

Trends in the Regional Structure of Manufacturing Industries in Japan

Hirofumi ABE* and Mikio NOGATA**

(Received October 14, 1989)

SYNOPSIS

The rapid economic growth of Japan in the postwar period has brought about the over-concentration of activities in a few large cities, and local regions have been losing their economic vitality due to the regional differentials and the population loss. Regional development planning in Japan has sought to achieve a balanced growth of the nation through the development of industries in local regions. This paper aims to examine the regional structure of manufacturing industries in the postwar period and to identify its current problems. Three methods, namely the analysis of coefficient of variation, the rate-share analysis and the shift-share analysis are applied using employment data of manufacturing industries for the years 1955 to 1985. Findings show that while the employment of manufacturing industries has been markedly decentralized from metropolitan to local regions, the disparities in growth rates still exist among regions.

* Department of Civil Engineering

** Okayama Prefectural Office

1. INTRODUCTION

Regional disparities in terms of income and employment have been major issues of concern in regional development planning in Japan. Various regional policies have been enacted since the First Comprehensive National Development Plan (CNDP) in 1962. The common strategy among them has been the relocation of manufacturing industries from metropolitan to local regions in order to redistribute employment and income in favor of low income regions. As Abe and Alden¹⁾ examined, there was a significant shift of manufacturing employment from metropolitan to local regions during the period 1960-1975, and the regional income disparities declined. However, the industrial structure has been changing rapidly since the First Oil Crisis in 1973, and the strong Japanese currency has damaged resource- and energy-intensive industries. Following these trends regions which have been dependent on the depressed industries are losing their economic vitality.

This paper examines the trends in regional industrial structure using data of manufacturing employment for the years 1955 to 1985. The analysis of coefficient of variation, the rate-share analysis and the shift-share analysis are applied to identify the regional structure of manufacturing industries and its current problems.

2. HISTORICAL REVIEW OF REGIONAL DEVELOPMENT PLANNING AND THE TRENDS IN MANUFACTURING INDUSTRIES

Before going into the analysis, the postwar regional development planning in Japan is reviewed as a background of the current regional industrial structure.

The postwar development of the Japanese economy can be broadly classified into three periods. The first period may be called the 'Period of Economic Recovery', during which Japan built its economy back up to the prewar levels. The second period continued from the mid-1950s to 1973 when the Japanese economy grew very rapidly. The real GNP growth rate often exceeded 10%, and Japan's GNP became the second largest among free nations in 1968. This period is called the 'Period of Rapid Economic Growth'. In 1974, Japan's GNP growth rate fell to a negative position because of the First Oil Crisis. The economic growth rate has subsequently changed to the modest but stable one since 1975, and the period from 1974 is often referred to

as the 'Period of Stabilized Growth'. As shown in Fig.1, the structure of manufacturing industries has changed markedly in the postwar period, and the main issues of regional development planning varied according to the changes in the industrial structure. Table 1 shows the outline of the postwar planning practice in Japan.

2.1 Period of Economic Recovery (1945 to mid 1950s)

When World War II ended, Japan lost 46% of the pre-war territory and 25% of the national wealth, and the industrial production was at about 30% of the prewar level. Reflecting these severe circumstances, the major planning issues during the Period of Economic Recovery were the achievement of economic independence, the development of natural resources and the disaster prevention.

The Japanese government adopted the 'Priority Production System' in order to achieve the optimum economic growth given its limited natural resources. The system meant, by way of a simple example, using steel to increase the production of coal and coal to increase the production of steel. The Comprehensive National Land Development Act was enacted in 1950, and remains the most fundamental law for regional development planning in Japan. The 1950 Act proposed the framework of regional development plans, which comprised a comprehensive national development plan, comprehensive regional development plans, comprehensive prefectural development plans, and development plans for special areas.

The outbreak of the Korean War in 1950 and the special procurement by the US Forces provided Japan with an opportunity for economic recovery.

2.2 Period of Rapid Economic Growth (mid 1950s to 1973)

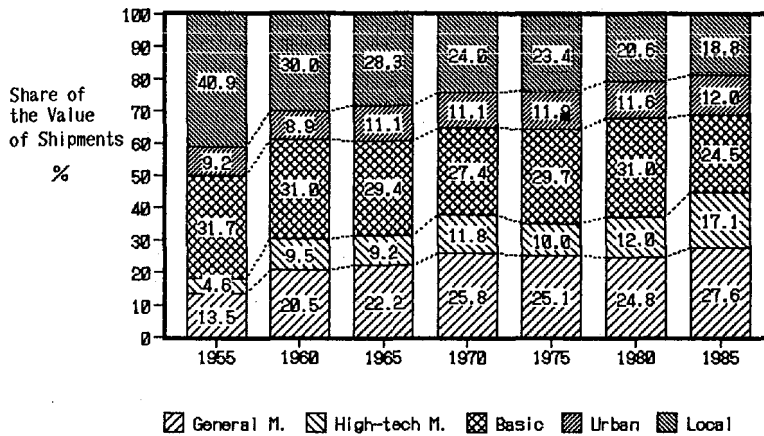
The Japanese economy reached the prewar level by the mid 1950s, and went into the Period of Rapid Economic Growth. Although there were frequent setbacks, the 1960s was a period of continuous growth. As shown in Table 1, five National Economic Plans (NEP) were put forward by 1970, but they were all short-lived because of the rapid growth of Japanese economy in 1960s, whereby planned GNP growth targets were often exceeded.

Two serious regional problems emerged during the Period of Rapid Economic Growth, namely the over-concentration of activities in large cities and the regional income differentials. The concentration of population, employment and income in three metropolitan areas (Tokyo,

Table 1 Postwar regional economic policies on industrial location in Japan

Period	Issues on regional Planning	Major planning practice	Legislation on regional planning
Period of Economic Recovery (1945 - mid 1950s)	Devastation of land due to war (1) Increase in food production (2) Exploitation of resources (3) Reconstruction of land (1) Onshore industrial park construction (2) Development of heavy and chemical industries (3) Concentration of plant facilities in 4 large industrial areas	1955 First National Economic Plan (Five-year Economic Self-support Plan)	1950 Hokkaido Development Act Comprehensive National Land Development Act
		1956 2nd NEP (New Long-range Economic Plan)	1952 Company Rationalization Promotion Act 1956 National Capital Region Development Act Act for Construction of Arterial Highway for National Development Act for Promoting Development of Tohoku Region
Period of Rapid Economic Growth (mid 1950s - 1973)	Emergence of regional problems (1) Excessive concentration of population in a few large cities (2) Regional differentials (1) Concentration of population and industries in a few large cities (2) Income gaps among regions (1) Concentration of population and industries in a few large cities (2) General gaps among regions (3) Resource limitations (4) Changes in people's valuation	1960 3rd NEP (National Income Doubling Plan)	1958 Act Concerning Development of Suburban Areas and Satellite Towns in the National Capital Region 1959 Act for Promoting Development of Kyushu Region
		1962 First Comprehensive National Development Plan - Growth Pole Development Strategy, Construction of New Industrial Cities and Development of Special Industrial Development Areas	1960 Act for Promoting Development of Shikoku Region Act for Promoting Development of Hokuriku Region
		1965 4th NEP (Medium Term Economic Plan)	Act for Promoting Development of Chugoku Region
		1967 5th NEP (Economic and Social Development Plan)	1961 Act for Promoting Industrial Development of Undeveloped Regions
Period of Stabilized Economic Growth (1973 - mid 1980s)		1969 2nd CNDP - Construction of nationwide transportation and communication network and large scale development projects	1962 Act for Promoting Construction of New Industrial Cities 1963 Kinki Region Development Act
		1970 6th NEP (New Economic and Social Development Plan)	1964 Act for promoting Development of Special Industrial Development Areas Act Concerning the Development of Suburban Development Areas in the Kinki Region
		1973 7th NEP (Basic Economic and Social Plan)	Act Concerning the Restriction on Factories etc. in the Existing Urban Areas of the Kinki Region
Present Period (mid 1980s -)	(1) Concentration of political and economic functions in Tokyo (2) Shift of industrial structure to software and service industries	1976 8th NEP (Economic Plan for the Latter Half of the 1970s)	1966 Chubu Region Development Act
		1977 3rd CNDP - Integrated residence strategy	1967 Act Concerning Redevelopment etc. of City Redevelopment Areas, City Development Areas and Conservation Areas in the Chubu Region
		1979 9th NEP (New Seven-year Economic and Social Plan)	Basic Act on Environmental Pollution 1970 Act for the Construction of National Shinkansen Railways
		1983 10th NEP (Economic and Social Guidelines for the 1980s)	1971 Act for Promoting Industrial Location in Agricultural Villages Special Measures Act for Promoting Development of Okinawa
		1987 4th CNDP - Formation of the multi-polar pattern of national land use by the integrated interaction policy	1972 Industrial Relocation Promotion Act 1973 Factory Location Act 1974 National Land Utilization Act 1983 Act for Promoting Development of High Technology Industrial Complexes (Technopolis Act)

Source: Compiled from Industrial Location and Environmental Protection Bureau, Ministry of International Trade and Industry, Regional Economic Policies in Japan (1988).²⁾



Note: The classification of industries is shown in Table 3.

Fig.1 Share of the value of shipments by industry for 1955-1985

Osaka and Nagoya) reached approximately 50% of Japan's total by the end of the Rapid Economic Growth Period. The extent of regional income differentials in Japan reached their highest level in 1962, which is the middle of the period of Rapid growth, and led to huge migration from local to metropolitan regions.

The National Economic Plans by 1960 emphasized the achievement of high economic growth and full employment. After 1960, however, the goals of NEPs were substituted by those which referred to the balanced growth of economy and society, which reflected the growing regional differentials. Prior to the first Comprehensive National Development Plan (CNDP), the third NEP, which was named 'National Income Doubling Plan', was published in 1960. Although the third NEP stressed the reduction of regional disparities in its goals, it proposed the further reinforcement of existing industrial areas in order to achieve high economic growth. The first CNDP was intended to supplement the third NEP by promoting the industrial development in local regions. The development strategy in the first CNDP was called the Growth Pole Strategy, under which 15 New Industrial Towns and six Industrial Development Special Areas were designated in order to decentralize industries from large cities to designated areas. Most of the designated areas were located in the coastal areas, which reflected the dominance of heavy and petro-chemical industries at this time.

Despite the dispersal measures taken in the first CNDP, the concentration of activities in metropolitan regions continued, and

led to the reconsideration of the first CNDP. The second CNDP was published in 1969. Its major strategies were the construction of a nationwide transportation network of Shinkansen railway systems and highways, together with large scale industrial development projects. In addition to the CNDPs in the 1960s, various acts for industrial relocation schemes were enacted to promote the relocation of manufacturing factories from metropolitan regions to local regions. The 1959 and the 1964 Acts prohibited the new location of large factories in the built-up areas of Tokyo and Osaka Metropolitan Areas. A more comprehensive industrial relocation scheme was later established under the Industrial Relocation Act in 1972.

2.3 Period of Stabilized Economic Growth (1973 to mid 1980s)

Two important economic events occurred in the early 1970s which led to the Japanese economy moving into a new phase. The first was USA's New Economic Program of 1971, which led to the Japanese Yen being revalued by 28% and then being placed on a floating exchange rate system in 1973. The second event was the First Oil Crisis in 1973, when the oil price was increased fourfold. These events had particularly important effects on the Japanese economy, because Japanese industries were heavily dependent on foreign trade. The heavy petro-chemical industries, which grew rapidly with cheap Arabian Oil in the 1960s, particularly suffered. The economic depression followed by the First Oil Crisis significantly changed people's view of the regions. Limits of the rapid economic growth were recognized by people, and local regions became more attractive than metropolitan regions.

The third CNDP was published in 1977 under these new economic and social circumstances. The decentralization of population and industries from large cities to local regions was still a major goal of the plan, although strong emphasis was placed on the enhancement of cultural and historical attributes of each region. The third CNDP proposed the settlement area scheme instead of the industrial development-oriented strategies in the first and the second CNDPs. It aimed to promote the settlement of population and industries by enhancing the living conditions in each region.

2.4 Present period (mid 1980s -)

The Oil Crises prompted the transition of the industrial

structure to one based largely on high technology industries, as shown in Fig.1. The High Technology Industrial Complex Development Act of 1983 aimed to create the growth points for the high technology industries. Development schemes are currently proceeding in 21 approved areas. Japanese economy recovered from the depression after the Oil Crises through the rapid changes in industrial structure. The strong Japanese currency and the growing overseas investment of Japanese companies are rapidly internationalizing the Japanese economy, and Tokyo is now one of the most important international money markets in the world. However, this trend has caused another over-concentration of economic activities in Tokyo Metropolitan Area, and regional differentials have been gradually growing again. The fourth CNDP was put forward in 1987. It stresses the decentralization of political and economic functions from Tokyo to the other regions and has proposed the multi-polar pattern of national land use.

3. METHODS OF THE ANALYSIS

Three different methods are applied to examine the regional structure of manufacturing industries. The first method, the 'analysis of coefficient of variation' is used to capture nation-wide regional disparities of manufacturing industries. The second method, the 'rate-share analysis' examines the trends in the specialization of regions in manufacturing industries. Two indices, namely the regional index and the expansion index, are calculated to identify the industrial structure. The final method, the 'shift-share analysis' has been extensively used in regional analysis. The technique divide a region's employment growth into three components; the national growth component, the proportionality shift component and the differential shift component. Region's growth performance is examined by comparing these components.

3.1 The analysis of coefficient of variation

The coefficient of variation is defined as the standard deviation of data divided by their mean. Let E_{ij} represents employment of industry j in region i , then the coefficient of variation for industry j , V_j is defined by the following equation.

$$V_j = \left(\sum_i (E_{ij} - E_j)^2 / N \right)^{1/2} / E_j \quad (1)$$

where,

- V_j : coefficient of variation for industry i
- E_{ij} : employment of industry j in region i
- E_j : mean of employment in industry j for all regions
- N : the number of regions

The coefficient of variation can be used to compare the variances of data sets which have different means. The smaller value of coefficient represents the less disparities among regions.

3.2 The rate-share analysis

The rate-share analysis was proposed by Takahashi³⁾, incorporating two regional specialization indices; the regional index and the expansion index. The regional index represents the level of specialization of region i in industry j . Formally,

$$S_{ij} = (E_{ij} / \sum_j E_{ij}) / (\sum_i E_{ij} / \sum_{ij} E_{ij}) \quad (2)$$

where,

- S_{ij} : regional index of industry j in region i
- E_{ij} : employment of industry j in region i

Regional index indicates the share of industry j in region i as ratio of its national average. If the index exceeds 1.0, region i is more specialized in industry j than the national average.

The expansion index represents growth or decline of regional index during the base year (year 0) to year t . The index is defined by equation (3).

$$R_{ij} = ((E_{ij}^t / E_{ij}^0) / (\sum_j E_{ij}^t / \sum_j E_{ij}^0)) / ((\sum_i E_{ij}^t / \sum_i E_{ij}^0) / (\sum_{ij} E_{ij}^t / \sum_{ij} E_{ij}^0)) \quad (3)$$

The expansion index is the ratio of regional indices for years 0 and t . If R_{ij} exceeds 1.0, region i is specializing in industry j more rapidly than the national average.

Regions are classified into the following four categories by using two indices.

- (a) Type 1 : $S_{ij} < 1.0$ and $R_{ij} < 1.0$
 Region i is not specialized in industry j ,
 and the level of specialization is declining.
- (b) Type 2 : $S_{ij} < 1.0$ and $R_{ij} > 1.0$
 Region i is not specialized in industry j ,
 but the level of specialization is growing.
- (c) Type 3 : $S_{ij} > 1.0$ and $R_{ij} < 1.0$
 Region i is specialized in industry j ,
 but the level of specialization is declining.
- (d) Type 4 : $S_{ij} > 1.0$ and $R_{ij} > 1.0$
 Region i is specialized in industry j ,
 and the level of specialization is growing.

3.3 The shift-share analysis

The shift-share analysis was proposed by Dann⁴⁾, and has been extensively used to examine regional employment growth.⁵⁾⁶⁾ This technique attempts to disaggregate a region's employment growth rate into three components; the national growth component, the proportionality shift component and the differential shift component. Before explaining each component, the following growth rates are defined.

- (a) Regional growth rate (G_i):

$$G_i = \left(\sum_j E_{ij}^t - \sum_j E_{ij}^0 \right) / \sum_j E_{ij}^0 \quad (4)$$

where,

E_{ij} : employment of industry j in region i
 $0, t$: base year and a subsequent year

- (b) National growth rate (G_n):

$$G_n = \left(\sum_i \sum_j E_{ij}^t - \sum_i \sum_j E_{ij}^0 \right) / \sum_i \sum_j E_{ij}^0 \quad (5)$$

- (c) Regional growth rate at national growth rates per industry (G_{in}):

$$G_{in} = \left(\sum_j (E_{ij}^0 * \left(\frac{\sum_i \sum_j E_{ij}^t}{\sum_i \sum_j E_{ij}^0} \right)) - \sum_j E_{ij}^0 \right) / \sum_j E_{ij}^0 \quad (6)$$

G_{in} is the growth rate that would have occurred in the region,

if each industry had grown at the same rate as the corresponding national industry during the same period.

Referring the above growth rates, regional growth rate G_i can be divided into three separate components.

$$\begin{aligned} G_i &= G_n + (G_{in} - G_n) + (G_i - G_{in}) \\ &= N_i + P_i + D_i \end{aligned} \quad (7)$$

The first element N_i is the national growth component, which is equivalent to the national growth rate of industry i . The second element P_i is the proportionality shift component, which estimates the influences of region's industry mix. If a region contains industries which grow fast at national level, the component would be positive, since G_{in} exceeds G_n in that case. If the region possesses many declining industries, the element would be negative. The third element D_i is the differential shift component. It measures the extent to which industries in the region grow at a different rate than they do nation-wide. Thus, if the region has specific factors which attract industries, the element would be positive.

The shift-share analysis provide us with a starting point to examine the region's growth performance.

4. STUDY AREA AND DATA FOR THE ANALYSIS

Data for the study come from the Census of Manufacturers during the years 1955 to 1985. The employment data for 46 prefectures and 20 manufacturing industries in the intermediate industry group of the Japan Standard Industrial Classification (JSIC) are collected. However, each of the three analyses in the previous section is applied at different aggregation of industries and regions to avoid the redundancy of results.

The analysis of coefficient of variation uses data by prefecture and industry of the intermediate industry group. The rate-share analysis is applied using data for 46 prefectures and 5 industries in Table 3. The shift-share analysis uses data for 5 industries and 14 regions which are shown in Fig.2 and Table 2.

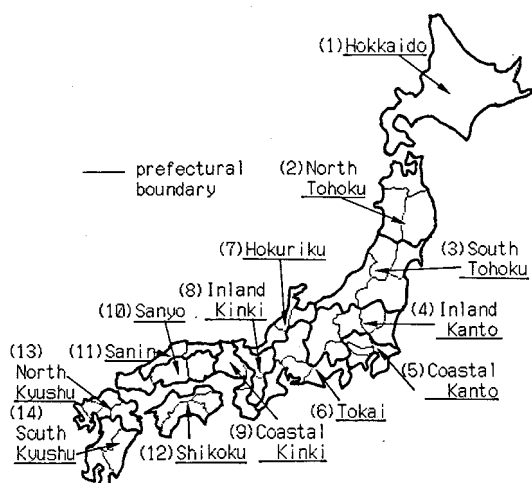


Fig.2 Locations of 14 regions

Table 2 Relationships between 14 regions and 46 prefectures

Region	Prefecture
(1) Hokkaido	Hokkaido
(2) North Tohoku	Aomori, Iwate, Akita
(3) South Tohoku	Miyagi, Yamagata, Fukushima, Niigata
(4) Inland Kanto	Ibaraki, Tochigi, Gunma, Yamanashi, Nagano
(5) Coastal Kanto	Saitama, Chiba, Tokyo, Kanagawa
(6) Tokai	Gifu, Shizuoka, Aichi, Mie
(7) Hokuriku	Toyama, Ishikawa, Fukui
(8) Inland Kinki	Shiga, Kyoto, Nara
(9) Coastal Kinki	Osaka, Hyogo, Wakayama
(10) Sanyo	Tottori, Shimane
(11) Sanin	Okayama, Hiroshima, Yamaguchi
(12) Shikoku	Tokushima, Kagawa, Ehime, Kochi
(13) North Kyushu	Fukuoka, Saga, Nagasaki, Oita
(14) South Kyushu	Kumamoto, Miyazaki, Kagoshima

Table 3. Classification of Manufacturing Industries

Coarse classification for the study	Industrial classification of the Japan Standard Industrial Classification
(a) General Machinery (General M.)	(15) Fabricated metal products (16) Ordinary machinery (18) Transport equipment
(b) High-tech Machinery (High-tech M.)	(17) Electric machinery, equipment and supplies (19) Precision instruments
(c) Urban consumer oriented industries (Urban)	(3) Apparel and related products (5) Furniture and fixtures (7) Publishing, printing and allied products (10) Rubber products (11) Tanned leather and leather products (20) Other
(d) Local resource oriented industries (Local)	(1) Food and kindred products (2) Textiles (4) Lumber and wood products (12) Ceramic, stone and clay products
(e) Basic resource oriented industries (Basic)	(6) Pulp, paper and allied products (8) Chemicals and allied products (9) Petroleum and coal products (13) Iron and steel (14) Non-ferrous metal and products

5. RESULTS OF THE ANALYSIS

5.1 The analysis of coefficient of variation

Figures 3 to 6 show the coefficient of variation by industry of intermediate industry group for the years 1955 to 1985. Fig.7 is a summary figure which shows the change in the coefficient by industry. Manufacturing industries except the transport machinery show decreases in the coefficients, which indicate that the concentration of employment in certain regions had been relaxed during the period 1955 to 1985. Marked decentralization is found in industries of the general machinery, the high-tech machinery and the urban consumer oriented industries. Decentralization of the local resource oriented industries and the basic resource oriented industries is not so clear as that of the other industries.

5.2 The rate-share analysis

Figures 8 to 12 show the classification of prefectures into four types of specialization, which are described in the previous section. Marked decentralization is found in Fig.9, where the type 4 prefectures in the high-tech machinery industries had moved from Kanto region to Tohoku region. The general machinery industries also showed decentralization. However, prefectures of type 4 were limited in Tokai and Kanto regions.

In Fig.11, most prefectures changed their types from 4 to 3 during the period 1955 to 1985, which indicate the rapid decline in the local resource oriented industries. However, local regions, such as Hokkaido, Shikoku and South Kyushu, were still specialized in the local resource oriented industries, and the level of specialization had been growing.

Prefectures of type 4 in the resource oriented industries were located in Kanto, Tokai, Kinki, Sanyo and North Kyushu, which are often referred to as the Pacific Belt Region. The heavy and petro-chemical industrial complexes were built in these regions during the Period of Rapid Economic Growth. They suffered severe damage in the Oil Crises.

The results of the rate-share analysis show the remarkable specialization of Tohoku region in the high-tech machinery industries. Rapid transportation systems, such as the Tohoku Highway and the Tohoku Shinkansen Railway were constructed in Tohoku region in 1970s. The improvement of accessibility to Tokyo Metropolitan Area

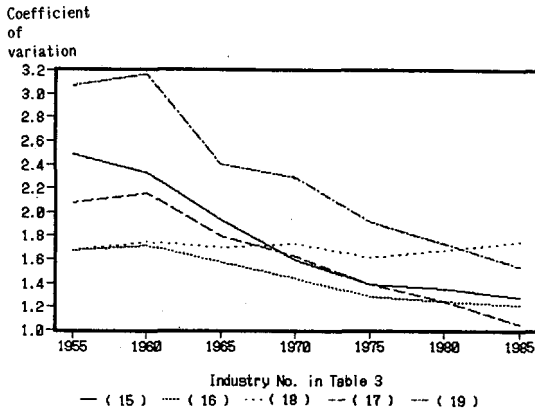


Fig.3 Coefficients of variation of general machinery and high-tech machinery for 1955-1985

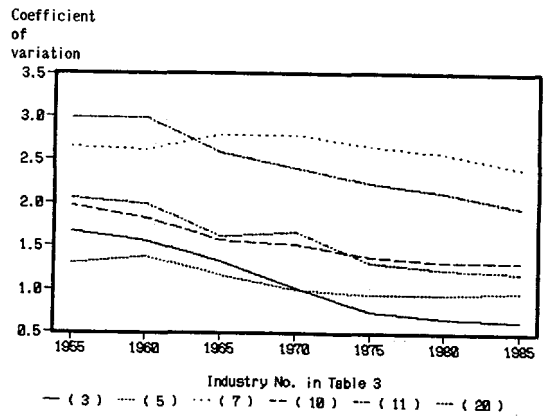


Fig.4 Coefficients of variation of urban consumer oriented industries for 1955-1985

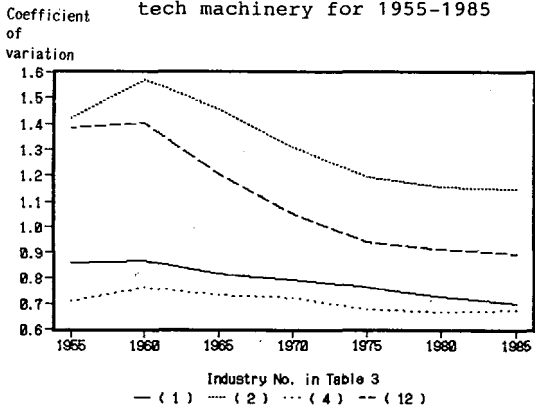


Fig.5 Coefficients of variation of local resource oriented industries for 1955-1985

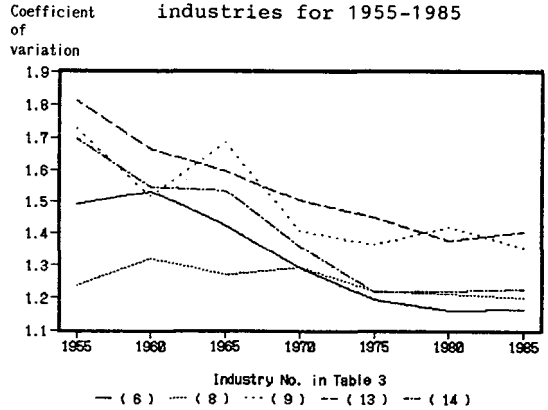


Fig.6 Coefficients of variation of basic resource oriented industries for 1955-1985

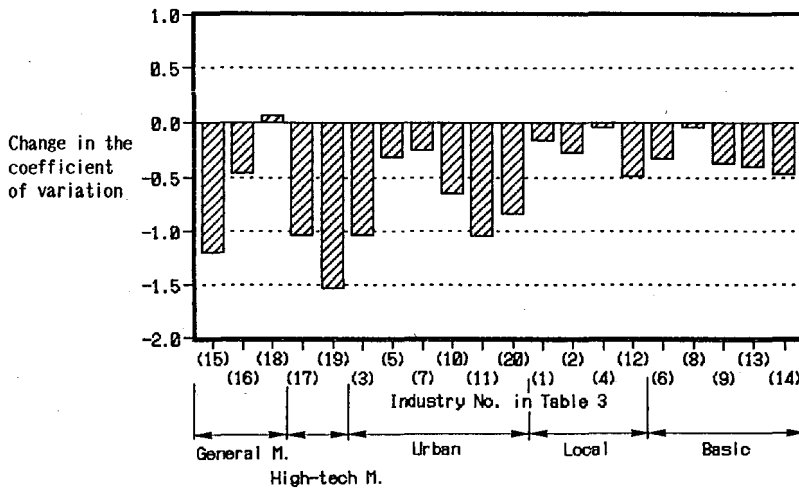


Fig.7 Changes in the coefficient of variation by industry for 1955-1985

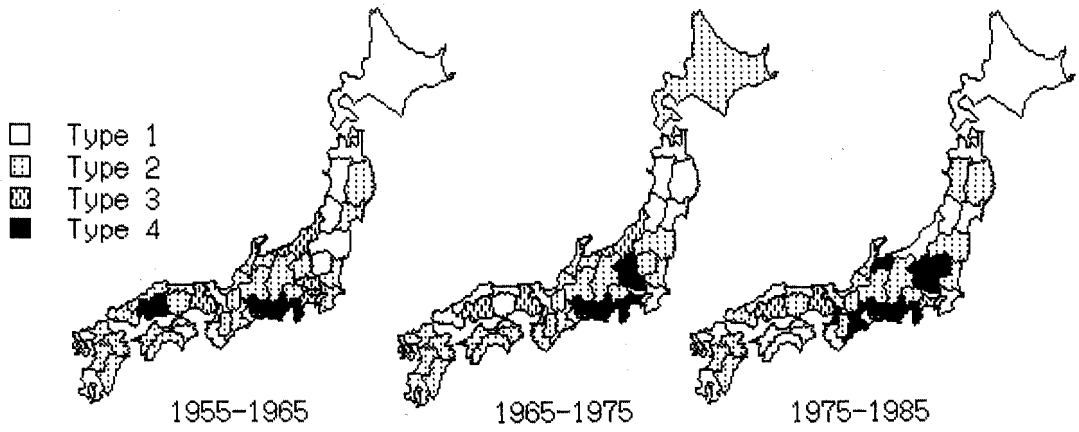


Fig.8 Type of specialization in general machinery by prefecture

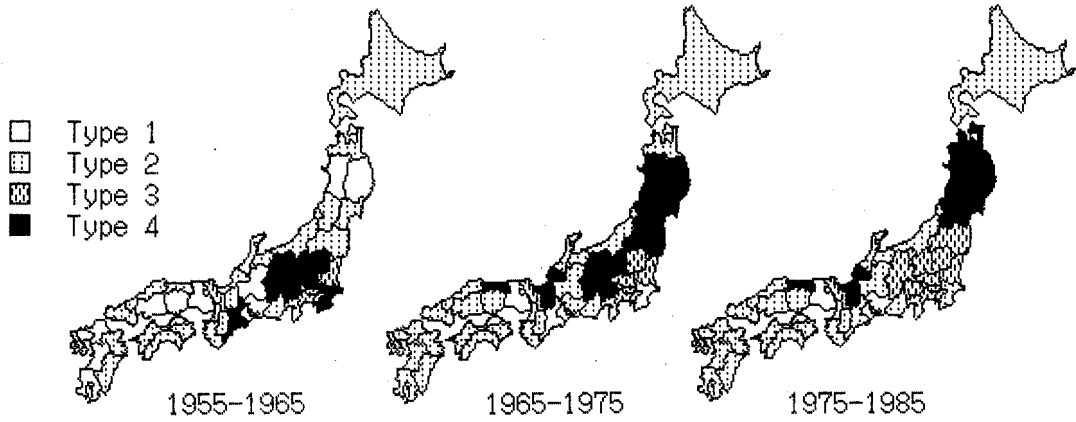


Fig.9 Type of specialization in high-tech machinery by prefecture

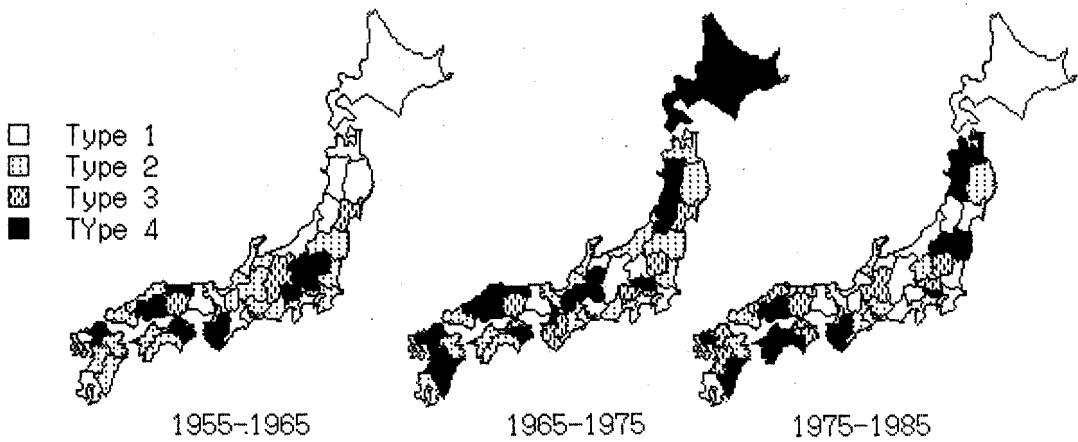


Fig.10 Type of specialization in urban consumer oriented industries by prefecture

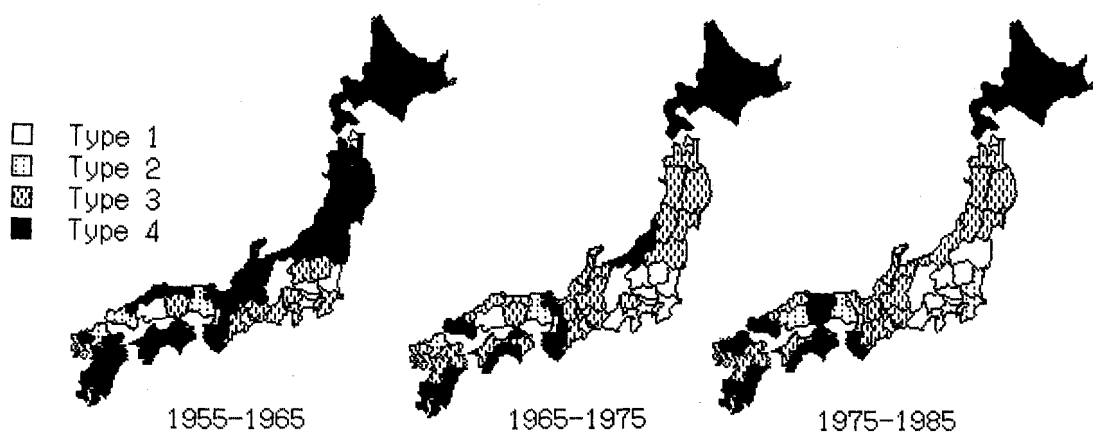


Fig.11 Type of specialization in local resource oriented industries by prefecture

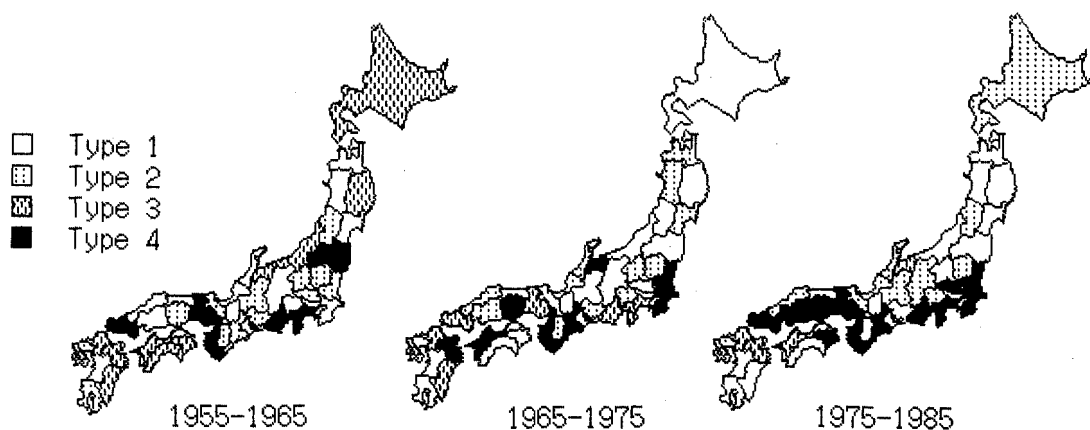


Fig.12 Type of specialization in basic resource oriented industries by prefecture

has promoted the location of machinery industries.

5.3 The shift-share analysis

Fig.13 shows the growth rate of manufacturing employment by region for the periods 1960-1965, 1970-1975 and 1980-1985. All regions showed the growth rates of more than 10% in the period 1960-1965, which is the middle of the Rapid Economic Growth Period. After 1970, however, large differences are found in the growth rates among regions. The growth rates of North Tohoku, South Tohoku, Inland Kanto, Sanin and South Kyushu were high in the periods 1970-1975 and 1980-1985, whereas those of the other regions remained low levels. Most of the growing regions had been specialized in the high-tech machinery industries, as shown in the rate-share analysis. The

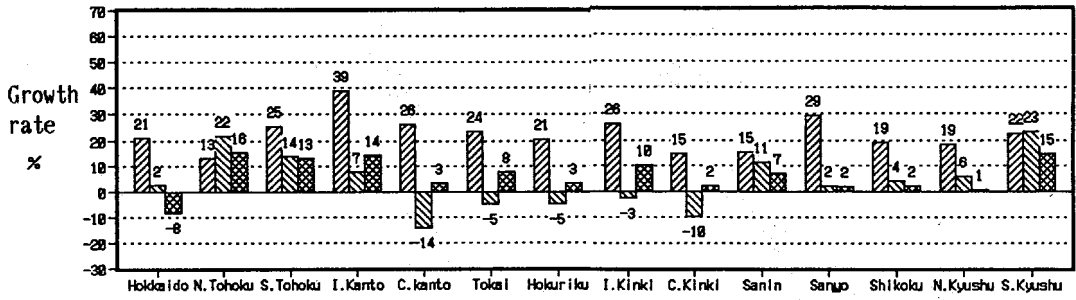


Fig.13 Growth rate of employment by region for periods 1960-65, 1970-75 and 1980-85

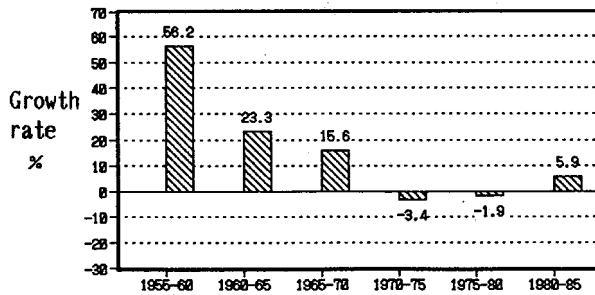


Fig.14 National growth component for 1955-1985

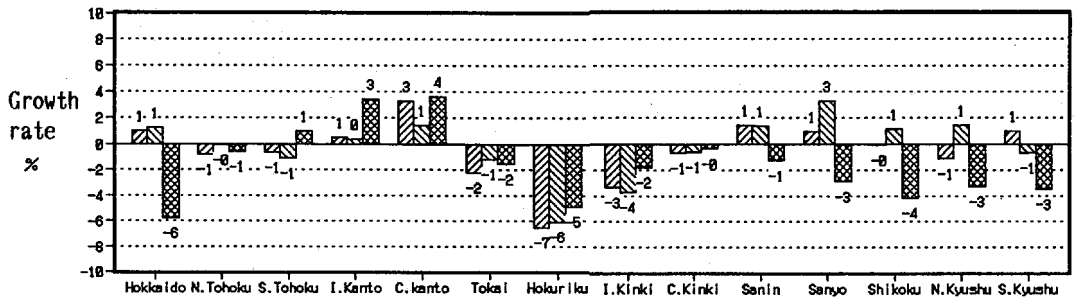


Fig.15 Proportionality shift component by region for periods 1960-65, 1970-75 and 1980-85

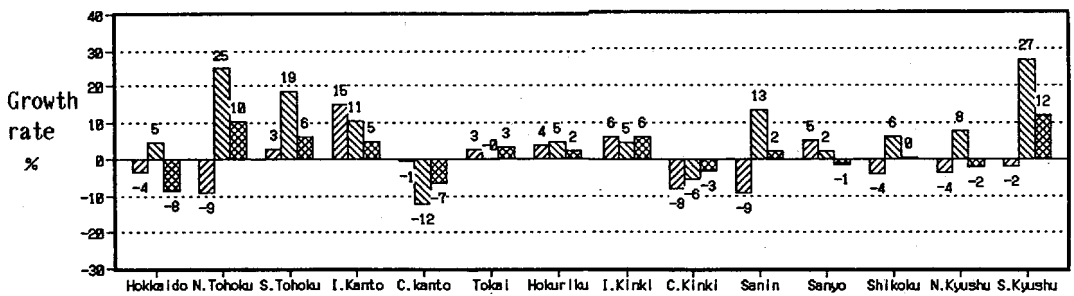


Fig.16 Differential shift component by region for periods 1960-65, 1970-75 and 1980-85

transition of industrial structure to high-tech machinery industries seems to be a major factor of employment growth.

The employment growth rate in Fig.13 are disaggregated into the three components, namely the national growth component, the proportionality shift component and the differential shift component, by applying the shift-share analysis. The results are shown in Figures 14 to 16.

As already described, the national growth component in Fig.14 is equal to the national growth rate of manufacturing industries. The growth rates for 1970 to 1985 show a remarkable contrast with those for 1955 to 1970. Japanese manufacturing industries suffered damage in the First Oil Crisis in 1973, and the employment growth rate fell down.

The proportionality shift component in Fig.15 represents the effect of region's industry mix on its employment growth. If the region possesses industries, which grow faster than industries on average growth at the national level, the component would be expected to be positive. A negative component means the reverse. The positive growth rates in Inland Kanto and Coastal Kanto indicate that the regions have favorable industry mixes, whereas the negative rates in Tokai, Hokuriku, Coastal Kinki means that their industry mix do not favor the employment growth. The components turned into negative ones in Hokkaido, Sanin, Sanyo, Shikoku and South Kyushu for the period 1980 to 1985. These regions grew rapidly through the development of heavy and petro-chemical industrial complexes during the Rapid Economic Growth Period. The structural recessions in these industries after the Oil Crises brought about the negative component.

The differential shift component in Fig.16 reflects the effect of region's specific factors on industrial growth. The positive component indicates the region has specific factors which attract industries, and the negative component represents the reverse. Two metropolitan regions, namely Coastal Kanto and Coastal Kinki, showed negative components throughout the periods 1960 to 1985. The restrictive measures for factory location have been enacted in these regions since 1959 and 1964, and the new location of factories has remained low levels. In contrast with the metropolitan regions, North Tohoku, South Tohoku, Inland Kanto and South Kyushu showed large positive components. These trends had been brought about by the rapid concentration of machinery industries which was shown in the rate-share analysis. The provision of transportation systems in these

regions, such as highways, airports and Shinkansen railway systems, seems to be a major factor to attract machinery industries.

6. CONCLUSIONS

The rapid growth of Japanese economy has brought about the concentration of economic activities in a few large cities, and the local regions have been losing their economic vitality due to the regional differentials and the population loss. The regional development planning in Japan has combated with the problems through various industrial location policies.

This paper has examined the trends in the regional structure of manufacturing industries for the years 1955 to 1985. Following a historical review of regional development planning in Japan, regional industrial structure in the periods 1955 to 1985 has examined by applying three methods, namely the analysis of coefficient of variation, the rate-share analysis and the shift-share analysis. Major findings of the analysis are summarized as follows:

(1) All manufacturing industries except the transport machinery showed the decentralization of employment for the years 1955 to 1985. Marked decentralization is found in the general machinery, the high-tech machinery and the urban consumer oriented industries.

(2) High-tech machinery industries had been rapidly concentrating in North Tohoku, South Tohoku and South Kyushu. Despite the recession after the Oil Crises, these regions showed a remarkable employment growth. The provision of transportation systems in these regions, such as highways, airports and the Shinkansen railway systems seems to be a major factor to attract machinery industries.

(3) The shift-share analysis has showed the low growth performance in the regions of the western part of Japan; Coastal Kinki, Sanyo, Shikoku and North Kyushu. These regions had been specialized in the heavy and petro-chemical industries during the Period of Rapid Economic Growth, and suffered much damage in the Oil Crises. In order to vitalize the industries, strong measures would be required in these regions.

REFERENCES

- (1) Abe, H. and Alden, J. (1988) Regional Development Planning in Japan, *Regional Studies*, Vol.22, No.5, pp.429-438.
- (2) Industrial Location and Environmental Protection Bureau, Ministry of International Trade and Industry (1988), *Regional Economic Policies in Japan*, A paper prepared by the MITI.
- (3) Minotani, C. (1985) *Regression Analysis*, Chap.2, Tokyo Tosho Publishing, Tokyo. (in Japanese)
- (4) Dunn, S.E. (1960) A Statistical Analytical Technique for Regional Analysis, *Papers and Proceedings of the Regional Science Association*, Vol.6, pp.97-112.
- (5) Armstrong, H. and Taylor, J. (1985) *Regional Economics and Policy*, Oxford, Philip Allan.
- (6) Schofield, J.A. (1989), *Federal Regional Development Policies in Canada: Employment Impact in Quebec and the Atlantic Provinces*, *Review of Urban and Regional Development Studies*, Vol.1, No.1, pp.65-79.