otherwise unexplainable shift in the trend of population

concentration might have taken place since 1970, but its statistical significance is not sufficient for drawing a conclusive statement.

The observed time trend may be considered to represent continuous improvements in transportation and communication including the starting of operation of the New Tokaido Line, improved highway networks, the introduction of faster and more frequent airline services and the popularization of automatic dialing system for long-distance telephone calls. Although not conclusive, the intensified concern with environment and a change in value in the public from economic growth to something more humane might have had some effect on the continuing trend of population concentration.

IV. CONCLUSIONS

The foregoing analysis has revealed that the recent emergence of a new pattern of population shifts, which can be characterized by a lesser degree of incremental population concentration in large metropolitan areas and a lesser number of depopulating prefectures does not necessarily imply changes in the preferences of the population. Rather, it can be explained by continuing changes in economic variables. Specifically, the slowing down of the economic growth rate and the declining income disparity among prefectures are considered to be largely responsible for the recent change. It is to be emphasized that these two factors outweighed the continuing upward trend for population concentration which can be considered as a result of general improvement in transportation and communication over time. Intensified concern with environment and a possible change in value in life might have contributed to some extent to the change, but the evidence is too uncertain to conclude.

Aside from the recent downturn of the growth rate of the economy, which might after all be temporary, the convergence of differences in prefectural per capita incomes has significant implications. First, the convergence started to appear around 1961 and continued for more than a decade in parallel with a generally high rate of economic growth. Although the convergence is associated with developed economies as found by Williamson,^{1/} this example demonstrate a particularly close relationship of the convergence with economic growth. As found earlier, this convergence appears to have been caused by convergence in wage rate differentials among different parts of the economy, which has in turn been caused by tightening of labor markets.

^{1/} Williamson, op.cit.

Second, it should be noted that this converging trend started well before the government's policy tools for decentralization of economic activities became available. Indeed, in terms of the share in public investment, the government has not yet adopted a policy of decentralization.

Third, the convergence of per capita incomes may imply the lessening of economies of scale in large metropolitan areas. However, closer look reveals an upward shift of the relative income level in prefectures immediately outside of a metropolitan center. Therefore, spatial extension of metropolitan areas can be granted to exist, but evidence is seriously lacking for the argument of lessening scale economies or even diseconomies of large metropolitan areas.

The role of transportation and communication improvement in lessening income disparity deserves attention. The consistent upward trend of population concentration can be regarded as a result of improved mobility of people and better information made possible by transportation and communication improvement. In addition, it must have contributed to lessening of income disparity by making the distribution of factors more in line with a spatial equilibrium.

Lastly, the growth pole strategy needs to be commented on. The successful cases such as Mizushima and Kajima have two common characteristics: (1) they are located within a short distance from a large metropolis and/or along a major route of transportation and (2) they have absorbed a large amount of investment.^{2/}

^{2/} According to Lo, op. cit., about \$190 million of public investment from 1957 to 1969 and \$2,300 million of private manufacturing investment from 1960 to 1970 were made in Mizushima and according to the official development plan for Kajima, shown in Chiiki Keizai Yoran, 1968 by Economic Planning Agency, \$750 million of manufacturing investment was anticipated.

It is possible to derive from the above analysis several implications to developing countries. First, there is a fundamental conflict between high economic growth and decentralization of population. If a high rate of economic growth is to be achieved, further concentration of population into a few large metropolitan areas cannot be avoided.

However, the continuation of a high rate of economic growth would soon or later lead to equalization of income and wage levels within the country. Then, the reduction in income disparity among regions would, in turn, prevent further concentration of population. Therefore, population concentration would be a temporary problem for developing countries.

This process, however, may take a long time. In the case of Japan, it took about 30 years by counting from the post-war reconstruction period before concentrating trend of population is substantially reduced. The situation would not be the same with respect to developing countries. With faster rates of change observable in recent decades, the time span might be shorter. But, it would be overly optimistic to expect this whole process would complete within 5 or 10 years.

Another option open to developing countries is, of course, to aim a lower rate of economic growth. Rapid population concentration can be avoided by this strategy, but income inequality would persist for a longer span of time.

The growth pole strategy is obviously another option. To what extent, this strategy ameliorates short comings of each of the two strategies is an open question which requires a detailed study for each case. From the experience in Japan, it can be said that this strategy is effective in expanding the zone of a metropolitan influence, but for relieving satisfactorily the problems of income disparity and population

concentration, the strategy would require a cost which is either impossible to pay or too high to justify the cost.

A P P E N D I X

Table A-2
Share of Prefectures in Population, 1950 - 1970

Prefecture	1950	1955	1960	1965	1970
Hokkaido	5.16	5.35	5.39	5.26	5.00
Aomori	1.54	1.55	1.53	1.44	1.38
Iwate	1.62	1.60	1.55	1.44	1.32
Miyagi	2.00	1.93	1.87	1.78	1.75
Akita	1.57	1.51	1.43	1.30	1.20
Yamagata	1.63	1.52	1.41	1.29	1.18
Fukushima	2.48	2.35	2.20	2.02	1.88
Ibaragi	2.45	2.31	2.19	2.09	2.07
Tochigi	1.86	1.73	1.62	1.55	1.52
Gunma	1.92	1.81	1.69	1.63	1.60
Saitama	2.58	2.53	2.60	3.07	3.73
Chiba	2.57	2.47	2.47	2.75	3.25
Tokyo	7.55	9.00	10.37	11.06	11.00
Kanagawa	2.99	3.27	3.69	4.51	5.28
Niigata	2.96	2.77	2.61	2.44	2.28
Toyama	1.21	1.14	1.11	1.04	0.99
Ishikawa	1.15	1.08	1.04	1.00	0.97
Fukui	0.90	0.84	0.81	0.76	0.72
Yamanashi	0.97	0.90	0.84	0.78	0.73
Nagano	2.48	2.26	2.12	1.99	1.89
Gifu	1.86	1.77	1.75	1.73	1.70
Shizuoka	2.97	2.97	2.95	2.96	2.98
Aichi	4.08	4.22	4.50	4.88	5.19
Mie	1.76	1.66	1.59	1.54	1.49
Shiga	1.03	0.96	0.90	0.87	0.86
Kyoto	2.20	2.17	2.13	2.14	2.17
Osaka	4.64	5.17	5.89	6.77	7.35
Hyogo	3.98	4.06	4.18	4.39	4.50
Nara	0.92	0.87	0.84	0.84	0.90
Wakayama	1.18	1.13	1.07	1.05	1.01
Tottori	0.72	0.69	0.64	0.59	0.55
Shimane	1.10	1.04	0.95	0.84	0.75
Okayama	2.00	1.89	1.79	1.67	1.65
Hiroshima	2.50	2.41	2.34	2.32	2.35
Yamaguchi	1.85	1.80	1.72	1.57	1.46
Tokushima	1.06	0.98	0.91	0.83	0.76
Kagawa	1.14	1.06	0.98	0.92	0.88
Ehime	1.83	1.73	1.61	1.47	1.37
Kochi	1.05	0.99	0.91	0.83	0.76
Fukuoka	4.24	4.32	4.29	4.03	3.88
Saga	1.14	1.09	1.01	0.89	0.81
Nagasaki	1.98	1.96	1.88	1.67	1.51
Kumamoto	2.20	2.12	1.99	1.80	1.64
Oita	1.51	1.43	1.33	1.21	1.11
Miyazaki	1.31	1.28	1.21	1.10	1.01
Kugoshima	2.17	2.29	2.10	1.89	1.67
Nation	100.0	100.0	100.0	100.0	100.0

Sources: Economic Planning Agency, Chiiki Keizai Yorau, 1968 and 1973. (Tokyo: Keizai Kikaku Kyokai, 1968 and 1973).

Table A-3

Per Capita Personal Incomes of Prefectures, 1955 - 1965
(in index)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Hokkaido	100.0	91.4	97.8	98.9	99.0	94.9	92.0	88.1	91.3	87.4	89.2
Aomori	75.7	77.8	75.3	76.3	76.5	73.5	71.0	73.6	73.8	74.4	77.6
Iwate	71.6	71.6	70.8	68.8	70.6	69.2	68.8	71.1	72.1	73.4	76.3
Miyagi	85.1	81.5	83.1	80.6	83.3	82.9	82.6	82.4	82.5	82.1	83.6
Akita	81.1	79.0	77.5	75.3	75.5	74.4	73.9	74.8	74.9	78.7	78.9
Yamagata	81.1	79.0	80.9	80.6	81.4	82.1	80.4	79.2	79.2	79.7	80.6
Fukushima	81.1	79.0	76.4	77.4	80.4	76.9	73.9	73.6	73.8	72.9	75.9
Ibaragi	74.3	71.6	71.9	73.1	75.5	74.4	73.2	73.6	73.2	71.5	71.1
Tochigi	85.1	84.0	79.8	80.6	83.3	86.3	85.5	84.3	83.1	83.6	84.5
Gunma	81.1	76.5	75.3	80.6	81.4	79.5	80.4	81.8	83.6	87.0	84.9
Saitama	94.6	93.8	94.4	93.5	94.1	93.2	94.2	94.3	95.1	96.6	96.1
Chiba	86.5	85.2	84.3	82.8	86.3	87.2	92.8	92.5	94.0	95.6	96.1
Tokyo	158.1	163.0	159.6	159.1	160.8	159.0	165.2	163.5	159.6	156.5	153.0
Kanagawa	117.6	114.8	118.0	119.4	118.6	119.7	124.6	125.2	126.2	126.1	120.7
Niigata	87.8	85.2	86.5	83.9	84.3	82.9	80.4	83.0	82.0	84.1	82.8
Toyama	100.0	92.6	95.5	95.7	97.1	94.0	96.4	96.9	96.7	93.7	94.4
Ishikawa	95.9	93.8	91.0	98.9	101.0	99.1	94.2	94.3	91.8	91.3	91.4
Fukui	94.6	90.1	88.8	89.2	90.2	88.0	87.0	86.8	85.8	87.4	85.8
Yamanashi	78.4	79.0	78.7	79.6	83.3	89.7	88.4	84.9	85.2	87.0	88.8
Nagano	87.8	87.7	83.1	82.8	85.3	84.6	84.8	85.5	85.8	87.4	88.8
Gifu	91.9	92.6	93.3	90.3	93.1	94.0	94.2	91.2	90.7	90.3	90.1
Shizuoka	89.2	88.9	92.1	93.5	96.1	94.9	94.2	91.2	92.3	90.3	90.1
Aichi	114.9	116.0	116.9	112.9	115.7	122.2	115.9	113.8	112.6	109.2	106.0
Mie	87.8	85.2	84.3	79.6	79.4	83.8	86.2	86.8	88.0	86.5	84.9
Shiga	91.9	92.6	91.0	90.3	92.2	88.0	86.2	84.9	85.2	86.5	84.1
Kyoto	108.1	109.9	106.7	107.5	108.8	108.5	107.2	106.9	107.7	107.7	105.2
Osaka	135.1	142.0	137.1	135.5	135.3	135.0	137.7	137.7	141.5	139.6	140.1
Hyogo	118.9	127.2	127.0	123.7	113.7	106.8	105.8	105.7	102.2	103.4	102.6
Nara	95.9	95.1	96.6	103.2	101.0	96.6	100.7	96.2	95.1	97.1	94.0
Wakayama	98.6	95.1	89.9	87.1	90.2	87.2	84.1	84.9	86.9	89.4	88.8
Tottori	83.8	79.0	78.7	77.4	78.4	77.8	73.2	73.6	71.6	72.0	72.8
Shimane	82.4	79.0	77.5	79.6	80.4	78.6	77.5	74.8	71.6	73.4	75.4
Okayama	91.9	88.9	85.4	84.9	87.3	85.5	87.7	89.3	86.9	84.5	87.1
Hiroshima	89.2	92.6	94.4	93.5	94.1	93.2	91.3	89.9	88.0	90.3	90.1
Yamaguchi	90.5	86.4	87.6	88.2	88.2	90.6	86.2	86.2	83.6	84.5	84.5
Tokushima	78.4	79.0	77.5	80.6	83.3	83.8	81.9	79.9	78.7	81.2	81.9
Kagawa	98.6	100.0	95.5	95.7	94.1	97.4	97.8	95.0	94.5	97.1	99.6
Ehime	86.5	85.2	83.1	80.6	81.4	82.1	81.9	80.5	80.3	80.2	81.5
Kochi	79.7	80.2	77.5	79.6	83.3	82.9	82.6	80.0	79.8	95.2	82.3
Fukuoka	102.7	100.0	104.5	104.3	100.0	95.7	92.8	91.2	90.2	90.3	92.7
Saga	83.8	77.8	76.4	78.5	77.5	81.2	76.8	77.4	74.9	76.3	78.4
Nagasaki	83.8	82.7	79.8	78.5	77.5	70.1	69.6	71.7	70.5	73.4	78.0
Kumamoto	82.4	80.2	70.8	71.0	70.6	69.2	70.3	74.2	77.0	78.3	79.3
Oita	74.3	71.6	75.3	79.6	77.5	73.5	70.3	73.0	72.7	74.9	77.6
Miyazaki	70.3	70.4	65.2	85.1	70.6	70.9	66.7	67.3	72.1	69.1	72.8
Kagoshima	60.8	60.5	62.9	64.5	63.7	61.5	62.3	62.3	63.4	62.3	64.7
Nation	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Economic Planning Agency, Income Statistics of Prefectures, 1955-1965 (Tokyo: Shiseido, 1968).

Table A-4
Per Capita Personal Incomes of Prefectures, FY1965 - FY1972
(in index)

	1965	1966	1967	1968	1969	1970	1971	1972
Hokkaido	93.8	92.8	96.2	94.6	92.3	94.8	92.3	92.8
Aomori	77.1	76.5	77.3	76.5	76.8	77.7	78.2	79.2
Iwate	72.9	73.7	74.6	76.7	75.7	76.7	75.0	77.3
Miyagi	86.1	84.0	84.7	85.7	85.4	86.7	86.2	87.7
Akita	84.5	87.4	89.4	90.3	83.2	79.6	75.5	75.0
Yamagata	80.6	82.3	83.8	84.9	84.3	83.5	79.9	82.5
Fukushima	75.2	76.8	77.6	78.5	77.7	79.8	77.4	79.3
Ibaragi	77.1	77.5	78.8	80.6	80.3	83.5	82.8	81.7
Tochigi	84.5	86.7	87.0	87.5	86.7	88.1	86.5	87.4
Gumma	88.8	89.8	90.0	90.8	90.5	91.6	89.2	88.1
Saitama	100.8	100.3	99.7	102.1	104.4	108.5	103.6	106.2
Chiba	93.0	94.5	97.1	98.0	99.3	102.9	95.7	96.9
Tokyo	149.2	147.4	144.3	142.2	141.6	142.7	138.7	138.4
Kanagawa	118.6	120.1	117.7	117.7	118.4	120.0	118.5	117.6
Niigata	85.7	85.7	85.8	87.2	85.2	84.6	81.8	82.1
Toyama	92.6	92.5	92.0	91.6	90.5	91.9	89.4	88.8
Ishikawa	91.5	91.8	91.7	94.1	94.5	95.2	93.5	93.2
Fukui	85.7	86.0	85.3	86.2	87.0	88.9	86.8	87.6
Yamanashi	80.2	83.3	82.6	81.1	83.4	86.7	85.5	84.9
Nagano	84.5	85.3	84.7	83.6	84.1	85.4	86.0	86.1
Gifu	-	93.2	92.9	94.1	94.1	94.0	91.4	91.0
Shizuoka	95.7	96.6	95.3	95.1	96.7	98.5	96.1	95.7
Aichi	107.0	108.2	106.5	105.6	106.2	112.7	106.3	104.2
Mie	88.0	88.7	91.5	92.8	93.8	95.4	93.2	92.4
Shiga	88.0	89.1	89.7	92.1	92.7	93.5	91.8	91.8
Kyoto	108.5	109.6	109.1	110.2	109.3	110.0	104.5	105.2
Osaka	133.0	129.0	123.9	122.8	121.2	123.5	121.7	121.2
Hyogo	109.7	107.2	105.3	105.1	106.4	106.0	104.4	101.7
Nara	91.9	92.5	90.3	90.0	86.3	85.8	85.2	85.5
Wakayama	89.5	90.8	90.0	91.3	90.5	93.1	86.8	85.4
Tottori	77.9	80.6	81.4	80.6	81.9	83.5	84.3	84.5
Shimane	74.4	76.5	75.8	76.0	74.6	74.0	72.2	73.7
Okayama	91.5	95.2	97.1	96.7	97.6	99.4	96.5	98.2
Hiroshima	101.9	102.1	101.5	101.3	101.6	102.1	101.7	100.8
Yamaguchi	93.0	92.5	90.9	92.3	91.2	92.1	88.8	88.0
Tokushima	85.3	88.4	87.0	90.3	92.0	92.3	88.5	89.0
Kagawa	88.4	90.1	91.2	92.1	92.3	92.7	89.9	90.1
Ehime	86.1	86.7	86.1	88.8	89.4	91.2	89.7	89.5
Kochi	-	-	-	92.1	91.8	93.1	91.3	89.3
Fukuoka	94.6	95.6	95.0	94.6	95.6	97.3	95.7	96.6
Saga	85.7	84.0	79.9	82.1	82.1	80.4	78.8	79.7
Nagasaki	76.0	75.1	73.5	75.5	76.1	78.5	78.6	79.5
Kumamoto	77.1	76.1	74.6	74.2	73.2	73.7	71.6	72.1
Oita	76.7	76.5	77.0	75.7	75.7	75.6	76.9	78.8
Miyazaki	74.0	73.0	72.9	75.2	75.2	74.6	73.2	73.7
Kagoshima	64.3	64.2	64.3	63.7	63.3	64.8	65.4	67.3
Nation	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Economic Planning Agency, Chiiki Keizai Yoran, 1973 (Tokyo: Keizai Kikaku Kyokai, 1973) for 1965 to 1970.

Bureau of Statistics, Office of the Prime Minister, Japan Statistical Yearbook, 1975 (Tokyo: Japan Statistical Association, 1975) for 1971 and 1972.

Table A-5
Variables Used for Regression Analysis

<u>Year</u>	<u>PC1</u>	<u>PC2</u>	<u>GR1</u>	<u>GR2</u>	<u>ID1</u>	<u>ID2</u>	<u>T</u>	<u>TD</u>
1952	31.3	26	11.7	-	-	-	0	0
53	30.3	26	7.7	6.2	-	-	1	0
54	27.0	6	2.8	5.9	-	-	2	0
55	26.9	4	10.8	8.8	93.9	0.18	3	0
1956	33.0	15	6.2	7.3	99.1	0.20	4	0
57	44.3	21	7.8	7.4	93.3	0.20	5	0
58	37.0	20	6.0	5.6	91.2	0.19	6	0
59	43.9	24	11.2	8.9	93.7	0.19	7	0
60	62.2	21	12.5	13.4	94.1	0.19	8	0
1961	75.9	22	13.5	14.4	99.5	0.20	9	0
62	86.4	24	6.4	7.0	97.8	0.20	10	0
63	64.4	22	12.5	10.4	92.8	0.20	11	0
64	62.1	24	10.6	13.2	90.8	0.19	12	0
65	61.7	28	5.7	5.1	84.9	0.17	13	0
1966	72.3	21	11.1	9.8	83.2	0.16	14	0
67	74.2	21	13.1	12.9	80.0	0.16	15	0
68	87.9	23	12.7	13.4	78.5	0.15	16	0
69	82.8	20	11.0	10.8	78.3	0.15	17	0
70	67.3	21	10.4	10.9	77.9	0.16	18	1
1971	49.7	18	7.3	7.3	73.3	0.15	19	1
72	44.7	13	9.8	8.7	71.0	0.15	20	1
73	39.1	7	6.1	10.2	-	-	21	1
74	35.4	3	-0.6	-1.9	-	-	22	1

Sources: Table 1 for PC1 and PC2.
Table 2 for GR1 and GR2.
Table 3 for ID1 and ID2.
T and TD by definition.

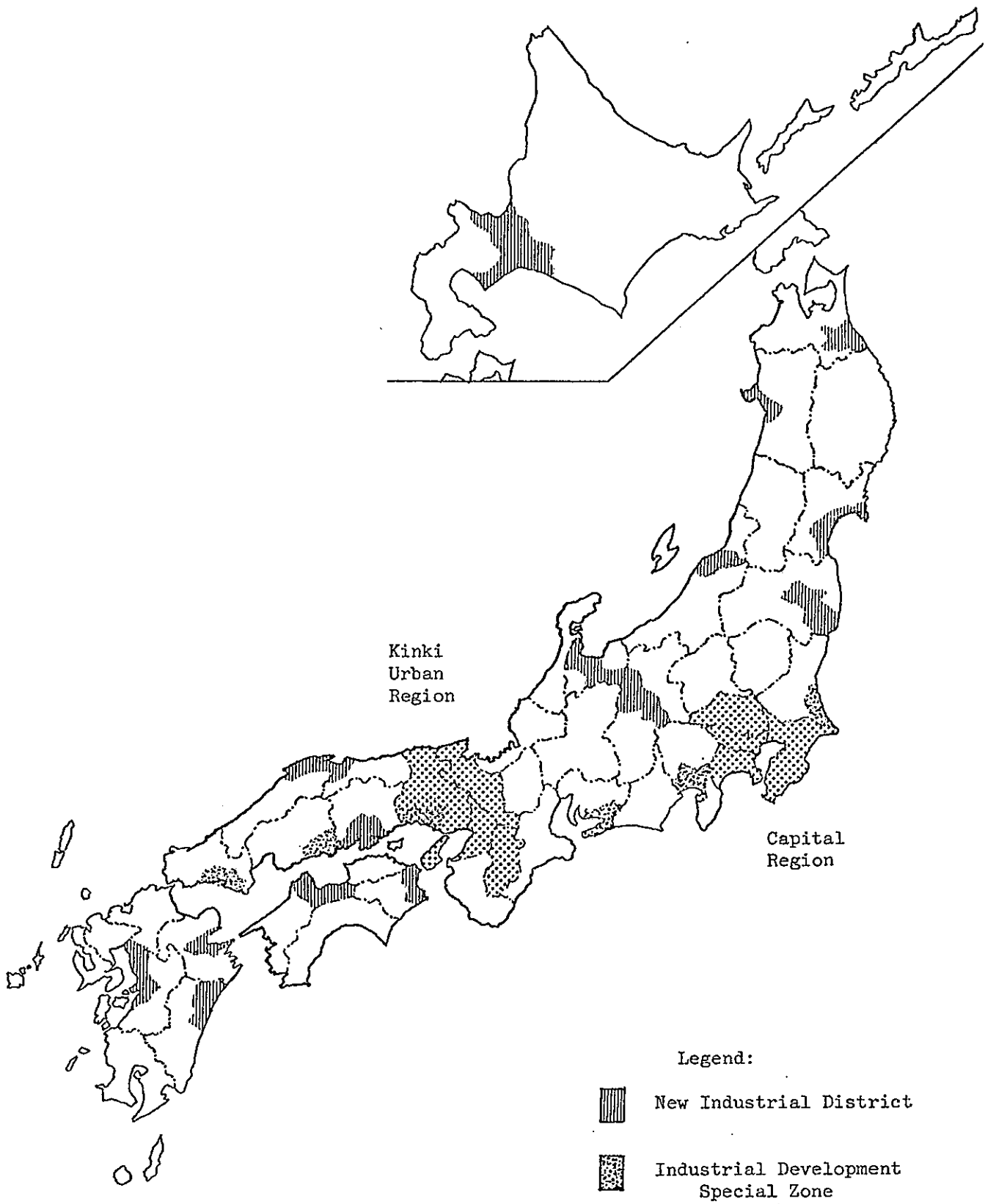


Figure A-1

Locations of Urban Regions and Industrial Development Areas in Japan