

No. 137 (82-4)

National Spatial Policies  
and Urban Development:  
Lessons from the Japanese Experience\*

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January 1982

\* To be presented at the Urbanization and National Development Conference, East-West Center, Honolulu, Hawaii, January 25-29, 1982.

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## I. Introduction

Most of developing countries are currently faced with a rapid rate of urbanization. More importantly, newly urbanized population is usually highly concentrated in specific areas, notably in and around large cities with multi-million population. Although there has been an argument that population concentration in multi-million cities would not be detrimental to and possibly favorable to economic development, Alonso [1], Mera [13] and Richardson [18], most national governments have held or at least proclaimed a policy of balanced regional development and of decentralization of urban growth.

In this respect, current urbanization trends in industrialized countries provide a meaningful clue, Vining and Strauss [20], Berry [2] and Vining and Kontuly [21]. In most of these countries, large cities are not growing faster than other cities and many of them are absolutely declining. As the author presented earlier, Mera [14], this trend is seen in Japan during the 1970's. And, the recent movement is enhancing this trend toward a national spatial stabilization, as will be presented in Section 2. In the spatial terms, Japan has now reached a nirvana.

This experience of Japan is particularly relevant to currently developing countries because Japan had gone through the entire cycle of rapid urbanization with high concentration of population in large cities to relative decline of large cities and stabilization of population within a short span of time. As the author has pointed out elsewhere, Mera [14] and [15], the success of Japan in solving urbanization problems is considered to lie in her success in economic development. In other words, Japan has successfully grown out of the

urbanization problems, a hypothesis which may be called the "growing-out hypothesis."

However, the growing-out hypothesis does not necessarily imply irrelevance of all national spatial policies. In the earlier paper, the author pointed out ineffectiveness of a particular spatial policy of the Japanese government, but it does not necessarily imply that all the spatial policies were ineffective or irrelevant. The purposes of this paper are (1) to pay particular attention to the spatial allocation policy of public investment during the process of Japanese development and to identify what effects it has had in changing the pattern of population distribution and in contributing to the national development and (2) to derive policy implications which would be useful for developing countries.

## II. A Brief Review of the Urbanization and National Development Process

When the World War II was over in 1945, Japan was an impoverished country. Most cities were devastated by air raids. A great majority of population resided in rural areas.<sup>1</sup> Since around 1950, however, the economy started moving ahead. During the 1950's the average annual growth rate of GNP recorded 8 percent, and it rose to 11 percent during the 1960's, (see Table 2). The growth rate during the 1970's was much less due to multifold price increases of oil and other international disturbances, but the country recorded a highest average annual rate of 5.8 percent among industrialized countries. These high rates of economic growth have brought about changes in the structure of the

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1. As shown in Table 1, the share of rural population was 62.7 percent in 1950 and it was even greater in 1945.

Table 1 Population of Japan by Urban and Rural Areas,<sup>1</sup> 1950-1980

Year	Total Population (in 1000)	Intercensal Rate of Population Increase <sup>2</sup> (%)			Share of Population (%)	
		Total	Urban	Rural	Urban	Rural
1950	84,115	15.3	-	-	37.3	62.7
1955	90,077	7.1	12.6	0.6	56.1	43.9
1960	94,302	4.7	9.4	-2.7	63.3	36.7
1965	99,209	5.2	9.9	-3.6	67.9	32.1
1970	104,665	5.5	8.7	-1.9	72.1	27.9
1975	111,940	7.0	8.7	1.8	75.9	24.1
1980	117,057	4.6	4.8	4.0	76.2	23.8

Notes: 1. Based on the urban areas delineated at the end of the intercensal period.

2. Urban areas are defined to be shi's, and all other areas rural.

Sources: [4], p.22.

Table 2      GNP Growth Rate and Fixed Capital Formation, 1952-1980

Year	Annual Growth Rate of GNP <sup>1</sup>		Fixed Capital Formation As Percentage of GNP <sup>2</sup>		
	Calender Year	Fiscal Year	Total	Private Sector	Public Sector
	Based	Based			
1952	-	11.7	20.5	14.3	6.3
53	6.2	7.7	22.5	15.2	7.2
54	5.9	2.8	21.3	14.3	7.1
55	8.8	10.8	20.1	13.8	6.3
1956	7.3	6.2	24.7	18.4	6.2
57	7.4	7.8	26.7	19.9	6.8
58	5.6	6.0	25.5	18.2	7.3
59	8.9	11.2	27.7	20.0	7.6
60	13.4	12.5	31.1	23.6	7.5
1961	14.4	13.5	33.7	25.4	8.3
62	7.0	6.4	33.5	23.9	9.6
63	10.4	12.5	32.4	23.1	9.3
64	13.2	10.6	32.4	23.7	8.7
65	5.1	5.7	30.2	21.0	9.2
1966	9.8	11.1	31.2	22.0	9.2
67	12.9	13.1	32.8	24.0	8.8
68	13.4	12.7	33.7	25.1	8.5
69	10.8	11.0	35.6	27.4	8.2
70	10.9	10.4	35.0	26.5	8.5
1971	7.3	7.3	34.4	24.7	9.7
72	8.7	9.8	35.1	25.1	10.0
73	10.0	6.5	36.8	27.9	9.0
74	-0.5	-0.0	33.9	24.7	9.2
75	1.4	3.2	32.2	23.0	9.1
1976	5.3	5.1	31.0	22.3	8.7
77	5.3	5.3	30.4	21.1	9.3
78	5.1	5.2	31.0	21.0	10.1
79	5.6	5.5	32.1	22.3	9.9
80	4.2	3.8	31.7	22.0	9.8

Notes: 1. Constant prices of 1970 are used for 1952 to 1975 and those of 1975 for 1976 to 1980.

2. In fiscal years.

Sources: [5] for 1952 to 1972,  
[8], October, 1978 for 1973 to 1975, and  
[8], October, 1981 for 1976 to 1980.

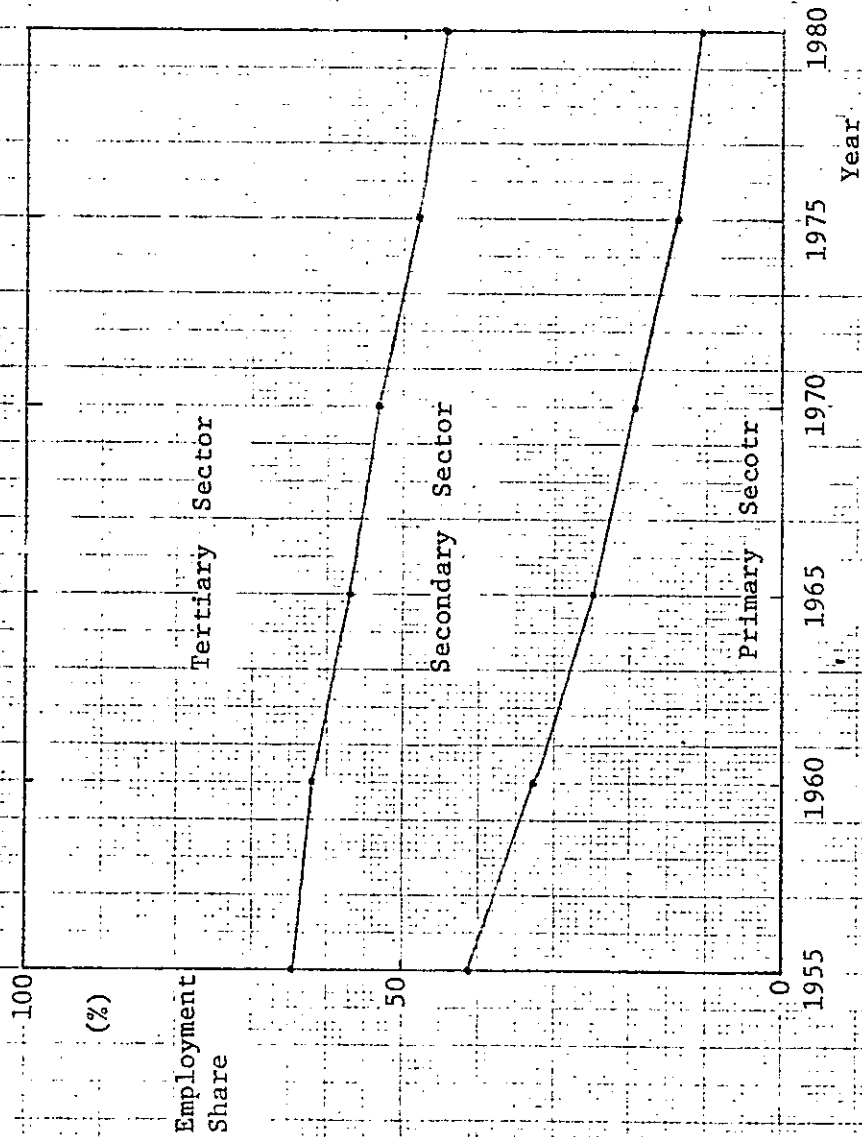
economy. In terms of urban-rural dichotomy of population, the share of urban population rose by 35 percentage points during the two decades from 1950 to 1970, from 37 percent to 72 percent, (see Table 1). In terms of the industrial structure, the share of the primary sector in employment declined from 41 percent in 1955 to 19 percent in 1970 and further down to 11 percent in 1980. The growth of the secondary industry was very high from 1955 to 1960 and stayed high until 1970, but in terms of growth rate of employment, the secondary industry was taken over by the tertiary industry since 1965. Since 1970, the tertiary industry is the only one which is growing, in terms of employment, at a high rate, (see Table 3).

The factors which have caused such high rates of economic growth and structural changes would be many and have been variously argued, Rosovsky and Ohkawa [19], Patrick and Rosovsky [17], Vogel [22], and Ouchi [16]. Among them, however, a high rate of investment is considered to be an essential and important factor. Not only production capacities were expanded, but also new production technologies were brought into with investment. The ratio of fixed capital formation to GNP was already at about 20 percent during the first half of the 1950's, but it further increased to a level above 30 percent by the beginning of the 1960's and kept increasing until it reached a peak of 37 percent in 1973. Since then, it started to decline, but is still above 30 percent, (see Table 2).

One of the factors which have made this investment more successful appears to be the composition of fixed capital formation by the private and public sectors. As Table 2 shows, the proportion of the public sector investment to the private sector investment stayed consistently in the range of one-to-two to one-to-three. This ratio was







Source: [3]

Figure 1 Share of Employment by Major Industrial Sector, 1955-1980

relatively small when the share of the private sector capital formation expanded, notably from 1956 to 1973, implying that the public sector apparently responded to, rather than was leading, the private sector.


Coming back to the issue of spatial distribution of population, it is to be noted that there was massive migration of population from rural areas to urban areas during the period of high economic growth and the emigration from rural areas exceeded the natural increase at a sizeable margin from 1955 to 1970, (see Table 1). As a result, the spatial pattern of population distribution was altered significantly during the post-war period. The spatial pattern of population distribution in Japan could be meaningfully analyzed by dividing the country into 13 regions as shown in Figure 2.<sup>2</sup> Kanto is a region which includes Tokyo and nearby prefectures. When it is further divided into Kanto-Inland and Kanto-Coast, the Kanto-Coast Region is the more intensely urbanized one having Tokyo as its core and the Kanto-Inland is a region which started to receive overflows from the metropolitan development around Tokyo. Tokai is a region having Nagoya City as its core and is relatively industrialized and urbanized. Kinki is a region which contains notable urban centers such as Osaka, Kyoto, and Kobe. The Coastal side Kinki is more intensely urbanized with Osaka and Kobe as its cores. The Kinki-Inland contains Kyoto and Nara and has been receiving more direct impact from the growth of the Kinki-Coast Region. These five regions constitute a belt which is more industrialized and urbanized and is often referred to as the "Pacific

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2. Although there are a number of ways of dividing the country into regions, the regional breakdown employed here is used by many ministries of Japan including, notably, the Ministry of Local Autonomy and the National Land Agency. For the purpose of statistical data organization, this system is most suitable for our purpose.

Legend:

1. Kanto-Inland
2. Kanto-Coast
3. Tokai
4. Kinki-Inland
5. Kinki-Coast
6. Hokkaido
7. Tohoku
8. Hokuriku
9. Sanin
10. Sanyo
11. Shikoku
12. Kyushu-North
13. Kyushu-South

 Urban Region

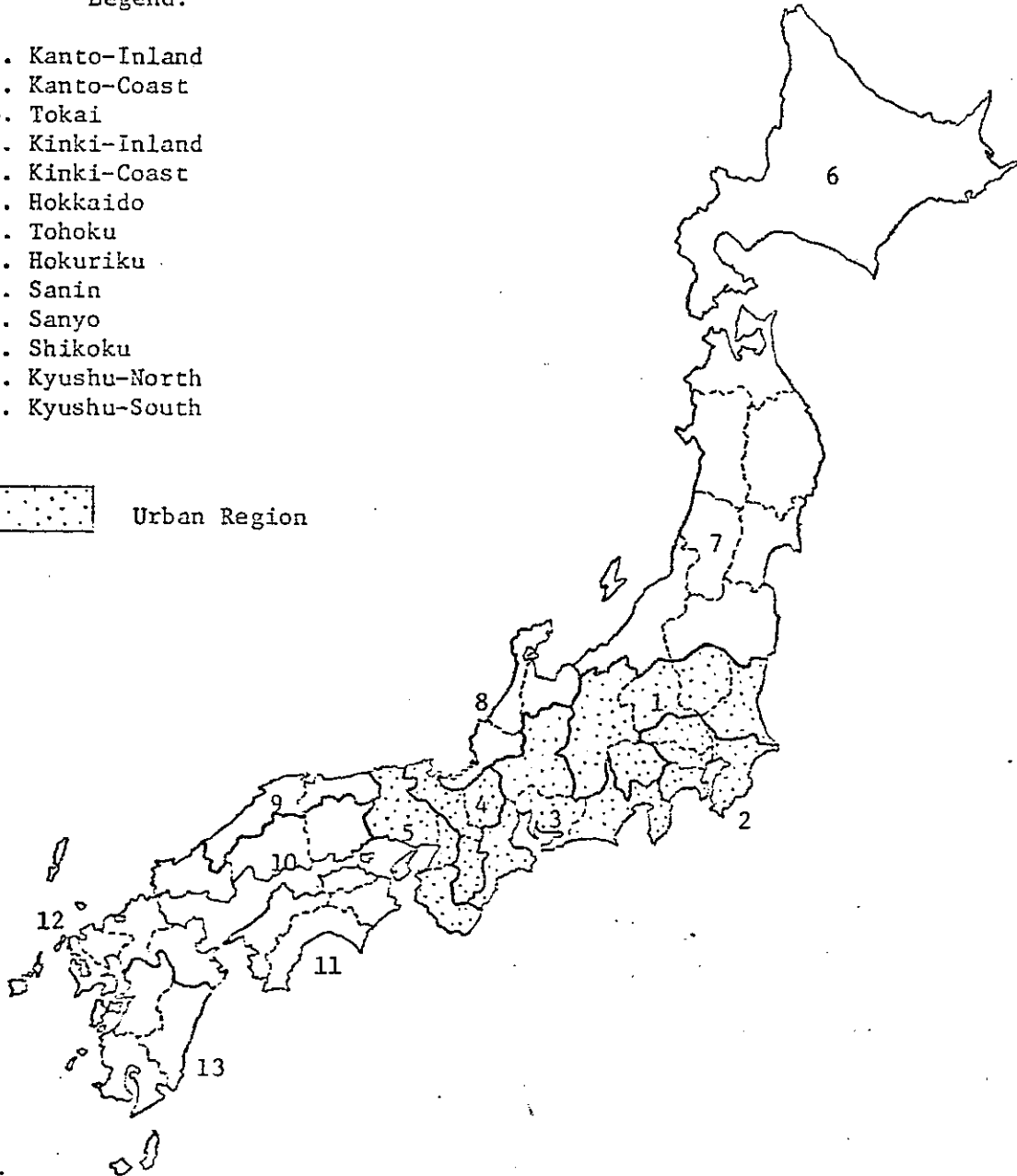


Figure 2      Regions of Japan

Megapolitan Belt", "the Tokaido Region" or "the Zone of Metropolitan Influence."

The other regions were generally less industrialized and urbanized. Consequently, they were low-income regions and suppliers of interregional migrants. For the purpose of the study, the former group of regions will be called the "urban regions," and the latter the "rural regions."

The growth rate of population from 1950 to 1980 by region is shown in Table 4 and Figure 3. During the period of high economic growth, e.g., 1955 to 1970, two different groups of region emerged, high growth and low growth regions. Kanto-Coast, Kinki-Coast and Toaki constituted the former group, which was joined by Kinki-Inland by 1970 and Kanto-Inland subsequently. Many of the low growth regions recorded a negative growth rate. The divergence in the growth rate between the two groups was the largest during the period of 1960 to 1965. Since this period, the gap started to narrow in a rapid pace. During the period of 1970 to 1975, no region recorded a negative growth rate and the growth rates of Kanto-Coast and Kinki-Coast had declined considerably. By the period of 1975 to 1980, Kinki-Coast recorded the lowest growth rate and most of the low-growth regions had increased a growth rate over the preceding five year period. What is more striking was the fact that the population growth rates of all the regions converged within five percentage points for the intercensal period. On the annual basis, no region was growing at a rate greater or smaller than that of any other region by more than one percentage point. If the ideal of national regional development is "balanced development," Japan had reached that ideal or the nirvana by 1980.

Table 4 The Intercensal Rate of Population Increase by Region

Region	Period (%)					
	50/55	55/60	60/65	65/70	70/75	75/80
1. Kanto-Inland	-0.1	-1.9	-0.0	2.5	6.1	5.7
2. Kanto-Coast	18.2	15.8	17.7	14.7	12.1	6.1
3. Tokai	7.0	6.3	8.3	7.8	8.1	4.6
4. Kinki-Inland	3.1	1.4	4.6	7.6	10.3	7.3
5. Kinki-Coast	13.5	12.6	15.2	11.1	7.6	2.5
I. Urban Regions	10.1	9.0	11.5	10.4	9.5	5.1
6. Hokkaido	11.1	5.6	2.6	0.2	3.0	4.5
7. Tohoku	2.8	-0.3	-2.2	-1.0	2.0	3.4
8. Hokuriku	0.8	0.7	-0.1	0.7	5.0	3.5
9. Sanin	2.0	-3.6	-5.8	-4.2	0.5	2.9
10. Sanyo	3.1	0.1	0.3	3.4	6.4	3.0
11. Shikoku	0.6	-2.9	-3.6	-1.8	3.5	3.1
12. Kyushu-North	6.6	1.2	-3.6	-1.0	4.0	4.4
13. Kyushu-South <sup>1</sup>	7.5	-2.5	-5.0	-4.8	1.0	4.5
II. Rural Regions	4.5	0.1	-2.0	-0.8	3.2	3.7
III. Nation	7.3	4.6	5.2	5.5	6.9	4.6

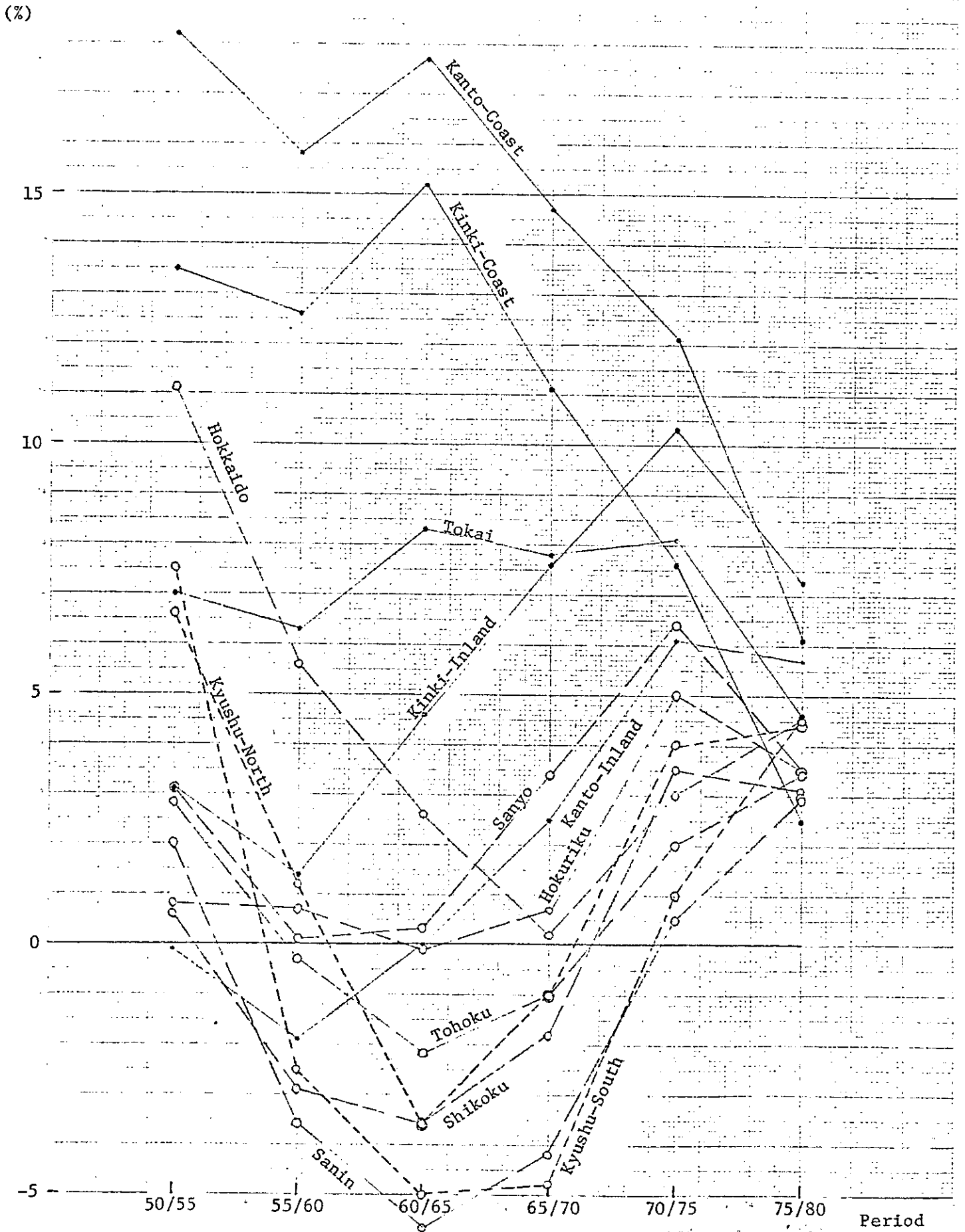
Note: 1. Okinawa is excluded throughout for intertemporal comparability.

Sources: [7] for 1950 to 1975.

[4] for 1980.

Figure 3 Intercensal Rate of Population Increase by Region  
1950-1980

Source: Table 4.



Then, what has led the country to this stabilization of population. In a previous paper, the author pointed out the following factors, Lower rate of economic growth, reduced interregional disparity of income, reorientation of the development objectives among the people from economic growth to environment/quality of life, Mera [14]. Among these, however, the reduction in interregional disparity of income is considered to be the most important in terms of its impact as well as from the viewpoint of policy formulation, because the other two factors could be readily satisfied but this is a factor which can hardly be achieved in developing countries. Therefore, in the following, attention will be directed to the identification of factors which might have contributed to the reduction in interregional disparity of income.

### III. Interregional Disparity of Income and Public Investment

As presented in Table 5 and Figure 4, the interregional disparity of income, as represented by the coefficient of variation of income per capita by prefecture, increased during the 1950's, and reached the highest level in 1961. Since then, it declined more or less consistently. The reduction was most notable for the period of 1960 to 1965 and since 1970. As can be seen in Figure 4, the income disparity shows a quite similar pattern of movement, if per capita income is measured by personal income or by distributed income.<sup>3</sup>

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3. According to prefectural income statistics compiled by the Economic Planning Agency, the distributed income of a prefecture is different from the respective personal income in that the former contains undistributed corporate profits and corporate taxes which the latter does not include, and does not include transfer payments from the government and other entities outside of prefecture which are included in the latter.

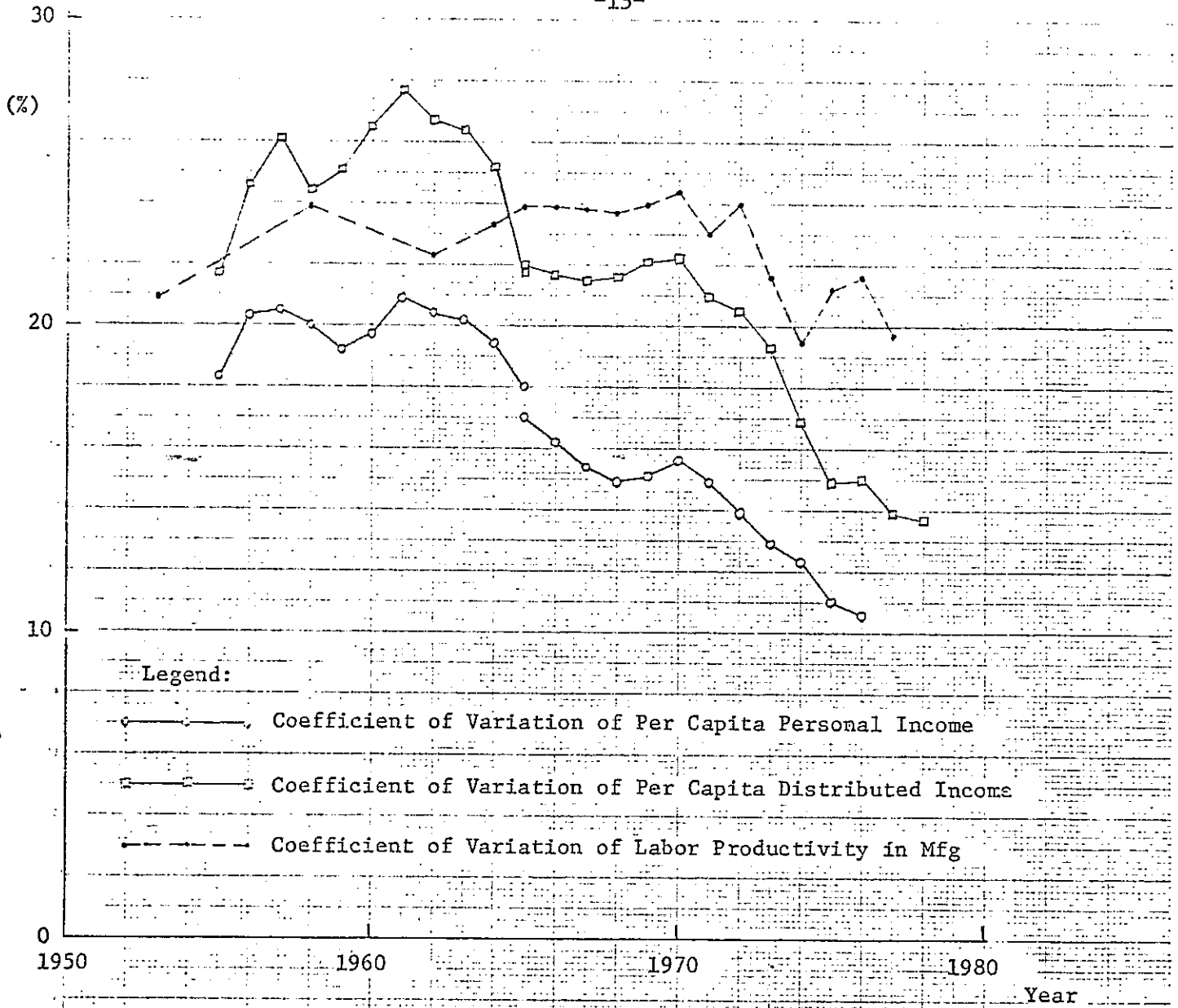
Table 5. Regional Disparity and Other Indices

Year	Coefficient of Variation Among Regions <sup>1</sup> (%)					Manufacturing Labor Productivity by Region (5)	Share of Governmental Transfer Income in Aggregate Personal Income (%) (6)	Share of Urban Regions in Public Investment (%) (7)
	Personal Income Per Capita by Prefecture		Distributed Income Per Capita by Prefecture		Fiscal Year Based			
	Calender Year Based (1)	Fiscal Year Based (2)	Calender Year Based (3)	Fiscal Year Based (4)				
1953						20.9		
1954								
1955	18.3		21.7				4.7	
1956	20.3		24.6				4.5	
1957	20.5		26.1				4.5	
1958	20.0		24.4			23.9	4.8	54.4
1959	19.2		25.1				5.0	57.1
1960	19.7		26.5				4.8	59.4
1961	20.9		27.7				5.0	59.9
1962	20.4		26.7			22.3	5.2	60.3
1963	20.2		26.4				5.5	59.2
1964	19.4		25.2			23.4	5.9	58.9
1965	18.0	17.0	21.8	22.0		23.9	6.2	59.4
1966		16.2		21.7		23.9	5.6	60.5
1967		15.4		21.5		23.8	5.6	60.6
1968		14.9		21.6		23.7	5.6	60.4
1969		15.1		22.1		24.0	5.6	60.3
1970		15.6		22.2		24.4	5.6	59.6
1971		14.9		21.0		23.0	5.7	59.0
1972		13.9		20.5		24.0	6.0	57.7
1973		12.9		19.3		21.6	6.1	57.8
1974		12.3		16.9		19.5	6.9	57.9
1975		11.0		14.9		21.2	7.9	56.3
1976		10.6		15.0		21.6		54.8
1977				13.9		19.7		53.5
1978				13.7				52.3

Notes: 1. The ratio of the standard deviation to the mean, unweighted.  
 2. 46 Prefectures, not including Okinawa throughout.  
 3. 13 regions as shown in Figure 2 and Table 4.  
 4. From 1955 to 1964, the governmental transfer income is estimated by subtracting from the percentage of the total transfer income by 0.8 percentage points, which was the share of other transfer incomes observed for 1965.

Sources: (1) and (3) from [9]  
 (2) and (4) from [10]  
 (5) from [7]  
 (6) from [9] for 1955 to 1964 and [10] for 1965 to 1975.  
 (7) from [11].





Source: Table 6.

Figure 4 Interregional Variation of Income and Productivity

Several factors can be identified as possible causes for this reduction. They include (1) relative changes in labor force participation rate, (2) an increasing share of transfer income by the government, (3) equalization of labor productivity between the two groups of regions, and (4) relative redistribution of a high productivity sector or sectors.

As shown in Table 6, the labor force participation rate in both groups of regions increased at a faster rate in urban regions than in rural regions, implying that per capita income was affected favorably to urban regions during the period by this relative change. Up to 1961, this was a factor for enlarging the disparity. But since then, it was a factor for slowing down, rather than accelerating, the reduction in the disparity. Therefore, the changes in labor force participation rate does not explain the reduction in interregional disparity during the 1970's. Since 1970, changes in labor force participation were very small and cannot be claimed to have been a major factor for the reduction.

The share in the total personal income of transfer income by the government by year is shown in Table 5. It had followed a gradual increasing trend during the period of observation. The increase was relatively large during the first half of the 1960's and the first half of the 1970's, both being the period of rapid reduction in the disparity. Therefore, these increases in the share of governmental transfer income may explain a part of the reduction in interregional disparity in per capita personal income. However, as has been seen already, the disparity in per capita distributed income also followed a similar trend. And, therefore, we must conclude that it was not a major factor for the reduction.

Table 6 Labor Force Participation Rate, Manufacturing Employment and the Share in Incremental Population of Urban and Rural Regions, 1950-1980

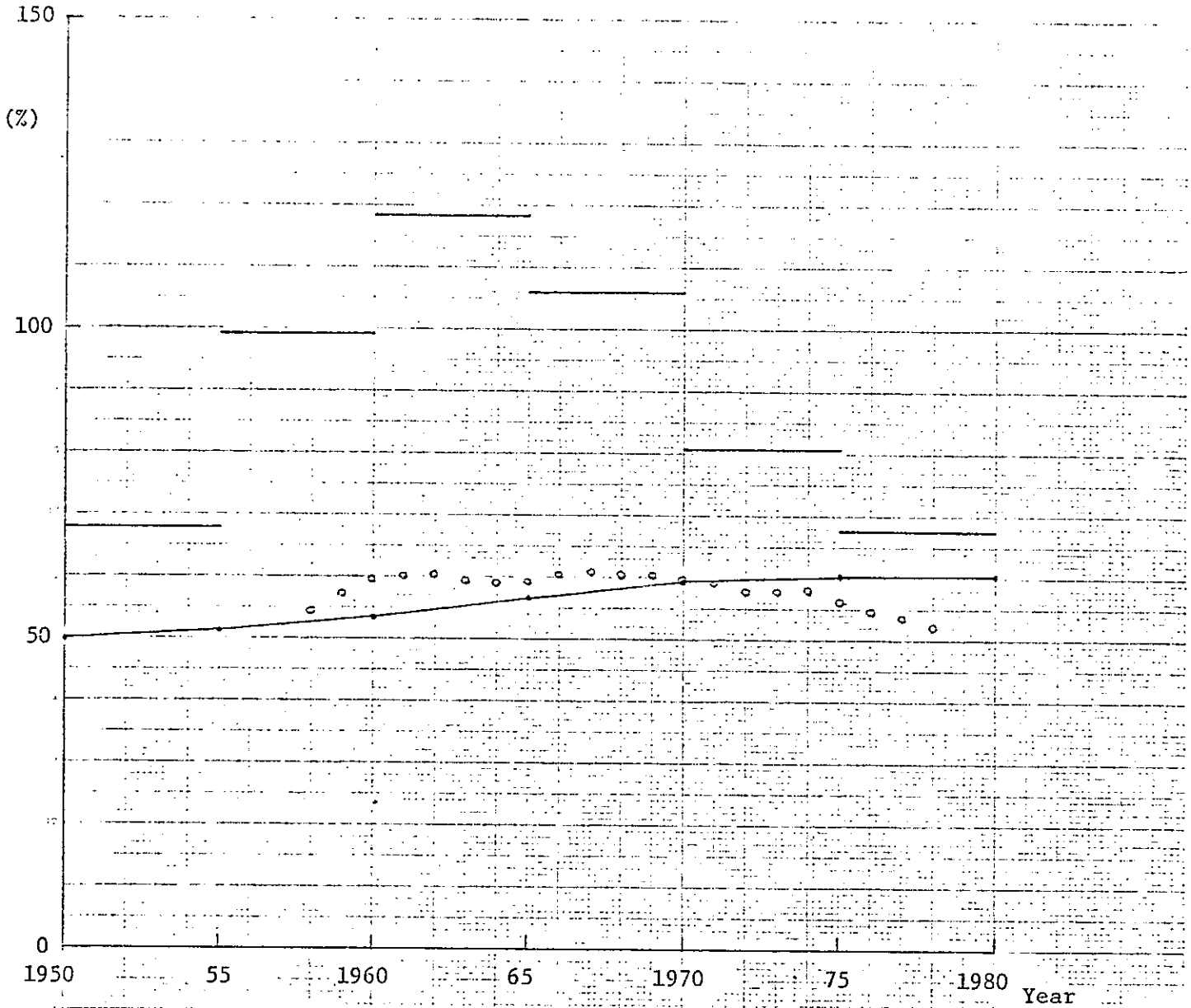
Year	Labor Force Participation Rate (%)		Share of Urban Regions in Manufacturing Employment (%)	Growth Rate of Mfg Employment from Preceding Census Year (%)		Share of Urban Regions in Incremental Population (%)
	Urban Regions	Rural Regions		Urban Regions	Rural Regions	
1950	41.7	44.0	64.0	-	-	-
1955	43.7	44.2	69.1	19.8	4.2	68.9
1960	47.5	45.9	77.0	54.2	2.9	99.1
1965	49.5	47.0	73.8	17.2	39.5	118.2
1970	50.2	50.1	73.5	15.3	17.4	106.0
1975	47.1	48.0	70.5	-6.3	8.6	80.8
1980	47.2	48.1	70.3	-0.8	0.1	67.7

Note: 1. The ration of employed persons to the population.

Sources: Computed from data in [7] for 1950 to 1975 and those in [3] for 1980.

Next, the relative labor productivity in manufacturing will be examined to see if the labor productivities of the two groups of regions came closer over time. The reason for singling out manufacturing is that the labor productivity in the primary sector is known to be fairly uniform all over the country and the labor productivity in the tertiary sector is known to be closely related to the labor productivity in the secondary sector in the same region. As is shown in Table 5 and drawn in Figure 4, no major reduction is observed before 1972 in the coefficient of regional variation of labor productivity in manufacturing. Although there is some diminishing trend since 1972, the degree of reduction in the disparity of manufacturing labor productivity is much less than that of per capita distributed income. Thus, as far as the reduction during the first half of the 1960's is concerned, the equalization of labor productivity in manufacturing was not a factor. Since 1972, it may have been a factor, but there were other factors as well.

The remaining factor is the relative spatial redistribution of a high productivity sector or sectors. For the same reason, the manufacturing sector will be examined. As Table 6 shows, the growth rate of manufacturing employment was greater by a wide margin in urban regions until 1960. But, since then the relative position was reversed. From 1960 to 1965, the manufacturing employment in rural regions grew at 39.5 percent, while that in urban regions grew at 17.2 percent. This period corresponds to the initial phase of rapid diminution of interregional disparity of income. The next five years did not see much reduction in income disparity. In terms of the growth of manufacturing employment, the rural regions scored a



Legend:

- Population Share of Urban Regions
- Share of Urban Regions in Incremental Population
- Share of Urban Regions in Public Investment

Sources: Tables 3 and 7.

Figure 5     The Shares of Urban Regions in Population and Public Investment  
1950-1980

growth rate only slightly higher than that of the urban regions. During the next five year period of 1970 to 1975, in which a rapid reduction in income disparity took place, there was a significant shift of manufacturing employment from the urban regions to the rural regions. From these observations, it can be concluded that the spatial relative or absolute redistribution of manufacturing employment has been a major cause for diminishing interregional disparity of income.

Then, a question arises: what has induced such significant shifts in manufacturing employment in the period of 1960 to 1965 and again in the period after 1970? In terms of public policy, what public measure, if any, has led to these changes. Since the spatial allocation of public investment is an important instrument for spatial policy, attention will be paid exclusively to public investment hereafter.

If attention is paid to the share of urban regions in the aggregate public investment, Column (7) in Table 5, it is known that it exceeded their population share until 1970, (see Figure 5). During this period, the share of the urban regions in incremental population was very large. Therefore, by taking into consideration the need to accommodate a greater amount of additional population, the greater share of the urban regions could be explained by the principle of equal distribution. However, since 1970, the urban share went down below the population share, even though the urban share in incremental population has still been above the share in total population. Then, we must conjecture that some other principle had been applied at that time.

This kind of inquiry is presented in subsequent sections in a more formal manner.

#### IV. Alternative Hypotheses about the Spatial Allocation Policy of Public Investment

Although the actual spatial distribution of public investment is invariably a result of various motives and objectives, it is possible to identify several typical policies. There are at least the following four typical policies which are not necessarily mutually exclusive:

- (1) The Egalitarian Policy
- (2) The Redistributive Policy
- (3) The Productive Efficiency Policy, and
- (4) The Catching-up (with the private sector) Policy.

##### 1. The Egalitarian Policy

By the egalitarian policy, a policy of spatial allocation of public investment by which the stock of social overhead capital (SOC) per capita is made equal everywhere at any time, i.e.:

$$\frac{G_i}{P_i} = A, \quad (i=1, \dots, m) \quad (1)$$

where  $G_i$  is the stock of SOC in region  $i$ ,

$P_i$  is the population of region  $i$ ,

$A$  is a constant for all regions (implying per capita SOC stock),

and all the variables are functions of time with the time subscript  $t$  omitted.

Differentiating (1) with respect to time, the following can be obtained:

$$\frac{\dot{G}_i}{P_i} = \dot{A} + A \frac{\dot{P}_i}{P_i} \quad (2)$$

This equation implies that per capita public investment in any region is equal to the sum of the average increase in per capita SOC stock and per capita SOC stock multiplied by the rate of population increase.

## 2. The Redistributive Policy

This policy refers to one by which per capita SOC stock in a low income region is always made greater than that in a high income region in order to compensate for lower income with better public services and/or to induce greater private activities in the future through more abundant supply of SOC. Mathematically,

$$\frac{G_i}{P_i} = A \left( \frac{y}{y_i} \right)^b, \quad b > 0, \quad (i=1, \dots, m) \quad (3)$$

where  $y$  is the average per capita income of the country,

$y_i$  is per capita income in region  $i$ , and

$b$  is a positive parameter, the value of which depends upon the strength of redistributive orientation of the policy.

By differentiating (3) with respect to time, the following is obtained:

$$\frac{\dot{G}_i}{P_i} = \left( \frac{y}{y_i} \right)^b \left[ \dot{A} + A \frac{\dot{P}_i}{P_i} + bA \left( \frac{\dot{y}}{y} - \frac{\dot{y}_i}{y_i} \right) \right] \quad (4)$$

Since the difference in the growth rate of per capita income of any region from that of the national per capita income was generally small relative to the growth rate of population ( $\frac{\dot{P}_i}{P_i}$ ), the third term of the right hand side of (4) is assumed to be zero, i.e.,

4. The second term is a simple growth rate, but the third term is a difference in the growth rate. In a system which evolves gradually, the third term is small relative to the second.



$$bA \left( \frac{\dot{y}}{y} - \frac{\dot{y}_i}{y_i} \right) = 0.$$

Then, the equation can be written as

$$\ln \frac{\dot{G}_i}{P_i} = b \ln \frac{y}{y_i} + \ln \left( A + A \frac{\dot{P}_i}{P_i} \right).$$

The parameter b can be estimated by fitting this equation to observed values.

### 3. The Productive Efficiency Policy

This policy refers to one that attempts to maximize GNP by allocating public investment where the marginal productivity of public investment appears to be largest. However, in order to make this policy operational, the relationship of SOC with other more directly productive inputs must be unambiguously specified. To undertake this task here is too excessive a task. Therefore, two alternative assumptions will be made. First, SOC is considered to be a necessary condition for private investment. Second, SOC is considered to be a necessary condition for labor force participation in productive activities. According to the first assumption, a relatively large amount of public investment should be allocated where the marginal productivity of private investment is greater. Due to constraints in data availability, the marginal productivity of private investment will be approximated by incremental output/capital ratio. On the side of public investment, relative intensity of public investment will be measured alternatively with respect to SOC stock or population. Then, the following two equations can be obtained:<sup>5</sup>

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5. In the following equation, the essential point is a positive value of "a" and zero value of intercept is not necessarily postulated.

$$\frac{\dot{G}_i}{G_i} = a \frac{\dot{Q}_i}{K_{i,-1}}, \quad a > 0, \quad (i=1, \dots, m) \quad (6)$$

and

$$\frac{\dot{G}_i}{P_i} = a \frac{\dot{Q}_i}{K_{i,-1}}, \quad a > 0, \quad (i=1, \dots, m) \quad (7)$$

where  $\dot{Q}_i$  is the increment in regional product of region  $i$ ,  
 $\dot{K}_i$  is the private investment in the productive sectors in region  
 $i$  in one year preceding time  $t$ , and  
 $a$  is a parameter which needs to be estimated.

If the second assumption is made, and the intensity of public investment is measured with respect to population, the equation is:

$$\frac{\dot{G}_i}{P_i} = a \frac{\dot{Q}_{i,-1}}{P_{i,-1}}, \quad a > 0, \quad (i=1, \dots, m) \quad (8)$$

where  $Q_{i,-1}$  is regional product of region  $i$  in one year preceding to time  $t$ , and

$P_{i,-1}$  is to be interpreted similarly.

For any of equations (6), (7) and (8), if the observed data for any  $t$  fit well to a specific value of  $a$ , then the relevant equation is considered to be valid and the productive efficiency policy is considered to have been in effect at that time.

#### 4. The Catching-up Policy

The above three policies are all based on some normative criterion. However, this policy is devoid of such a normative criterion. Instead, public investment is considered to have been allocated in proportion to private decisions. Such a policy may be justified if private investment creates the need for public investment. In a situation in which SOC is scarce, any private investment is considered to lead SOC

in the same region to a greater degree of scarcity, thus generating acute need of public investment. This policy may be considered to be similar or identical to the productive efficiency policy. But, there is a distinct difference. In this policy, simple catching up with private decisions is aimed at without any such normative concept as productive efficiency or maximizing GNP. Mathematically, this policy can be expressed by:

$$\dot{G}_i = a \dot{K}_{i,-1}, \quad a > 0, \quad (i=1, \dots, m) \quad (9)$$

In the above equation, one period lag is assumed for operational convenience.

#### V. An Empirical Examination of the Hypothesis

Once the necessary data are obtained for all regions for any particular year, the plausibility of each policy can be tested by examining to what extent the corresponding equation can explain the observed data. This test could be undertaken most rigorously with prefectural data,<sup>6</sup> or less rigorously, but quite convincingly, with data from the 13 regions. But, due to the length of time needed for such an analysis, a simpler regional breakdown is adopted for the present study: the country is divided into two blocks, urban and rural regions as defined already.

Instead, further elaboration is made to the classification of SOC. According to the official statistics of the Government of Japan, public investment is divided into several categories by purpose. Among them, the following two classes appear to be most relevant to our analysis:

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6. There are 47 prefectures in the country. Data on public investment by prefecture is available since 1958.

1. Public Investment for Community Environmental Development (PICED), and

2. Public Investment for Industrial Development (PIID).

The former group of public investment is aimed at building up infrastructure which is designed to satisfy the needs of people mainly in the consumptive side of their activities, and the latter group is to satisfy the needs mainly in the productive side of their activities.<sup>7</sup> The other groups are those for agri-fishery facilities, national land conservation and miscellaneous purposes. The shares of the two groups have varied over time, but PICED's share ranged from a third to nearly half and PIID's share from 15 to 30 percent over the past 20 years. PICED is steadily increasing its share, but PIID is gradually losing its share.<sup>8</sup>

Because of the limited availability of consistent data, the present analysis will be limited for the period from 1966 to 1978. This is a period in which a trend for equalization of regional income levels as well as a trend for convergence of regional population growth rates had already set in. Basic data are gathered from the following sources:

- (1) Japan Economic Planning Agency [9] and [10] for population, personal and distributed income by region, regional product, fixed gross capital formation by the private sector, 1965-1978.

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7. PICED is defined to be those for local roads, streets, urban land adjustment, housing, environmental sanitation, welfare facilities, educational facilities, water supply and sewages. PIID is defined to be those for national and prefectural highways, ports, airports, and industrial water supply. Source: [12], p.16.

8. [12], p.17.

- (2) Japan Ministry of Local Autonomy [11] and [12] for public investment by major category by region, 1965-1978.
- (3) Japan Economic Planning Agency [6] for gross stock of publicly provided capital stock as of 1960.
- (4) Japan Economic Planning Agency [5] and [8] for GNP deflator and the one for gross fixed capital formation by the public sector, 1960-1978.

To examine the plausibility of the first two policy alternatives, the egalitarian and the redistributive policies, attention will be given only to equation (5). This is because equation (2) can be subsumed in (5), as (5) becomes (2) when  $b$  is equal to zero. Thus, if  $b$  turns out to be positive, the policy is judged to be redistributive. If  $b$  is zero, it is egalitarian. And, if  $b$  is negative, it is judged to be counter-redistributive.

In Appendix Figures 1 through 3, the value of  $b$  for each year is obtained by connecting the two points, each representing the urban regions and rural regions, respectively. These points were obtained by transforming equation (5) into the following three equations, each of which describes the relationship for the aggregate public investment, Piced and Piid, respectively:

$$\ln D_i \equiv \ln \left( A + A \frac{P_i}{P_i} \right) - \ln \frac{G_i}{P_i} = b \ln \frac{y_i}{y} \quad (10)$$

$$\ln D_i^c \equiv \ln \left( A^c + A^c \frac{P_i}{P_i} \right) - \ln \frac{G_i^c}{P_i} = b \ln \frac{y_i}{y} \quad (11)$$

$$\ln D_i^d \equiv \ln \left( A^d + A^d \frac{P_i}{P_i} \right) - \ln \frac{G_i^d}{P_i} = b \ln \frac{y_i}{y} \quad (12)$$

where super script c refers to Piced, and  
super script d refers to Piid.

On the whole, the policy for spatial distribution of aggregate public investment is considered to have been more egalitarian in the earlier period than redistributive and clearly redistributive in the later period, (see App. Figure 1). During the most recent years, i.e., since 1976 or 1977, it was very much redistributive. But, when components of public investment are examined, the picture is substantially altered. As far as public investment for community environmental development (PICED) is concerned, the distribution policy turned out to have been very counter-redistributive, (see App. Figure 2). The value of  $b$  had been in the order of negative 2, and no obvious change is observed in the orientation of the policy over time. However, PIID had been distributed by the opposite principle, (see App. Figure 3). Although the distributive policy in the second half of the 1960's was more or less egalitarian, it gradually shifted toward greater orientation to redistribution. During the most recent two years, this orientation had been most pronounced. The value of  $b$  had reached the order of 6 to 9.

Since the policy in the earlier period was, on the whole, egalitarian in the aggregate terms, it should be interpreted that higher income regions received much of public investment for consumption and welfare-oriented purposes, and little of it for productive purposes, but lower income regions received little of the former and much of the latter. However, in the aggregate terms, the policy gradually shifted toward redistribution and since 1971, the redistributive orientation has been consistently intensified. This reorientation has been achieved by greater redistributive orientation of PIID and not of PICED.

In App. Figures 4 through 6, equation (6) is tested by applying the following three equations, respectively, for the aggregate investment, PICED, and PIID.

$$\frac{\dot{G}_i}{G_i} = a \frac{\dot{Q}_i}{K_{i,-1}} \quad (13)$$

$$\frac{\dot{G}_i^c}{G_i^c} = a \frac{\dot{Q}_i}{K_{i,-1}} \quad (14)$$

$$\frac{\dot{G}_i^d}{G_i^d} = a \frac{\dot{Q}_i}{K_{i,-1}} \quad (15)$$

These equations are based, as stated in Section IV, on the assumption that public investment helps to allocate private investment over space.

For the aggregate public investment, the productive efficiency policy appears to have been operative until around 1973, although the policy was more pronounced in the earlier period, (see App. Figure 4). A quite similar policy orientation is observable for PICED, (see App. Table 5). However, for PIID, a double reversal appears to have taken place. In the earlier period, i.e., from 1966 to 1969, the productive efficiency policy was in operation, but since then it vanished. However, after a period of transition and adjustments, this policy appears to have been reestablished since around 1974 or 1975, although with less stability, (see App. Figure 6). This time, the more productive are the rural regions, rather than the urban regions as before.

The productive efficiency policy is examined by the use of equation (7), and the results are shown in App. Figures 7 through 9. Quite similar remarks can be made as those made with respect to App. Figures 4 through 6, although the years of transition are slightly different.

The productive efficiency policy is further examined on the basis of equation (8), which can be interpreted as being based on the assump-

tion that public investment helps to reallocate population and labor force in space. In the aggregate terms, the policy was efficiency oriented only from 1966 to 1970 at most, and, since then the policy turned out to be moving toward counter productive efficiency orientation, (see App. Figure 10). However, as far as PICED is concerned, the policy had been consistently production efficiency oriented, (see App. Figure 11). The data for PIID show quite similar trends to those of aggregate public investment, (see App. Figure 12).

The catching up policy is examined by the use of equation (9). Data are plotted in App. Figures 13 through 15, by using the following equations, respectively, for the aggregate public investment, PICED and PIID:

$$\begin{aligned} \dot{G}_i &= a \dot{K}_{i,-1} \\ \dot{G}_i^c &= a \dot{K}_{i,-1} \\ \dot{G}_i^d &= a \dot{K}_{i,-1} \end{aligned}$$

In the aggregate terms, the catching up policy explains the actual spatial allocation of public investment fairly well, with a possible exception of 1978, (see App. Figure 13). This policy is also well applicable to PICED as seen in App. Figure 14. In this case, even 1978 is well included. But, with respect to PIID, this policy holds well only for the period of 1966 to 1969. Since then, the spatial allocation of public investment for industrial development started to depart from the pattern of private investment, (see App. Figure 15). Specifically, heavier PIID was made in rural regions since then than the amount which was "expected" by private investment.

The above findings are summarized in Figure 6. Generally, the



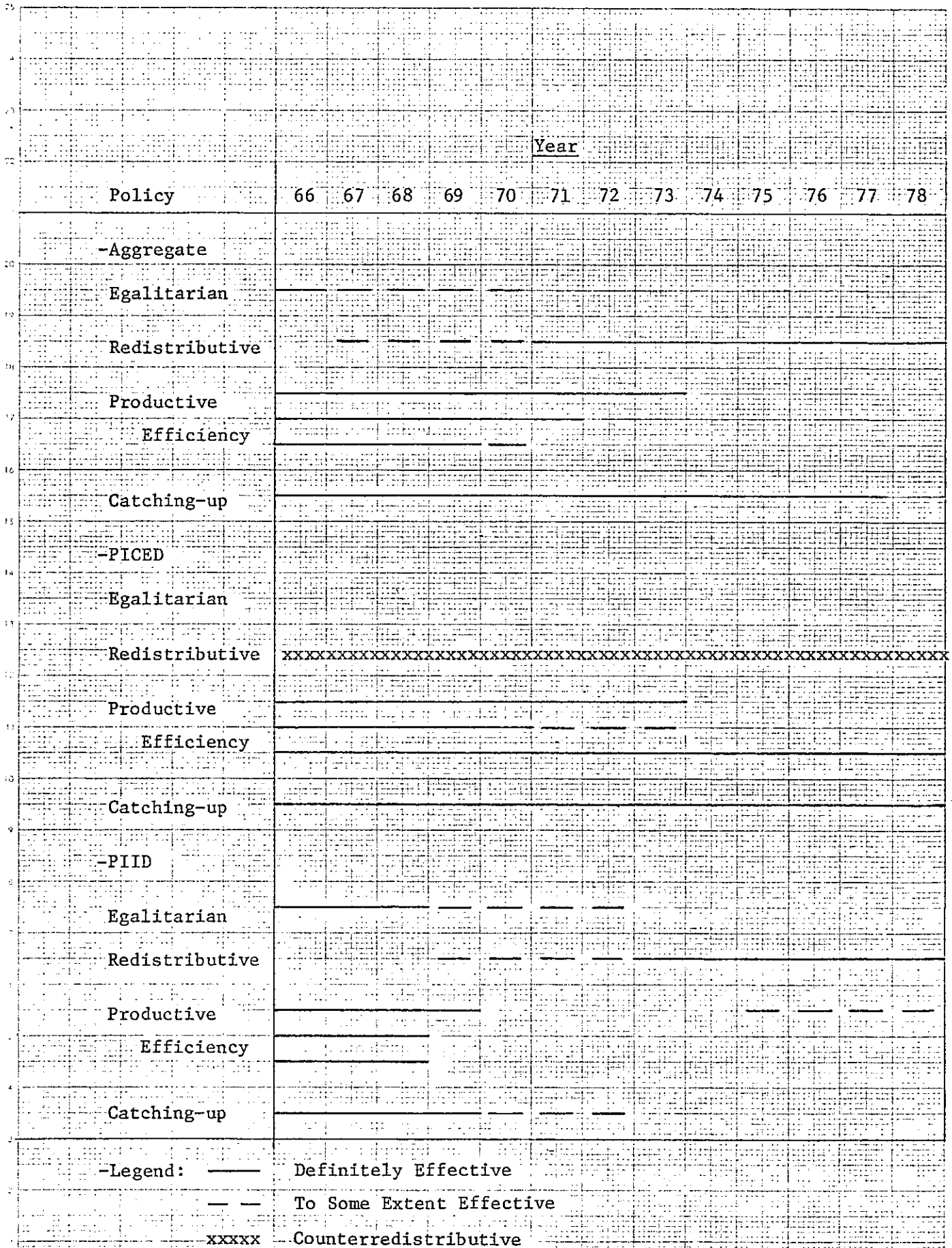


Figure 6 Summary of Effective Policy Alternatives

following conclusions can be made:

- (1) During the early part of the observation period, i.e., during the second half of the 1960's, the productive efficiency policy was followed for the spatial distribution of the aggregate investment as well as each component part of public investment.
- (2) Generally, the catching-up policy was prevalent throughout the period. The redistributive policy gained in importance by the end of the 1960's and this orientation has been intensified since then.
- (3) With regard to aggregate public investment, the catching-up policy can be considered to be the single most important policy in describing the actual spatial distribution throughout the period. The productive efficiency policy was in effect until 1970.
- (4) The spatial distribution policy of Piced was consistently counter-redistributive, but at the same time consistent with the catching-up policy.
- (5) The spatial distribution policy of Piiid reflects well the changing attitude of the Government during the period. In the earlier part of the period, the policy was egalitarian, productively efficient and catching up with private investment, at the same time. But, since around 1969, the policy went through turbulent changes and since 1973 the current policy of redistribution has been established.

## VI. Conclusions and Implications for Developing Countries

In order to identify factors which have brought stability in the spatial distribution of population in Japan, the spatial allocation policy of public investment has been examined above. Due to limitations in data availability and time for data processing, the analysis

has been restricted to the period of 1966 to 1978 and to the urban-rural dichotomy. However, it should be noted that in this period the interregional income disparity was already on the way down and regional population growth rates started showing a sign of convergence. On the side of public investment policy, the policy in the second half of the 1960's was definitely productive efficiency oriented and, on the whole, egalitarian. In other words, where the productivity of private investment was high, there was public investment and the opportunity for private investment was fairly well distributed in proportion to population. We cannot ascertain if this rather happy situation existed prior to 1965, and this is an interesting research topic. And, the entire conclusion from this analysis may depend upon the answer to this question.

There could be two alternative scenarios which may describe the situation prior to 1966. One is to assume that the earlier policy was more egalitarian than catching-up. Because it was egalitarian, i.e., every part of the country was provided with a more or less equal level of infrastructure, it can be claimed that a rapid growth of manufacturing employment in rural regions was possible during the period of 1960 to 1965. According to this scenario, this growth of manufacturing employment in rural regions had led to a move toward reduction in income disparity, and, hence, toward convergence of regional population growth rates.

Another scenario is to assume that the earlier policy was closer to the catching-up and the productive efficiency than the egalitarian. As a result, the economy was helped to grow and private investment was expanded. Due to increased congestion in highly urbanized areas and for taking the advantage of abundant supply of labor at low wages

in peripheral regions, industries started to locate themselves in less developed rural regions. In this scenario, the role of public investment is limited to contributing to economic growth, and a gradual decentralization of activities is considered to have emerged purely as a result of natural processes of development.

Scanty data available for the period prior to 1966, the former scenario appears to be the more realistic. In other words, a fairly egalitarian policy of public investment with respect to spatial distribution had prepared even peripheral and less developed regions for eventual industrial development, which had led to a decline in income disparity and slowing down of flows of population to highly urbanized areas.

In deriving implications for developing countries from this inconclusive analysis, attention should be given to differences between the conditions of Japan during the 1950's and 1960's and those of currently developing countries. In particular, the size of the country, natural resource endowment, the educational level of the population, cultural tradition, the political conditions, the strength of the power of the national government and others may have to be examined before the applicability of the Japanese experience is to be judged. However, it would be highly interesting to note that the Japanese spatial allocation policy of public investment during the 1960's and before was very likely to have been highly egalitarian, and that the subsequent decentralization of manufacturing activities and the diminution of interregional problems may have been attributable to this egalitarian, but not redistributive, policy.

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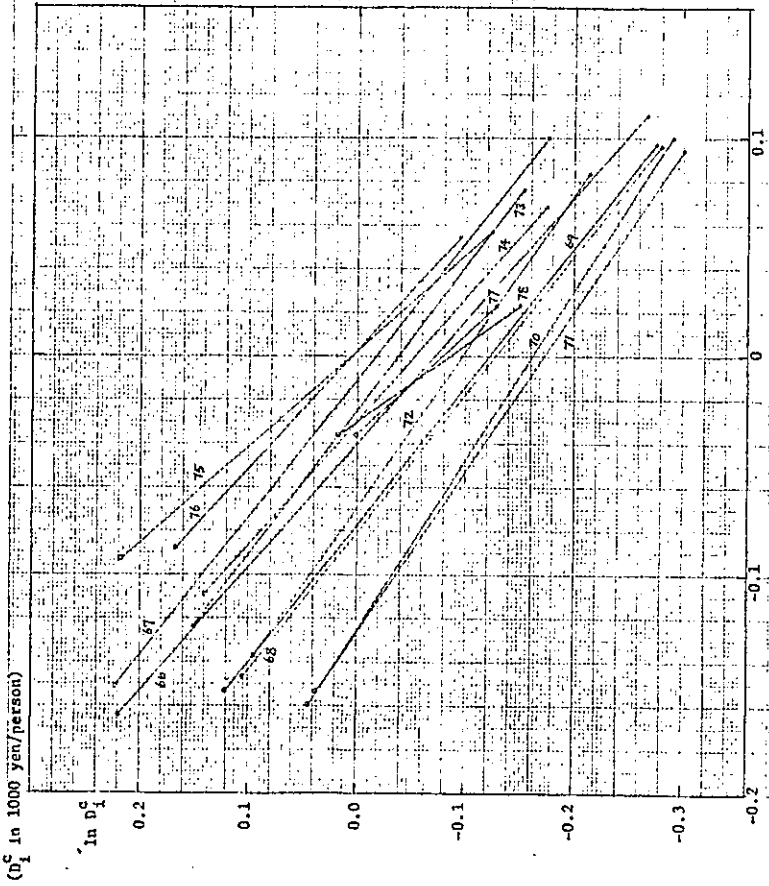
APPENDIX FIGURES

General Notes:

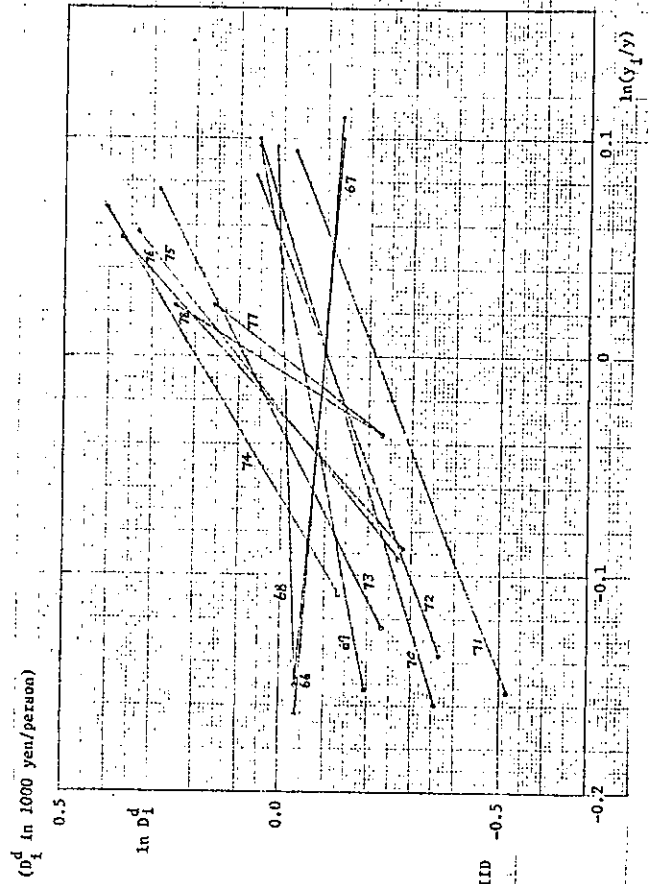
1. Data sources and definitions are as described in pp.25 - 27.
2. Constant prices of 1970 are used throughout.

Legend:

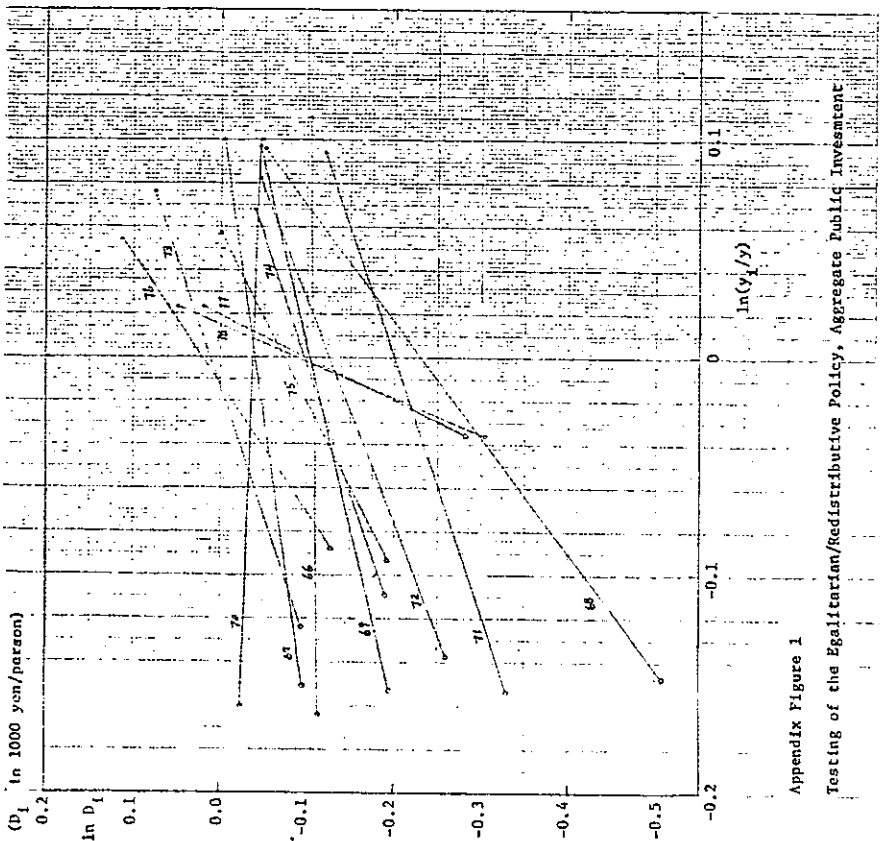
- Urban Regions
- Rural Regions



Appendix Figure 2 - Testing of the Egalitarian/Redistributive Policy, PIGED



Appendix Figure 3 - Testing of the Egalitarian/Redistributive Policy, PIID

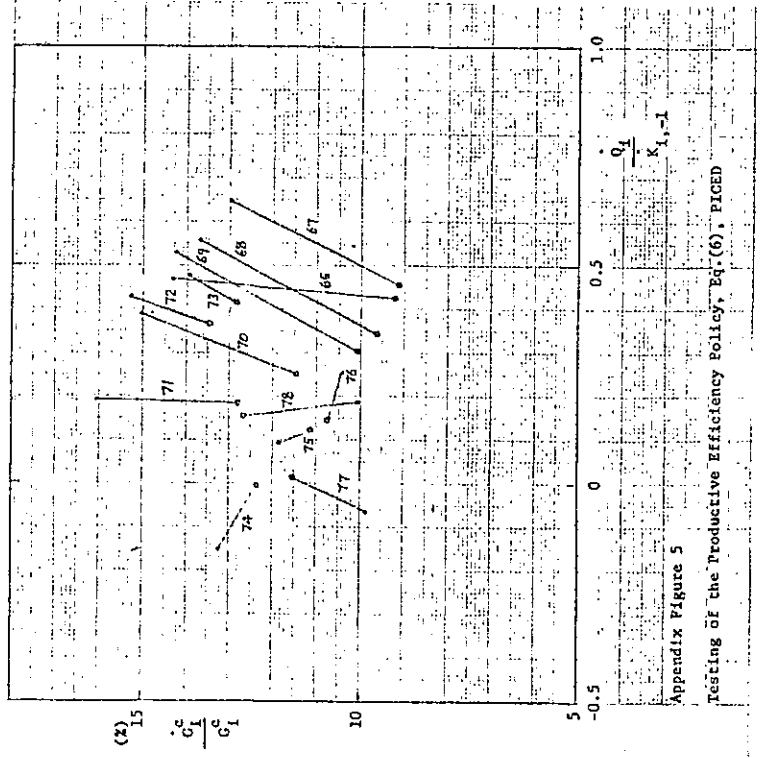
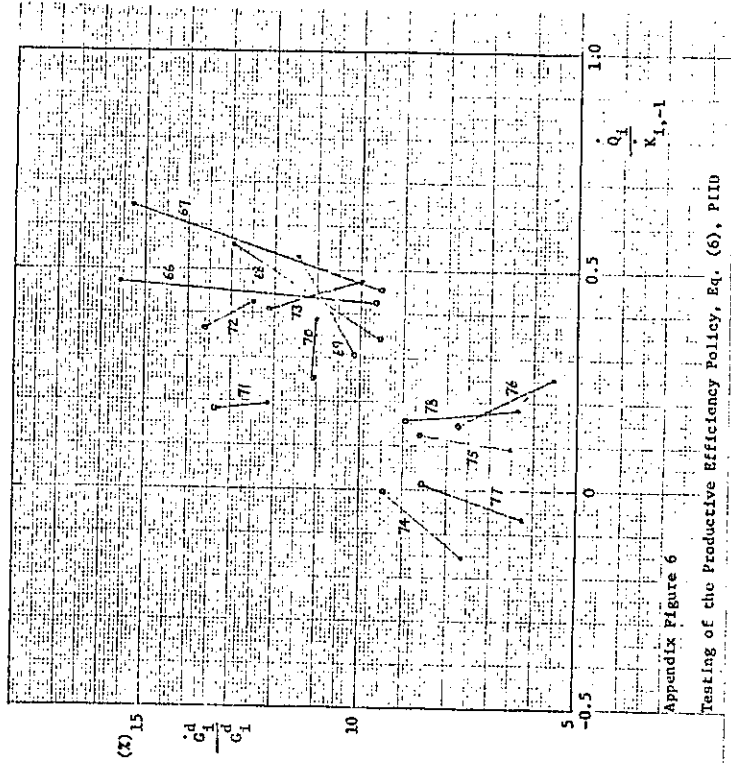
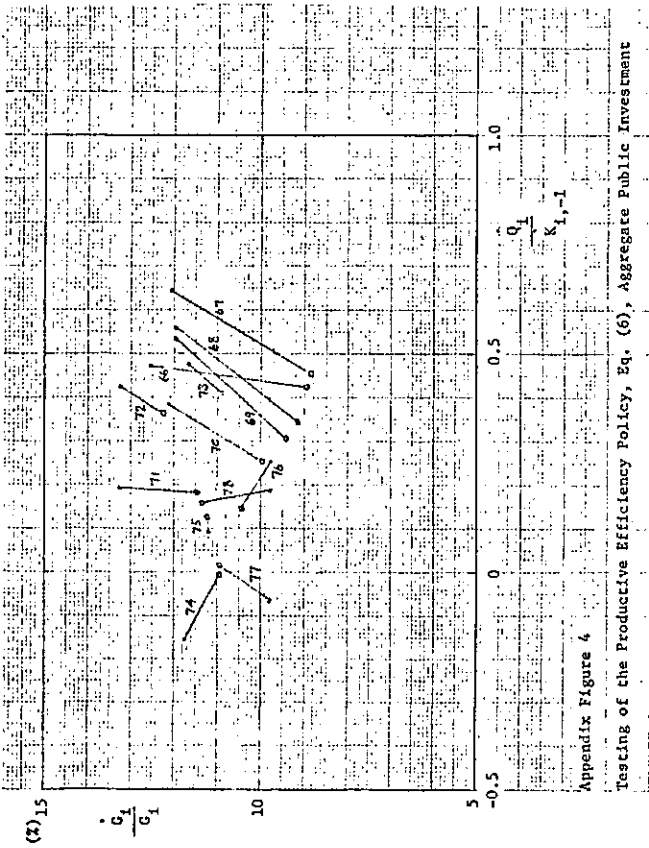


Appendix Figure 1 - Testing of the Egalitarian/Redistributive Policy, Aggregate Public Investment

E. 44 1 250 1000 1971

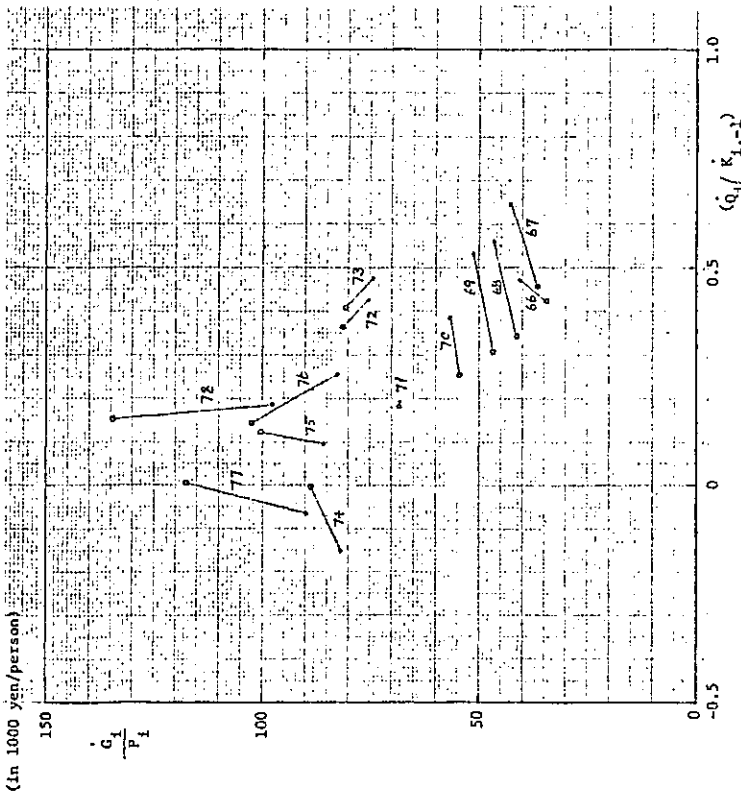
Appendix Figure 3



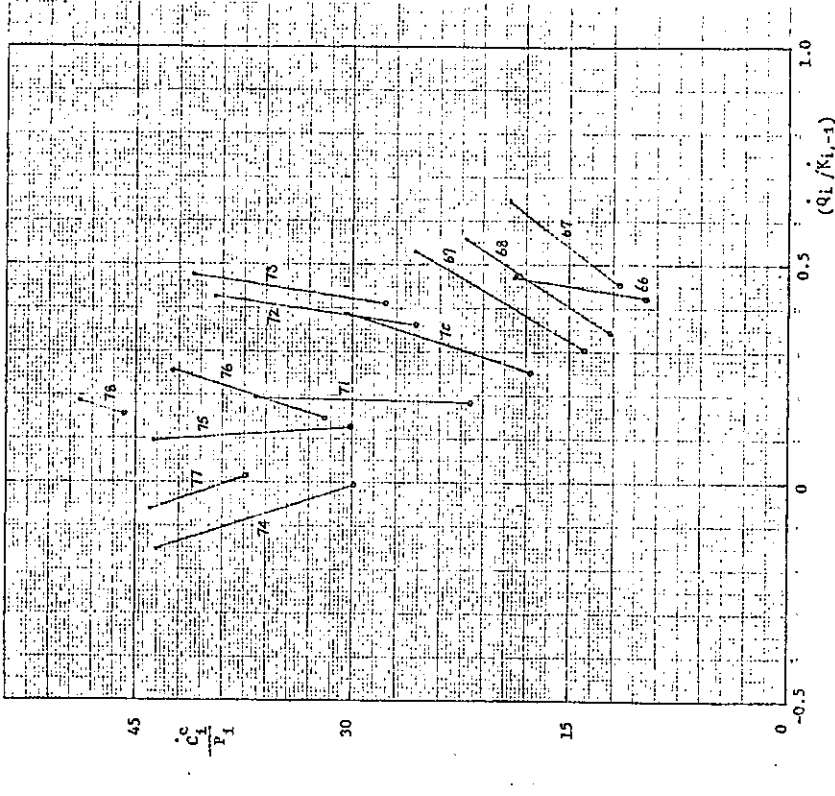


Appendix Figure 7

Testing of the Productive Efficiency Policy,  
Eq. (7), Aggregate Public Investment



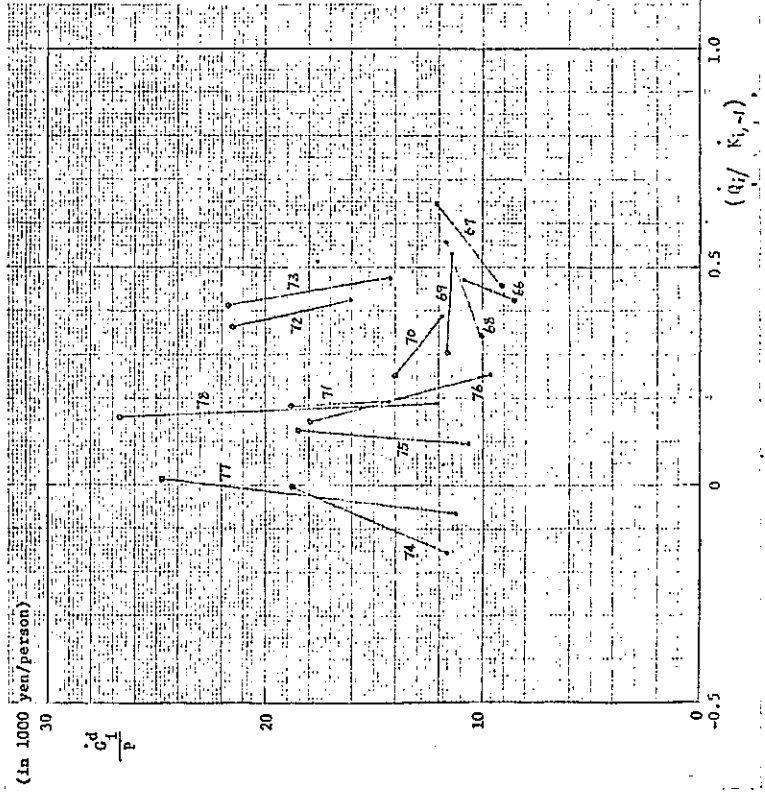
(in 1000 yen/person)

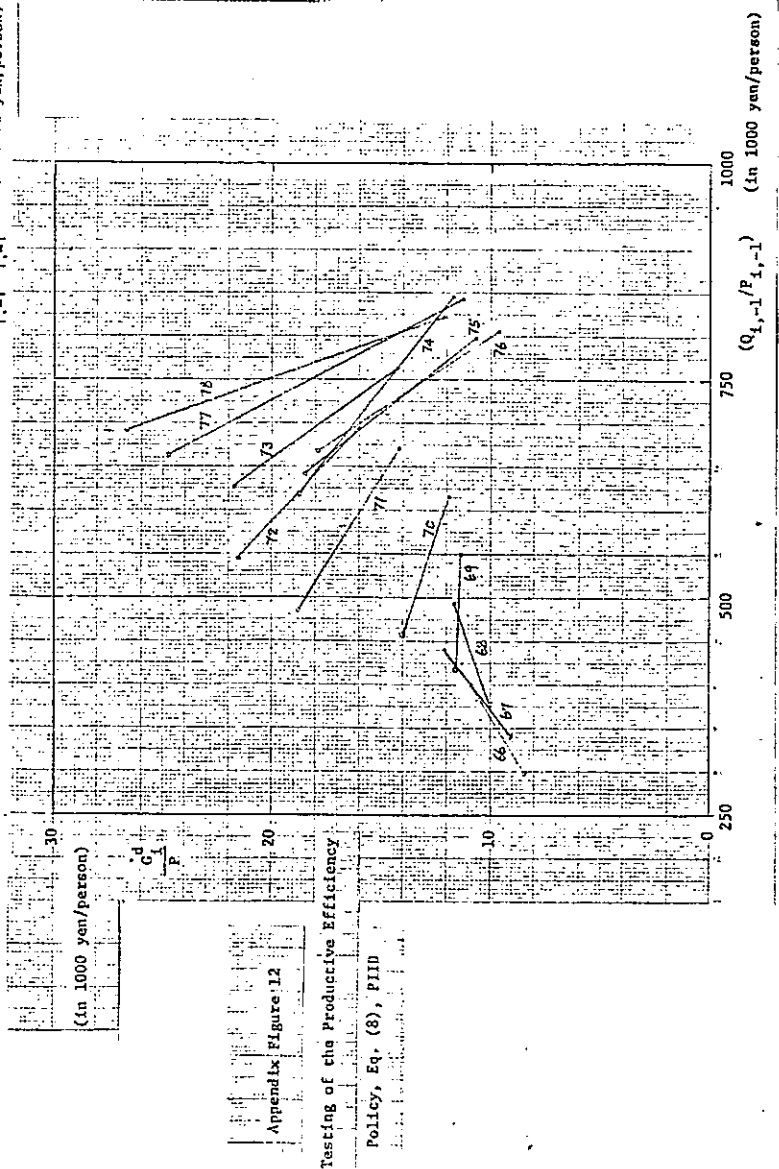
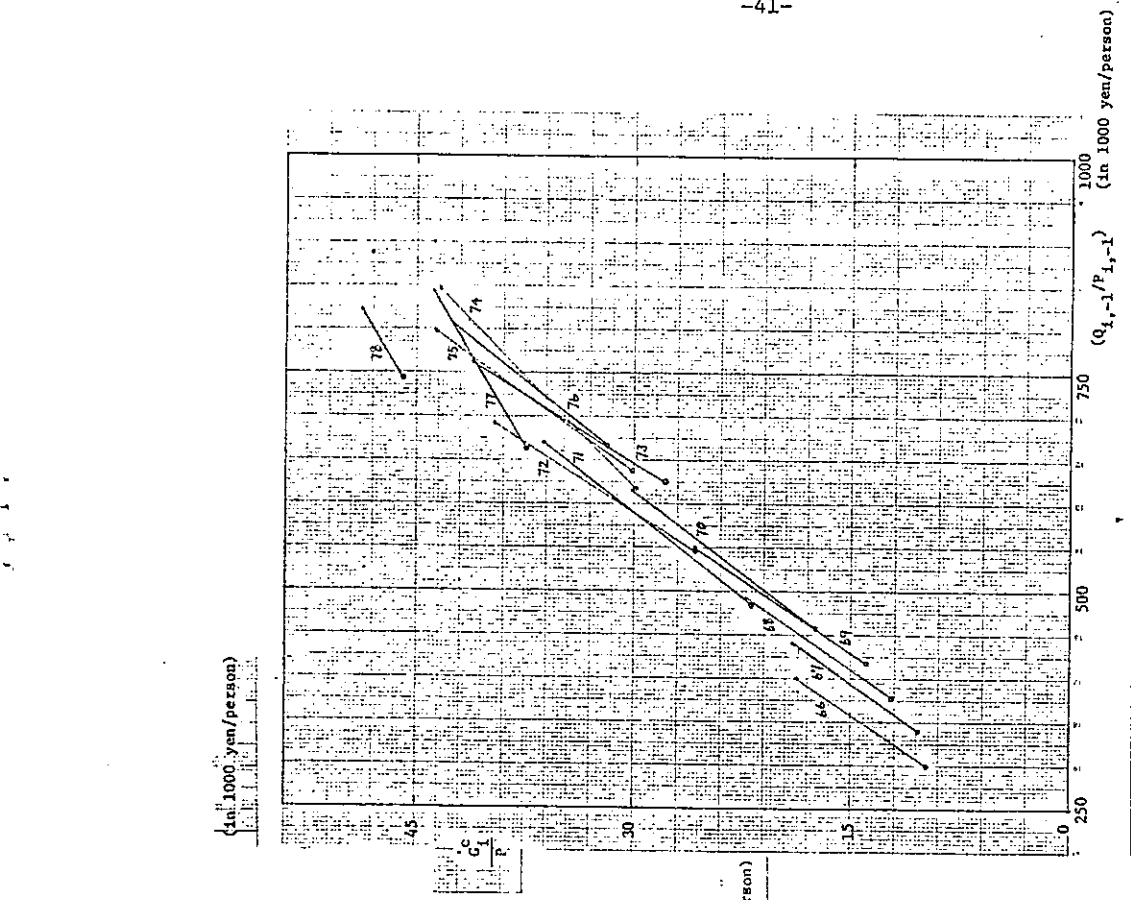
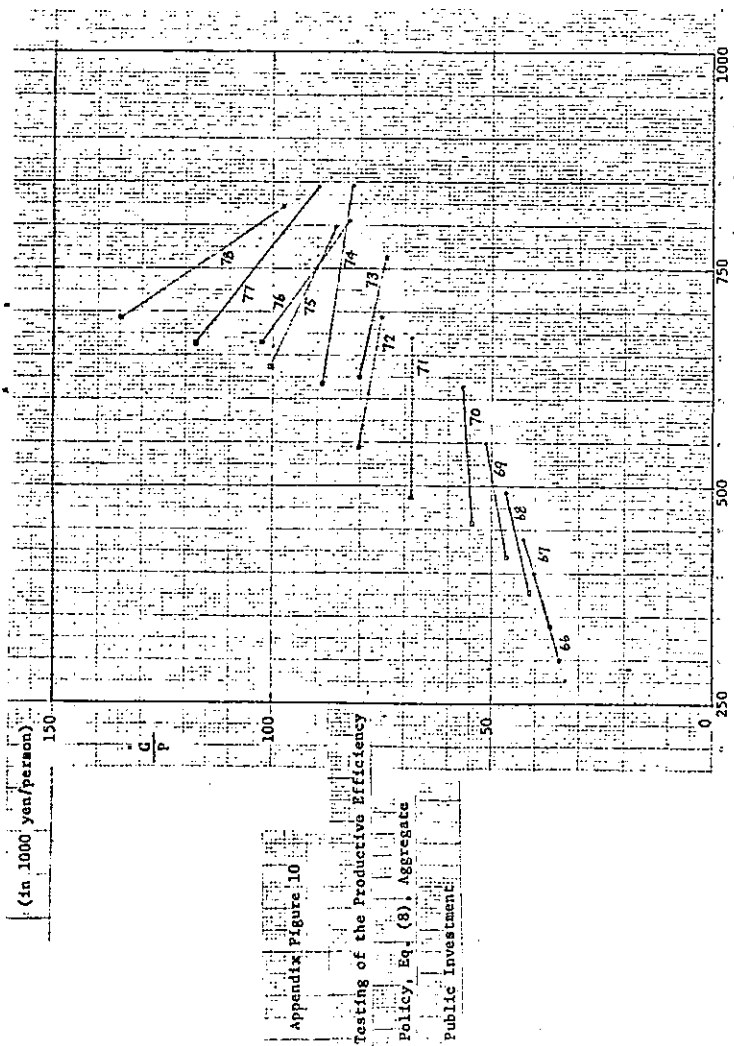


Appendix Figure 8  
Testing of the Productive Efficiency Policy,  
Eq. (7), PICED

Appendix Figure 9

Testing of the Productive Efficiency Policy,  
Eq. (7), PIID





Appendix Figure 11  
Testing of the Productive Efficiency Policy, Eq. (8), PIGED

(in 1000 yen/person)

$(Q_{t-1}/P_{t-1})$

(in 1000 yen/person)

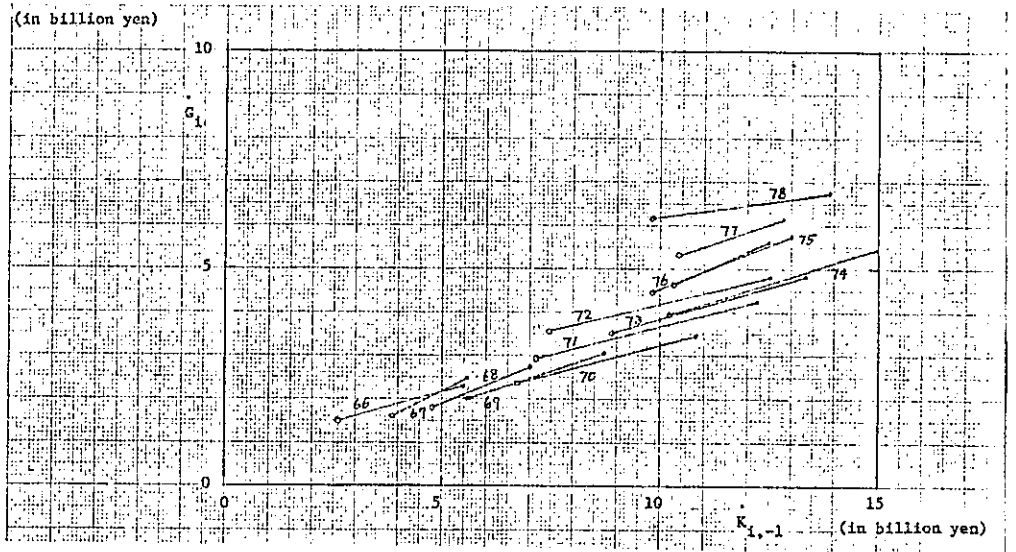
$(Q_{t-1}/P_{t-1})$

(in 1000 yen/person)

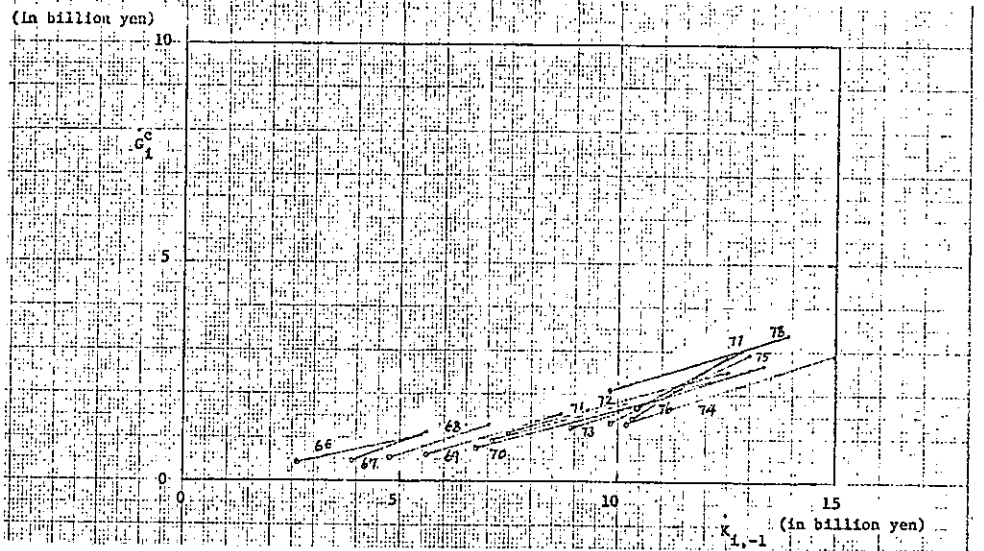
$(Q_{t-1}/P_{t-1})$

(in 1000 yen/person)

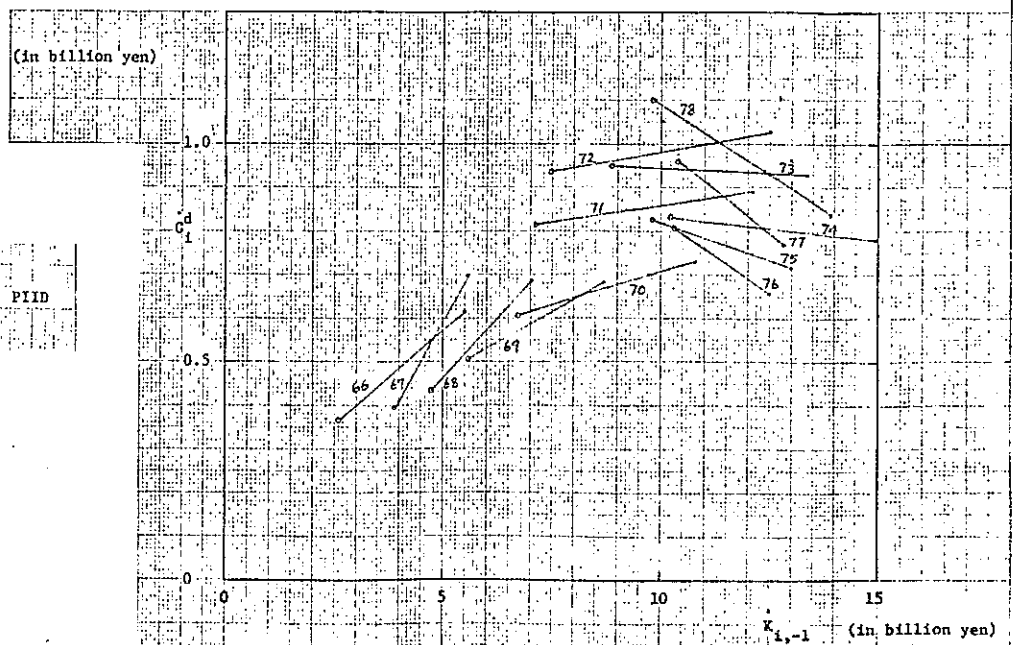
Appendix Figure 13  
Testing of the Catching-up Policy,  
Aggregate Public Investment



Appendix Figure 14  
Testing of the Catching-up Policy, PIGED



Appendix Figure 15  
Testing of the Catching-up Policy, PIID



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