Part Two

SECTORAL ANALYSIS

Chapter 5

AGRICULTURAL DEVELOPMENT AND ITS POLICY PROBLEMS

I Recent Development of Agriculture in Brazil

1-1 Brazil's Position in World Agriculture

(1) Expansion of Economic Frontiers

Brazil, with a land area of 8,510,000 square kilometers, occupies one half of the South American continent and is equivalent in size to the whole of Oceania. It can be said to be a continent of its own. However, according to United Nations Food and Agricultural Organization (FAO) statistics, the land area used for agriculture is only 16% of the total and the cultivated land ratio (percentage of total land area under cultivation) was only 3.5% in 1960 (Note 1). If evaluated on the basis of the land area producing the main agricultural products (including perennial crops)--during the period from 1960 to 1971, the land used to produce the 15 main types of products increased by 44% (Note 2)--then the present ratio probably now exceeds 4.5% (Note 3). This value is low compared to the average world cultivated land ratio of 11% and is very low in comparison with the 39% average for the developing countries in the Far East. It is also small in respect to the Latin America average of 7% and is less than the cultivation rate of about 6% for Australia where there are large expanses of usable land not under cultivation.

In Japan, the cultivated land ratio is about 15% although the area of uplands and low lands which can be cultivated is only 24% of the total land area (Note 4). Under such conditions, it can be said that Japanese land development is already excessive. In Brazil, flat land of less than 200 meters above sea level accounts for 41% of the total land area (Note 5) and there are no major mountain ranges or deserts to limit human activity. There are many large pampas or grassland areas with pleasant climates several hundred meters above sea level. One of the characteristic points about Brazil is that even though there are regions where civilization has never penetrated, such as the Amazon basin, there remains a clear distinction between the littoral region which has been settled from the sixteenth century and is rather highly developed, and the still undeveloped interior.

According to the FAO Indicative World Plan for Agricultural Development, the land area which can be cultivated in Latin America as a whole is 29% of the total land area and by 1985, 30% of the potential cultivatable land will actually be under cultivation (23% as of 1962) (Note 6). Brazil occupies 41% of the total land area of Latin America and the area of land cultivated in Brazil is 25% of the total land cultivated in Latin America. Therefore, the low cultivated land ratio in Brazil is not due to limits on the utilization of resources but is actually one of the indices showing the high possibility of utilizing resources.

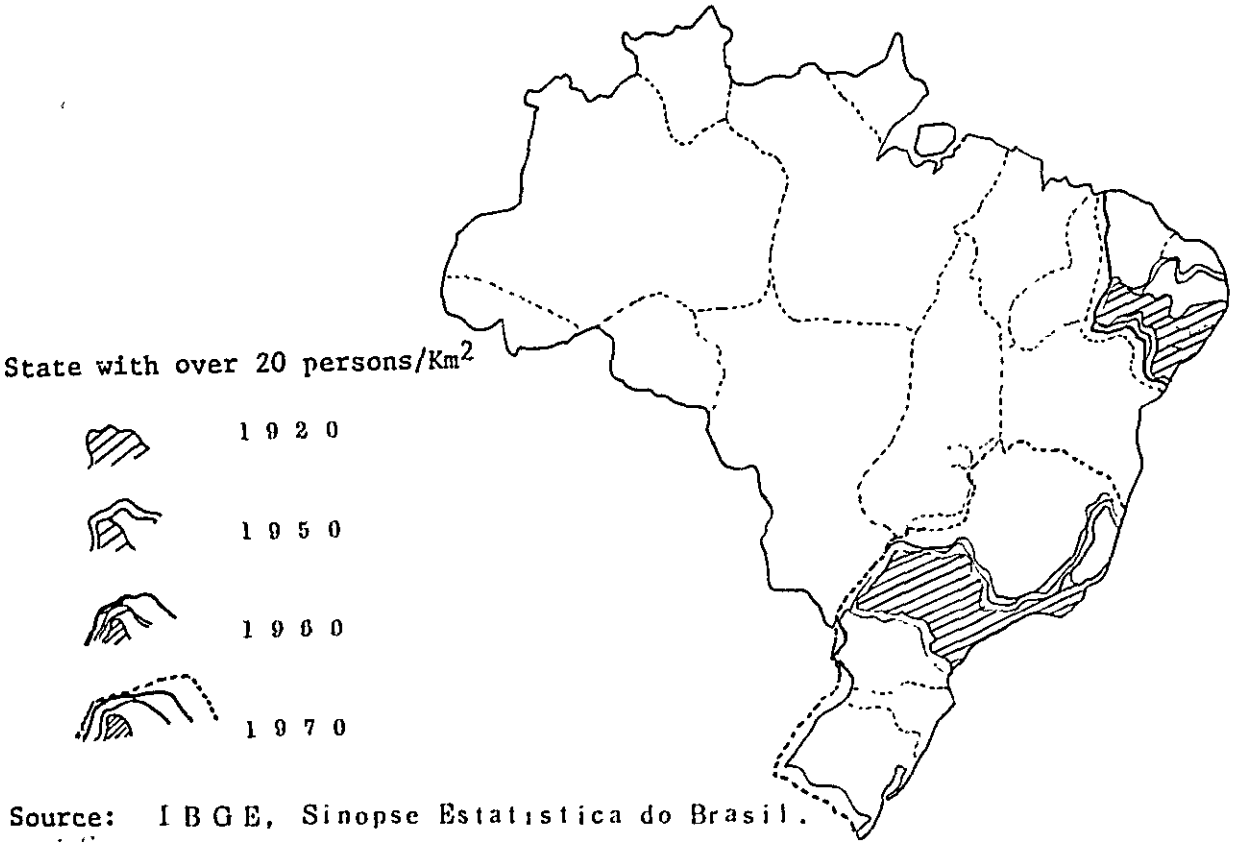
In North America during the nineteenth century, large numbers of immigrants moved to new areas to clear and settle the virgin lands and establish the foundations of the United States which is now economically and politically the world's most powerful nation. The opening of the West,

through the pioneering spirit of voluntary settlers, was promoted by the rapidly increasing population. However, there was nothing equivalent in Brazil to the expansion to the Western frontier in the United States although there were migrations to the southwest of the new coffee line in Sao Paulo and Parana states in the closing years of the nineteenth century as well as some immigration from Europe to the southern part of the country, at about the same time. At the height of the sugar production period for about 100 years from the middle of the sixteenth century, the northeast coastal region of Brazil prospered from the cultivation of sugar cane while the serton, or semi-arid inland region, was an area of ranches and farms which supplied food to the slaves and sugar barons on the coast and there was no prosperity in this "um outro Nordeste." In the boom during the eighteenth century, a beautiful capital city was constructed in Minas Gerais state but the surrounding ranches and small farms remained unchanged and the boom passed. The rubber boom in the lower Amazon region from the end of the nineteenth century absorbed many people, and Manaus and Belem became large cities, but around 1913, this boom died out and only the buildings erected at the height of the prosperity remain today.

These various booms which have occurred in Brazil resulted in migrations to other regions according to the economic conditions at the time and there was almost no spread of the prosperity of the Coast to the interior. According to L. Waibel (Note 7), there were two main factors which hindered voluntary immigration to the interior: most of the land was already privately owned and there was a lack of legal guarantees for the immigrants, insufficient traffic routes for them to use and no stable markets where they could sell their farm produce. Under such conditions, the expansion of the cultivated land can only be attained by promotion of immigration by the federal and state governments and expansion by the "fazendeiro" who own large "fazenda" or farms. However, in the past several years, there has been marked progress in the gradual advance to the interior. Once, the expansion of the world coffee market has resulted in a shift of the coffee front. Today, the economic significance of coffee has decreased somewhat and diversified small and medium farms where grains or vegetables are grown are gradually expanding to the interior. The recent increases in international demand have caused expansion in the production of the non-traditional export commodities and a resulting expansion of the agriculture frontier to the interior.

When food prices increased because of World War I, the economic sector centered around São Paulo and Rio de Janeiro, which had expanded as a result of the growth and development of the coffee market, saw an expansion to the interior which was aided by the remarkable progress in expansion of transport facilities. The construction of Brasilia and the transfer of the capital to the interior in 1960 presented one incentive for a shift westward. Roads were constructed and the air transport network was expanded to cover a wider area than before. However, the Western shift of the economic frontier, i.e. the widening of the economic boundaries in accordance with population movements, actually started during the 1960s. As can be seen in Fig. 5-1 (Note 8), the range of the states with population

Fig. 5-1 Movement of Economic Frontiers



Source: IBGE, Sinopse Estatistica do Brasil.

densities of more than 20 persons per square kilometer is gradually expanding from the developed Coastal regions to the interior. In the 1950s the only states with population densities exceeding 20 persons per square kilometer were Ceará, Rio Grande do Norte and Paraiba in the Northeast and three states in the South. In the 1960s, Minas Gerais was added to this list and there were also very significant population increases in Parana among the above three states in the South as well as in Mato Grosso in the Central west. In 1970, the population density in the Central-west was still only three persons per square kilometer but there has been a definite expansion of the economic frontier to these regions.

(2) Quantitative Expansion of Brazilian Agriculture

In Brazil, where the agricultural utilization of natural resources offers great potential, the economic frontier has started to gradually move toward the interior. The present road system in Brazil is not adequate to support the growth of the economy but the length of paved federal roads has been expanding steadily, from 9,400 km in 1961, to 14,900 km in 1967 and 23,700 km in 1970 (Note 9). This expansion is fostering the shift of the economic frontier toward the interior and the expansion of urban areas is resulting in a simultaneous shift of the agricultural activity toward the interior. The recent increases in international market prices for agricultural products are causing a quantitative expansion in agricultural production in Brazil.

As is discussed in detail elsewhere in this study, agricultural expansion in Brazil and in particular the expansion of cultivated land by the gradual push of the frontier toward the interior is an important factor in sustaining the agricultural growth rate at the 6% level over the past few years. Table 5-1 shows a comparison of the expansion in the planted land area and changes in the production index. The expansion of the planted land area for grains (rice, wheat and maize) which is about half of the total, and changes in the grain production index (Indices do Quantum) are almost parallel which indicates that the increase in production depends mainly on the increase in planted land area.

Table 5-2 shows the increases in planted land area in the various regions of the country. The increases are largely concentrated in the South and Central-west regions which indicates that there is a close relation between the shift in the economic frontier and the expansion of agricultural production.

Interior lands which had not been utilized until comparatively recently are gradually being placed under cultivation especially in the Central-west and South regions, but one characteristic of this trend is that the agricultural production pattern is gradually changing. In the last 10 years (comparing the 1959-61 and 1969-71 averages), the products showing the greatest production increases have been soybeans (7.6 times), wheat (2.8 times), peanuts (2.0 times), bananas (1.9 times), oranges (1.8 times), cassava (1.7 times) and maize (1.6 times). Coffee production has dropped by one half. As can be expected, the main production areas for these items which have shown very large increases are centering around the South, Central-west and Minas Gerais.

Brazil, which occupies 7% of the world land area and 42% of that of Latin America, has only 3.5% of the world land area used for agriculture and 24% of that in Latin America. Regarding the output of the agricultural sector, the Brazilian share of world agricultural production is only 2.6%. This share has not changed over the last 10 years although there have been recent increases in Brazil's agricultural production capacity. The same situation is also found in the relation between agricultural income in Brazil and that in the world as a whole (See Table 5-3). However, the production pattern is changing as was described above so that the production of non-traditional items such as soybeans and maize is increasing and the production of coffee, the mainstay of the Brazilian economy, is decreasing. Therefore, the position of some products in international markets is improving. As can be seen in Table 5-4, soybean production grew from only 0.8% of the world total in 1960 to 3.2% in 1970 and the amount exported rose from 0.8% of the world exports to 2.3%. In the same period, the production of maize increased from 4% to 6% of the world total and the amount exported rose rapidly from 0.1% to 4.8%. There was strong de-emphasis on coffee and as a result the dependence of Brazilian agricultural exports on coffee fell from 75% in 1960 to 58% in 1970. This indicates that, while the share of Brazil in world agricultural trade has been expanding gradually over the last 10 years, the country has come to play a rather important role not only in the world coffee market but also in the beef, grain and other markets.

Table 5-1 Expansion of Production and Planted Land Area (1955 = 100)

	Planted land area	Production indices			
	15 main items	Grains	Average(1)	Grains	Coffee
1961	125.6	118.8	162.5	123.7	238.8
1962	129.0	122.6	148.6	131.4	177.1
1963	135.4	133.7	143.2	133.3	145.0
1964	139.4	139.6	119.1	138.3	57.7
1965	147.4	151.7	184.5	167.3	223.3
1966	141.3	143.9	145.9 (160.8)	143.4	117.1
1967	147.7	154.3	164.5 (158.6)	163.3	146.7
1968	151.4	160.9	154.5 (162.7)	165.3	103.0
1969	156.5	168.1	164.0 (177.7)	169.9	124.9
1970	163.1	179.3	158.7	199.4	73.5
1971	169.9	194.0	--	--	--

Note: (1) The figures in parentheses are indices corrected by data of the Ministerio da Agricultura. These series are considered to be near to actual conditions.

Source: Conjuntura Econômica, vol. 26, Nov., 1971; Fundacao IBGE, "Anuário Estatistico do Brasil," 1971.

Table 5-2 Expansion of Planted Land Area by Region

(Unit: 1,000 ha)

	North	North-east	South-east	South	Central-west	Entire nation
1965						
Planted land area	331	9,171	10,861	9,368	2,204	31,935
Grain cultivation only	146	2,428	4,920	5,058	1,690	14,242
1970						
Planted land area	360	9,725	10,315	12,331	2,596	35,328
Grain cultivation only	170	2,463	5,044	7,117	2,017	16,811
Area increase (1965-70)						
Planted land area	(0.9) 29	(16.3) 554	(Δ 16.1) Δ546	(87.3) 2,963	(11.6) 392	(100.0) 3,393
Grain cultivation only	(0.9) 24	(1.4) 35	(4.8) 124	(80.2) 2,059	(12.7) 327	(100.0) 2,569

Note: Figures in parentheses indicate regional shares in cultivation increases.

Source: Fundacão IBGE, "Anuário Estatístico do Brasil."

Table 5-3 Agriculture in Brazil and the World

		Gross domestic product (billion dollars)	Agricultural income (billion dollars)	Population (million persons)	Land area (million hectares)	Agricultural production(2) (million wheat equivalents)	Agricultural population (million persons)	Land used for agriculture (million hectares)	Agricultural exports (million dollars)
1960									
World(1)	A	1,456.4	262.2	2,353.8	12,435	1,942.8	499.8	3,691	25,685
Brazil	B	14.4	2.6	65.7	851	50.4	11.7	127	1,122
Japan		43.1	5.6	93.2	37	33.9	14.5	7	467
B/A (%)		1.0	1.0	2.8	6.8	2.6	2.3	3.4	3.9
1970									
World(1)	A	3,351.9	435.7	2,872.5	12,435	2,476.5	516.8	4,204	34,745
Brazil	B	34.5	4.8	93.6	851	64.0	12.6	145	1,972
Japan		197.6	17.8	103.5	37	46.5	10.8	6	662
B/A (%)		1.0	1.1	3.3	6.8	2.6	2.4	3.5	5.7

Notes: (1) Excluding Asian countries with centrally planned economies.
(2) Value according to the relative value of agricultural products in each region taking the average for wheat for 1961-65 as 1.

Source: UN, "Statistical Yearbook;" FAO, "Production Yearbook;" FAO, "Trade Yearbook."

Table 5-4 Level of Main Brazilian Agricultural Products in the World Market

	Production (1,000 tons)	Percentage of total world production (%)	Exports (1,000 tons)	Percentage of total world exports (%)
1960				
Coffee	2,085	49.0	1,009	38.0
Beef	1,359	4.9	6	0.6
Sugar	56,927*	13.2	769	4.5
Cotton	536	4.9	95	2.4
Soybeans	206	0.8	42	0.8
Cassava	17,617	22.5	--	--
Maize	8,672	4.0	10	0.1
Wheat	713	0.3	--	--
1970				
Coffee	882	22.2	963	29.3
Beef	1,720	4.3	98	5.0
Sugar	75,247*	12.9	1,126	5.1
Cotton	672	5.7	343	8.6
Soybeans	1,500	3.2	290	2.3
Cassava	30,074	33.1	--	--
Maize	16,000	6.0	1,471	4.8
Wheat	1,800	0.6	--	--

Note: * Sugar cane.
Source: FAO, "Production Yearbook;" FAO, "Trade Yearbook."

1-2 Role of Agriculture in the Brazilian Economy

(1) Production Expansion and Productivity Improvement

The real growth rate of Brazilian agriculture increased from 3.5% in the early 1960s to 5.9% in the late 1960s, with an especially high rate of 7.4% from 1968. The expansion in the amount of agricultural exports also increased rapidly from 4.0% in the early 1960s to 7.1% in the late 1960s, with the high rate of 9.0% from 1968 (See Table 5-5). To explain these growth rates, it is necessary to consider the expansion of cultivation of land to the interior and the increased production of non-traditional products for export as mentioned above, as well as the advantageous international market conditions on which these expansions are based. This rapid expansion in the agricultural sector is also one factor supporting the recent general economic growth in Brazil. However, as can be seen in Table 5-5, the share of agriculture in the national economy dropped from 22.6% in 1960 and 22.3% in 1965 to 18.0% in 1970 because of higher growth in the secondary industries. In addition, the percentage of the total population employed in the primary industries fell from 53.7% in 1960 to 44.2% in 1970. Although

Table 5-5 Agricultural Growth and Expansion of Agricultural Exports

	Expansion of real GDP 1960 = 100				Export share of GDP (%)	Expansion of exports 1960 = 100		Agricultural product export share of total exports (%)
	Total	Agri-culture	Industry	Commerce, etc.		Total	Agricultural products	
1960	100.0	100.0	100.0	100.0	22.6	100.0	100.0	84.7
1961	110.1	107.6	110.8	112.2	20.4	110.6	107.1	82.0
1962	115.9	113.5	119.5	115.8	20.5	95.7	92.9	82.2
1963	117.7	114.7	119.7	119.1	20.4	110.9	109.4	83.6
1964	121.2	116.2	125.9	121.6	20.1	112.7	104.3	78.4
1965	124.5	132.4	119.9	123.2	22.2	125.7	105.0	70.7
1966	130.8	128.1	133.9	130.3	20.5	137.2	130.2	80.3
1967	137.1	135.3	137.9	137.8	20.7	130.3	119.6	77.7
1968	149.9	137.2	159.3	150.1	19.2	148.3	142.9	81.6
1969	163.3	145.4	176.4	164.5	18.6	178.8	165.7	78.4
1970	178.9	153.5	196.1	180.8	18.0	213.7	178.2	70.6
1971	199.1	171.0	219.6	200.7	18.0	228.8	185.0	68.5

Note: Real GDP index is based on 1949 standard.
Source: FGV, Instituto Brasileiro do Economia; Banco do Brasil; Carteira de Comércio Exterior.

the amount of agricultural exports also have increased rapidly, the percentage of agricultural exports in total exports has dropped from 84.7% in 1960 to 80.7% in 1965, 70.6% in 1970 and 68.5% in 1971. If the share of exports in the GDP is taken as an indication of the degree of dependence of the national economy on exports, the export dependence of Brazil has become about 8%. It is noteworthy that the export dependence in the agricultural sector started to increase from 1968 in spite of the coffee recession and rose from a low of 25% in 1967 to 31% in 1970 (Note 10).

It has already been mentioned that quantitative expansion of Brazilian agriculture is based on the expansion of land under cultivation and increased production of non-traditional items, but this increased production naturally results in more people employed in agriculture. According to data from the Departamento de Censos, Institute Brasileiro de Economía, there were 12,163,000 persons employed in the agriculture, forestry and fishing industries in 1960 which was 53.7% of the total employed population of 22,651,000. In 1970, it was 13,071,000 or 44.2% of the total employed population of 29,545,000. In the past 10 years, the annual population growth rate in Brazil was 3.2% and the growth rate of the employed population was 2.1% p.a. However, the increase of the population employed in agriculture was only 0.7% which is rather low compared with the 5.9% annual increase of persons employed in industry. This shows how much industrialization has progressed in Brazil during the last decade and also how many persons from farming areas have been absorbed by industry. The growth rate of the rural population over the last 10 years is almost the same as the growth rate of those employed in the agriculture, forestry and fishing (Note 11). It may be noted that the growth rate of persons employed in agriculture for the five years from 1960 to 1965 was about 2.1% and in the latter part of the 1960s, there was no increase in the population employed in agriculture; for the country as a whole, there was a decrease. However, these observations must be taken as tentative ones because of statistical problems. On the other hand, the annual increases in employment in industry were 4.3% in the early 1960s and 7.5% in the late 1960s.

How does the growth rate in agriculture compare with the real economic growth rates in other fields? It has already been mentioned that the real growth rates in agriculture were 3.5% from 1961 to 1966 and 5.9% from 1966 to 1971. Table 5-6 compares the average growth rates for 1960-62, 1964-66 and 1969-71. Labor productivity in agriculture showed an increase rate of 1.8% in the early 1960s and of 5.1% in the late 1960s. The average increase for the 1960s was 3.5%. The increase of industrial labor productivity was much lower. However, the question is how to interpret the fact that the productivity in agriculture exceeded that in industry. One reason for this could be a problem of statistical analysis. Another reason might be that the increased agricultural production in Brazil is supported by the expansion of the frontier, i.e. boundaries of the land under cultivation, where holdings are large in scale and labor-saving farming methods are used. From the latter part of the 1950s, Japan introduced agricultural methods which reduced labor inputs through mechanization and partial cooperative production to counteract the rapid loss of farm labor to the cities.

Table 5-6 Annual Labor Productivity Increases in Agriculture and Industry

	Agriculture			Industry		
	1960-62 to 1964-66	1964-66 to 1969-71	1960-62 to 1969-71	1960-62 to 1964-66	1964-66 to 1969-71	1960-62 to 1969-71
Real growth rate	3.9	4.5	4.2	3.6	9.3	6.7
Employment increase rate	2.1	-0.6	0.7	4.3	7.5	5.9
Labor productivity increase rate	1.8	5.1	3.5	-0.7	1.8	0.8

Notes: 1. The employment increase rates are for 1960-1965 and 1965-1970.
2. For the employment increase rates in the early 1960s, the increase rates of the rural population are used for agriculture and of the urban population for industry. In the late 1960s, the rates are calculated from the increase rates in the population employed in agriculture or industry for the entire period and the increase rates for the early 1960s.

Source: FGV; Instituto Brasileiro do Economia ; Departamento de Censos.

The increase in labor productivity when the switch was made to these labor-saving methods amounted to 7-8%. However, if the increased productivity in large-scale Brazilian agriculture is basically true, then this is remarkable and indicates the presence of large amounts of natural resources which can easily be made productive.

(2) Regional Differences in Agriculture

During the latter half of the 1960s there was a remarkable expansion of agriculture and with this an increase in labor productivity. This productivity gain in agriculture naturally increased the income level and raised the living standard of farmers. This in turn contributed greatly to the expansion of the domestic market for non-traditional agricultural products. This expansion of domestic markets has certainly been one factor promoting the growth of the Brazilian economy with its long-standing stress on the promotion of import-substitution industries.

However, even though efforts are being made to introduce industry into the undeveloped interior, the expansion of secondary industries is still concentrated in southern Brazil, mainly in the São Paulo area. Table 5-7 indicates that agriculture is expanding in the Central-west and South regions which have become industrialized comparatively recently. Therefore, it is evident that the economically underdeveloped North and Northeast regions are falling even further behind.

Table 5-7 Regional Distribution of Agricultural and Industrial Incomes(1)

(Unit: %)

	North	North-east	South-east(3)	South	Central-west	Brazil
Agriculture						
1960	2.0	22.1	(23.0) 43.0	28.2	4.7	100.0
1966	1.9	23.1	(22.7) 41.8	27.1	6.1	100.0
1968	2.1	24.6	(19.5) 37.9	28.7	6.7	100.0
1970(2)	1.5	20.5	42.0	28.3	7.7	100.0
Industry						
1960	1.9	8.0	(54.4) 77.5	11.9	0.7	100.0
1966	1.4	6.4	(55.7) 79.9	11.5	0.7	100.0
1968	1.4	6.3	(56.8) 80.9	10.8	0.6	100.0

Notes: (1) Net domestic product at factor cost.
(2) In 1970, based on estimation of regional agricultural (including livestock) production.
(3) Figures in parentheses indicate São Paulo State.

Source: Fundacão IBGE, "Anuário Estatístico do Brasil," 1971.

Over the last decade, the Brazilian population increased by 23,518,000 people, which included a 2,616,000 increase in the rural population. This shows that the urban population increase was much greater than that in rural areas. For the whole of Brazil, it was clear around 1967 that the urban population exceeded the rural population (Note 12) but in the South, around Sao Paulo and Rio de Janeiro, the urban population probably exceeded the rural from as early as 1950. Although there are no appropriate data concerning the absolute decreases of rural population or population engaged in agriculture in southeast Brazil at this time, the 1960 and 1970 censuses showed a definite decrease in the number of persons employed in agriculture. According to these figures, the urban population increased by 65.3% while the rural population rose by only 6.7%.

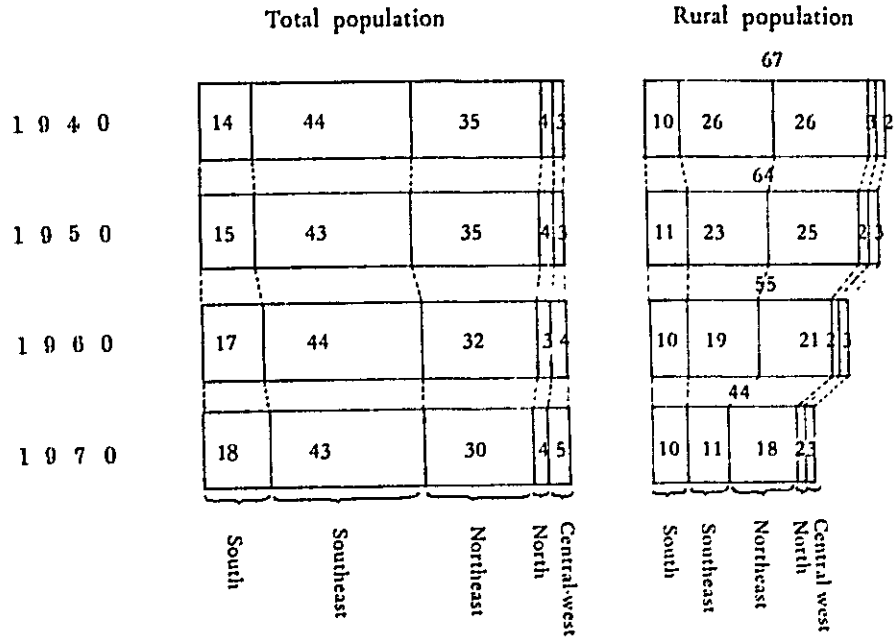
Table 5-8 shows the regions in which the increases of urban population exceeded those of the rural population. The development policies of SUDENE, etc., completion of road networks, promotion of industrialization in economically backward areas and increases in the distribution of commodities are bringing about expansion of urban functions and the concentration of the population. However, the largest urban population increase rate of

Table 5-8 Regional Population Growth: Comparison between 1960 and 1970

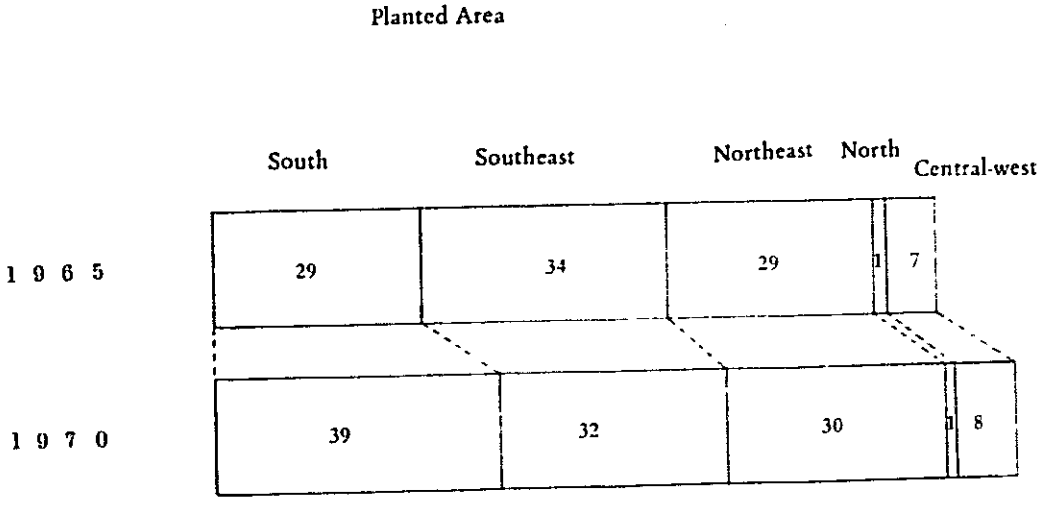
	Total population			Rural population			Urban population		
	Growth (1,000 persons)	Contribution to total Growth (%)	Growth rate (%)	q Growth (1,000 persons)	Contribution to total Growth (%)	Growth rate (%)	growth (1,000 persons)	Contribution to total growth (%)	growth rate (%)
South	4,792	20.4	40.3	1,826	69.8	24.6	2,966	14.2	66.4
Southeast	9,269	39.4	29.8	△ 2,259	△ 86.3	△ 17.1	11,528	55.1	64.7
Northeast	6,246	26.5	27.8	1,946	74.4	13.2	4,300	20.6	56.0
North	1,050	4.5	40.4	383	14.6	23.7	667	3.2	67.8
Central-west	2,161	9.2	71.9	720	27.5	36.8	1,441	6.9	136.8
Brazil	23,518	100.0	33.1	2,616	100.0	6.7	20,902	100.0	65.3

Source: Departamento de Censos.

Fig. 5-2 Regional Distribution of Population and Cultivated Land



Note: Figures are percentages taking the total population each year as 100.



Note: Percentages taking the total planted land area in 1965 as 100.

55% was in the Southeast where the economy is still concentrated. This indicates that the economic power in this region is gradually increasing. Forty percent of the over-all population increase was also in this area but a special characteristic of the Southeast was decrease in the rural population, which was not found in other areas. This appears to be related also to the tendency for the planted land area to decrease in the Southeast as was shown in Table 5-2. This region provides Brazil with 40% of its total agricultural income and it is still very powerful in the agricultural sector. However, this level is gradually decreasing while the levels in the South and Central-west are increasing. This can also be seen in the population trends. Remarkable increases in both the total and the agricultural population are found in the Central-west, South and North regions and of these, the South and Central-west make the largest contributions to the over-all increase in rural population (See Table 5-8). This phenomenon also corresponds to the large contribution made by the South and Central-west to the increase in cultivated land as shown in Table 5-2. Recently, with competition with industrial use for land in São Paulo state has resulted in the migration of some fazendeiros to Minas Gerais, Goias and Mato Grosso in search of larger fasenda. Fasenda in the Southern states producing grains and soybeans are expanding and this can be considered as a result of this phenomenon. However, these areas are contiguous with the peripheries of the developed regions and economic disparities tend to increase between these areas and the North and Northeast regions which are the objects of development policies although these policies have not yet yielded results. Table 5-2 shows shifts in the distribution of population and land under cultivation in each region. It is evident from this figure that the level of agriculture is increasing in the South and Central-west while there is a relative recession in the North and Northeast.

2 Factors in Agricultural Development - Comparison with Japan's Experience

2-1 Economic Incentives

(1) Pattern of Agricultural Policies

The Minister of Agriculture, Dr. José Francisco de Moura Cavalcanti, stated in a speech on August 1, 1973 that agricultural development strategy would have four aspects: (1) active development of regions which are economically backward and the resources of which therefore cannot be exploited on a national scale; these areas are to be developed by the promotion of large-scale plans such as the National Over-all Plan (PIN), Plan for the Promotion of Agriculture and the Redistribution of Land in the North and Northeast (PROTERRA), San Francisco Valley Development Plan (PROVALE) and the Central-west Development Plan (PRODOESTE); (2) commercialization of agricultural communities through technical development in agriculture to change the traditional agricultural market to community enterprises; and (3) stimulation measures such as maintaining minimum prices for agricultural products, providing agricultural credit and

providing tax exemptions to maintain long-term agricultural growth (Note 13). The implementation of such a strategy can be said to follow the pattern of the main agricultural policies since the Revolution of 1964. The agricultural land reform law (No. 4504) of 1964 was aimed mainly at the transfer of agricultural land ownership to farmers as well as technical assistance and mechanization for the modernization of agriculture, the maintenance of low prices, etc. In the Programa Estratégico de Desenvolvimento which was begun in 1968, the main measures called for were the expansion of arable land area, agricultural land reform and increased provision of agricultural credit. This strategic plan included the large-scale programs mentioned above. The First National Development Plan (Plano Nacional de Desenvolvimento--PND), which was begun in 1972, stressed the expansion of the economic frontier and the optimized utilization of manpower through the implementation of these large-scale programs. However, it is considered that development by enterprises should be promoted in the execution of these large-scale programs to ensure efficiency in respect to technology and funds. This is intended to develop modern agriculture by the initiative of enterprises in the Central-west and South. Renovation of traditional agriculture by expansion of the agricultural area and technical development, modernization of distribution systems, and so on are also emphasized but the necessity of providing financial incentives to promote such measures is pointed out (Note 14).

Dr. Cavalcanti emphasized that in Brazil economic incentives by means of provision of credits and minimum price supports previously have been used as key Government policies and they are expected to remain so in the future. However, compared with a direct assistance system, such Government incentive policies can be applied easily to commercial farm management rather than self-sufficient agriculture. It is said that the backbone of Brazilian agriculture is entrepreneurship but the future development of Brazilian agriculture will no doubt depend on economic incentives, credit system and price support system based on entrepreneurship. As mentioned above, in spite of the measures to aid economically backward areas, agricultural development is seen not in the Northeast with its numerous exceedingly small farms but is evident near the already-developed areas in the South and Central-west where there is a large proportion of commercial farm management.

(2) Credit System

The first agricultural credit system began in 1937 when the Bank of Brazil created the Agricultural and Industrial Financing Bureau (CREAI). This new institutional financing replaced the former private financing and funds were supplied under conditions beneficial to the farmers. This definitely played a role in the modernization of farm production activities. To extend the activities of this agricultural credit system, a National Agricultural Financing System (Sistema Nacional de Credito Rural--SNCR) was set up by law No. 4829 in 1965. In 1967, it was decided by the Central Bank of Brazil Resolution No. 69 that 10% of the deposit level of all banks must be directed toward agricultural financing (Note 15). At present,

private financing in agriculture still exceeds institutional financing but it can be said that even prior to 1965 institutional agricultural financing rather effectively stimulated expansions in production. The reason for this is that at the beginning of the 1960s, agricultural credits accounted for about 20% of all bank financing to the private sector and those credits reached 16% of the agricultural income. However, in 1968 the rates mentioned above had increased greatly, to 30% and 26%, respectively. In 1972, financing was equivalent to 36% of total agricultural income which indicates that previous defects, such as insufficient number of branches of Bank of Brazil for financing in local areas and the severe limits on investment resources, particularly for long-term investment, have been improved somewhat by positive policies to expand agricultural financing and that this financing is being actively utilized (See Table 5-9).

Table 5-9 clearly indicates the remarkable increase in the supply of agricultural credit but it is also noteworthy that there has been a gradual increase in the proportion of investment in agriculture, i.e. financing to form fixed investments in agriculture by means of long-term funding. Table 5-10 shows that, among the total institutional financing for agricultural production, there has been a decrease in financing required for seasonal cultivation, while long-term financing required for the purchase of land and machinery, etc. increased from the 30% level in 1965 to around 40% recently. It is also clear that financing for livestock (Note 16) for which demand increases are predicted in both domestic and international markets has gradually increased to become a large part of the total. This indicates that institutional financing in agriculture has played a positive role in the recent expansion of agricultural production.

Although such an agricultural credit system offers conditions which are beneficial to the development of agriculture, some problems are also involved. One is that it is not possible to ensure sufficient funds to meet the increasing demands. Recently all of the banks have raised their deposit rates to the National Fund for Rural Refinancing (Fundo Nacional para Refinaciamento Rural--FNRR), a part of the General Fund for Agriculture and Industry (Fundo Geral para Agricultura e Industria--FUNAGRI) of the Central Bank of Brazil by 10 to 15% to provide funds for agricultural credits but with 50% of the investment demand being met by private organizations, it is difficult to supply sufficient funds and this situation probably has some effect on the supply of funds to other production sectors. This lack of funds naturally means that selective financing is essential and priorities are decided for each state by the State Agricultural Financing Application Program (Programa Estaduais de Aplicacão de Crédito Rural--PESAC). According to recent studies (Note 17), it is clear that this has resulted in rather rapid drops in the number of small financing loans by the Bank of Brazil and the percentage of credit amounts in agricultural financing.

As is clear from Table 5-11, another important point in financing is the shift to the South and Central-west regions. Southeastern Brazil, particularly the state of São Paulo which formerly took one half of agricultural credits still gets the largest share although there has been a gradual

Table 5-9 Agricultural Production Income and Financing

	Gross agricultural product(1) (A)	Agricultural credit(2) (B)	B/A	Percentage of agricultural credit balance in total credit balance in private sector
	Billion Cruzeiros		%	%
1960	15.1	2.35	16.2	18.3
1962	18.7	2.86	16.6	21.8
1964	18.1	3.15	18.2	25.8
1966	16.5	3.46	19.6	29.4
1968	18.7	5.40	26.4	29.8
1969	22.6	6.49	28.7	--
1970	28.6	9.25	32.3	--
1971	38.4	12.87	33.6	--
1972	51.2	18.67	36.4	--

Notes: (1) Until 1968, gross domestic agricultural product according to 1968 prices. From 1969, nominal net domestic agricultural production.
(2) Until 1968, in constant 1968 value. From 1969, nominal amount of financing.
Source: Ministério do Agricultura, "Notas Complementares Sôbre Política Agrícola Nacional;" Central Bank of Brazil, Bank of Brazil and FGV data.

Table 5-10 Distribution of Agricultural Production Financing by Type

	Agriculture			Livestock			Total		
	Seasonal	Investment	Total	Seasonal	Investment	Total	Seasonal	Investment	Total
1965	69.0	19.0	88.0	2.1	9.9	12.0	71.1	28.9	100.0
1967	61.3	18.3	79.6	6.4	14.0	20.4	67.7	32.3	100.0
1969	54.2	14.4	68.6	8.2	23.2	31.4	62.4	37.6	100.0
1970	54.7	17.2	71.9	7.7	20.4	28.1	62.4	37.6	100.0
1971	52.1	19.4	71.5	7.6	20.9	28.5	59.7	40.3	100.0
1972	55.1	21.1	76.2	6.3	17.5	23.8	61.4	38.6	100.0

Note: Excludes marketing loans.
Source: Same as Table 5-9.

Table 5-11 Regional Distribution of Agricultural Financing

		North (%)	Northeast (%)	Southeast (%)	South (%)	Central-west (%)	Brazil
							(Cases)
No. of cases	1969	0.8	12.4	44.2	35.9	6.6	1,145.2
	1970	0.7	11.2	46.3	33.9	5.9	1,190.6
	1971	0.9	16.5	44.7	32.7	5.2	1,252.8
	1972	1.3	16.0	43.8	33.0	5.9	1.266.2
							(Million cruzeiros)
Amount	1969	1.3	13.7	49.4	28.3	7.2	6,489.1
	1970	1.0	10.8	49.9	31.8	6.5	9.248.0
	1971	1.1	13.0	46.1	32.6	7.2	12,869.7
	1972	1.6	12.2	42.8	34.5	8.8	18,668.8

Source: Ministerio da Agricultura, "Notas Complementares Sôbre Politica Agricola Nacional."

Table 5-12 Comparison of Rates of Agricultural Fixed Capital Formation by Institutional Financing in Japan and Brazil

	Brazil			Japan		
	Net domestic product of agriculture A	Investment-type agricultural financing(1) B	B/A	Net domestic product of agriculture A	Investment-type agricultural financing(2) B	B/A
	(Million cruzeiros)			(Billion yen)		
1969	22,627	1,809	8.0	3,259.9	263.6	8.1
1970	28,621	2,482	8.7	3,266.3	256.4	7.8
1971	38,355	3,762	9.8	3,096.4	268.8	8.7
1972	51,246	6,162	12.0	---	---	--

Notes: (1) Amount of investment financing in agriculture and livestock.
(2) Amount of medium- and long-term financing in agriculture and livestock by agriculture modernization funds and the Agriculture, Forestry and Fisheries Finance Corporation.

Source: For Brazil: Ministerio da Agricultura, "Notas Complementares Sôbre Política Agrícola Nacional"; for Japan: Ministry of Agriculture and Forestry, "Social Accounts of Farmers and Agriculture in 1971" (in Japanese).

decrease in both the amount of financing and the number of cases. The proportion of the amount of financing in the South and Central-west is increasing. This is closely related to the recent trends in agricultural shifts and regional differences which are described above. In the Northeast, the number of financing loans is increasing although the monetary share of the region is decreasing while in the South and Central-west, there has been a decrease in the percentage of cases but a rather rapid increase in the amount of financing. However, this suggests that agriculture in the South and Central-west, which developed so much recently, took the lead mainly because of the large-scale management used.

The above paragraphs have dealt with the agricultural credit system in Brazil. The following will compare the roles of credit provided mainly by banks in Brazil and of the equivalent financing in Japan (Note 18) (by government financial organizations and by cooperatives, etc. assisted by the Government). Institutional financing in Japan is aimed at expanding the scale of agricultural management and modernizing that management by providing equipment and improving technology. It plays a major role especially in the purchase of farm land and equipment. However, as can be seen in Table 5-12, the rate of formation of fixed capital by institutional financing (agricultural fixed capital formation by institutional financing divided by net domestic product of agriculture) is only 8-9%. Most of the financing is arranged by farmers themselves, mainly through agricultural cooperatives. However, in Japan the formation of fixed capital by means of direct government investment was only 23.3% of the total fixed capital formation and if this is expressed as the rate of agricultural fixed capital formation as mentioned above, it becomes 13.3%. This means that in Japan 38% of the agricultural fixed capital formation is through financing in which public capital participates or through direct public investment. The rate of fixed capital formation in this way is about 23%. From the latter half of the 1950s, the rate of gross fixed capital formation in agriculture in Japan rapidly increased. The average rate of 19.4% for 1955-57 had risen to 30.3% in 1964-66. In the same period, the percentage of public investment (percentage in respect to agricultural production by direct government investment) increased from 6.5% to 8.3% and the role of public capital in agricultural fixed capital formation was about 30% considering only direct government investment (Note 19).

In Brazil, there appears to be a clear increase in the role of institutional financing with the participation of public funds in capital formation (Note 20) but the part corresponding to direct investment as in Japan can be considered as being very small. Naturally, there has been some progress in development in the North and Northeast and in investment in underdeveloped areas in these regions but considering the important role of both institutional financing and direct government investment as well as the supply of funds through agricultural cooperatives as in Japan, the role of institutional financing in Brazil differs from that in Japan. However, it no doubt plays a major role in stimulating commercial management of farms.

(3) Minimum Price Guarantees for Agricultural Products

Thus, the two mainstays of Brazilian agricultural policies are credit and pricing policies. The coffee economy, which typifies this, has been a major problem for Brazil. Overproduction of export crops such as coffee, sugar and cacao beans and the rapid drop in export prices have brought the problem of export prices of Brazilian agricultural products to the fore. Other important measures are those to stabilize domestic prices, particularly those of food. These become political problems in the course of a severe inflation. The problem of food price stability arises from large annual fluctuations in the supply, i.e. production (See Table 5-13).

The stabilization of prices for export crops and a few special crops is undertaken by organizations including the Brazilian Coffee Institute (Instituto Brasileiro do Cafe--IBC), the Executive Commission for the Renovation of the Cocoa Economy (Comissao Executiva do Plano de Recuperação Econômica Rural da Lavoura Cacaueria--CEPLAC), the Sugar and Alcohol Institute (Instituto do Açucar e do Alcool--IAA), the Riograndense Rice Institute (Instituto Riograndense de Arroz--IRGA) (Note 21) which has the maximum production of any primary product and the National Commission for Wheat (Comissão do Trigo Nacional--CITRIN) for wheat, the major imported agricultural product (Note 22). For other crops minimum prices are set by such organizations as the National Food Supply Agency (Superintendencia Nacional de Abastecimento--SUNAB), the Production Financing Commission (Comissão de Financiamento da Produção--CFP), the Brazil Warehouse Public Corporation(Companhia Brasileira de Armazenamento--CIRBRAZEM) and the Brazil Food Public Corporation (Companhia Brasileira de Alimentação--COBAL). Through financing and purchases on this basis, farmers are protected against falling prices.

The traditional export products such as coffee, cotton, cocoa and sugar still play a major role in the Brazilian economy and represent the main proportion of agricultural production (See Table 5-14). However, the level of coffee, for which Brazil had a 60% share of the world market in the 1920s, is gradually declining. In the 1950s, the share fell to 44%, and then to 35% in the 1960s. By 1970, it had dropped to the level of less than 30%. Therefore, diversification and replacement of coffee is being emphasized in the agricultural sector, and concurrently the food supply and demand conditions in the world in recent years as well as increases in demand for feed grains, livestock products, etc. are promoting the change to new crops. Under such conditions, the policy of guaranteeing minimum prices for agricultural products can be said to be increasing in importance as a means to induce and promote structural changes in Brazilian agriculture.

In Brazil, the policy of fixing minimum prices for agricultural products has been in effect since 1945 and was originally adopted to increase the output of the six products under consideration. Thereafter, production increased and the results of policies mainly related to facilities such as warehouses gradually expanded such sectors. However, the greatest actual

Table 5-13 Annual Variability in Prices of Eight Main Crops, 1944-65

	Coefficients of variation	Extreme deviations from trend	
		Below	Above
Rice	26%	39%	47%
Maize	20	26	38
Wheat	32	40	59
Coffee	37	47	65
Cotton	28	29	71
Sugarcane	25	31	45
Beans	22	31	48
Cassava	17	27	22

Source: Louis Herrmann, "Changes in Agricultural Production in Brazil, 1947-1965."

Table 5-14 Production and Export Figures for Traditional and Non-Traditional Agricultural Export Products

	Production(1)		Exports	
	1960-62	1969-71	1960	1970
Traditional exports	27.3%	19.9%	80.1%	65.7%
Coffee	13.4	6.0	62.8	46.5
Cotton	7.1	6.0	4.0	7.8
Cocoa	1.1	1.2	8.7	5.0
Sugar	5.7	6.7	4.6	6.4
Non-traditional exports	33.0	40.6	1.4	9.8
Maize	11.7	14.0	0.0	3.8
Soybeans	0.4	1.9	-	1.3
Oranges(2)	2.0	2.7	0.5	0.8
Beef	18.9	22.0	0.9	3.9
Others	39.7	39.5	18.5	24.5

Notes: (1) Obtained from items assessed at 1961-1965 prices.
(2) Including orange juice.

Source: USDA, "Indices of Agricultural Production for the Western Hemisphere," (excluding the United States and Cuba); Fundação IBGE, "Anuario Estatística do Brasil."

change came with the establishment of the marketing loan system based on the minimum prices from 1967 as a means of price stabilization. Over the last 20 years, marked prices have seldom been lower than the minimum prices and only a few purchases were made by the government, but from 1967, the market prices have never been below the minimum prices (See Table 5-15). Therefore, price stabilization has had direct results for certain products at certain times such as for maize in 1963 and rice in 1965 but generally speaking, this system of minimum prices published before harvests provides a production index rather than maintaining farmer's incomes through price supports. This results in keeping down surplus supplies on the market. By means of this price fixing, production increases are arranged to follow demand. In regions that are far from markets, this system also prevents price drops. If this fixing of minimum prices and marketing loan act as a positive incentive for the producer, then it can be said to be a more effective policy from the Government standpoint than direct market intervention. Recently, the minimum price levels have been determined on the basis of fluctuations in international market prices but if the price fluctuations are considered as described below, they can be viewed to be acting as price incentives for specific commodities.

In the price fluctuations of agricultural products in Brazil, there is a tendency for the prices to rise nominally but the real prices allowing for increases caused by inflation actually tended to decrease during the 1960s (See Table 5-16). There is a trend to increased prices recently, mainly for non-traditional export crops and beef. The producer's price index, if taken as 100 in 1968, became 330 in 1972. In the same period, the purchase price index for agricultural production materials increased only from 100 to 245. For example, the purchase price of a 44 HP tractor in 1968 was equivalent to 324 bags of coffee, 729 bags of rice or 2,173 bags of maize (1 bag: about 60 kg in all cases), but in 1973, the equivalents were 109, 501 and 1,087 bags respectively (Note 23). As can be seen in Table 5-17, the agricultural product export prices which tended to decrease throughout the 1960s started to increase from around 1969 except for coffee and cocoa and there have recently been remarkable increases in the prices of bananas, oranges, pepper, maize and beef.

Such price fluctuations reflect the recent fluctuations in foreign markets and the increase in the producer's price also reflects the expansion in domestic markets. Under such conditions, the minimum prices have been raised by the CFP and the adoption of price inducements for specific products is being considered. For example, there have been increases over the past five years of 4.4 times the minimum price for cassava, 3 times for maize and 2.5 times for soybeans. From 1971-72, there has also been a 2.5 fold increase in the minimum price of sorghum (See Table 5-18). However, these fluctuations clearly reflect changes in international market conditions.

One recent feature of Brazilian agriculture has been the replacement of coffee with other crops. In order to diversify production and exports, price incentives for non-traditional export crops, etc. are

Table 5-15 Relation between Purchases by CFP and Producer's Prices and Minimum Prices

	Cotton		Peanuts		Rice		Maize		Soybeans	
	Purchases (1,000 tons)	PP/MP	Purchases (1,000 tons)	PP/MP	Purchases (1,000 tons)	PP/MP	Purchases (1,000 tons)	PP/MP	Purchases (1,000 tons)	PP/MP
1952	14.7	1.01	-	0.88	-	0.93	-	1.51	-	1.91
1953	421.7	0.99	-	1.09	-	1.66	-	1.63	-	1.23
1954	0.6	-	-	1.19	-	1.20	2.4	1.10	-	1.11
1955	-	-	-	0.91	-	1.03	0.1	2.02	-	1.31
1956	1.3	-	-	1.18	-	1.14	-	1.70	-	1.49
1957	-	1.18	-	1.48	-	1.07	-	1.50	-	1.73
1958	-	1.14	-	0.99	-	1.11	-	1.44	-	1.59
1959	0.9	1.17	-	1.21	-	1.10	-	1.83	-	1.73
1960	3.5	1.50	-	1.91	-	1.02	-	1.20	-	2.25
1961	0.3	1.49	-	1.30	43.9	0.83	0.3	1.78	-	1.78
1962	-	1.23	-	1.08	-	1.77	-	1.82	-	1.91
1963	8.2	1.13	63.0	1.01	-	1.31	657.6	0.88	-	2.17
1964	2.4	1.62	-	2.39	1.7	0.95	0.1	1.57	-	2.28
1965	-	1.24	-	1.19	1,695.1	0.76	422.0	1.02	-	1.21
1966	-	1.25	-	1.26	-	1.47	0.3	0.97	-	-
1967	-	-	0.5	-	0.0	1.59	9.9	-	-	-
1968	-	1.16	-	1.55	-	2.01	-	1.21	-	2.11
1969	0.0	1.16	-	1.46	4.3	1.60	4.4	1.48	-	2.04
1970	-	1.09	-	1.30	535.5	1.19	5.3	1.22	-	1.85
1971	-	1.36	-	1.53	13.6	1.53	8.1	1.30	-	1.90
1972	-	1.17	-	1.15	-	1.15	-	1.24	-	1.47

Note: PP = producer's price, MP = minimum price.
Source: R.M. Paiva et al., "Brazil's Agricultural Sector," São Paulo, 1973, pp. 152-153.

Table 5-16 Real Price Indices for Agricultural Products[1] (1962-66 = 100)

	All products		Food products				
	Including coffee	Excluding coffee	Total	Animals[2]	Plants[3]	Raw materials for industry	Export[5] products
1948-50	93.1	93.2	90.6	75.6	102.2	192.6	103.2
1951-54	96.4	93.2	91.4	75.7	103.6	99.7	121.5
1955-58	96.1	95.5	96.1	80.6	108.1	93.5	102.0
1959-62	99.2	100.6	101.3	92.8	107.7	98.2	99.6
1963-66	97.4	96.6	96.0	100.0	92.9	98.8	100.3
1967-70	88.1	86.7	87.2	87.2	87.1	84.8	95.8

Notes: (1) Deflated price indices compiled by the FGV.
(2) Cattle, pigs, sheep, goats, milk, eggs, honey.
(3) Rice, bananas, potatoes, beans, oranges, cassava, maize, wheat.
(4) Cotton, peanuts, cocoa, maize, tobacco, wool.
(5) Coffee, cotton, cocoa.

Source: R.M. Paiva et al., "Brazil's Agricultural Sector," Sao Paulo, 1973, p. 43.

Table 5-17 Fluctuations and Indices of Prices of Main Export Agricultural Products (1968 = 100)

	Sugar	Bananas	Cacao beans	Coffee	Oranges	Pepper	Soybeans	Maize	Beef
1960	76	67	91	101	121	227	-	89	104
1962	90	53	72	94	100	140	91	-	82
1964	132	92	77	121	87	131	-	102	118
1966	81	109	74	108	112	148	112	110	125
1968	100	100	100	100	100	100	100	100	100
1969	106	171	145	104	146	109	99	110	108
1970	114	187	107	139	170	158	98	119	132
1971	124	210	85	100	145	150	119	128	207

Source: R.M. Paiva et al., "Brazil's Agricultural Sector," São Paulo, 1973, pp. 56-57.

Table 5-18 Changes in Minimum Prices of Agricultural Products

(Unit: Cr$)

	Cotton[1] 15kg	Maize 60kg	Sorghum 60kg	Cassava 50kg	Beans[2] 60kg	Paddy 50kg	Soybeans 60kg	Peanuts 25kg
1967/68 a	6.00	5.15	-	3.26	15.91	9.08	8.16	5.17
1968/69	7.00	7.46	-	4.37	20.50	11.73	10.23	6.39
1969/70	8.70	9.00	-	6.10	25.00	14.92	12.82	8.00
1970/71	10.50	11.00	-	7.30	39.83	16.47	17.12	9.97
1971/72	15.00	13.53	9.60	13.00	45.00	21.71	24.80	13.00
1972/73	17.10	18.00	14.40	22.50	57.00	30.00	30.00	17.00
1973/74 b	24.55	30.00	24.00	23.50	100.00	37.50	36.00	24.00
b/a (%)	250.7	302.1	250.0[3]	437.8	360.5	219.7	251.9	275.6

Notes: (1) Algodão em caroço
(2) Feijão Uberabinha
(3) Increase rate of 1973/74 in respect to 1971/72

Source: Same as Table 5-12.

indispensable. However, the fact that Japanese agriculture has grown without the influence of changes in the international market conditions is a main point of difference with Brazilian agriculture. The economy became dependent on coffee and before that, agriculture went through rubber and sugar periods. Therefore, the pricing policies differ from the food control system of Japan centering on rice and the policies are molded to fit market situations. In addition, the production structure is arranged mainly for commercial agriculture.

Japanese pricing policies take the form of protecting farmers by direct Government subsidies and participation just as in the case of agricultural financing and investment policies. As a result, farmers adopt improved technology in conjunction with direct Government investment. Such policies are considered to be unavoidable because rice plays such an important role in Japanese agriculture and production has depended on independent smallholder since the agricultural land reform. In the general Japanese budget throughout the 1960s, for price support and marketing measures expenditures, mainly compensation for deficits in special food control system accounting, accounted for 40 to 50%. Such a thing is difficult to imagine in Brazil which is not isolated from international markets and where the production system is such that changes in conditions are reflected directly in production fluctuations.

2-2 Agricultural Productivity

(1) Agricultural Expansion and Productivity

As was mentioned above, production expansion in Brazilian agriculture has been achieved by increasing arable land area and introducing labor-saving agricultural methods. Such expansion appears to be achieved through entrepreneurship as was mentioned above and the use of economic inducement policies to achieve this. Such conditions are promoted by the existence of many untapped agricultural resources, the investment of capital and the latent power to increase production easily by expansion of the labor force, as well as recent changes in the world market conditions. However, the expansion of productivity in this manner has inherent long-term limits. If the agricultural frontier is expanded to the cerrado area in the Central-west, it will be necessary to try to increase the fertility of the land artificially in some way.

Table 5-19 shows the differences in the manner of agricultural expansion in Japan and Brazil. The table indicates that Brazilian agriculture is primarily labor-saving while Japanese agriculture is characterized by land-saving. It also indicates that for the last decade there have been remarkable improvements in Japanese agricultural labor productivity and there is a gradual swing toward labor-saving. In Brazil, agricultural production has increased by about 40% over the last 10 years (4% p.a.) but there have been only slight increase in labor productivity and almost no improvement in land productivity.

Table 5-19 Comparison of Agricultural Productivity in Japan and Brazil

	Brazil			Japan		
	1960-62	1969-71	1969-71/ 1960-62	1960-62	1969-71	1969-71/ 1960-62
Agricultural productivity(1) A	32.80	45.90	140%	26.15	26.00	99%
Arable land area(2) B	29.7	40.4	136	6.1	5.5	90
Population employed in agriculture(3) C	11.7	12.6	108	14.5	10.8	74
A/B	1.10	1.14	104	4.29	4.73	110
A/C	2.80	3.64	130	1.80	2.41	134

Notes: (1) Weighted by the relative prices by region in 1961-65 using the FAO production indices excluding livestock. Unit: 1 million wheat units.
(2) FAO, "Production Yearbook" 1960 and 1970. However, 1970 Brazil figures were estimated from the crop area increase rate.
(3) FAO, "Production Yearbook" for 1960 and 1970.

Table 5-20 Factors in Agricultural Production Increases: Changes between 1948-50 and 1967-69

(Unit: %)

	Annual production growth rate	Production increase factors (contribution rates)			
		Area expansion	Increased yields	Crop conversion	Transfer of crops to places with lower fertility
Brazil	3.8	91.9	20.2	-0.8	-11.3
South(1)	4.0	71.7	39.4	2.2	-12.7
East	1.5	108.7	-36.2	20.3	-2.8
Central-west	7.8	125.4	-11.4	-14.0	0.1
Northeast	4.4	115.9	1.3	-6.8	-10.4
North	4.5	96.9	2.2	-14.4	15.3

Note: (1) Including São Paulo state.
Source: G. Patrick, "Sources of Growth in Brazilian Agriculture, The Cros Sector;" R.M. Paiva, et al, "Brazil's Agricultural Sector," 1973, p. 65.

According to George Patrick (Note 24), the average growth rate of Brazilian agriculture for 20 years up to 1967-69 was 3.8% (including coffee) but 92% of this growth was due to the expansion in area and 20% to the increase in the yield, i.e. to improvements in techniques. The negative factors caused by changes to crops with low yield in terms of value and by moves from less fertile land were -1% and -11% respectively. By region, the South (including São Paulo state) showed a contribution of 71% by the production increase through arable land expansion and yield increases. The contribution by means of improved yields was 39%, and the contribution caused by the expansion of the planted land area to less productive land was -13%. In the Central-west, the contribution of area expansion was 125% and the negative contribution because of lower yields was -11%. That caused by conversion to crops with lower yield in terms of value, was -14% (See Table 5-20).

In the South and Central-west which have been the centers of Brazil's recent agricultural expansion, it is clear that arable area expansion plays an important role in production increases but the arable frontier is expanding to less productive land and, although farming is becoming more extensive, the production increases are mainly for grains, etc. which are comparatively low in terms of value production. In regions other than the South including São Paulo state where many crops with greatly improved yields such as vegetables are cultivated, the fact that there has been almost no improvements in yields is noteworthy. Table 5-21 compares changes in amounts harvested per hectare for crops which have shown large increases in production in Brazil as a whole for the last 10 years. Although there are a few exceptions such as wheat, generally the higher the increase in production, the greater the dependance on planted area expansion. On the whole, improvements in output per unit land area have been low.

(2) Technical Improvements and Comprehensive Development

It has often been said that agricultural development as described above, i.e. development dependent mainly on arable land expansion, has resulted from the large amount of unused resources becoming productive because of the annual population increase of 3%, the improvement of market conditions and an increase in demands for agricultural products. During this growth, there have been almost no efforts to improve the fertility or productivity of the land. As shown in Table 5-21, there are some crops where the yield per unit land area has improved but if the crops such as tobacco and potatoes which require intensive care are excluded, there appear to have been few improvements. Even in the case of wheat which showed the greatest improvement in yield, the average world harvest rate has already reached 1.5 tons per hectare and compared with the average rates of 2 tons in the United States and 1.4 tons in Latin America, the Brazilian level seems to be rather low.

Measures to expand the capacity of the land include stabilization of the water supply by irrigation, deep plowing using machinery, increased

Table 5-21 Trends of Production Growth and Yields for Major Crops

	Production			Yield per hectare			
	1959-61	1969-71	1969-71/ 1959-61	1959-61	1964-66	1969-71	1969-71/ 1959-61
	---1,000 tons---		%	---ton/ha---			%
Soybeans	209.6	1,594.2	760.6	1.24	1.09	1.13	91.3
Wheat	623.0	1,758.1	282.2	0.56	0.83	0.95	169.5
Peanuts	450.1	881.5	195.8	1.38	1.28	1.27	92.0
Bananas(1)	257.4	493.2	191.6	1.40	1.46	1.78	127.4
Oranges(1)	8,387.3	15,541.6	185.3	74.60	72.89	77.73	104.2
Cassava	17,415.6	29,932.1	171.9	13.19	14.12	14.58	103.3
Maize	8,499.0	13,755.9	161.9	1.29	1.28	1.36	105.7
Tobacco	160.2	247.1	154.2	0.76	0.87	0.98	128.9
Potatoes	1,051.3	1,580.0	150.3	5.57	6.29	7.04	126.4
Rice	4,762.9	6,670.8	140.1	1.60	1.54	1.37	85.7

Note: (1) Units of fruit.
Source: Conjuntura Economica vol. 26, Nov., 1972.

use of fertilizers and the introduction of suitable new varieties. An investigation has been made of one of these methods to increase land capacity, the utilization of fertilizer. Throughout Brazil, the expenditures on fertilizer increased rapidly since 1967 and the last five years have shown a record expansion of 3.4-fold in such expenditures (See Table 5-22).

However, although the domestic production of fertilizer has increased recently, the self-sufficiency rate has been dropping every year, From 40% at the beginning of the 1960s, the rate dropped to below 20% in 1970. As is clear from Table 5-23, the increase in fertilizer expenditure was greatest in the South which can be assumed to be due to increases in the two crops of wheat, soy beans and maize in that region. The fertilizer expenditures are concentrated in the states of São Paulo and Parana where there is a high proportion of intensive crops such as vegetables and coffee. In the North and Northeast, commercial crops such as sugar cane and pepper are fertilized but the cultivation techniques utilizing fertilizer are inferior to those in other areas. Although fertilizer is only one example, the extension of planted land area makes it more difficult to perform intensive cultivation and the rapid expansion to the interior presents a danger because of insufficient supplies of the knowledge and materials required for intensive crop care. For example, demand for lime, which is essential for the improvement of acidic soil is increasing as the arable land in the South and Central-west expands but since the transport costs rise as new farms are extablished deeper into the interior, supplies will become difficult and the same tendency will occur as with fertilizer.

The expansion of arable land tends to hinder the introduction of intensive agricultural techniques but as the arable land frontier is extended further into the interior, the techniques required to improve harvest yields are introduced in some cases. Naturally, this is the introduction of machinery. With the recent development of industry in Brazil, particularly of the automobile industry, the domestic production of tractors is increasing rapidly. According to the statistics, the total production of tractors in 1965 was approximately 11,000, most of which were small- and medium-size types of less than 45 HP. However, in 1971, the production reached 25,000 and in 1972, it was 34,800. The majority of these were large types of more than 46 HP. The great expansion in the production of large tractors indicates the necessity for cultivation by large-scale equipment, i.e. an increase in the proportion of large-scale farms. As can be seen in Table 5-24, the number of tractors per farm has increased greatly in the South, Central-west and Central-east and this increase in tractor production can be considered as related in the same way. According to census figures, the average scale of Brazilian farms is gradually decreasing but, because of the tendency for the planted area to increase, it can be assumed that the average size of the farms are not decreasing to such a degree in the South and Central-west. In the North, Northeast and Southeast, the number of persons employed in agriculture is not decreasing as the scales of the farms decrease but in the South and Central-west, the dro, in the population engaged in agriculture exceeds the rate of decrease

Table 5-22 Fertilizer Expenditures by Region

(Unit: 1,000 tons)

	Brazil	North	Central	South
1960	299	24	216	59
1962	237	21	182	34
1964	255	22	190	43
1966	281	28	215	37
1967	448	40	319	85
1968	603	38	400	123
1969	627	52	429	151
1970	979	89	647	262
1971	1,126	95	672	350
1972	1,515	124	887	504
1972/1967 (times)	3.4	3.1	2.8	5.9

Notes: 1. Nutrient unit: N.P.K. total.
2. There are cases when total regional figures do not equal national figures.
3. The North consists of the North and Northeast and the South of the two states of Santa Catarina and Rio Grande do Sul.

Source: Sindicato da Industria de Adubos e Colas, Est. de São Paulo.

Table 5-23 Regional Fertilized Areas for Major Crops

(Unit: 1,000 ha)

	North		Central		South	
	Fertilized area	Planted land area	Fertilized area	Planted land area	Fertilized area	Planted land area
Cotton		448	636	1,212	-	-
Rice	-	17	250	1,010	191	383
Potatoes	-	-	88	88	-	61
Coffee	-	-	1,000	2,000	-	-
Sugarcane	146	365	300	756	-	53
Beans	-	372	28	285	27	274
Tobacco	-	14	-	-	115	115
Cassava	-	185	5	104	13	174
Maize	-	443	1,800	3,600	500	1,670
Wheat and soybeans	-	-	250	583	757	1,314
Total	146	1,844	4,357	9,638	1,603	4,144

Notes: 1. The North consists of the North and Northeast; the South, the states of Rio Grande do Sul and Santa Catarina.
2. The North and South estimates are for 1969 and those of the Central Region are for 1968.

Source: Ministerio da Agricultura, "Identificão e Avaliação Preliminar de Politica dė Estimulos a Producão e Uso de Fertilizantes."

Table 5-24 Scale of Farms by Region

		North	North east	South-east	South	Central-west	Brazil
Farm area							
Total	1950	23,108	58,341	61,384	35,421	53,604	231,858
(1,000 ha)	1960	23,452	62,989	64,438	38,993	59,988	249,860
	1970(1)	(27,673)	(70,548)	(57,994)	(67,458)	(83,383)	(307,056)
Per farm(2)	1950	296	69	105	74	670	112
(ha)	1960	170	45	78	48	377	75
	1970	(106)	(32)	(62)	(53)	(329)	(62)
No. of farms							
Total	1950	78	844	582	481	80	2,065
(1,000)	1960	138	1,408	824	808	159	3,338
	1970	262	2,213	931	1,275	253	4,933
No. of employees							
Total	1950	326	4,327	4,000	1,950	386	10,989
(1,000 persons)	1960	544	6,659	4,548	3,194	685	15,634
	1970	982	7,836	4,217	4,257	957	18,249
Per farm	1950	4.18	5.13	6.87	4.05	4.83	5.32
(persons)	1960	3.94	4.73	5.52	3.95	4.33	4.68
	1970	3.75	3.54	4.53	3.34	3.78	3.70
No. of tractors							
Total	1950	0.06	0.45	5.16	2.57	0.14	8.37
(1,000 vehicles)	1960	0.43	3.13	34.13	21.46	2.19	61.34
	1970	1.01	6.03	79.56	60.53	9.45	156.59
Per farm	1950	0.08	0.05	0.89	0.53	0.18	0.41
(vehicles)	1960	0.31	0.22	4.14	2.66	1.38	1.84
	1970	0.39	0.27	8.55	4.75	3.74	3.17

Notes: (1) Estimated using the regional crop area increase rates with 1960 as the base year.
(2) Number of tractors per 100 farms.

Source: Departamento do Censos.

in the scale of farms. This means that in the South and Central-west, farm employment is being held down to some extent by the introduction of machinery, etc.

As is indicated above, Brazilian agricultural development is often said to be especially dependent on the expansion of the agricultural frontier. In the South and Central-west, as well as part of the Southeast, labor inputs are being reduced through the use of machinery and there is a tendency for new crop varieties to be introduced to increase productivity, and for the use of fertilizer to rise. This means, briefly, that modernization through intensive care technology is gradually being achieved on the basis of labor-saving techniques and arable land expansion because of the presence of plentiful resources. Contrary to this, Japanese agriculture since the Meiji Period was first concerned with the establishment of land-saving techniques. Government investment activities concentrated on land improvement to increase the effects of these land savings techniques. Experimental research in order to establish nationwide land-saving techniques on a guidance basis was performed and the results led to high productivity and excellent use of technology within the framework of very small scale farming. However, the rapid decrease in rural population from the latter half of the 1950s resulted in conditions under which it was necessary to add modernization of agriculture by means of labor-saving techniques to agriculture based on land-saving techniques, the reverse of that in Brazil.

Of the agriculture-related expenditures of the Japanese Government, those for experimental research and extension activities accounted for 37% in the 1910s, 7% in the 1920s, 6% in the 1950s and 4% in the 1960s. The percentages of expenditures for improving the production base were 23%, 41%, 67% and 39% respectively (Note 25). It is impossible to obtain such data for Brazil but the interest of the Government in experimental research has been slowly increasing in recent years. The Brazil Agriculture Research Company (Empresa Brasileira de Pesquisas Agropecuárias--EMBRAPA) which commenced activities in the spring of 1973 on the basis of Law No. 5851 of 1972, provides financial support for research, but there are still many problems such as those of training personnel. Extension activities are carried out by the Agricultural Financing and Technical Assistance Association (Associação Brasileira de Crédito e Assistencia Rural--ABCAR) which was founded in 1956 and provided technical assistance in connection with financing by the Bank of Brazil. However, it seems impossible for sufficient extension services to be assured when there are only 2,970 personnel.

3 Problems and Perspectives of Brazilian Agriculture

3-1 Local Integration of Policy Problems

The Minister of Agriculture, Dr. Cavalcanti, has said, "One of the problems limiting the development process is that there are still some people in the undeveloped regions and outside the market economy and this

shows clearly that there is incomplete utilization of material and human potentials in the Brazilian economy." Therefore, the development strategy should emphasize expansion of the economic frontier by integration of undeveloped regions, improvement of the distribution of production factors and strengthening of domestic markets, establishment of an independent economic course, planned growth through coordination of the various sectors and an outward-looking economic system.

The difficult problems involved in the Brazilian economy, i.e. major regional differences, lack of basic social capital, low education rate which hinders effective utilization of manpower resources, etc., have been pointed out many times and the correction of such defects is an important policy theme in economic planning. In achieving the basic aims of economic planning, i.e. raising the economic level to that of developed countries and improved distribution among the people of the wealth accruing from economic growth, it is naturally very important to first consider domestic integration. However, large-scale plans such as regional development plans actually do not always give conspicuous results as can be seen in the case of PROTERRA. Compared with the agriculture of the Central and South regions which has expanded rapidly partly due to improvement in international conditions, and the remarkable growth in industry because of active Government policies to induce foreign investment, the relative backwardness of the regions in which development has been delayed is actually increasing. It appears that there will soon be an intensification of the north/south problem in Brazil.

Naturally the progress of industrialization and the expansion of urban areas contributes greatly to the urban shift of the rural population and the increased demands for agricultural products. This is clearly shown by the recent rapid expansions in the industrial sector and the flow of the rural population to the cities in the latter part of the 1960s. Industrial expansion promotes the supply of agricultural production materials and development of the road network and the automobile industry widen the markets for agricultural products. However, these results have now led to a remarkable increase in agriculturally developed land and there is relative deterioration in the man/land ratio in the North Region as is evident from Table 5-24. Even though there appears to be an expansion of markets for agriculture in the developed areas centered on São Paulo, putting pressure on economically backward agriculture in the North. It is often stated that commercial agriculture which is directly linked to outside markets and which responds rapidly to changes in such markets has received the largest and fastest benefits from the recent favorable turn in market conditions. These benefits are gradually reaching the interior as the cultivation frontier expands but once there is any turn for the worse in market conditions, production in these newly-developed areas with poor market positions will no doubt rapidly decrease. In other words, the conditions required for modern agricultural production in the underdeveloped areas cannot always be achieved sufficiently. It is highly desirable that positive investment in the infrastructure be promoted in agriculturally backward areas, that an environment be created in such areas to utilize the

innovations of entrepreneurs and that technical knowledge be offered to self-sufficient farming communities so that they can cope with environmental changes. The development of human capabilities through education will also definitely promote the more effective utilization of manpower resources.

3-2 International Competition

The present favorable conditions are encouraging the expansion of agriculture to new areas and this is also one condition which is increasing regional disparities as has been discussed above. However, the problems of growth of agriculture through external stimulation and economic incentives and of regional differences in economic development must not be considered as only domestic problems. The First National Development Plan aims at providing international competitive power and emphasizes the establishment of an outward-looking economic system. However, as Table 5-3 indicates, current Brazilian agricultural productivity is below the world average and the harvest yields per unit area for each crop are much less than the international levels as was made clear above for the case of wheat. In addition, there have been little or no improvements over the past decade or even before. The first thing that deteriorating market conditions will bring about, in all probability, is decreased production in newly productive areas and over-all Brazilian agricultural production might be endangered. The present extensive agricultural management is profitable in respect to costs but it must not be overlooked that it might result in conditions such as unstable production and lower quality which do not increase competitiveness.

There is the possibility that the relative value of the investment required for agriculture will become more beneficial for agriculture through the aggressive industrialization policies. The progress of industrialization will also expand the demand for agricultural products as the urban areas grow. Such conditions should promote technical improvements in agriculture. There will also be a necessity for experimental research and the spread of the results of such research since technical improvements are indispensable from the standpoint of international competitive power. If production can be stabilized and the quality can be increased, there should be a more active transfer of resources from agriculture to industry.

At present, agriculture accounts for 70% of the Brazilian economy and in particular is important as a source of foreign currency. The dependence on coffee has decreased considerably but in its place the role of non-traditional export crops is greatly increasing and the Government also expects increased production of non-traditional export crops in the future. There is therefore a trend toward diversification in production and exports but for the time being, Brazil will be dependent on agriculture for most of the capital required for economic development. Naturally, the necessity of strengthening competitiveness is emphasized in this respect. The non-traditional export crops are temperate and this alone presents a problem of competition, especially with North America. Future development of entrepreneurship will be necessary to provide competitive power. However, the

way in which the government acts will no doubt have a great influence on technical development, which was one of the points stressed by Dr. Cavalcanti.

As was described previously, the contribution of Brazilian agriculture to world agriculture is at present less than 3% of world production but the land area used for agriculture is about 4% of the total world area which means that there are considerable possibilities for expansion. If superiority in market competition is achieved through technical improvements matching the change of the demand by the change of the economic structure, the contribution of Brazil to world agriculture should increase. One of the main potentials for Brazilian agricultural development is that there is a much greater possibility of land utilization than in other countries. At the same time, the current low technical level also means that considerable improvements are possible. From the standpoint of world food resources, Brazil must contribute more to world agriculture and she has the potential to do so. This could be done by considering a national economic growth pattern, a large part of which is devoted to agriculture.

Notes

1) FAO, "Production Yearbook." Includes arable land and land under permanent crops.

2) Conjuntura Economica, vol. 26, Nov., 1971.

3) According to 1967 statistics. The area of land producing crops was 4.4% of total land area.

4) National Land Bureau, Ministry of Construction, "Investigation of Areas of Japanese Cities, Villages, etc." (in Japanese).

5) Fundaçao IBGE - Instituto Brasileiro de Estatística, "Sinopse Estatica do Brasil," 1972.

6) FAO, "Provisional Indicative World Plan for Agricultural Development," vol. I, 1969, p. 49.

7) Leo Waibel, "European Immigrants in Southern Brazil." (Translated from the Japanese edition).

8) In the first 20 years of the twentieth century which were the peak of the coffee-based monoculture economy, the population of Sao Paulo state doubled and reached a density of about 19 persons per square kilometer in 1920. The only states with higher population densities at that time were Rio de Janeiro, Guanabara and the states of Pernambuco and Alagoas in the Northeast where some of the prosperity of the sugar period remained.

9) Overseas Technical Cooperation Agency, "Report of Survey of Brazilian Republic Federal Export Corridor Program Survey Group." Dec., 1972, p. 24.

10) GDP in US dollars from UN, "Statistical Yearbook," also from real comparison with export figures (FOB, US dollars).

11) Rural population and population engaged in agriculture can be compared as follows:

	Rural population	Percentage of total population	Population engaged in agriculture	Percentage of total employed population
	million persons	%	million persons	%
1960	39.0	54.9	12.2	53.7
1970	41.6	44.0	13.1	44.2
1970/1960	106.7		107.5	

12) USDA, ERS, "Brazil's Position in World Agricultural Trade," Oct., 1967.

13) A Politica Agricola Nacional, Palestra Proferida em 1 Agosto, 1973 pelo Sr. Ministro da Agricultura, Dr. José Francisco de Moura Cavalcanti.

14) Conjuntura Economica, Nov., 1972; and Federal Republic of Brazil. "First National Development Plan, 1972/74," Nov., 1971.

15) It was raised from 10% to 15% in 1973.

16) Consumption and exports of meat in Brazil increased annually by 2.5% and 14.3% respectively from 1960-62 to 1965-67. By obtaining estimates for 1975 by means of the demand income elasticity value, annual expansions from 1965-67 to 1975 are foreseen as 3.3% for consumption and 2.5% for exports.

17) R.L. Meyer, D.W. Adams, N. Rask and P.F. Cidade de Aranjo, "Rural Capital Markets and Small Farmers in Brazil: 1960-72," Columbus, Ohio, Jan., 1973.

18) Over 90% of the total institutional financing of agriculture until 1966 was handled by the Bank of Brazil but thereafter the rate decreased and it was only 70% in 1968.

19) Mitsugi Kamiya, "Agricultural Capital Formation and Financing Procurement," General Agricultural Research, vol. 22, No. 3, July, 1968 (in Japanese).

20) The interest rates for institutional financing as of February, 1972 were 13-15% for farm management funds and 10-15% (including currency value correction rate) for investment funds. These are somewhat lower than normal interest rates and assistance for the interest is provided.

21) Except for coffee, rice was previously the main crop in Brazil. Recently, rice has actually surpassed coffee as the main crop because of the decrease in coffee production. As of 1970, rice occupies more than 13% of total agricultural production (excluding livestock). Rice is followed by maize with just 13% and coffee with less than 9%.

22) The highest wheat production in Brazil's history was in 1971 but the self-sufficiency in wheat was only 60%. Therefore, imports of wheat are normally the largest of any agricultural product. As of 1970, wheat imports made up 44% of the total food and beverage imports.

23) Eduardo Pereira da Carvalho, "Agricultural Policy Rulings in Brazil with a View to Economic Development," a paper presented at the XV International Congress of Agricultural Economists in August, 1973, p. 6.

24) George Patrick, "Sources of Growth in Brazilian Agriculture: The Crop Sector" and R.M. Paiva et al., "Brazil's Agricultural Sector, Economic Behavior, Problems and Possibilities," São Paulo, 1973, pp. 63-65.

25) Mitsugi Kamiya, op. cit.

Chapter 6

INDUSTRIALIZATION AND EXPORT PROMOTION

1. Development of Postwar Industrialization

The development of industries in Brazil after the war can be divided into three stages from the standpoints of industrialization and trade.

1.1 First Stage

The first stage lasted from just after World War II until the early 1960s. During this period, emphasis was placed on the rapid development of import substitution industries. Brazil then imported the capital and consumer goods required for industrial production, using foreign currency earned by exports of primary products, mainly coffee. However, the difficulty of maintaining imports at required levels during the war encouraged the establishment of domestic industries and promotion of industrialization, and these trends became even more pronounced after the war. This was because the equipment and raw materials necessary for industrial production could be imported using foreign currency increments gained as a result of increases in coffee prices during the first ten years after the war and the foreign currency accumulated from exports of primary products during the war. The Brazilian Government adopted a basic policy of promoting imports by maintaining the cruzeiro at a somewhat high level, and established quantitative import quotas to facilitate the imports of capital goods and raw materials required for industrialization.

As a result of these policies, the profit rates in domestic oriented industries increased more than in the export-oriented industries and there was a rapid development of import substitution industries because of increased investment opportunities. Although agricultural production expanded every year, by only 4.8% from 1947 to 1955, industrial production increases in the same period reached 9.0% per annum and industry's share of the GDP became bigger.

During this period the international balance of payments became unfavorable because of the great increase in imports required to promote rapid industrialization and the decrease in export income because of the decline in international market prices for primary products. Therefore, the multiple exchange rate system was adopted and tariff barriers were erected. In spite of these measures, this was a period of reduced expansion in total domestic production. However, industrialization policies continued to be strong during this period and in 1956, the Five Year Economic Development Plan was instituted by President Kubitschek, to industrialize by expanding basic industry, transport capacity and the service sector. In 1956, the economic growth rate was low but from 1956 to 1961 the average annual GDP growth was 8.3% and industrial production during the same period reached a record of 11.3% per annum. Since the average annual increase in agricultural production was only 5.8% during this same period, the percentage of the GDP occupied by industrial production continued to increase and the industrialization of the Brazilian economy advanced steadily.

It was during this period that growth of the heavy and chemical industries started, through the participation of foreign capital. Previously, progress in industrialization had been limited to light industries, by means of small-scale investments of local capital, but during this period measures were taken to liberalize imports of machinery and equipment by foreign enterprises in order to facilitate the induction of foreign capital for economic development and also to obtain deferred payments for imported machinery. As a result, foreign capital in the form of direct investment reached US$511,000,000 from 1955 to 1961. Of this, US$380,000,000 (74.2%) was devoted to heavy industry with US$235,000,000 going to the automobile industry. During this period, there were increases in foreign investment in most of the leading Brazilian enterprises including Volkswagen (1953), Usiminas (1957) and Ishibras (1959).

There was also a change in trade dependence; the percentage of exports in gross domestic production, which averaged 15% before the war, dropped to 8.9% in 1955 and further to 7.3% in 1959. These figures indicate that the Brazilian economy is gradually changing from emphasis on the exports of agricultural products to industrial products for its domestic market. This means that the influence of changes in international markets on the Brazilian economy is rather small.

When this development plan which stressed industrialization through import substitution was put into effect, a limit to development gradually began to appear during the 1960s and the country was plagued by rampant inflation. The expansion of the GDP deflator which had been 11-12% per annum around 1950 increased rapidly, to 29% in 1959, 26% in 1960 and 33% in 1961.

1.2 Second Stage

This period was one of limited economic growth because of the increased inflation. The growth rate of the GDP deflator was remarkable: 55% in 1962, 78% in 1963 and 88% in 1964, which indicates a more rapid inflation rate than in the first stage. In 1962, the GDP increased by 5.3% and industrial production by 8.2%. In 1963, the GDP increased by only 1.5% and industrial production dropped 5.3%. The increase in agricultural production from 1961 to 1963 was only 3.2%. The Government tried to slow inflation by means of the Three Year Socio-Economic Development Plan but this was almost totally ineffective. At the end of March, 1964, the military regime came into power by a coup d'etat.

The new Government immediately took severe traditional monetary and fiscal measures to curb inflation using military control powers and obtained loans from the United States to improve the international balance. This resulted in a slowing of the rate of decline of the cruzeiro market and the price increase rate as reflected by the GDP deflator dropped from 55% in 1965 to 39% in 1966 and finally to 27% in 1967. The economic growth rate gradually recovered to 5.1% in 1965 and 4.8% in 1967. Industrial production

expanded by 12.2% in 1966 and 2.4% in 1967. Therefore, the industrialization policy yielded little results and this can be considered a time of adjustment for the subsequent industrial expansion. This was therefore a preparatory stage.

1.3 Third Stage

The third stage started in 1968 and has continued to the present. In this stage, economic policies again underwent a major change, with emphasi now being placed on putting to use idle production capacity, this idle capacity having been caused by tight money policies. In making this change, there was high-level growth in excess of the permissible range of the savings rate of the country, which was not very large. Another policy was a change from the past policy of promoting import-substitution industries to fuller utilization of production capacity in order to promote exports. It was decided to establish and develop export-oriented industries by such measures as the crawling peg system of the exchange rate, tax privileges for exports, credit grants and induction of foreign investment. These policies were strongly promoted.

In the six years since 1968, the economic growth rate has continued at 9-11%. This has resulted despite the absence of high operating rates and equipment capacities in all major industries, and the necessity for new equipment investment has become greater. As one important consequence, large-scale investment in excess of domestic requirements has taken place in the heavy and chemical industries. Part of this has been directed to the export market, and a period of the gradual expansion of industries such as machinery and petrochemicals which are not intended to be import substitution industries has started.

In industries such as textiles, leather goods and food products where the stage of import substitution was almost attained, the aim has been to diversify the export structure and to expand the volume of industrial products exported. In this way, these industries are gradually becoming export-oriented.

This period almost coincided with the experience of Japan, namely, domestic supply and demand restrictions were removed through industrial expansion to cope with the lack of commodities, and then from the latter half of the 1950s economic independence was promoted mainly through active investment in equipment in order to keep up with technical innovation, and main industrial policy was industrialization in the heavy and chemical sectors in anticipation of internationalization of the economy. The policies in Japan at that time for the development of the heavy and chemical industries emphasized the modernization of the most important basic industries and the establishment of newly emerging industries on the strength of technical innovation. For example, in the iron and steel industry, new integrated plants, large in scale by international standards, were established during the Second Modernization Plan (1955-60), which greatly increased

production capacity as well as a remarkably improved labor productivity, so that quality also came to be among the best in the world. This was also a period of the promotion of domestic production based on strong government protective policies for new industries such as automobiles, petrochemicals, synthetic fibers, synthetic rubber, electronics and machinery.

It is therefore of great interest to observe whether, in the future, the Brazilian economy will follow the same high industrial growth trajectory experienced in Japan from the latter half of the 1950s.

2. Industrialization and Industrial Structure

The following is a sectoral comparison of production activities, equipment investment trends, and export activities in Brazil during the third stage mentioned above with those in Japan.

2-1 Production Activities in Each Industry

Rates of production expansion in the manufacturing and mining industries in the years from 1967 to 1971 are shown in Table 6-1. In this period, the average annual rate of production expansion in all the industries was 11.5% but an upward trend in the rates was found for the basic production goods industries, capital goods industries and durable consumer goods industries; the highest rate was 23.5% for transportation equipment such as automobiles, followed by 17.9% for general machinery, 13.0% for metals, 13.6% for chemicals, 13.9% for rubber and 14.1% for leather goods. In the non-durable consumer goods industries, rates included 8.7% for textiles, 7.9% for food products and 7.9% for paper and paper products. This is a rather low rate of expansion though textile-related products are said to have been expanding well recently. Heavy industries which strongly promoted import-substitution industrialization during the latter half of the 1950s when Kubitschek was President started with remarkable production increases in the period of strong economic development after 1968. In the capital goods industries such as general and industrial machinery and the petrochemical industry (including synthetic fibers and resins), the tempo of expansion is rather accelerated, although they have not yet attained large scale because the import substitution process is yet to be completed. In the light industry field, however, where domestic demand is now almost completely met, the motivation for production expansion has weakened except for some industries such as textiles where there are gradual trends toward exports. From the above it could be said that the changes in the country's industrial structure already appear to have come a rather long way toward heavy industrialization.

2-2 Equipment Investment Trends in Each Industry

At the present time, it seems that there are no statistics showing the amounts of equipment investment in Brazil for each industry. However, Table 6-2 shows the amounts for fixed equipment investment in each type of manufacturing industry in accordance with the amounts approved for investment projects by the Censelho de Desenvolvimento Industrial (CDI). (Note: Coverage is limited to the manufacturing industries and is estimated as 10% of the gross domestic investment in all industries.)

Equipment investment in the production goods industries, particularly in basic industries such as steel and chemicals, occupies about 40% of the total. When the intermediate products produced from these basic materials are included, the equipment investment reaches 68% of the total. These equipment investment figures reflect the promotion of heavy and chemical industrialization which has been emphasized recently in Brazilian industrial development. Investments in the non-durable consumer goods industries for textiles, leather and foods and their finished products, and in the automobile and related industries are also relatively high. However, the total equipment investment in the capital goods industries such as industrial machinery, electrical equipment and shipbuilding totals only about 3% of the whole. This low level of investment, together with the fact that 68% of the total investment in machinery in all industries is used for imported machinery, shows that the capital goods industry in Brazil is still in the infant stage. It is characteristic of the economy that increases in production caused by increased fixed capital formation are comparatively great, but they are not connected with accumulated equipment investment in the capital goods sector.

In Japan, during the early period of technological innovation which coincides with the economic growth since the latter half of the 1950s, a certain level in the capital goods industries and the basic production goods industries had already been attained. And in this period as a result of tight foreign currency controls, the policy adopted was one of severely restricting imports of foreign machinery for equipment investment, and of fostering domestic capital goods industries. However, at that time, there was no surplus equipment capacity in the established capital goods industries and there were pressing needs for the introduction of new technology. Therefore, the so-called "investment generates investment" mechanism was activated as equipment investment in the machinery and related industries accumulated in order to satisfy increased demands for such investment. That the rate of equipment investment which induced the investment required for individual consumer expenditures and financing, exports, etc. through its demand effect was comparatively low, and that there was mutual reaction of equipment investment in the related industries which caused an increase in equipment investment, are manifestations of this mechanism.

In Brazil, there has been considerable inducement for equipment investment because of the lack of production capacity but it was necessary to depend on imported machinery because of lack of development of local

Table 6-1 Recent Expansion Rates in the Brazilian Manufacturing and Mining Industries

	Average expansion rates for 1967-71	1970 expansion rate	1971 expansion rate
Manufacturing industry	11.5%	11.1%	8.1%
Non-metallic minerals	12.1	25.4	3.9
Metals	13.0	6.3	14.0
General machinery	17.9	16.5	14.9
Electrical and communication equipment	12.7	7.6	14.9
Transportation equipment	23.5	16.3	17.6
Wood products	10.4	10.8	6.6
Paper and paper products	7.9	17.2	6.7
Rubber	13.9	22.0	15.1
Leather	14.1	11.0	-
Chemicals	13.6	17.9	13.4
Textiles	8.7	Δ 0.1	14.0
Textile products	4.6	17.9	14.0
Food products	7.9	9.7	2.2
Beverages	6.3	0.9	2.3
Tobacco	7.2	6.3	2.3
Mining	-	-	-
Construction	10.7	16.6	3.1
Electric power	11.3	10.1	12.3
Total	11.5	11.1	9.0

Source: Ministerio da Fazanda

Table 6-2 Equipment Investment for Each Industry in 1971
- Approved Base by Conselho de Desenvolvimento Industrial -

(Unit: CR$1,000)

	Total investment	%	Machinery and equipment A	Imports B	B / A
Capital goods	120,387	2.9	94,791	71,663	75.6%
Machinery	39,265	0.9	29,911	22,843	76.4
Electrical and electronics	69,127	1.7	55,372	41,386	74.7
Shipbuilding	11,995	0.3	9,508	7,434	78.2
Basic production goods	1,694,495	39.6	1,011,993	602,881	59.6
Metals	810,987	18.9	501,464	301,938	60.2
Chemicals and petrochemicals	833,508	20.7	510,529	300,943	59.0
Intermediate production goods	1,225,187	28.7	734,904	475,718	64.7
Metal products	108,941	2.6	85,877	71,379	83.1
Non-metal products	1,116,246	26.1	649,027	404,339	62.3
Transport equipment	508,260	11.9	233,655	188,771	80.8
Consumer goods	725,004	16.9	602,282	485,228	80.6
Durable consumer goods	6,033	0.1	4,699	4,030	85.8
Non-durable consumer goods	718,971	16.8	597,583	481,198	80.5
Total	4,273,343	100.0	2,677,625	1,824,261	68.1

Source: CDI.

capital goods industries. Therefore, the mechanism of investment-generating-investment has not functioned, which is the main point of difference with Japan.

2-3 Export Trends in Each Industry

The emphasis in Brazilian industry thus shifted clearly to the chemical and heavy industries but the point which demands attention here is the change in the export structure. In 1971, industrial products made up only 28% of the total exports. More than half of exports, 57% to be exact, consisted of agricultural and related products, mainly coffee beans, raw cotton and meat. If the mining product exports which accounted for 11% are added, the total becomes 68%, a strong majority. However, when considering the average annual rates of expansion from 1967 to 1971, the rate of expansion of exports of agricultural and related products was only 10% while that of industrial products was 22% and that for mining products 23%. It is fully expected that there will be large increases in the exports of industrial and mining products in the future because of the promotion of industrialization in the mining and manufacturing industries.

The following table shows a comparison between various types of exports in Japan in 1955 and in Brazil in 1971.

Table 6-3 Comparison of Composition of Exports, Brazil and Japan

	Japan, 1955 (US$ million)	(%)	Brazil, 1971 (US$ million)	(%)
Agricultural and food products	136	6.8	2,082	71.7
Textiles and textile products	749	37.2	31	1.1
Chemicals and chemical products	94	4.7	50	1.7
Metals and metal products	386	19.2	68	2.3
Machinery	247	12.3	122	4.2
Others	399	19.8	551	19.0
Total	2,011	100.0	2,904	100.0

Although there were no major differences in the scale of exports in both countries, the part played by agricultural products in Brazil was predominant and the heavy and chemical industry products such as chemicals, metals and machinery accounted for only 8%. In 1955 in Japan, on the other hand, textiles still made up 37% of exports but the heavy and chemical industrial products were almost equal to that, at 36%.

Such a trade structure has been bestowed on a fertile country like Brazil which has plentiful natural resources but in Japan, the unfavorable natural conditions resulted in a strong desire for industrialization. Japanese enterprises, in 1955, with light industrial and rather low level heavy and chemical industrial products, gained international competitive power as the result of rationalization efforts by enterprises. For a period of about ten years after 1955, the main themes in Japanese economic policy were (1) to promote exports in order to accumulate foreign currency reserves to assure purchases of natural resources and (2) to strengthen international competitive power to increase exports. In order to achieve this, cooperation was obtained from enterprises based on the proposition that Japan's own export structure must be based on chemical and heavy industrialization because such emphasis was prevalent in the world trade structure. Through such efforts, the above aims were generally achieved in the latter half of the 1960s.

In Brazil, however, heavy and chemical industry products have developed only recently and through the introduction of foreign technology; therefore two points stand out: the insufficient accumulation of technology and the strong unbalance among the various industrial fields. Even in the export of light industrial products such as textiles, Brazil is at the stage of maintaining a domestic balance by means of strong protective policies such as tariff barriers and taxation systems as well as financial incentives.

Luckily Brazil has been favored with excellent natural conditions and high exports of primary products and related finished products can be expected. For the time being, the foreign currency obtained by these exports can be used to introduce new machinery and technology for equipment investment and industries--mainly the heavy and chemical industries--can be developed to a high level by importing any raw materials required for expanding production. In such a case, even though the basic industrialization policy in Brazil must definitely be heavy and chemical industrialization of both the industrial and export structures, it is doubtful that policies such as those used in Japan comprise the best plan for Brazil to follow. Therefore we can evaluate highly the First National Development Plan (1972-74) which has for its industrial development strategy a balanced development of the heavy and chemical industries along with the agricultural, mining and primary products industries.

3. Industrialization and the Role of Government

As in other developing countries, the Brazilian economy has been greatly influenced by the intervention of the federal and state governments in economic affairs; in Brazil this has been especially true since the 1964 Revolution. For example, according to the statistics of the Getulio Vargas Foundation, the government investment was Cr$7,432 million or 33.9% of the gross capital formation of Cr$21,949 million in 1969. However, when the Cr$47,373 million of investment in government-affiliated enterprises such as railways, electric power, communications, oil, mining and iron and steel is added, the total reaches 55.5% or more than half of the gross capital formation. The following are the main points concerning the government participation in fields closely related to industrial development:

(1) Management of government enterprises mainly in the key industries

(2) Government fixed capital formation in order to improve the infrastructure

(3) Intervention in pricing and capital investment policies of main enterprises

(4) Taxation and financial incentives to promote regional development and exports.

3-1 Management of Government Enterprises in Key Industries

In the developing countries, there are more cases in Central and South America where the basic industries such as iron and steel, oil and mining have been nationalized. This is done mainly to ensure the proper distribution and efficient utilization of limited resources such as money and manpower, and thus to guarantee a stable supply of materials required for economic development with stress on expanding production investment. For a while after the war, in Japan, a priority production system, to increase output of coal, steel and electric power required for reconstruction, was adopted on the assumption of severe constraints on supply for various goods but in Brazil, it appears that production expansion balanced by planning can be achieved by managing the key industries as government enterprises and that this leads to efficient development of high-priority industries. Actually, the majority of government enterprises are in such key industries as railways, electric power, iron and steel, oil drilling and refining, and communications.

Although there are more than 900 electric power companies, the federal power corporation, Electrobras (a holding company) has taken over about 140 small companies and supplies 35.5% of the nation's total power. When independent state-operated power companies are added, the power supplied by government-managed companies exceeds 60%. At present, the

reorganization of the electric power industry is being debated and it appears that the largest private power company, the Canadian-owned Light Co., might be placed under federal or state management. There is a trend towards state control in the local regions by the federal government, mainly through Electrobras.

In the fields of oil drilling, refining and marketing, the state oil company, Petrobras, was established with a large amount of government investment to cope with international oil capital and has a 92% share of total refining capacity. Preliminary moves for the future include strengthening the marketing sector to cope with other international capital and advancing into the petrochemical field (Petroquisa has been established). There is also considerable interest in investing in the development of foreign oil resources in Iraq, Algeria, and perhaps other countries.

In mining, the Companhia Vale do Rio Doce (CVRD), controls 80% of production and over 90% exports of iron ore. Its main role is to support the state steel plants (described below) but it is also strong in regional development and related activities such as construction of railways needed for the transport of the iron ore and the management of the special harbor at Victoria. CVRD has also recently began to develop pulp and bauxite resources in the Amazon region.

The first state iron and steel enterprise, CSN, was established before World War II and in the latter half of the 1950s and beginning of the 1960s, two new companies, Usiminas and Cosipa, were founded. These three large state enterprises control 60% of total national production capacity. Recently, the construction of large-scale steel plants in Tubarao and Itaqui have been studied. In 1968, the Iron and Steel Deliberation Committee, CONSIDER, was formed by the Ministry of Industry & Commerce to draft general policy recommendations on basic matters concerning the iron and steel administration such as long term supply and demand, production planning and investment plans. In autumn, 1973, a holding company for the state steel plants, Siderbras, was established to coordinate production and marketing planning among the state enterprises and ensure efficient management of these enterprises.

Because the development of large-scale projects in key industries such as electric power, oil, mining and steel was considered to be difficult if attempted only by means of private investment, those projects have been promoted by government enterprises with minority participation by foreign investors. Holding companies have been set up in the electric power and steel industries as coordinating bodies to prevent redundancies and diseconomies among the various state enterprises. Whether this system achieves the intended results is thus a matter of considerable interest.

3-2 Development of Infrastructure

If stabilizing the supply of basic commodities by developing state enterprises is considered as a prerequisite for making a national market system, then the expansion of the infrastructure--traffic, transport, communications and related facilities--is indispensable for the continued development and unification of the country, particularly in view of its vastness.

In land transportation, Brazil quickly developed its railway system during the latter half of the twentieth century and the country has since entered the automobile age. For freight transport, bulk cargo such as ore or timber is carried by rail but most other freight is carried by truck. Road transport accounts for about three-quarters of all domestic freight movement. Long-distance passenger buses are also in operation, and because they are often more convenient and faster than the railways they are widely used. Considering the number of passenger-kilometers, 80% is accounted for by automobiles and only about 5% of long-distance travel is by plane. Although there are differences in quality among federal, state and local roads, the road system as a whole is very good and in particular, wide interstate national highways (paved and at least four lanes wide) are of good quality. A nation-wide network of these highways is almost complete. The Transamazonica Highway, now under construction, will connect new agricultural production areas and collecting areas, and should bring civilization to now-underdeveloped areas. When the plan for a coastal highway connecting the northern and southern parts of the country is realized, it should be possible to expand the industrial belt now centered around Rio de Janeiro and Sao Paulo. The completion of roads being developed in relation to the export corridor projects will further increase the links between inland areas and the coast.

Many railways were originally built to carry agricultural products for export from the interior to coastal ports and because of differences in the period of construction and the technology used, there are variations in gauge and other technical characteristics, and the rail networks are short and are limited to certain areas. The rolling stock, roadbeds and rails are almost all old and their maintenance is poor. Recently, considerations have been given to railways as the methods for transport of not only agricultural products but also other freight such as ore and industrial products. Plans are being made to unify standards on a nationwide scale, interconnect lines, and plan the construction of new lines on the basis of a coordinated national program. However, as yet there has been no outstanding result.

Compensating for the deficiencies of the railways, coastal and river shipping for long-distance and heavy cargo must be evaluated as a method of domestic transport in Brazil. However, Brazil owns comparatively few ships and many of them are over-age, resulting from inadequate expansion of marine transport. With incomplete harbor facilities and insufficient cargo handling equipment and storage facilities, marine transport has not kept up with economic growth and industrial development.

The necessity to expand the ocean-going merchant fleet in accordance with "cash and carry" principle has been stressed in connection with export expansion and investment in the shipping industry has been promoted by establishing ship funds. However, Brazilian ships now carry only 20% of total exports. As part of the export corridor plan, large commercial ports are being constructed in the Victoria, Santos, Rio Grande and Paranaguer areas but at present it is planned that they will be mainly for bulk cargo and items handled in large quantities including primary products. There are not as yet sufficient container handling facilities.

Therefore, the pressing needs in the transport field for the Brazilian economy are not limited to expansion of coastal shipping and completion of the railway network but involve the establishment of an over-all transport system in which there is coordination of roads, railways, coastal and ocean-going shipping and airlines. This will be, in the future, one of the basic government policies to be strengthened as a foundation to support the expansion of the economy.

3-3 Price Controls and Investment Inducement Policies

The government can assume direct control over prices by means of Conselho Interministerial de Preços (CIP) and over equipment investment by means of Conselho de Desenvolvimento Industrial (CDI).

The CIP has the authority of direct intervention in the prices of a majority of industrial products. Enterprises apply to the CIP for permission to raise prices through their industrial federations. Increases require approval by the CIP. This type of price control is one of the main ways the government can control inflation. Applications cannot be accepted within three months of the preceding increase and often only about half of the requested increase rate is approved. In 1973, the government decided to keep the price increase rate within 12% and at the same time, the CIP standards for granting approval were tightened because of fear that there would be shortages in basic commodities. Approvals for price raises were thus curtailed. As in Japan, after postwar price controls were abolished, government intervention in the pricing system was avoided as much as possible except in unavoidable cases such as public utility fees and some agricultural product prices. This was because it was feared that discrepancies in the distribution system which might occur because long-term restraint on free price formation in the market through competition could ultimately harm the rationalization of the economy as a whole.

The CDI processes applications for the establishment of new enterprises and expansion plans for existing enterprises. The contents of these plans are investigated and applications are approved according to their assigned priority. The CDI is therefore the key to equipment investment in Brazil. The trends in the country's industrialization policies can be known by studying the approval policies and priorities of the CDI. The CDI classifies manufacturing industries into eight fields and decides the

investment priorities for each so as to achieve an annual industrial growth of 10-12% on the basis of the First National Development Plan. The following privileges are granted by the CDI in order to obtain these conditions.

(1) Customs tariff and commodity distribution on tax (ICM) exemptions for the imports of machine parts which cannot be obtained in Brazil;

(2) Exemptions from the industrial product taxes (IPI) for the same purpose;

(3) Exemptions from industrial product taxes (IPI) for purchases of domestic machinery;

(4) Accelerated depreciation for the same purpose; and

(5) Long-term, soft loans from governmental financial institutions such as the Bank of Brazil, the National Bank for Economic Development (BNDE), the Federal Savings Bank (CEF) and the Social Integration Plan (PSI).

For example, if the CDI conditions are met, for equipment investment when machinery is to be imported, there would be import tariff exemptions of more than 30%, commodity distribution tax exemptions of 15-17% and industrial product tax exemptions of 5%. This represents a monetary savings equivalent to more than 50% of the total investment. In addition, long-term, low-interest loans are assured. As can be seen from Table 6-2, of the total investment of about Cr$4.3 billion of 551 approvals in 1971, about Cr$2.7 billion was for the import of machinery and equipment but the tax exemptions amounted to about Cr$1.2 billion or 28% of the total investment, and 44% of the total investment was for imported machinery.

Among the different industries, the exemption rates are the highest in the primary product industries where the exemptions represented 38% of the total equipment investment. This was followed by the intermediate product industries where the exemptions were equivalent to 27% of the total. In the consumer goods industries, the figure was rather low--only 22%. The government provides incentives to promote investment in the capital goods industries and in particular the machinery industry, but as mentioned above, the scale of investment is small, and comes to only about 3% of the total approved investment; at present these incentives have not been very effective in this sector.

3-4 Export Promotion Measures

The Brazilian Government has taken strong measures to promote exports because the rapid increase in recent years of outstanding foreign

debt has caused fears concerning future instability in the international balance of payments. Export promotion also serves to develop the market for manufactured goods after the completion of large-scale industrial plants which have been planned or built recently, and this will be a main point in future government policies. To achieve this export promotion, the export corridor plan and the crawling peg system, as well as the following tax incentive measures are also being used.

(1) Income tax exemptions for profits earned from exports and approval to treat costs of promoting exports as expenditures;

(2) Exemption from industrial product taxes (IPI) for industrial products for exports and local raw materials required for its production;

(3) IPI exemptions for capital goods imports to be used for the production of export commodities;

(4) Exemptions in commodity distribution taxes (ICM) for export products;

(5) Reduction of import duties on raw materials imported for the production of industrial goods for export; and

(6) Import duty exemptions on used machinery to be utilized to make industrial goods for export.

These incentives cover the same range as the incentive measures of the CDI for equipment investment and Brazilian export incentives can be considered as being rather powerful.

However, such powerful protective measures at the stage when the country's exports have begun to attract international attention might reach the same level as the support provided to the Japanese shipping industry--which was criticized in the international community. Before this stage is reached, it will be necessary to gradually reduce or ease such incentive policies. Therefore even though the measures to promote the exports of domestic products will be decreased, international competitive power can be increased through the efforts of the enterprises themselves.

This poses the question of what will be the means by which Brazilian enterprises will make efforts to modernize. In Japan, when there was an unfavorable international balance after a spurt in equipment investment, tight financial policies were often adopted to improve the balance. To compensate for low domestic demand under such conditions, there were strong export drives, and it became necessary to reduce production costs in order to improve access to foreign markets. This meant that the enterprises were given a specific impetus in their efforts for modernization. In Brazil where the domestic demand rose above the normal level after 1968, enterprises are almost able to take the attitude that "if you can make it, you can sell it."

4. Industrialization and Corporate Structure

4-1 Formation of Giant Industrial Groups

As has been described above, the policy of industrialization in the heavy and chemical areas which is strongly promoted by the Brazilian Government has resulted in the emergence of the big business and industrial groups, which are undertaking the large-scale projects believed to be indispensable for gaining a good position in international markets.

One type of big business is characterized as governmental enterprises. They have increased in scale, especially in manufacturing, and as explained above they are making advances in many related fields. Their existence cannot be overlooked even in the newly-developing industries. Good examples are Petrobras and Companhia Vale do Rio Doce.

A second type is the multinational corporation, a number of which have advanced into Brazil. Examples are Volkswagen, Dow Chemical and Union Carbide.

A third type is the corporate groups formed by traditional private capital in Brazil. This type has developed in various ways but generally they have in their groups farms and financial institutions. Many are tightly-controlled by family concerns. The Matarazo group is a typical example of this type. One characteristic of traditional Brazilian businessmen is that many of them have merchant-like attitudes of seeking to gain profits during the course of inflation, rather than attitudes of industrialists. However, as industrialization with emphasis on the heavy and chemical industries expands in the future, it will be interesting to see if such "merchants" change into "industrialists."

These three types of industrial groups are common in developing countries, where there are many cases wherein the government and multinational industrial groups are strong and the private sector comparatively weak. Such conditions are not limited to Brazil but there has been a remarkable growth in government enterprises in the country in recent years. However, government enterprises were originally limited to fields where it is difficult for private industry to operate profitably and there have been few problems of competition or opposition to private enterprises. When new investment is required for large-scale projects, there are many instances of joint undertakings between government and foreign investors, or between foreign capital and private capital, or among all three. Of the large-scale projects for the construction of new steel, aluminum, pulp or petrochemical plants in which Japanese enterprises have recently participated, all have been joint undertakings with such industrial groups.

In the period of high economic growth in Japan, there was intense competition for industrial market shares between industrial groups including banks and trading companies on "package production-principle." This gave dynamism to economic development, but in Brazil the scale of individual

enterprises is small by international standards and it is difficult to expect the enterprises to form several groups with severe equipment investment competition as in Japan. However, the Brazilian economy is vigorous and has a high growth potential, and governmental intervention is powerful. The formation of industrial groups to undertake large-scale projects can now be evaluated as making possible concentration of capital and management systematization, rather than having bad effects on the enterprise structure.

4-2 Characteristics of Small and Medium Enterprises

In the initial period of economic growth in Japan after the war, medium and small enterprises, paying low wages, helped support development of certain larger enterprises as subcontractors and this dual structure fostered the rapid growth of the economy. However, thereafter the low productivity in the small and medium enterprises started to hinder the growth of the parent enterprises which were striving to improve productivity to meet international competition. The elimination of the qualitative differences within the dual structure by improving the productivity of the technologically weak subcontractors was believed to be vital for raising the level of the industrial structure and strengthening export competitiveness. For this reason, aggressive policies to improve the structure of small and medium enterprises were adopted. Since the small and medium enterprises were dependent upon their parent enterprises, there were inherent limits to reducing costs by means of mass production and also limits to the contributions made to the competitive power of the parent companies. It is therefore much better if such subcontractors became less dependent on specific large enterprises and become specialized manufacturers selling their products to many, not just one, large corporations. For this reason, the dual structure in which small and medium subcontractors are closely connected to only certain large companies is gradually being dismantled in Japan.

In Brazil, however, there is no clearcut definition of small and medium enterprises as in Japan and there are comparatively few policies to protect small and medium enterprises as such. There are also no clear policies for the general promotion of small and medium enterprises. A commodity distribution tax of about 15% is levied on the goods exchanged between enterprises so that many companies restricted to the minimum use of affiliates for the manufacture of parts and processing of materials. Whenever feasible, the "make or buy" question was answered with "make" so that specialized subcontracting manufacturers did not develop and the basis for such a system was suppressed.

Naturally, there are many small and medium enterprises formed by traditional private capital and the importance of small and medium enterprises in the national economy has never been underestimated. However, because of inadequate technology and personnel, the quality of the products of small and medium enterprises is generally poor and often they cannot meet delivery deadlines. Because of this, small and medium enterprises

are not usually affiliated with specific large companies, and have many customers. Competitive relations are not severe and the companies as individual specialized manufacturers have comparatively independent relations with their customers. Obviously, the parent companies must select between manufacturing parts themselves or subcontracting and buying from affiliates, selecting whichever is cheaper. This means that small and medium subcontractors must reduce their costs but, unlike in Japan, the problems of difference in quality symbolized by low wages held down by association with the parent company seems to be slight.

However, if heavy and chemical industrialization is to take place and productivity is to increase so that an independent industrial system which is competitive internationally can be established, it will be necessary for related subcontractors to acquire know-how and technology from abroad and attain suitable productivity levels. The system of independent specialized manufacturers selling to many large enterprises already appears to have been established. However, there is still great room for improvement in the areas of technology and management.

4-3 Establishment of Trading Companies and Their Role

In October, 1972, the Brazilian Government promulgated a law concerning trading companies. This law evaluated the capabilities of the general trading companies in Japan and the role of these companies in the export business. It was clear that such companies would be of use in furthering Brazil's export promotion policies since the export corridor plan was to begin. This indicates the enthusiasm of the government to promote exports.

Brazilian manufacturers receive the same tax exemptions when they have their products exported by any trading company registered with the trade department (CACEX) of the Bank of Brazil as they do when they export by themselves. Small and medium enterprises with weak financial bases can delegate part of the storage and financing which they formerly handled all themselves when they entrust their export business to a trading company. The operating funds required in such cases can be obtained by the trading company in the form of special financing from the Export Financing Fund (FINEX). However, in this trading company law from which so much was expected, the commodities dealt with are limited to industrial products. In addition, the severe business conditions such as the obligation to establish branches overseas and the fact that the tax exemptions are not much different than those received formerly by the manufacturers are two additional problems. Therefore, there are at present few inducements for businesses to register, and only a very few have done so.

One of the keys to understanding the "secret" which made possible Japanese economic growth and advances into international markets is the role of the general trading companies. These companies extended their business networks to all corners of the world through hard work over a long

period and under the influence of national characteristics. The trading companies have an abundance of well-trained personnel, and deal in a very wide range of products. They are capable of importing from any country and exporting to all markets, but do not limit their business to imports and exports. They make the flow of goods smoother by informing producers and other dealers of market and demand trends in various parts of the world, and undertake third-country trade. Other aspects of their extremely wide-ranging business activities include obtaining information concerning such things as the promotion of investment in new industries; providing financing, storage and transport facilities; and organizing mergers and arranging for cooperation among enterprises.

Naturally the achievements of such trading companies will differ depending on the country and the times. In Japan, the downfall of the trading companies has been discussed for the last ten years. The reason for this is that the wholesale functions of the trading company by which they distributed goods on the basis of their own judgment and at their own expense are gradually diminishing in importance as enterprises become larger and diversified. The trading firms were said to have become mere representatives or intermediaries between the producers and the consumers. However, as enterprises increase in size and range, the capabilities of the general trading companies have again come to be appreciated and they are playing bigger roles than ever before.

In Brazil, where the commodity structure and stage of development differ from those in Japan, trading companies need not play exactly the same roles as they do in Japan. It will be essential that their activities be based on a thorough understanding of and adaptation to customs, education, language, currency, laws, government policies, etc., of all the countries they deal with. A worldwide network is required in order that the above activities can be performed effectively. Under the present conditions in Brazil, it seems reasonable to expect that the personnel and environment required for such trading companies will be on hand in the future. The trading company law will greatly help the formation of such trading companies, and shows that the efforts of the policy makers to promote exports have begun in earnest, but it will take time and efforts on the part of those concerned before concrete results are achieved.

Chapter 7

TRANSFER OF TECHNOLOGY

1. Technology Transfer Concepts

1-1 Background

Other than those people concerned with the development process and with technical assistance, few Japanese have any interest in the transfer of technology, and investigations and research on this subject have been carried out in Japan only since around 1970. However, the course of Japanese technological development as a model case of the industrialization process had already gained international attention some time previously.

Therefore, several case studies concerning Japanese technological development have been prepared from economic, technological, social and other standpoints. The most organized of these was the study entitled "Technological Development of Japan" by the Japanese National Committee for UNESCO in 1967. A summary of the results of this study was published in Paris in 1971.

The process of technological development, particularly in the initial stage just after the Meiji Restoration (1868) and the time of great technological innovation after World War II (around 1960), which attracted international attention as the "Japanese Miracle."

Technological transfer played a major role in the promotion of industrialization in Japan. Generally speaking, the process of industrialization, or of innovation, i.e., as a typical process of progress in science, technology and production, shows the following three stages of evolution which are analogous to those of biology.

The first is mutation, the second selection and the third growth. Technologically, the first stage consists of discovery and invention based on new ideas and theories. In the second stage, there is technological selection and adaptation both socially and economically and this results in innovations. In the third stage, the adopted techniques are diffused physically and systematically so that they permeate and become established in the economic and social sectors.

If the pattern is typical, technological transfer occurs in the second and third stages. Because of this, technological transfer played a much more important role in Japanese industrialization than the creation of technology by invention and discovery. In the first stage, a foundation of technically creative capacity is established among the suppliers of technology, and the second and third stages are concerned with the technical response or absorptive capacity of those receiving the technology. In Japan, skillful technological selection and excellent technological diffusion were carried out for the recipients.

Recently, there have been calls for a change so that Japan, as the technological supplier, plays an active, not passive role.

After the World War II, Japan skillfully made extensive use of postwar technological innovations, which greatly aided the process of economic growth. In this way, she was able to expand rapidly from recovery to growth and from growth to prosperity. The new factor of technological progress played a more important part in the growth mechanism than can be explained by traditional economic theory.

In traditional economic theory, technology is disregarded because (1) it is considered a factor outside the economic system; (2) it is taken as a prerequisite for economic growth and is assumed to be fixed, or (3) it is considered to play only a small role even though its importance is confirmed.

However, to consider technical progress, analyze economic growth or examine either international comparative advantages or international patterns of specialization, is meaningless if attention is not given to the postwar progress of technological innovation. Also, there have been important changes in economic growth theory and international trade theory and as a result, the role of technological progress in economic grorth has been included in analytic research work on many occasions since around 1960.

Around 1965, the economic gap between the developed and developing countries was scrutinized by the OECD and other organizations, and it was argued that the economic gap is actually the result of a technological and management gap. As a result, this technological gap attracted considerable attention. Japan, as a traditional technology-importing country, was faced with the problem of continuously keeping up with advances in technology. Because of this dependence on foreign technology, a new argument for autonomous technological development arose.

At the beginning of the 1970s, technology assessment became an issue in the developed countries, particularly the United States, due to increased awareness of environment-related problems and apprehension concerning economic growth. In technological assessment, there are to be initial social, economic and ethical evaluations when selecting technology. It has focussed attention on the hitherto-neglected negative results of technological progress and sought to reexamine the route which progress was taking.

The issue of technological assessment has also been a subject of discussion in Japan, where recent economic growth has proceeded at an extremely rapid pace and where there is an extremely high density of industrial activity in highly urbanized areas. As one result, there has even been a trend to overlook the advantageous aspects of science and technology and to view them as being intrinsically adverse to society.

Actually there is probably little necessity for an affluent country which has attained for its people a certain standard of living to continue a high degree of economic growth. However, the economic expansion of a

developing country is aimed directly at increasing the country's various economic resources. In such cases, it is essential the positive role of science and technology is recognized and used.

In parallel with the changes in the inter-relation of technology and the economy as mentioned above, the world is beginning to expect that Japan can contribute to solving the North-South problem. This is supported by the experience and attainments of Japan in her technological development. Another reason is that the process experienced by Japan has been characterized by international transfer and domestic diffusion of advanced technology.

Naturally, the Japanese experience is highly local in character since it combines a classical development model supported by traditional techniques and national characteristics on the one hand and a modern model in which there was a discriminate selection of advanced technology on the basis of the competitive structure of the Japanese economy on the other.

1-2 The Role of Technology Transfer

An attempt to apply science and technology transfer to solve the North-South problem has already been begun both by the United Nations and international organizations in Southeast Asia, Latin America and elsewhere. In all cases, it has been recognized that scientific and technological cooperation is to be used as a strategic measure to develop the nation or economy in question. Based on awareness of the great influence of science and technology on the economy of a nation, it is planned to orient technological transfer by using three concepts: (1) the development gap = the scientific and technological gap, (2) aid efficiency = scientific and technological cooperation, and (3) independent development = effective use of human resources and development of scientific and technological capacities. There is a very clear general recognition of these points in Brazil.

Technological transfer is considered to be related to international affairs, including economic development, international division of labor and price formation and also to be a wide-ranging general concept inseparable from external economic, industrial, and scientific and technological policies.

Problems of the selection and adaptation of production technology involved in the technology transfer problem will be useful for the improvement of the international balance of payments, the absorption and effective utilization of manpower, improvement of capital stock, whose deficiencies are common in developing countries. Problems related to the creation and establishment of national technology will give a new direction to the national development process so that national sovereignty will be assured, and thus it is expected that decisive contributions can be made concerning the formation of more effective export strategy for industrial products as well as discovering new field of international cooperation.

For example, the First National Development Plan (1972-74) of Brazil points strategic measures for national development or scientific and technological policies as a factor of economic expansion, and employment and human resources. Thus it emphasizes creation and acceleration of opportunities for transfer of technology.

The plan states that "the policy of acceleration of technology transfer will be based upon the precise knowledge of the technological needs of the productive system and of the potentiality for domestic development of science and technology.... The priority sectors for transfer of technology will be defined with due consideration to the confrontation between domestic demand and domestic offer of know-how, as well as the nature of the productive sector and its importance for the fulfillment of economic policy directives."

The plan recognizes that technological development and in particular, the innovations of the past two generations have had a great influence on industrial development, international trade and economic growth. It clearly states that these things first became possible through technological progress.

The main aim of economic development strategy in Brazil is to make national integration more perfect, i.e., the coexistence of modern industry and technology, the more efficient development of basic industries and better mobilization of resources to raise the competitive ability of the national economy.

Technological innovation will introduce changes in the comparative advantages both nationally and internationally by changes of the price structure through the development and utilization of new products and services which replace the old in many fields and a remarkable reduction in transport costs which reflect the great size of Brazil. Therefore, it is necessary to promote the development of new technological fields and high-technology industries, the strengthening of infrastructure technology and research projects on indigenous Brazilian technology (technology connected with cultivation in special soils, tropical food products, etc.).

In the industrial field, emphasis is placed on the capacity to diffuse the modern technology, particularly in respect to capital goods, so as not to lag in international technical innovation (in Japan, one technological aim after the war was to catch up with and overtake others). As is shown in Tables 7-1 and 7-2, past introduction of technology in Brazil reflects backwardness in the capital goods sector.

In industry as a whole, the following are emphasized for their role in diffusing technology in other industrial fields: (1) development of new fields for application, where technological levels are high and which have the possibility of import substitution; (2) strengthening basic industries; (3) reorganizing traditional industries; and (4) promoting exports. In particular, there is an urgent necessity for the Brazilian economy, which is

Table 7-1 Brazil's Induction of Technology by Type of Product and Ownership of Brazilian Corporation

	Total no. of cases		Types (cases)			By year (%)				
	No. of cases	%	Domestic enterprise	Subsidiary of foreign firm	Foreign enterprise	-1954	1955/61	1962/64	1965/67	1968/70
Capital goods	470	23.7	312	72	86	25.2	22.1	26.4	23.6	23.0
Intermediate goods	795	40.1	519	86	190	20.4	34.1	37.4	41.2	51.6
Durable consumer goods	162	8.2	88	42	32	16.5	11.4	5.5	10.6	4.6
Non-durable consumer goods	396	19.9	283	24	89	32.0	17.6	23.9	18.2	17.6
Automobile parts	160	8.1	73	35	52	5.9	14.8	6.8	6.4	3.2
Total	1,983	100.0	1,275	259	449	100.0	100.0	100.0	100.0	100.0

Source: IPEA. Total cases up to 1970.

Table 7-2 Brazil's Expenditures for Induction of Technology by Type of Product

	No. of cases	Expenditures (million dollars)	Expenditure percentages	By year (%)					
				1965	1966	1967	1968	1969	1970
Capital goods	306	30	7.2	4.2	8.6	10.3	8.9	6.1	5.6
Intermediate goods	557	119	28.6	42.0	29.3	37.3	26.2	18.9	29.3
Durable consumption products	121	55	13.2	3.4	9.3	20.3	20.3	11.9	10.3
Non-durable consumption goods	273	56	13.5	7.6	13.7	15.9	22.5	10.7	10.2
Automobile parts	123	155	37.3	42.6	38.8	15.9	21.9	52.1	44.3
Total	1,380	416	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: IPEA, 1965-70.

dependent on foreign investment, to assign priority in its technological strategy to measures related to foreign companies. Foreign investment should be directed to high-technology fields and discouraged in fields where Brazilian companies are already established.

To sum up, the issue of technology transfer in developing countries (although Brazil can be considered as a semi-developed country) has been considered in policies or strategic measures related to economic development.

Technology is transferred not only between nations but also through many domestic routes such as from the government to the people, from large industries to medium and small industries, from the industrial sector to the agricultural and social development sectors, within the same industrial fields and between the regions of a country where there are wide regional differences. However, there is not as yet a generally-accepted concept or definition of technology transfer. Here, abstract arguments on definitions will be avoided in favor of factual accounts of the process.

2. Induction of Foreign Technology and Formation of Autonomous Technology

2-1 Trends in Technology Induction

Table 7-3 compares the induction of technology in Japan and Brazil.

The scientific and technological level in Japan is now rather high by international standards. This has resulted in part from an active expansion of independent research and development activities but an even more important factor has been the induction of technology from advanced countries in Europe and the United States and the subsequent absorption and adaptation of this technology. Recently, there has been a gradual increase in the export of technology from Japan in accordance with improvement in technological levels. The flow of technology within the country is also very brisk.

Brazil will continue to be an importer of technology but, considering the growth rate in the number of such instances and the level of expenditures for such imports, Brazil is characterized by fluctuation rather than by a continuous increase. Although the available data do not show the cause of this, the induction of technology in Japan tended to increase steadily.

By industry, the highest proportions of imports of technology in Brazil have been in the steel and metal industries with 371 instances (18.7% of total cases up to 1970). This was followed by the chemical industry with 254 cases (12.8%), machinery (12.1%), electrical communication equipment (11.0%), transport equipment (9.8%), textiles (7.0%) and pharmaceutical industries (6.8%). These represent 78.2% of the total of 1,983 imports.

Table 7-3 Induction of Technology by Brazil and Japan

	Brazil					Japan				
	Induction of technology (A)			% (A)	% (A)	Induction of technology (B)			% (B)	% (B)
	No. of cases	Expense (million dollars)	Growth rate	GNP	total imports (%)	No. of cases	Expense (million dollars)	Growth rate	GNP	total imports (%)
Before 1954	103					956				
1955						185	20		0.09	0.8
1956						311	33	65.0	0.13	0.9
1957	265					254	43	30.3	0.15	1.1
1958		32.2		0.18	2.3	242	48	11.6	0.17	1.6
1959		(Average)				378	62	29.2	0.18	1.6
1960	113					588	95	53.2	0.23	2.0
1961	115					601	113	18.9	0.23	1.9
1962	114					757	114	0.9	0.19	2.0
1963	103	14.6		0.06	1.0	1,137	136	19.3	0.19	1.9
1964	93	(Average)				1,041	156	14.7	0.19	2.0
1965	123	42.5	--	0.16	3.9	958	167	7.1	0.18	2.0
1966	211	45.8	7.8	0.16	3.1	1,153	192	15.0	0.18	1.9
1967	259	62.7	36.9	0.22	3.8	1,295	239	24.5	0.19	2.0
1968	181	70.2	12.0	0.22	3.3	1,744	314	31.4	0.21	2.4
1969	182	91.0	29.6	0.26	4.0	1,629	368	17.2	0.21	2.3
1970	98	104.0	14.3	0.27	3.7	1,768	433	17.7	0.21	2.2
1971	---	132.0	26.9	0.31	3.6	2,007	488	12.7	0.21	2.4
Years unknown	23	---	--	--	--	---	--	--	--	--
Total	1,983					17,010	3,069			

Note: Japanese data are for fiscal years (April to March).

Source: For Brazil: IPEA, "A Transferencia do Tecnologia no Brasil"; for Japan: data from the Science and Technology Agency.

The countries which supplied the most technology, in terms of percent of total instances of induction, were the United States (41.3%), West Germany (17.9%) and France (10.1%). Each of the other countries provided less than 7%, and 2.7% of the total imports was from Japan.

Concerning expenditures (the total expenditures in the 1965-70), the transport equipment industry spent the most to acquire technology, and accounted for 39.9% of the total, followed by the steel and metal industries, 11.1%; electrical communication equipment, 9.2%; chemicals, 7.6%; pharmaceuticals, related industries 5.2%; and textiles, 3.9%. The portion for general machinery was only 2.2%.

Of the total import expenditures, 33.2% was for technology from West Germany, 29.4% from the United States and 8.4% from France. Each of the other countries accounted for less than 7%, with figure for Japan being 3.9%.

Conditions in Japan were as follows. Japanese technological imports are divided into A and B types. Type A imports are those with contract and payment periods of one year or longer and type B those with periods of less than a year.

Leading industries, by number of type A imports (totals for 1951-70) were general machinery, 26.0%; electrical machinery, 17.9%; and chemicals, 16.3%. These three industries accounted for 60.2% of type A imports. The main countries of origin were the United States (57.1%), West Germany (12.3%), Great Britain (7.7%) and Switzerland (6.1%), with these four countries accounting for 83.2% of the total of 9,870 cases. During the same period there was a total of 7,140 cases of type B technological imports but they show a tendency to level off or decrease with time.

The above industries which showed high imports are all industries in which there was much postwar technical innovation. One reason for the high figure for the general machinery industry in Japan is that previously the technological level in that field was rather low; also, it was necessary to elevate the technical level in that field in order to promote technological innovation in related fields.

No data was available on technological exports from Brazil but there has been a gradual increase in such exports from Japan since 1960, and in 1971 they were equivalent to 12.3% of the amount spent for technology imports. The term "international trade of technology" is thus becoming applicable to Brazil. The corresponding figure in West Germany was 40% and in France 60%. In Great Britain, however, technological exports exceeded imports by 10% and in the United States such exports are 11 times imports. Therefore, emphasis must be placed on the necessity of increasing Japanese technological exports, i.e. of developing high-level technology using Japanese inputs.

2-2 Characteristics of Technology Imports and Necessity for Autonomous Technology

Almost all technological imports to Japan were acquired by Japanese companies, while in Brazil, more than 70% of such imports were by companies with foreign investment (See Table 7-4), because induction of technology in Brazil is often combined with dependence on equity participation, unlike the situation in Japan. This contrast suggests that Brazilian scientific and technological policies should promote more actively the development of independent technology.

Some Japanese companies have already surpassed the technological levels prevalent in comparable Western countries. Progress in industrial technology in Japan has been promoted primarily by enterprises possessing such high technical levels, with considerable stimulation provided by intense inter-firm competitive. For example, Table 7-5 shows that, on an average, more than three companies have competed in the import of one technique. The competition for the import of the polypropylene technology in 1960 is a typical instance. After the manufacturing method for isotactic polymers was developed in 1955, polypropylene was the first synthetic resin to gain world-wide attention. In 1957, two Japanese companies concluded provisional contracts for importing the technology of the resin but the Ministry of International Trade and Industry did not approve either as the ministry considered them premature. However, government policy on this later was eased and the private sector competed to import the technology in 1960. No less than 20 companies participated in this competition.

Another useful example to study is the acquisition of technology imports by the Japanese petrochemical industry. The petrochemical industry is new, even in international terms as it originated only in 1920. In Japan, it dates to the 1930s. As is well known, petrochemicals became a major field for technical innovation on an international scale after World War II.

Japan was technologically isolated during the war and because of this delay, the commercialization of petrochemicals depended almost entirely on imported technology. Among these techniques, the most ultramodern for polyethylene was the Ziegler method but at that time, comparatively old basic manufacturing technology for solvents, monomers, etc. were imported. Importing these was aimed not only at helping to close the traditional technological gap between Japan and foreign countries but at the same time, it was also meant to form the basis for establishing an integrated petrochemical industry. By using out-of-date technology, it was not necessary to experience a technological "scrap and build" process, and rational systematization could be achieved.

More advanced technology was then selected at the time of technology transfer to strengthen international competitive power. One example is ethylene production technology which already had reached an advanced stage of development. The technological gap was considered to be only a spatial

Table 7-4 Brazilian Technological Import Expenditures According to Types of Import and Enterprise (1965-1970 totals, %)

Type of imports	Type of enterprise: Total	Domestic enterprises	Subsidiary of foreign firm	Foreign enterprise
Technical assistance	100.0%	16.4	67.4	16.2
License	100.0	24.5	30.7	44.8
Use of trademark	100.0	20.3	31.8	47.9
Technical service	100.0	71.8	3.6	24.6
Establishing a project	100.0	80.7	14.7	4.6
Total	100.0	27.1	51.8	21.1

Source: IPEA.

Table 7-5 Concentration of the Same Technological Imports in Japan

Field \ Year / Item	1969 (A)	1969 (B)	1969 (C)	1970 (A)	1970 (B)	1970 (C)	1971 (A)	1971 (B)	1971 (C)
Chemicals	11	46	4.2	9	28	3.1	7	19	2.3
Metals	4	10	2.5	3	7	2.3	3	7	2.3
General machinery	9	22	2.4	11	27	2.5	19	49	2.6
Electrical machinery	9	52	5.8	16	71	4.4	18	98	5.4
Others	2	10	5.0	6	17	2.8	8	20	2.5
Total	35	140	4.0	45	150	3.3	55	193	3.5
Proportion of total cases	-	12.1	-	-	11.3	-	-	12.4	-

Notes: (A) = Type of technology; (B) = No. of cases (No. of Japanese companies);
(C) = No. of companies per technique

Source: Science and Technology Agency, "Science and Technology White Paper, 1973".

gap with no quality differences. There were cases where foreign innovations were first commercialized in Japan. Examples of this can be found in the field of electronics.

From the Meiji Period, it had been a traditional Japanese concept that even imported technology should always be "fresh." This means that technological modernization in Japan was oriented toward the international level from the beginning. However, during the early Meiji Period, economic operation of state-owned enterprises was not a primary concern of the government leaders, but later, plagued by accumulated deficits, they sold the enterprises to private interests, and the new owners made every effort to reduce costs with low wages and high labor quality. However, the situation after World War II has been quite different from that in the Meiji Period and the leadership of private enterprises has emphasized rationalization to reduce spiralling costs of labor and other factors.

One other characteristic of postwar conditions is that the production process for a single product is now very complex. This reflects the active desire for new commercialization and adoption of new industrial process by less developed enterprises in technology induction. And it shows that Japanese enterprises have a deep interest in new technology. This attitude without prejudice towards technology also played a role in the subsequent development of autonomous technology.

Although technology is considered to have universality, market conditions are not always the same as in the country which originated and exported the technology. One characteristic of Japanese technological imports is that the product is improved in accordance with the market conditions. For example, the process of refining ethylene oxide has been improved in Japan to meet the market demand for high purity of this material. The severe marketing conditions have resulted in improved quality. At the same time, there are also social demands such as the problem of environmental pollution. Tables 7-6 to 7-9 show various technology import characteristics and conditions.

Most technology transfer in Brazil depends on technical assistance. In contrast, since most of the technology transfer to Japan is through the medium of private enterprises, it is impossible to compare the data of the two countries. Table 7-7 shows that the percentage of licenses with no know-how component among the total foreign technology imports is decreasing. This indicates that Japanese technology has reached a sufficiently high level so that acquisition of new patent rights is no longer necessary. This also suggests that technological progress in these fields is tending to slow down throughout the world. The fact that only licenses account for 50% of imports in the electrical industry shows that Japanese electrical technology has reached the technological level where only licenses are required, even without know-how. Also influencing this phenomenon is the fact that know-how (and licenses, etc.) which exists and is desired by a potential importer of technology is not always available in the international technology market.

Table 7-6 Expenditures for Technological Imports by Types in Brazil (1965-1970)

(Unit: percent)

Type \ Year	1965	1966	1967	1968	1969	1970	Total
Technical assistance	55.4	66.9	53.4	71.0	79.8	70.7	68.6
License	2.2	12.0	16.7	9.6	5.3	7.5	8.7
Use of trademark	0.8	6.2	10.8	6.0	5.2	4.9	5.8
Technical service	32.0	11.2	13.3	9.3	6.7	14.4	12.8
Establishment of project	9.6	3.7	5.6	4.1	3.0	2.5	4.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: IPEA.

Table 7-7 Shares by Industry of License Contracts for Type A Technology Induction in Major Industries

(Unit: percent)

(Shares--percent)	1966	1967	1968	1969	1970	1971
Chemistry	25.7%	12.3%	13.0%	9.0%	10.5%	6.7%
Metals	50.0	4.5	14.7	11.2	10.4	11.8
Machinery	10.7	8.6	6.7	8.1	9.6	8.8
Electricity	34.9	66.6	63.3	51.1	52.7	53.5
Others	12.3	18.3	8.8	8.5	4.9	3.8
Total	20.7	22.2	20.4	15.6	14.6	13.8
(No. of cases above)	125	142	216	180	194	213
Total type A cases	601	638	1,061	1,154	1,330	1,546

Source: Science and Technology Agency, "Report on Induction of Foreign Technology" (in Japanese).

In any case, it is natural tendency that innovative technology is tending to lose momentum in certain fields as the technological levels of the technology-importing countries become competitive with the exporting countries. Therefore, the merchandising of technology will decrease and technological independence increase, and thus technology transfer conditions will become even more severe. This is substantiated by Table 7-8 which shows that contract periods are becoming longer, payment conditions more severe and royalty rates increasing. Table 7-9 indicates that there has been a steady increase in cross-licensing.

Concerning Brazil's regulations on foreign investments in licenses, etc., up to 5% of the total income of an enterprise can be treated as expenditures for tax purposes for license and technical assistance fees (however, only 1-4% is actually approved in the manufacturing industries) and up to 1% of the total for trademark utilization fees.

However, the payment of technical assistance fees is permitted for the first five years after the establishment of the enterprise or the start of provision of the assistance but this five-year period can be extended. Payments of license and technical assistance fees in excess of the above-mentioned percentages are considered as earnings and subject to taxation. The total expenditure in Brazil for this type of technology transfer was expected to reach 90% of foreign investment and 109% of profit remittances abroad in 1971.

Companies with more than 50% foreign equity cannot treat payments of license or trademark utilization fees as expenditures. Technical assistance fees may be paid, to foreign shareholders who hold more than 50% but the remittance cannot be treated as expenditures for tax purposes. Payments for licenses, use of trademarks and technical assistance are all subject to 25% taxation at the source. Branches in Brazil are not permitted to pay fees for licenses or trademarks to their foreign parent companies even when the licenses or trademarks belong to the parent companies. These also cannot be treated as expenditures.

With the deterioration of contract conditions, the necessity of autonomous technology is now gradually being given greater emphasis in Japan. It is essential for the developing countries to emphasize the necessity of absorbing advanced technology and also to build up technical capabilities to improve this technology so that technology transfer will become more efficient. It is also highly desirable that Brazil develops autonomous technological capabilities and adaptation capacities in order to reduce technological dependence on foreign investors.

There are therefore three routes for technology transfer contracts between companies, in a narrow sense: (1) from parent company to wholly-owned subsidiary, (2) from parent company to a joint venture in the developing country, and (3) pure licensing (technological merchandising) contract between supplier and user. In Brazil, (1) and (2) are the main routes while (3) is most common in Japan. This indicates clearly that

Table 7-8 Changes in Main Contract Conditions of Type A Technology Imports in Japan

Item	Contract period				Payment conditions									
					Initial				Rate of running royalties					
Year	Years -5	Years 5-10	Years 10-15	Years 15-	Others	Gratis	Yes	No	-2%	2-5%	5-8%	8%-	Others	None
1965	-78	197	141	27	29	--	196	--	51	194	55	6	145	
1966	-93	239	169	24	76	--	226	--	58	206	71	9	257	
1967	-52	238	166	13	89	--	203	--	45	210	74	8	102	
1968	-167	409	286	50	149	57	531	473	32	249	246	40	283	154
1969	-189	379	288	70	228	35	621	498	52	260	328	53	243	183
1970	202	433	359	68	268	37	813	480	61	286	337	79	294	236
1971	291	453	378	85	339	60	875	611	65	357	375	106	321	272

Source: Same as Table 7-7.

Table 7-9 Cross-Licensing Contracts in Japan by Category for Major Industries by Year and Contract Type

	1965		1966		1967		1968		1969		1970		1971	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Chemicals	1	0	1	0	9 (1)	0	12	0	8	0	4	0	9	3 (3)
Metals	0	0	3	1	0	0	3 (1)	0	0	0	2	0	4	0
Machinery	0	0	1	0	7 (1)	0	1	0	5 (2)	0	3	0	8	3 (2)
Electric	1	0	2	0	3	0	17	0	8	0	10	0	25	0
Others	1	0	1	0	0	0	5	1	0	0	7 (1)	0	2	0
Total	3	0	8	1	19 (2)	0	38 (1)	1	21 (2)	0	26 (1)	0	48	6 (5)

Notes: 1. Figures in parentheses indicate joint research contracts. 2. In 1964, there were no cases and in 1963, there was only one type A case for chemicals. 3. For definition of types A and B, see text.

Source: Same as Table 7-7.

Brazil must find more centralized and dynamic means to establish autonomous technology.

3. Selection and Adaptation of Technology

3-1 Selection of Industries and Technology

In most developing countries, it is usually necessary to promote new export industries through cooperation with developed countries to improve the international balance and increase exports. In order to select and transplant industries suitable for the resources and characteristics of a nation, most countries modify their protective policy, shifting from creating and fostering new industries in the stage of import substitution to fostering industries having high export potential and estimating foreign capital to invest in these industries.

It is probably possible to promote import-substitution industries by protective taxes, customs duties, etc. However, export industries cannot be developed simply by expanding the import substitution industries and maintaining a protective environment. Export industries depend on the country's specific resources (theoretically, there must be no limit on resources, and a stabilization of international demand) and also must have international competitiveness supported by modern technology.

On many occasions when foreign capital is induced and priority is given to the selection and establishment of industries, almost no interest is paid to the type of technology to be imported. The issue is evaded by leaving selection of technology up to the investors from the advanced nations.

From the standpoint of the advanced nations economic cooperation and particularly the establishment of a company on a private basis inevitably does have a profit motive and it is necessary to consider carefully the marketability of the products. The general motives for establishment of enterprises include (1) securing the export market for the products or technology available with the company, (2) developing new markets by means of production overseas, (3) securing or improving access to sources of raw materials and (4) finding local partners including the government. In extreme cases of the establishment of import-substitution industries, there were some cases where the marketability was evaluated by use of statistics of the country's imports.

At present however, the developing countries including Brazil which are establishing export industries are emphasizing the technological aspects of the enterprise by refusing permission unless there are assurances that the company will contribute to the improvement of the country's technological levels. Particularly in areas where the development of industrial sites is used as an industrialization measure, there are often cases where the allotment of factory sites is considered on a priority basis depending on the technological relevancy of the type of industry of the products and the existence of usable techniques to prevent environmental pollution.

It is generally recognized that one of the basic concepts for the selection of industries in developing countries is that, all conditions being equal, there is a greater possibility in many developing countries of achieving international competitiveness and comparative advantage from labor-intensive industries rather than capital-intensive industries even when labor productivity is lower than in advanced countries.

Since it is relatively difficult to procure capital, in many developing countries, and a large part of the labor force is either partially or completely unemployed, this concept is probably appropriate in some ways. Since technology is traditionally considered as the technological relation between the amount of input of the production elements required and the production output during a set period of time, the technology chosen for labor-intensive industries must be "relatively" labor-intensive technology.

However, is it always true that technology selected for labor-intensive industries must be labor-intensive technology? The stipulation that labor-intensive technology is for light industry as capital-intensive technology is for heavy industry tends to make technology too standardized.

The above theory has various paradoxic premises. If we take the above expression "other conditions being equal" as an example, "technology" itself has been included in "other conditions." The textile industry is considered a typical labor-intensive light industry, but the technology now used in the textile industry can be said to be capital-intensive.

The relation between the type of industry and the technology to be selected is not always fixed and is actually rather flexible. In some industries, there are various options in selecting production technology and there are cases where it is possible to choose between labor-intensive or capital-intensive technology. In other types of industry, however, there is often only one possible manufacturing method.

In relation to the North-South problem, there is the concept of intermediate or appropriate technology. The technology used in preparing the soil of a developed country is influenced by the natural features of the developed country and cannot be applied directly in developing countries. Therefore, such technology must be modified--i.e., improved--in accordance with local needs and capabilities so that it can be used in the developing country.

However, the latitude for choosing between capital-intensive and labor-intensive technology for example is often very limited, and more often than not, the choice is between these two extremes, with no intermediate possibilities. Even though labor-intensive technology is used, there are cases where not mere manpower but trained manpower is necessary. There are cases where industries which have an employment system characterized by a relatively highly-trained work force and which are labor-intensive tend to require machinery and equipment which are rather highly capital-intensive.

The general notion of production technology contains both "discreteness" with technology broken down into specialized fields and "totality" based on the organic connections among related fields. In the selection of technology, other conditions such as national requirements and social demands have to be taken into account. These conditions make it difficult to generalize or classify the selection of technology.

As has already been pointed out, the high growth of the Japanese postwar economy was supported by the selective transfer of advanced technology to increase competitive power and raise industry to international levels. At an early stage during that period, labor-saving technology was introduced into Japan even though Japan had a surplus of labor. The Japanese economy is characterized as one of entrepreneurs and manpower of relatively high quality, who skillfully utilized this labor-saving technology with yielding as results increases in productivity and production. Thus, a technology-oriented market was successfully developed. Surplus manpower was absorbed as production increased under the high growth conditions. This exceedingly rapid growth has been followed by the appearance of a manpower shortage.

Japanese industrial technology today is, in general, export-oriented, and it was the priority-approval basic given to the import of foreign technology by the Foreign Investment Law (1950) that started this trend which has contributed much to the improvement of Japan's international balance of payments. Previously, laws and regulations intended to foster a favorable balance of payments had strongly limited induction of technology. However, selective induction of good-quality technology with remittances abroad guaranteed by the Foreign Investment Law made it possible to acquire technology which imparted high international competitiveness to Japanese industry. (Technology induction was liberalized in 1968.)

3-2 Development Process and Technology Transfer

This section will outline the relation between the industrial development process and the effects of foreign technology using the Japanese electronics industry as an example. As was pointed out earlier, the electrical machinery industry has concluded the largest proportion of pure licensing contracts.

Excluding for the moment discussion of enterprises established after the war, the history of the manufacture of electrical machinery and devices in Japan can be traced back to the Meiji Period. The manufacture of electrical machinery started in the Telegraphy Equipment Manufacturing Plant established in 1873. Telegraphy technology was new then so that the industry's start was different from that of the spinning, shipbuilding and iron industries--formed on the small-scale Western industry base--as well as the paper, raw silk, cotton and smelting industries based on traditional technology.

In the beginning, the approach taken was not to acquire production know-how but first to accumulate experience in reparing foreign equipment which had been imported for domestic use, and after suitable experience had been gained in this way, the policy of producing equipment domestically was adopted. This was the case for telegraph equipment, for example, and this can be considered as Japan's typical sequence of technical development: repair and imitation of imported equipment, and then local manufacture of equipment and competition with foreign equipment.

The training of electrical technicians started in 1877 at a school which was later to become the engineering department of Tokyo University. The electrical engineers from this school were the advance guard in the march toward technological independence. Several engineers from the Telegraphy Equipment Manufacturing Plant started their own independent business, in keeping with the flourishing spirit of entrepreneurship of the times. This business produced various types of equipment such as light bulbs, communication devices and heavy electrical machinery.

The telegraph and electric lighting industries were started at about the same time in Japan (in Europe and America, the former came several tens of years earlier). After the import of a 3-phase AC generator in 1897, the electric lighting industry was expanded so as to supply electric power. During this time, a research organization for new technology was established with the separation of the Institute of Electrical Engineers of Japan from the Academy of Engineering in 1888 and the founding of the Electro-Technical Laboratory in 1891 (now a part of Agency of Industrial Science and Technology).

In 1900, the Japanese electrical industry was still weak and the inflow of foreign investment and foreign-made electrical equipment continued. This was a basic reason for the lack of uniformity of the electrical frequency which has existed to this day. There are still two frequency areas in Japan because equipment imported from Germany was for 50Hz and that from the United States for 60Hz. Almost the same phenomenon is found with the railway gauge in Brazil. This still presents a problem in the uniformity of industrial standards.

After the advent to Japan of the industrial revolution--centered mostly on light industry--at the end of the nineteenth century, infrastructure consisting of the energy sector (mainly electric power), transport and other sectors was quickly established. In textiles, then the leading industry, production exceeded imports for the first time in 1891 and by 1897, exports had caught up with imports. The influence of technical development in this type of leading industry on the establishment and development of subsequent industries can be seen in the heavy and chemical industrialization after World War I and in the development of technical innovations after World War II.

Industrialization in Japan may be compared to that in Mexico. Mexican industrialization was based on techniques and markets for existing

hand-made products. The leading fields were textiles and iron and the process was aided by the construction of a transport network also valuable for national integration. This classical industrialization process is quite similar to that in Japan. However, the development patterns in Brazil were the reverse of the normal, e.g., the normal expansion from railroads to automobiles and airplanes in the transport sector.

The decrease in imports of foreign machinery because of World War I provided an opportunity for small-scale local manufacturers to gain independence, and the performance capabilities of domestic electrical equipment started to increase. Through the accumulation of trial-and-error experience during this period, there was a shift from craftman-type technology to modern technology. However, the indigenous technological level at at that time was evaluated so low by users that they felt that the purchase equipment imported by a local compnay was safer than buying locally made equipment. As a result, 50% of the main power equipment purchased between 1922 and 1927 was foreign-made.

Under such conditions, the most rapid method to save the domestic market from control by foreign enterprises was "technical cooperation." In the 1920s, almost all of the large enterprises concluded technical cooperation agreements. From the middle of the 1930s the war preparation economy caused (1) the scale of production to expand (2) technology to be accumulated in fields where experience was lacking through government purchases (particularly the radio field) and (3) technical assistance to be spread by the establishment of subcontractors, systematization and arrangement of affiliates (technology transfer to small and medium enterprises), stability of the supply of manpower, etc. This is what a West German automobile maker established in Brazil has been successful in doing: forming groups of Brazilian subcontractors.

During World War II, the technological gap with the advanced countries again widened. Technological imports just after the war were of three types in terms of their course of development: (1) foreign dependence as one link in the historical process, (2) sectors where industrialization was delayed although the basic technology had been established (nylon, etc.), and (3) fields whose starts were completely delayed (synthetic resins, etc.). The electrical machinery industry is included in type (1).

After the war, the core of the electrical industry shifted from heavy electrical machinery to electronics technology. This shift was made possible because of the successful commercialization of the semiconductor. The electrical machinery industry became an integrated industry including electronics. At this time, the government enacted the special laws for the promotion of the machinery industry (1956) and of the electronics industry (1957). The former was for a basic industry which formed a foundation for industrial improvement and the latter was for a technologically advanced industry which took the lead in industrial technological innovations. (The two laws were combined in 1971.)

Since most of the electronics technology was developed in the United States during the war, the Japanese electronics industry again had to depend on the United States for the import of technology. As a typical example of the consequences of this, the Japanese electronic computer industry was behind by about 10 years when it was created. Japan which possessed some advanced electronics technology had no performance record in the field of computers.

Technological progress in the computer field is very rapid. Starting with 1953 major innovations were made every six years and the period from 1971 corresponds to the 4th or 3.5 generation. These generations are distinguished by the use of vacuum tubes (first generation), transistors (second generation) and integrated circuits (third generation) and increasing the capacities of these circuits (3.5 generation). The products and processes of such a technologically advanced industry become out of date very quickly. The term mini-computer was coined about 1969 but in three short years, technological development is entering its second generation.

Although almost all technological imports into Japan were liberalised in 1968, computer technology will not be liberalized until 1975. At present, there are only three Japanese computer companies with foreign investment active in Japan (excluding IBM-Japan) but Japanese companies are improving their technological level through the program for "large scale projects" for industrial technology research and development inaugurated by the government in 1966.

4. Science and Technology Policy

4-1 Basic Plan for Scientific and Technological Development (1973/74) in Brazil

This section does not take up administrative structure or functions. These are shown in the diagram showing administrative structures in Japan. (See Appendix; in the Japanese edition of this report, the administrative structure in Brazil also was included.)

The First National Development Plan (PND), which emphasized science and technology policies as strategic measures, indicated that the following science and technology policies should be carried out.

(1) Promotion of administrative functions: this includes application of a public finance system for technological development, adjustment and modernization of R&D activities (execution of the Basic Plan for Scientific and Technological Development--PBDCT), improvement of employment conditions for researchers and establishment of a national system for scientific and technological information;

Table 7-10 PBDCT Investment Plan

(Unit: Cr$ million; 1973 value)

Priority Programs	1973	1974	Two-year total
1. Development of new technologies	306	393	699
1.1 Nuclear energy	177	224	401
1.2 Space activities	114	138	252
1.3 Oceanography	15	31	46
2. Technology of the infrastructure	196	220	416
2.1 Power	154	173	327
2.1.1 Electric power	110	114	224
2.1.2 Petroleum	44	59	103
2.2 Transportation & communications	42	47	89
3. Industrial technology	551	865	1,216
3.1 Program of Ministry of Commerce and Industry	238	241	479
3.2 Special program for industrial technology	209	257	466
3.3 Program of Ministry of the Navy	4	3	7
3.4 Program of the Ministry of the Army	51	107	158
3.5 Program of the Ministry of Aeronautics	33	41	74
3.6 Program of the Ministry of Mines and Energy	16	16	32
4. Agricultural technology	212	264	476
4.1 Agriculture and stock breeding	182	234	416
4.2 Forest resources	17	14	31
4.3 Fisheries	7	9	16
4.4 Meteorology	6	7	13
5. Special Integrated Projects; Technology applies to social development	93	110	203
6. Basic research; Graduate research	439	486	923
7. Supporting activities	117	93	210
8. Planning, Programs under study	44	80	124
Totals	1,958	2,309	4,267

(2) Development of priority technological fields: this includes the the development of new technology (nuclear power, space, oceanography) and high-level technological industries (iron and steel, chemicals, electronics), strengthening of infrastructure technology (electric power, oil, transportation and communications) and the promotion of agricultural research plans (cultivation of special soils, irrigation, tropical foods, etc.);

(3) Strengthening of technological infrastructure and creative capacities: this includes the establishment of export-oriented industries, modernization of management techniques and policies to stimulate technical innovations;

(4) Promotion of technology transfer; and

(5) National integration of education, science and technology and industry.

This covers almost all present policy problems in science and technology. It is necessary for Brazil to determine how to execute these policies.

On the basis of the First National Development Plan, a revolutionary plan known as the Basic Plan for Scientific and Technological Plan (Plano Básico de Desenvolvimento Científico e Tecnológico 1973/74--PBDCT) was put into effect. This plan was drawn up through the cooperation of various ministries, mainly the Ministry of Planning and General Coordination (MINIPLAN), in collaboration with the National Research Council (Conselho Nacional de Pesquisas--CNPq).

The responsibility for devising and improving science and technology policies lies with the above two organizations. The former (MINIPLAN) deals mainly with national development strategy and the latter (CNPq) plans policies from the standpoint of science and technology.

The investment plan of the PBDCT is shown in Table 7-10. In 1973 and 1974, the plan is to invest Cr$4.3 billion in research and development, Cr$1.953 billion in 1973 and Cr$2.309 billion in 1974 (1 US dollar = Cr$6).

As the Minister of General Planning and Coordination pointed out, "This decisive policy is aimed at permitting Brazil to keep pace with the progress of international science and technology." The plan is based on this aim. From 1968, spending in Brazil on research and development fell short of (on the average) Cr$100 million in terms of the 1973 value of the cruzeiro and the outlay for research and development in First National Development Plan of 1971 averaged only Cr$670 million annually. Therefore, the Cr$2 billion allocated for this purpose in the PBDCT is 20 times the first figure above and about triple the PND figure.

The largest share in the investment plan, Cr$1.2 billion (28.5%), is for the industrial technology field. This is followed by basic research (21.6%), new technological development (16.4%), agricultural technology (11.1%) and infrastructure (10.0%).

As can be seen in the table, some of the above fields are divided into subsections and each of these has a detailed research plan. Of these detailed plans, the most noteworthy are the plans for ocean development to be used for independent Brazilian nuclear power, for industrialization development of schist, for interrelation between costs of construction, upkeep and utilization of highways, for development of a mini-computer industry, for development of food products particularly of tropical foods, for the promotion of regional research and development in connection with regional development within the national integration plan, and for a survey of the application of foreign technology in Brazil. Almost all of the research themes of interest in developed countries have been covered.

In the basic research sector, cooperation with universities in the various academic fields is to be strengthened. Technical assistance activities are to include a national system for scientific and technological information, Brazilian scientific academy and stepped-up technical cooperation with foreign countries.

The main plans concerning industrial technology are the program of the Ministry of Commerce and Industry and the special industrial technology plan. These were compiled with the cooperation of the staff of the Ministry of Commerce and Industry. The industrial technology policies have two main aims which should play a very important role in technological transfer: (1) increasing the technological absorption capacity of Brazilian industry and (2) improving the selection of imported technology.

The program of the Ministry of Commerce and Industry has 27 items ranging from general themes such as industrial technology information, industrial property ownership, technology transfer and industrial technology strategy, to technology for non-ferrous metal, iron and steel, electronics and chemical industries and agriculture. The special industrial technology plan has four items: (1) minicomputer technology, (2) establishment of a regional technology center, (3) a food research program, and (4) the plan of the Ministry of Planning and General Coordination.

Of the total investment for this plan, 65.8% will come from the budgets of the ministries involved, 23.3% from Brazilian financial organizations, 6.1% from other local capital and 4.8% from abroad. However, as was pointed out previously, this plan is revolutionary in comparison to recent expenditure levels. Because of the situation in research organizations where there is competition with university research institutes for staff which is in short supply and where activities are generally not very creative, this work will probably need a lot of decisive action and effort.

The various policies in Brazil are highly flexible and decisive action can be expected.

4-2 Science and Technology Policies in Japan

It is impossible to describe all Japanese scientific and technological policies in the limited space available. Only a few aspects of Japanese research activities will be pointed out here.

Japanese science and technology policies are formulated by the Council for Science and Technology which consists of the related ministers and some scholars with the Prime Minister as the ex oficio chairman. Independence of the scientific and technological administration began with the founding the Science and Technology Agency in 1956. The agency has controll over the administration of science and technology and also serves at the secretariat of the Scientific and Technical Administration Committee. It also established research programs in such fields as nuclear power and space. The various ministries concerned carry out the related policies for industrial and agricultural technology and science.

The most recent decisions of the Scientific and Technical Administration Committee have been on (1) the basis of the general science and technology policies of the 1970s (1971), (2) research and development aims in international cooperation (1973), and (3) research and development aims closely related to society (interim report, 1973).

The aim of policies in the 1970s is to increase the scale of research investment throughout the country to 3% of the national income as soon as possible. The amount of government expenditures is to increase within the range permitted by national financing. The main measures to achieve this aim are to be (1) systematization of research and development (promotion of the main research and development fields and national projects) and (2) opening new scientific and technological fields (environmental science and technology, software science, life sciences, etc.).

Table 7-11 shows the changes in research expenditures over the years. The total research investment is now 2% of the national income. The Government pays for 27% and the budget for science and technology is about 3% of the national budget. In Brazil, this latter figure is expected to be 2% at the PND level.

Table 7-12 shows that the research and development activities in Japan are based on private sector leadership.

The scientific and technological policies include four functional levels: (1) planning, administrative decisions and management concerning science and technology, (2) control, promotion and financial management of scientific and technological research at the national level, (3) execution of research, and (4) public service related to science and technology.

Table 7-11 Research Expenditures in Japan

Year[1/]	GNP A (100 million yen)	National income B (100 million yen)	General expenditure budget C (million yen)	Total research expenditures D (million yen)	Defense research expenditures E (million yen)	Government budget related to science and technology F (million yen)	D/A(%)	D/B(%)	F/C(%)	Amount of D borne by national and regional governments G (million yen)	G/D(%)
1965	328,125	261,059	37,447	425,832	---	120,600	1.30	1.63	3.22	131,149	30.8
1966	384,493	304,863	43,143	388,660	4,946	143,088	1.27	1.60	3.32	156,546	32.0
1967	453,221	363,120	49,509	606,295	6,654	167,937	1.34	1.67	3.39	183,370	30.2
1968	533,680	430,058	58,186	767,835	8,651	192,018	1.44	1.79	3.30	216,390	28.2
1969	629,972	499,763	67,396	933,228	9,326	221,238	1.48	1.87	3.28	245,191	26.3
1970	732,481	592,370	79,498	1,195,328	11,059	263,314	1.63	2.02	3.31	301,413	25.2
1971	810,932	657,861	94,143	1,345,919	12,294	305,296	1.66	2.05	3.24	369,021	27.4
1972			114,677	1,586,700		374,029			3.26		
1973			142,841			462,853			3.24		

Notes: 1. Fiscal year (April to March).

2. The total research expenditures according to a survey by the Prime Minister's Office covering all companies, research organizations and universities.

3. The budget related to science and technology includes the following:

   a. Science and technology promotion fees: costs of national laboratories and institutes; assistance costs; administration costs; fees related to space and nuclear power.

   b. Other research costs: costs of other scientific and technological research and testing, including expenses of national universities, etc.

Table 7-12 Origin and Purpose of Research Expenses in Japan (1971)

(Unit: 100 million yen)

Purpose \ Origin		Total	National and regional governments	Public	Foreign countries
Total		13,459	3,690	9,759	10
Companies, etc.		8,950	220	8,722	8
By research organizations	Subtotal	2,005	1,796	208	1
	Government management	1,816	1,772	44	0
	Private management	188	23	164	1
By universities, etc.	Subtotal	2,504	1,675	829	1
	Government management	1,617	1,599	18	-
	Private management	887	76	811	-

Source: Compiled from data of the Statistics Bureau, Prime Minister's Office.

Table 7-13 Comparison of Educational Indices for Brazil and Japan

			No. of schools	No. of teachers	No. of students at start of year	Year
Brazil	Elementary education		146,136	457,406	12,812,029	1970
	Secondary education		15,641	336,212	4,562,126	1971
	Higher education		2,620	61,111	561,397	1971
Japan	Elementary education		24,790	367,941	9,493,485	1970
	Secondary education		15,630	460,153	8,872,577	1971
	Higher education	Two-year college	486	32,468	275,256	1971
		University	389	122,821	1,404,186	1971

Note: In Japan, primary education lasts six years, secondary education six years including three years for junior high school and three years for senior high school.

Source: For Brazil: IBGE, "Sinopse Estatistica do Brasil;" for Japan: Ministry of Education, "Report of Basic School Survey" (in Japanese).

To promote independent research and development, functions (1) to (3) must be emphasized for the establishment of local technology. For example, in Brazil (2) is especially emphasized because it will stimulate and aid public financing. There will be assistance from various development agencies such as National Fund for Scientific and Technological Development (FNDCT), Agency for Financing of Studies and Project (FINEP), the National Economic Development Bank (BNDE), the Special Agency for Industrial Financing (FINAME) and the Technical and Scientific Development Fund (FUNTEC), as well as various state government agencies. However, in Japan research fund aid to establish independent technology is very small except for assistance by national projects and the large-scale project system. Such things are left to independent, private activities.

Function (4) normally has no direct role in scientific and technological research and education. However, such a function must be recognized as important in scientific and technological transfer and technological selection and adaptation. This range covers the following services related to technology:

(1) Scientific and technological information and documentation services;

(2) Standards, specifications and patents;

(3) Natural resources and environmental services (weather, etc.);

(4) Natural science display services; and

(5) Science and technology utilization and diffusion services.

In respect to these points, there are considerable qualitative differences between Japan and Brazil.

In our comparative analysis, it was found that there are always statistical restrictions in the science and technology field. Therefore, the statistical surveys concerning science and technology are useful, though indirectly, for the improvement of technological levels and stimulation of technology transfer.

The establishment of industrial standards has the same effect on the quality of products. The contribution of industrial standardization is considerable for improvement of inadequate industrial coordination and the backwardness of the parts industry which hinders industrial development. The PBDCT emphasizes this point as has already been pointed out, but the problem is how it is executed.

5. Technological Education

Since technological innovations lead to many social and economic changes, it is necessary that people be capable of responding positively to these changes in order to promote long-term economic development. An important condition for the remarkable expansion of industrialization in the developed countries in recent times has been that the people of these countries have had to have a rational and positive outlook in adapting to the changes involved.

At present, industrialization is being achieved and independent technology is being established in many developing countries but one key to these changes is that the people be able to discard old values and customs and develop the spiritual capacity to adapt to the new industrialization. To develop autonomous technology, not only direct measures such as increasing research investment and promoting scientific and technological education but measures to develop, in the people as a whole, basic capacities so that autonomous technology can be attained are also extremely important.

The National Development Plan in Brazil emphasized measures concerning human resources. In Japan, measures concerning human capabilities appeared around 1965 in the National Income Doubling Plan.

One of the foundations for the development of human capacity is increasing the physical strength and the other is to raise the general level of education. Human capabilities are diversified and the abilities required in various types of occupation are also diverse. Therefore there are probably various types of job training connected directly with economic and technological development but the people must receive a common general education as a basis for diversified occupational training.

Table 7-13 shows a comparison of general educational indices. General education in Brazil became full-scale around 1930. Previously, the great size of the country had hindered the spread of education. The table shows that there has been considerable improvement in elementary education in recent years but at present the illiteracy rate is still about 3%.

A modern school system was established in Japan in 1872 and the school system gradually was made complete. There are few other cases in the world of such systematization so early and such a rapid increase in the school population. The spread was particularly remarkable in elementary education and the attendance rate for compulsory education was 56% for boys and 23% for girls five years after the system was established. By 1902, these figures exceeded 90%. Such rise in educational levels in only 30 years was highly effective in boosting the moral work abilities of the people.

The national characteristics of the Japanese and the conditions which regulate these characteristics have contributed both directly and indirectly to technological and industrial development in manner which

cannot be overlooked. These characteristics include (1) homogenity of the society because of common race and language, (2) a religious background which showed no rejection against modernization, (3) spiritual characteristics such as diligence, imitativeness, curiosity and entrepreneurship, (4) paternalistic management as evidenced by the lifetime employment and seniority wage systems.

Some of the human ability measures which apply directly to technical innovations and technological transfer have been (1) improvement in the training and abilities of scientists, technicians and researchers, (2) training of skilled workers, (3) re-education and retraining and (4) occupational training. Indirectly, education has been guaranteed and cooperation has been established between industry and education.

In the Japanese period of technological innovations at the beginning of the 1960s, a problem arose concerning the training of the required scientists, technicians and skilled workers to adapt to these new conditions. For example, the scientific and engineering staffs in the universities were expanded to increase the numbers of students in these fields. Tables 7-14 and 7-15 show the distribution of science and engineering students. Because of the statistical inadequacies, it is not completely certain but it is suggested that there are considerable differences in the distributions in Japan and in Brazil.

The Brazilian National Development Plan and PBDCT refer to details of other policies to develop human abilities. The PBDCT includes research on education and technology such as modern audio-visual education and it also points to the integration of industry, research and the universities.

Another more realistic technological transfer pattern in developing countries is as follows. At the initial stage, the parent company sends technicians and managers to assist the subsidiary company on the basis of the technical assistance agreements between the parent company (supplier) in the developed country and the subsidiary (user) in the developing country. In the next stage, plans for the education and training of local employees are carried out by the parent company and others. This is almost entirely devoted to the learning of existing technology and it is very rare for training or communication to concern the research capacity required to develop new technology.

It is often said that the people in developing countries can learn how to do but they cannot learn why they do it. They can make a transistor radio without knowledge of vacuum tube. The responsibility for this lies with neither the developed or the developing country. It is a problem for both and it suggests the road to the establiishment of autonomous technology.

Technology transfer is of three types: (1) human, (2) information and (3) goods. The transfer channels include (1) human transfer, (2) entrepreneurial activities, (3) scientific and technological documentation and

Table 7-14 Number of Students by University Faculty in Brazil and Japan (1971)

	Brazil		Japan	
	No. of students at start of year	(%)	No. of students at start of year	(%)
Philosophy and literature	156,187	27.8	177,661	12.7
Law	76,906	13.7	143.012	10.2
Economics	52,218	9.3	391,455	27.9
Engineering	39,433	7.0	230,817	16.4
Medicine	30,990	5.5	17,971	1.3
Dentistry	6,571	1.5	7,963	0.6
Agriculture	6,482	1.2	44,077	3.1
Social work	6,352	1.1	37,873	2.7
Fine arts	4,889	0.9	32,026	2.3
Construction and city planning	4,591	0.8	70,272	5.0
Pharmacology	4,185	0.8	26,596	1.9
Nursing	2,882	0.5	-	-
Veterinary medicine	2,743	0.5	8,532	0.6
Others (including basic courses)	164,968	29.4	50,394	3.6
Science	-	-	43,061	3.1
Merchant marine	-	-	1,635	0.1
Home economics	-	-	23,935	1.7
Education	-	-	96,906	6.9
Total	561,397	100.0	1,404,186	100.0

Note: There are some discrepancy since the faculties sometimes overlap.

Source: For Brazil: "Sinopose Estatistica do Brasil;"
for Japan: Ministry of Education, "Basic Survey of Schools" (in Japanese). Only undergraduate teaching staff is included.

Table 7-15 Distribution of Science and Engineering Students in Higher Education, Brazil and Japan (1971)

		Brazil		Japan			
		University (No.)	University (%)	University	University (%)	Two-year college	Special schools
Number of students	Total number of students	561,397	100%	1,404,186	100.0	271,573	46,707
	Science	*	--	43,061	3.1	171	--
	Engineering	39,433	7.0	301,089	21.4	22,585	46,707
	Agriculture	6,482	1.2	52,609	3.7	3,527	--
	Health (medicine)	41,746	7.4	55,303	3.9	6,265	--
	Total	87,661	15.6	452,062	32.2	32,548	46,707
Number of graduates	Total number of graduates	64,049**	100.0	272,949	100.0	117,512	6,280
	Science	*	--	7,935	2.9	107	--
	Engineering	7,288	11.4	55,850	20.5	7,964	6,280
	Agriculture	1,200	1.9	11,135	4.1	1,526	--
	Health (medicine)	7,154	11.2	11,313	4.1	2,546	--
	Total	15,642	24.4	85,233	31.2	12,143	6,280

Notes: 1. Asterisk indicates classification is not possible: two asterisks indicate figure for 1970.
2. Health includes medicine, dentistry and pharmacology but not the undergraduate course.

Source: See Table 7-14.

information, (4) interaction between suppliers and users, (5) education and training, (6) consulting activities, (7) trade in patents and know-how, (8) conferences, symposia and training courses concerning science and technology, (9) general trade and economic and technical cooperation, and occasionally, (1) chance of human contact among scientists, technicians, etc.

Positive human contacts and the promotion of intellectual currents can be considered as the keys in solving the problem of technology transfer.

Chapter 8

SUPPLY OF FUNDS FOR GROWTH AND FISCAL AND MONETARY POLICIES

1. Economic Growth, and Fiscal and Monetary Policies

The Brazilian economy has continued to grow at the high annual rate of 9 - 10% since 1968, and this growth is made manifest as the GNP or GDP obtained by converting the volume of commodities and services produced by industry into a monetary value. The problem is the mechanism which supports this growth and is, specifically, the supply of funds.

The economic growth mechanism can be simply expressed as, through the mechanism of funds distribution, distribution of resources is carried out in a manner which promotes growth. It is desirable that economic growth be continuous and stable with long-term targets supported by economic planning. Policies aimed at short-term rapid growth require caution because they will not always enable growth rates to be sustained over long periods.

The supply of funds is influenced by business cycles, and the manner whereby funds are supplied influenced again business cycles. Therefore, a system by which funds can be supplied smoothly is necessary to prevent, in the short term, any inclinations toward inflation or deflation and, in the long term, to help sustain stable economic growth. Fiscal and monetary policies are the only means to ensure such a supply of funds.

To carry out such fiscal and monetary policies, it is necessary to clearly define the various means to be used and the results in each case and at the same time to employ fiscal and monetary policies which are suitable from both the long-term and business cycle aspects.

The main means to be used in fiscal policies must be related to either revenues or expenditures. Revenue policies involve the distribution of public loans and taxes. Among measures related to taxes, are determining the mix of rates for different taxes and for income taxes in particular, tax exemptions as well as progressive gradation of tax rates by income levels. Expenditure policies are influenced by the scale of the expenses and the distribution, economically and functionally, of the expenditures.

For monetary policies, the three classic policy measures used are the official rate, the deposit reserve rate and open market operation. The following equations indicate relationship between fiscal and monetary policies. The national income and its structure can be derived from equation (1) in respect to income disposal or supply and from equation (2) in respect to expenditures or demand:

$$Y_s = C(Y) + S(Y) + T(Y) \quad \ldots\ldots\ldots (1)$$

$$Y_d = C(Y) + I(Y) + G \quad \ldots\ldots\ldots (2)$$

where: Y = national income and the subscripts "s" and "d" mean supply and demand respectively, C = consumption, S = savings, T = taxes, I = investment and G = government spending.

In both equations (1) and (2), the variables on the right side are all functions of "Y" except for "G". In the two equations, "S" is connected with "I" in respect to monetary policy and in respect to fiscal policy, "G" is spent in accordance with "T". The portion enclosed in the broken line shows the private economy sector. If the two equations are to be equivalent, the distribution of "C" in consumer spending in equation (1) must agree with the demand "C" for consumer goods in equation (2) but there is no guarantee that "S" will equal "I". Therefore, considering the inflation and deflation gaps arising from business cycles only for the private economy sector, there will eventually be an "S" "I" gap under unfavorable conditions and an "S" "I" gap under favorable conditions. According to Keynes, "S" will decrease to the level of "I" if the "S" "I" gap continues and a $Y_s=Y_d$ equilibrium will be established at that level. One way to check this tendency is the money market which acts as a channel to connect "S" and "I". As was mentioned earlier, the three operational measures in such cases are the official rate, the deposit reserve rate and open market operation. However, the connection between "S" and "I" must increase not only a monetary function but also the effective demand and the excess in savings must be absorbed. To accomplish this, there is the relation between "T" and "G" for government financing.

Generally, when private economy is unfavorable and financing is "S" "I", government fiscal policies should be such that "T" "G", and the deflation gap must be filled. To do this, a budget must be made so that gross tax revenues are restrained and public spending is expanded. An issue of public bonds can be used to obtain funds for this expanded government spending and serves to induce money from private savings "S" to government spending "G". On the other hand, when "S" "I" under favorable conditions, it is necessary to close the inflation gap by utilizing the functions of the money market and adopting tight money policies so that "T" "G" on the fiscal side. Under the conditions prevailing at present in the developed countries, fiscal and monetary policies are aimed at closing the inflation gap.

In Japan, for example, the main events related to fiscal and monetary policies during 1973 were as follows.

January 9	Bank of Japan raised the deposit reserve rate.
January 15	Cabinet approved the draft 1973 budget.
February 13	Decision made to float the yen.
February 26	Bankers' Association established limits on credit to the ten largest trading companies.
March 2	Bank of Japan raised the deposit reserve rate for the second time.
March 31	Official rate raised by 0.75%, to 5%.
May 29	Official rate raised again by 0.5%; deposit reserve rate also raised.

June 13	Bank of Japan selective loans policy (so-called "window guidance") greatly strengthened.
June 30	Official rate raised for third time: 0.5%.
August 28	Official rate raised for fourth time: 1%; deposit reserve rate also raised.
October 19	Prime Minister Tanaka revealed plan for 2 trillion yen tax reduction.
November 14	Government and Liberal-Democratic Party decided to raise consumers' rice price by 9.8%, effective from April, 1974.
November 16	Cabinet decided on basic measures against the oil crisis.
December 4	Government Enterprise Unions struck for inflation allowance.
December 13:	Ministry of International Trade and Industry froze retail prices of liquified petroleum gas for home use.
December 14	Bank of Japan announced that wholesale prices jumped 3.2% from November level.
December 21	Official rate raised for fifth time, by largest margin to date: Government decided to freeze Japanese National Railway fares and consumer rice price for six months. Tow oil bills were promulgated and enforced from next day.
December 22	Preliminary budget for 1974 drafted by Ministry of Finance. Government proclaimed oil crisis conditions.
December 28	Bank of Japan announced that wholesale prices rose 28.6% above the December, 1972 level. Prime Minister's Office announced that consumer prices in Tokyo were 17% higher than in December, 1972.

From the above list, the following points are evident:

(1) During 1973, inflation rose and was accelerated even more by the advent of the oil crisis.

(2) Tight monetary policies were adopted to counter inflation. The official rate was raised on five occasions by a total margin of 9% and the deposit reserve rate was raised on four occasions. The Bankers' Association established credit controls and the Bank of Japan utilized selective loans.

(3) From October, direct price controls were adopted such as freezing increases in public utility charges and retail prices for home-use liquified petroleum gas for which price

increases had already been decided, and also the establishment of the two oil laws.

(4) Concerning fiscal matters, measures to suppress inflation were adopted in the enforcement and drafting of budgets but there was not the elastic response as with the monetary policies. Part of the public utilities charge increases in the 1973 budget were deferred to the 1974 budget. The 1974 budget should show greater trends against inflation.

(5) The plan for a two trillion yen tax reduction seems to be contrary to the anti-inflation policies but it is considered as a way to dampen the impact of inflation on ordinary living standards and it also related to the strike by government enterprise workers for an inflation allowance.

The increase in prices at the end of December, 1973, resembles the conditions in Brazil several years ago and the inflation allowance is equivalent to the concept of monetary correction (Correcao Monetária) in Brazil.

Although fiscal and monetary policies ensuring the smooth supply of funds are required in the short term to close inflation or deflation gaps caused by business cycles and in the long term to guarantee stable economic growth, there is the problem of how to decide roles correctly of the fiscal and monetary functions at such times. It can be considered that monetary policies are more important than fiscal policies in dampening demand during an inflation and the reverse is true in stimulating effective demand during deflation. However, as can be seen in the above chronological account, government fiscal and monetary policies concerning wages and prices and the control of demand for commodities are essential. This is related to the level to which a long-term fiscal and monetary structure has been established in the national economy. To achieve results by manipulation of the official rate and the deposit reserve rate, it is necessary to establish a money market and operate it in such a way that the people respond to the monetary control system. The existence of an open market is essential for market operation and there must also be sufficient bonds for operation. On the fiscal side, it is also necessary to establish a tax collection system.

The response of fiscal revenues and expenditures to business fluctuations and economic growth can be shown schematically as follows:

Table 8-1 Sensitivity of National Expenditures and Revenues to Business Cycles and Growth

			Flexible with conditions	Growth adjustable
Annual Expenditures				
Operating expenses	Consumption			o
	Transferred expenses	(A)	o	
		(B)		o
Capital expenses	General government			o
	Government enterprises		o	
	Housing			o
Annual Revenue				
Direct taxes	Personal income tax	(C)	o	
		(D)		o
	Corporate tax		o	
Indirect taxes	Alcohol and tobacco			o
	Commodity tax		o	

Notes: (A) means unemployment insurance benefits.
(B) means health insurance benefits
(C) means high tax brackets
(D) means low tax brackets

Source: Emi, K.: "Economic Stabilization and Annual Expenditure Structure," in "Economic Growth and Fiscal and Monetary Policies," ed. by Fujino and Udagawa, 1967.

The system of supplying currency for growth is discussed below. Expansion of the economic growth or the scale of the national economy is reflected by a rise in the level of the GNP. The increase in the amount of currency required as the economy grows is as shown in Table 8-2. In this table, the M_1/GNP ratio remains almost constant at about 7% because the supply of cash runs parallel with economic growth. The gradual increase in the M_2/GNP ratio is due to increases in the use of checks for business transactions and in deposit assets. The gradual increase in the M_1+M_2/GNP ratio indicates that economic growth results in a slow increase of the amount of currency required.

In Japan, the following four routes supply the currency to fulfill the above requirements:

(1) The route which depends upon a favorable international balance of payments;

(2) The route which depends on government expenditure deficits;

Table 8-2 Trends of Marshall's k

	M_1/GNP	M_2/GNP	M_1+M_2/GNP
1956	7.7%	19.5%	27.1%
1957	6.8	17.4	24.2
1958	7.1	18.9	26.0
1959	7.2	19.8	27.0
1960	7.1	20.2	27.4
1961	7.0	20.0	27.0
1962	7.1	21.6	28.7
1963	7.1	24.4	31.5
1964	6.9	23.3	30.2
1965	7.1	25.2	32.4
1966	7.1	25.0	32.1
1967	7.2	23.8	31.0
1968	7.0	22.6	29.6
1969	7.2	23.4	30.6
1970	7.2	23.0	30.2

M_1 = cash
M_2 = deposits

Source: Survey Bureau, Bank of Japan, "Monetary Systems in Japan."

(3) The route which depends on insufficient funds in private financial institutions, namely

(a) Lending by means of discounting of bills and loans by bills in commercial banks, and

(b) Buying operations.

The following table shows the relations among the routes in respect to the main assets of the currency authorities.

Table 8-3 Main Assets of Currency Authorities in Japan

	Currency in circulation	Total assets	Share: Foreign assets	Share: Government credit	Share: Private credit
end 1965	2,564	3,585	21.6	27.0	35.5
end 1966	2,914	3,913	19.5	28.5	42.2
end 1967	3,412	4,517	16.2	41.1	32.8
end 1968	4,042	5,306	19.7	44.0	30.1
end 1969	4,811	6,338	20.8	42.0	30.3

Source: Statistics Bureau, Bank of Japan, "Comparative International Statistics for Japanese Economy", 1971.

Table 8-4 Main Assets of Currency Authorities in Four Countries

		Currency in circulation	Total assets	Foreign assets	(%)	Government credit	(%)	Private credit	(%)
Japan (billion yen)	end 1965	2,563.8	3,585	774	21.6	969	27.0	1,273	35.5
	end 1966	2,913.5	3,913	762	19.5	1,116	28.5	1,652	42.2
	end 1967	3,411.6	4,517	731	16.2	1,855	41.1	1,482	32.8
	end 1968	4,041.9	5,306	1,040	19.7	2,337	44.0	1,596	30.1
	end 1969	4,811.4	6,338	1,316	20.8	2,661	42.0	1,923	30.3
U.S.A. (100 million dollars)	end 1965	370.7	643	155	24.1	463	72.0	3	0.5
	end 1966	393.4	686	149	21.7	509	74.2	4	0.6
	end 1967	416.4	734	148	20.2	561	76.4	--	--
	end 1968	447.3	784	157	20.0	592	75.5	--	--
	end 1969	474.7	817	170	20.8	624	76.4	--	--
England (100 million pounds)	end 1965	27.3	67.4	10.7	15.9	56.4	83.7	0.3	0.4
	end 1966	28.9	71.8	11.1	15.5	59.9	83.4	0.8	1.1
	end 1967	29.7	77.8	11.2	14.4	65.5	84.2	1.2	1.5
	end 1968	31.2	91.7	10.1	11.1	81.6	89.0	--	--
	end 1969	32.4	87.1	10.8	12.4	76.3	87.6	--	--
West Germany (100 million mark)	end 1965	294.6	538	332	61.7	116	21.6	55	10.2
	end 1966	307.7	570	349	61.2	121	21.2	63	11.1
	end 1967	315.7	537	354	65.9	126	23.5	57	10.6
	end 1968	325.0	622	425	68.3	136	21.9	61	9.8
	end 1969	346.2	604	280	46.4	147	24.3	177	29.3

Source: Same as Table 8-3.

As can be seen in Table 8-3, the percentage of public credit in Japan is very high when compared with other nations and the effects of the so-called over-loans are evident. From 1965 to 1969, foreign assets remained at about 20% but government credit increased sharply from 28.5% in 1966 to 41.1% in 1967, while the private credit dropped from 42.2 to 32.8% in the same years. This shows a change from private to public leadership in credit requirements. At the same time, Bank of Japan credit proceeded towards normalization mainly by the currency supply through loans and bond transactions.

Of the four routes described above, (1) is not desirable since it does not maintain an international balance of payments and (2) is not recommended because it does not aid in controlling inflation. Therefore, the only normal supply routes are (3) - (a) and (3) - (b), with (a) related to short-term deposits and (b) to long-term deposits. The basic long-term supply route for currency is the bond transactions in (b). However, in order for this route to function properly, it is necessary to raise the level of the bond market.

2. Inflation in Postwar Japan

The following table lists the related economic indicators which show postwar inflation in Japan and its decline.

In accordance with the changes in the various economic indices from 1945 to 1972 shown in Table 8-5, the postwar Japanese economy can be divided into the following three periods:

First period	1945-54
Second period	1955-65
Third period	1966-72

From Table 8-6, the following period can be added:

Fourth period	1973-

The price changes during these four periods can be outlined as follows:

(1) In 1946 when there was a multiple effect on both wholesale and retail prices because of the sharp decrease in the production index and the sharp increase in the currency in circulation, there was hyperinflation with an increase rate of several hundred per cent compared with the previous year. However, both prices suddenly decreased because of a production recovery and the decrease in the amount of currency in circulation.

Table 8-5 Annual Fluctuations of Various Economic Indices 1945-1972

(Unit: percent)

Year	Currency in circulation	Wholesale price index	Consumer price index (Tokyo)	Industrial production index	Real GNP
1945	148.2	51.1	47.0	-55.9	---
1946	67.4	364.5	513.8	-55.6	---
1947	132.9	195.9	116.2	24.2	8.6
1948	61.5	165.6	73.0	30.1	12.7
1949	0.3	63.3	25.3	29.3	2.1
1950	18.8	18.2	-7.1	21.1	11.0
1951	19.9	38.8	16.0	36.5	13.0
1952	13.8	2.0	4.1	7.3	11.0
1953	10.8	0.7	7.6	20.8	7.4
1954	-0.9	-0.7	5.5	8.4	3.7
1955	9.0	-1.8	-1.3	7.5	11.1
1956	16.9	4.4	0.8	23.2	6.4
1957	7.0	3.0	3.1	16.3	6.8
1958	7.1	-6.5	0.9	-1.3	3.9
1959	16.4	1.0	1.5	19.9	11.7
1960	19.7	1.1	3.5	24.5	13.3
1961	19.5	1.0	5.3	19.3	14.4
1962	17.5	-1.7	6.7	8.2	5.7
1963	17.8	1.8	7.8	10.1	12.9
1964	12.7	0.2	4.1	17.0	10.8
1965	11.5	0.8	7.3	4.8	5.4
1966	13.6	2.4	4.8	13.2	11.8
1967	17.5	1.8	4.1	19.5	13.4
1968	18.9	0.9	5.5	15.4	13.6
1969	19.0	2.1	5.7	16.0	12.4
1970	15.7	3.6	7.2	13.8	9.3
1971	15.4	-0.8	6.3	2.6	5.7
1972	29.1	0.8	4.8	7.2	12.0

Source: For 1945-1965, Statistics Bureau, Bank of Japan, "Main Japanese Economic Statistics from the Meiji Period," 1966; for 1966-1972: are from Bureau of Statistics, Bank of Japan, "Annual Report of Government Statistics," 1973.
"International and Domestic Business Indices," Nihon Keizai Shimbun, Dec., 1973 - Feb., 1974.

Notes:
1. The real GNP are figures for the fiscal year.
2. The consumer price indices of 1945 and 1946 are the Tokyo retail price indices.

Table 8-6 Monthly Change of Various Economic Indices in 1973

(Unit: percent)

Month	Average circulation of Bank of Japan notes	Wholesale price index	Consumer price index (Tokyo)	Industrial production index
Jan.	26.2	7.6	6.8	26.6
Feb.	26.1	9.2	7.3	18.5
March	27.3	11.0	9.0	12.7
April	27.5	11.4	10.0	18.4
May	27.9	12.3	11.3	23.2
June	27.5	13.6	11.6	17.2
July	27.5	15.7	12.4	16.8
Aug.	27.6	17.4	12.6	22.4
Sept.	27.1	18.7	14.2	15.7
Oct.	26.1	20.3	13.2	16.9
Nov.	26.7	22.3	14.8	17.6
Dec.	25.4	29.0	20.4	12.6

Source: Same as in Table 8-5.

(2) After the consumption per capita regained the prewar level (average for 1934-1963) in 1953, the depression reached its lowest level in 1954-55, but after that, business conditions improved and the economy entered a period of growth. In 1955-59, wholesale and consumer prices were stable while industrial production increased at an annual rate of about 20% except for a temporary drop in 1958, and the so-called quantitative boom started. This trend changed from 1960 when consumer prices started to rise and continued to climb even in 1965, a depression year. The rise in the consumer prices became a built-in feature of economic growth.

(3) The consumer price index between 1966 and 1972 was maintained at a level of about 5% and the increase rate was normal. In spite of this, the growth was as high as it had been in the years from 1955 to 1965, because wholesale prices remained stable and the international balance continued to be favorable due to high export expansion.

(4) The excess foreign cash reserves from the great expansion of exports in 1971 and 1972 flowed into the domestic economy. Part went towards land and commodities speculation and laid the basis for inflation. From October, 1973, the oil crisis was an added factor and the rise of commodity prices was accelerated. The currency circulation rate was higher in 1972 than in 1971 as shown in Table 8-2. As can be seen

from the monthly breakdown in Table 8-3, the consumer and wholesale prices rose every month when compared with the same month in the previous year, and the Bank of Japan note circulation rate which is used as a variable to represent the currency circulation rate was strong at 26-27% when compared with the same months the year before. The average increase per month from January to December, 1973 when compared with the same months in 1972 (the rate of increase in December over November was considered as the same for the previous year) was 27.0% for the Bank of Japan note circulation rate, 12.5% for wholesale prices and 9.4% for consumer prices. It can be assumed that the previous tendency of the Japanese economy has changed greatly with 1973 as the turning point. The increase in consumer prices of about 10% is very closely related to the cost of living index in Brazil. This shows that Japan can actually learn from Brazil's experience in fighting inflation.

Fig. 8-1 shows the chronological course of inflation or price increases in postwar Japan. The problem is what causes the inflation at the various stages. These reasons are outlined below.

In the first stage, there was a lack of the basic goods essential for every-day life because of the insufficient production capacity after the war but at the same time, the discharge of soldiers with their terminal pay when the military forces were disbanded resulted in excess buying power. This led to inflation from just after the war until the time of the Dodge line. Since production recovered because of the special procurements for the Korean war and production capacity was gradually becoming sufficient due to equipment investment, the price rises stopped at the end of this first stage. Since this first stage was mainly during the Occupation, fiscal policies were considerably influenced by the policies of the Occupation forces.

The second stage saw the ceiling of production capacity became high because of the investment of the first stage. At the same time, the business circulation recovered and there were "demand-pull" type price increases. In this second stage, monetary policies played the most important role which was referred to in the General Analysis entitled "Japanese Economic Policies for 1955-1960."

The third stage was a period which can be described as "demand-shift" inflation. In this case, the over-all capital formation shifted from private equipment investment to public investment centered on housing construction and social capital, and prices rised in these fields led to other price increases. Simultaneously, inflexibility in the lower strata of wages was strengthened by shortages of manpower and increased union bargaining power. Because of this, "cost-push" factors were beginning to appear.

Fig. 8-1 Comparison of Increase Rates of Currency Distribution Level, Consumer Price Index and Real GNP with those of the Previous Year

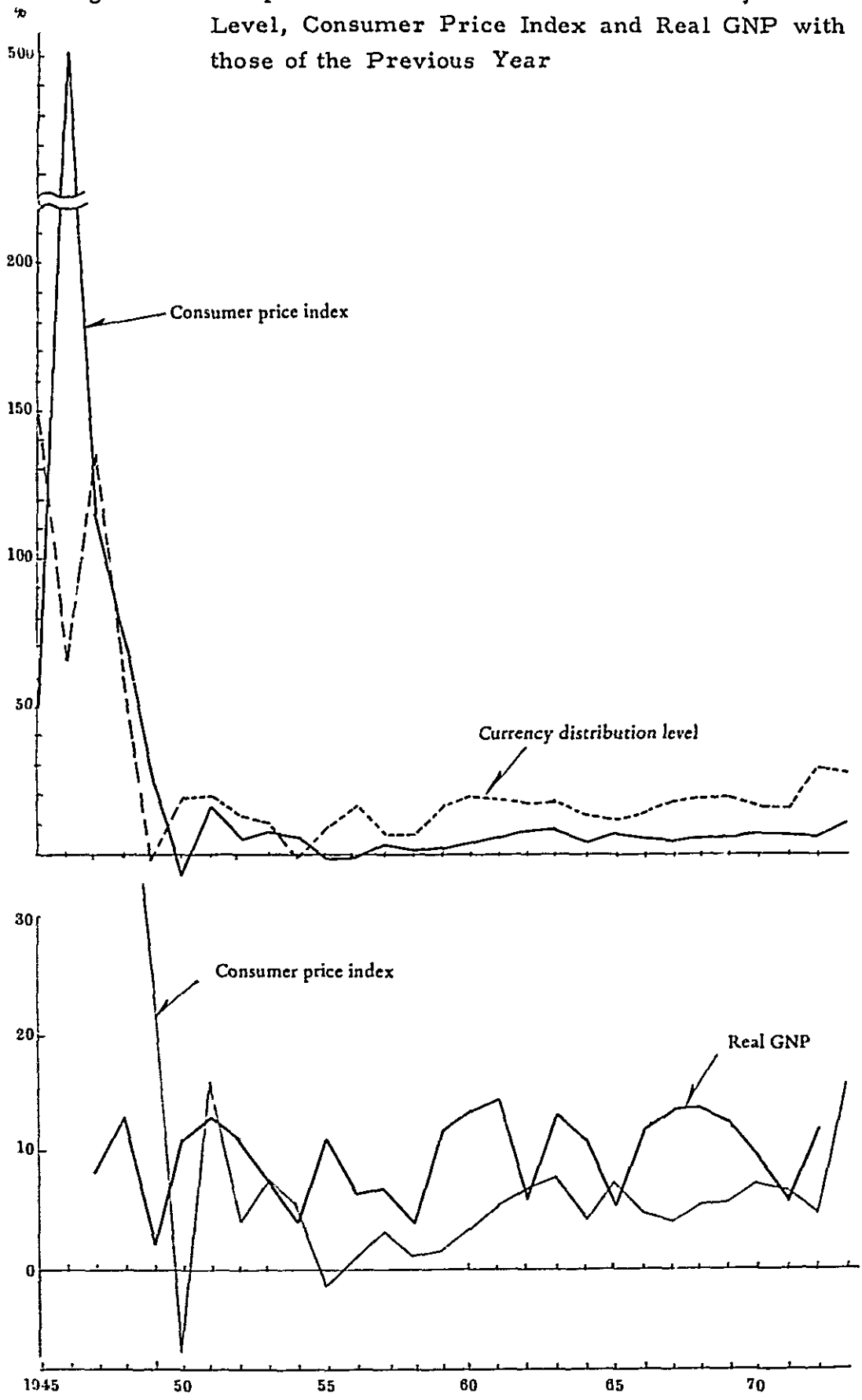
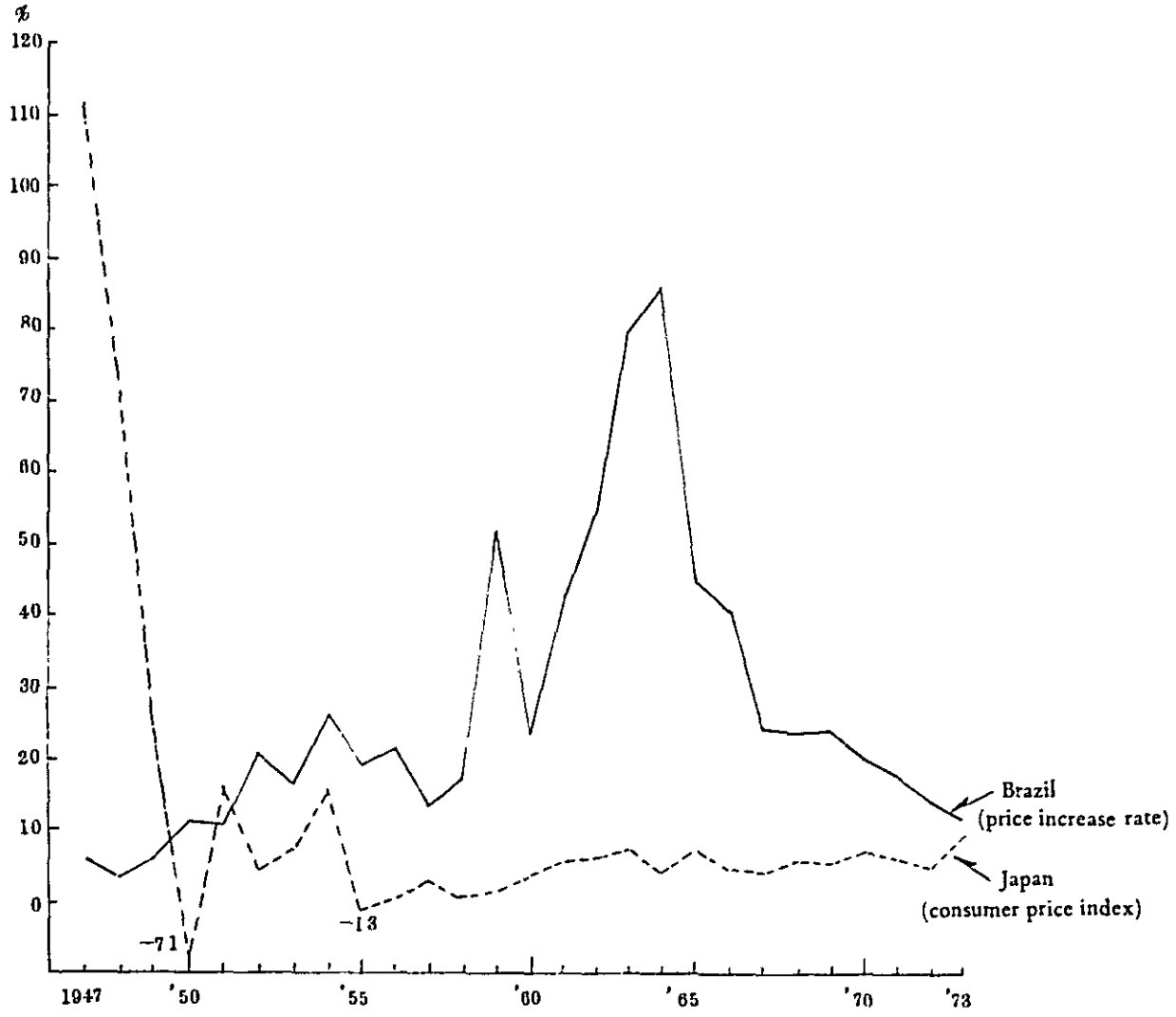


Fig. 8-2 Comparison of Price Increase Rates in Brazil and Japan, 1947 to 1973



In the fourth stage, there was an increase in the scale of fiscal expenditures because of the necessity for distribution of resources. Monetary policies were eased due to a favorable international balance of payments and increases in wages and prices were tolerated under such an economic environment. The expansion in exports resulted in an increased flow of surplus funds into large-scale industries, mainly those oriented to exports. This led to land and commodity speculation.

The oil crisis which occurred during the last part of the fourth stage resulted in a run of some consumer goods by the public because of fears of shortages, spurred by the anticipation of continued inflation, and this was coupled with manipulation of supply by large industries.

An article by Naomi Maruo suggests the relation among the rates of consumer price increases, real economic growth and amount of currency in distribution as well as the gap in wage and productivity increases for each of the above postwar inflation periods.

First, there is the problem of whether or not Japan's postwar inflation is demand inflation. Maruo took the real economig growth rate ($\dot{Y}$) as the demand index and obtained its influence on the consumer price increase rate as shown in the following figure.

Fig. 8-3 Relation between Real Economic Growth and Consumer Price Rises in Japan

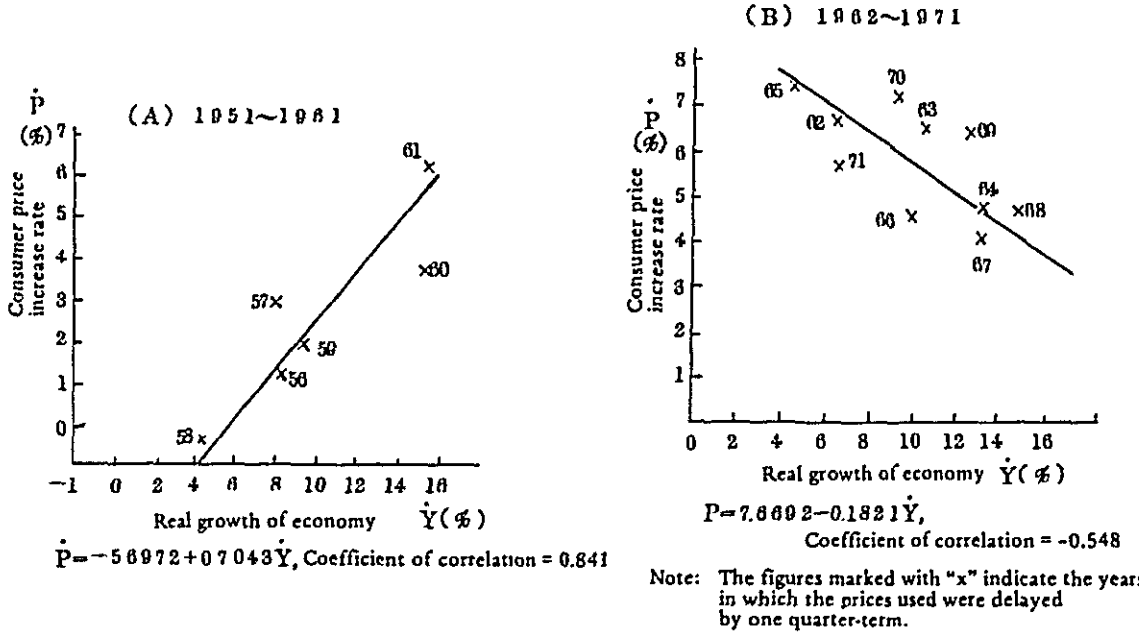


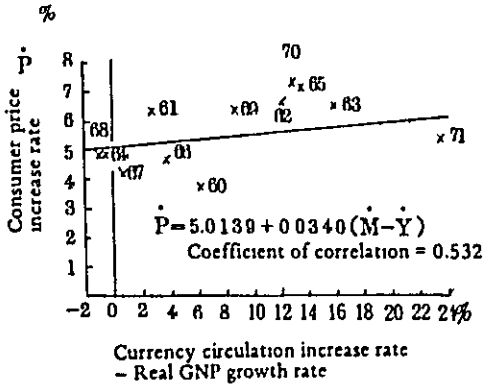
Fig. 8-3 shows clearly that during the 1950s, there was a positive correlation between P and Y, and during the 1960s, this correlation was inverted which means that inflation during the 1960s cannot be viewed as demand inflation.

To test the currency inflation theory, the currency circulation increase rate (M) minus the real GNP growth rate ($\dot{Y}$) were plotted on the abscissa of a graph with $\dot{P}$ as the ordinate. This relation is shown in Fig. 8-4. The correlation was positive but the coefficient of correlation was low as 0.53 and even when $\dot{M}-\dot{Y}=0$, $\dot{P}$ was about 5%. Therefore, there was no significant correlation between the two in the 1960s.

However, it is necessary to try the same calculations for the stage just after the war and recent conditions.

In order to investigate the tendency toward cost inflation in Fig. 8-5, a graph was plotted with the difference ($\dot{W}-\dot{Y}$) between the average monetary wages ($\dot{W}$) and the national economic productivity (Y=GNP/PL, L=total number employed) as the abscissa and P as the ordinate. The results are shown in the figure.

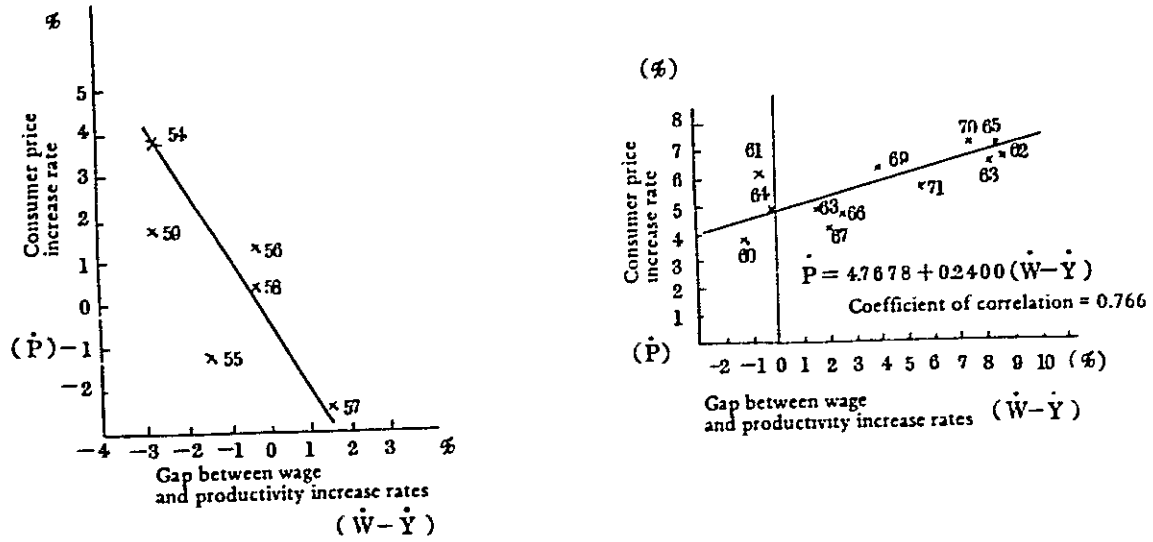
Fig. 8-4 Relation between the Consumer Price Increase Rate and the Gap between the Currency Circulation Increase Rate and Real GNP Growth Rate in Japan



Note: The currency circulation increase rate is the rate of increase of the currency in circulation.

Fig. 8-5 Relation between the Consumer Price Increase Rate and the Gap between the Increase Rates of Wages and Productivity in Japan

(A) 1954~59 (B) 1960~71



The results show that there was an inverse correlation during the 1950s but this changed to a positive correlation in the 1960s. This was because during the 1950s, the tendency to cost inflation had not appeared. The rise of the wage increase rate over the productivity increase rate in the 1960s caused the trend to cost inflation. Maruo pointed out the concept of productivity difference inflation is basically related to inflation in the low

productivity sector and in Japan, the complexity of the distribution process is the connecting factor.

When the above investigation is compared with the four stages given here. The second stage shows demand inflation and the third stage cost inflation. In the first stage, monetary inflation was mixed with demand inflation and in the fourth stage, there was a mixture of cost inflation, import inflation and in particular demand shift inflation centered on the export industries.

When comparing the Brazilian and Japanese economies, there are two points of special interest. The first is the interesting comparison between the processes of overcoming inflation in Japan in the first stage and in Brazil. The second is that the experience of the correcão monetária in Brazil should be helpful as a reference in fighting the recent galloping inflation in Japan.

3. Future Growth of Brazil and Restraining Factors

Fugure growth in Brazil can be seen from investigating mainly government forecasts and it can be seen in government economic planning. The most recent economic plan of the Brazilian Government is the First National Development Plan, 1972-1974. It has the following three national objectives:

(1) To make Brazil a developed country in one generation;

(2) To double the 1969 per capita income by 1980; and

(3) To increase the level of the 1974 economy to that which can be achieved with an annual GNP growth rate of 8-10%. Specifically,

  (a) The average employment increase rate for 1970-1974 is is to be 3.1% and that for 1974, 3.2%.

  (b) The inflation rate is to be 10% per annum until the end of the present regime.

  (c) International economic policies are to be carried out to accelerate the expansion of the national economy without destroying the progress made in domestic inflation control measures.

  The aim is to achieve simultaneously complete employment, inflation control and equilibrium in the international balance.

The plan to double the per capita income was also a policy of the Ikeda Cabinet in Japan. The fiscal and monetary problems here can be explained as follows: More intense mobilization of the national financial system and capital market to provide greater participation in the financing

of real capital formation for the private sector and the creation of solid business structures.

In other words, the essential points are the establishment of money and capital markets as channels to connect savings and investment.

The International Bank for Reconstruction and Development (IBRD) has described the future of Brazil in an internal document, "Development Prospects":

(1) The main driving force in the Brazilian development strategy is the maintenance of an extremely large growth rate compatible with international balance. The growth rate aim in economic planning is 8-10% but the actual growth rate was 11% in 1971 and 1972. However, this rapid rate of growth has rapidly widened the external resource gap.

(2) An analysis of the possibility of future utilization of external credit resources and the ability of Brazil to repay its debts, has shown that it will be difficult to maintain a financing resource gap as large as that in 1972. In order to stabilize this resource gap, it will be necessary to keep the import expansion rate less than that for exports. This can probably be achieved by decreasing the growth rate to 8-9%. However the savings rate must be shifted sharply upwards.

(3) The outlook for Brazilian exports is a real growth of 13-14% and a nominal growth of about 16%. The necessity for exports is still great. The majority of the surplus production capacity of industry was absorbed by 1970. Therefore, it can be assumed that the capital production ratio which thus far has been 2 to 1 will increase. The import demand elasticity from 1968 to 1972 was 1.7 and if the growth continues at the 1971-1972 pace in accordance with such large amounts required for limited imports, the resource gap will expand. However, the gap can finally be only by external credit so that the credit worthiness of Brazil will be endangered.

We have almost the same opinions as those given in the IBRD analysis above. Actually, the magnitude of Brazil's dependence on foreign investment is shown in the rapidly increasing foreign debt. In the years 1970, 1971 and 1972, this debt was US$5.3 billion, 6.1 billion and 9.3 billion respectively. The problem is that repayments of this debt have only been US$1.48 billion, 1.69 billion and 2.28 billion (at the end of June) in these respective years. It cannot be denied that this has an important effect on the country's international balance of payments.

To avoid such a dilemma, the dependence on foreign funds for industrial investment resources must first be gradually decreased and

therefore the dependence on domestic savings must be increased. The problems in this connection are as follows:

(1) As was pointed out with respect to economic planning, money and capital markets must be firmly established but at the same time, incentives must be provided for private savings. The capital market has been stagnant since the 1971 boom but it should be developed on a long-term basis.

(2) There should be attempts to reduce deficit government financing but, considering the ratio of deficit financing to the GDP, there was a steady decrease from 4.3% in 1963 before the start of the military regime to 0.3% in 1971. This is considered to be due to efforts to reduce personnel expenses by means of administrative reform from the expenditure standpoint and tax increases from the revenue standpoint.

(3) It is considered necessary to establish a proper foreign debt balance to GDP (or GNP) ratio and to make this one type of brake on foreign capital induction. In this connection, the foreign debt balance of US$9.3 billion in 1972 was 18.6% or about one-fifth of the US$50 billion GDP of that year but the question is whether or not this is an excessive burden. Since there is naturally a foreign currency reserve balance (US$4 billion in 1972) against the foreign debt balance, the ration actually is: (foreign debt balance-foreign currency reserve) divided by the GDP=10.6%.

In the same calculation for Japan in 1971, the foreign debt balance taken as a total of the government foreign debt and the foreign debt component in public and industrial debts was only US$1.7 billion. When this was added to the US$1.5 billion in pure debts of short-term overseas assets and liabilities of the foreign exchange banks, the total became US$3.2 billion but this was still much lower than the foreign exchange reserves and the relation between the foreign debt balance and the foreign currency reserves was exactly the reverse of that in Brazil. Since the GNP was US$256.6 billion in 1971 (calculated at one dollar = 308 yen in 1971),' the ratio of the foreign debt balance to the GNP was only 1.2% which presents no problem. The ratio of the foreign currency reserves to the GNP was 5.9%.

The advent of the oil crisis has caused conditions in Japan to become unfavorable, but in the near future, the figures might not approach those of Brazil.

The problem is whether or not the experience in Brazil in the past is applicable in Japan where dependence on foreign investment is considered to be a result of a high level of

Table 8-7 Changes in Foreign Debt Balances, Foreign Currency Reserves and Related Percentages of GNP in Japan

Year	Foreign debt balance (1)	Foreign currency reserves (2)	GNP (3)	(1)/(3)	(2)/(3)	(1)/(2)
	100 million dollars	100 million dollars	100 million dollars	%	%	%
1955	2.5	7.4	240	1.0	3.1	33.8
1960	2.1	18.2	431	0.5	4.2	11.5
1965	9.3 (18.3*)	21.1	888	1.0 (2.1*)	2.4	44.1 (86.7*)
1970	15.0 (25.6*)	44.0	1,868	0.8 (1.4*)	2.4	34.1 (58.2*)

Notes: 1. The figures in parentheses with an asterisk show cases where the annual pure debt of short-term overseas assets and liabilities of foreign exchange banks has been included in the total.
2. Calculated at one dollar 360 yen.

Source: Bank of Japan, "Economic Statistics Yearbook," various years.

growth. When the above calculations are made for 1955, 1960, 1965 and 1970, the results are as shown in Table 8-7.

As can be seen in this table, the foreign debt balance never exceeded 1% of the GNP, and even when the short-term pure debt was added, the highest percentage was 2.1%. In addition, the foreign currency reserves were always greater than the foreign debt balance.

These results indicate that Japan's dependence on foreign investment has traditionally been low and this has actually been characteristic since the Meiji Period. Professor L.R. Klein of Pennsylvania University has written about this that "Japan successfully laid the foundation of capitalistic economy without relying on net capital imports." (L.R. Klein, "A Model of Japanese Economic Growth (1878-1937)," Econometrica, 29: 3, p. 279, July 1961)

Because of factors such as an unwillingness to borrow from foreign countries, the Japanese penchant for saving and the establishment of a strong domestic money market, Japan has developed a high degree of self-sufficiency in industrial

investment by utilizing domestic savings. Naturally, the base which has made this possible is the high economic growth during the past generation.

The problem is that the Brazilian foreign debt balance must be set at a suitable ratio so that future economic growth will not become static, but in the past, the debt service ratio, (annual redemption of foreign debt/amount of exports + invisible trade income) was used. Recently, the coefficient of vulnerability which takes into account foreign currency reserves and imports has come into use. According to this coefficient, there has been a gradual decrease every year, from 59% in 1968 to 34% in 1972. This indicates that, from the fiscal and monetary standpoints, there is no need for misgivings concerning the international balance limitation conditions and also from the IMF standpoint, the Brazilian Government foreign currency control measures were considered to be quite appropriate. It will be necessary to make theoretical analysis on this point.

(4) One more means to decrease the dependency on foreign investment is to increase the amount of exports, and in particular to increase the production capacity of agricultural products and promote related export corridor planning. Through the growth of import-substitution industries, the dependence on imports can be decreased and the relation between the trade structure and international economy can be strengthened with increased exports. Monetary and fiscal policies will be aided indirectly by such measures. For an outline of such policies adopted in Japan, refer to Fig. 3-3, "High growth rate and the fiscal and monetary structure."

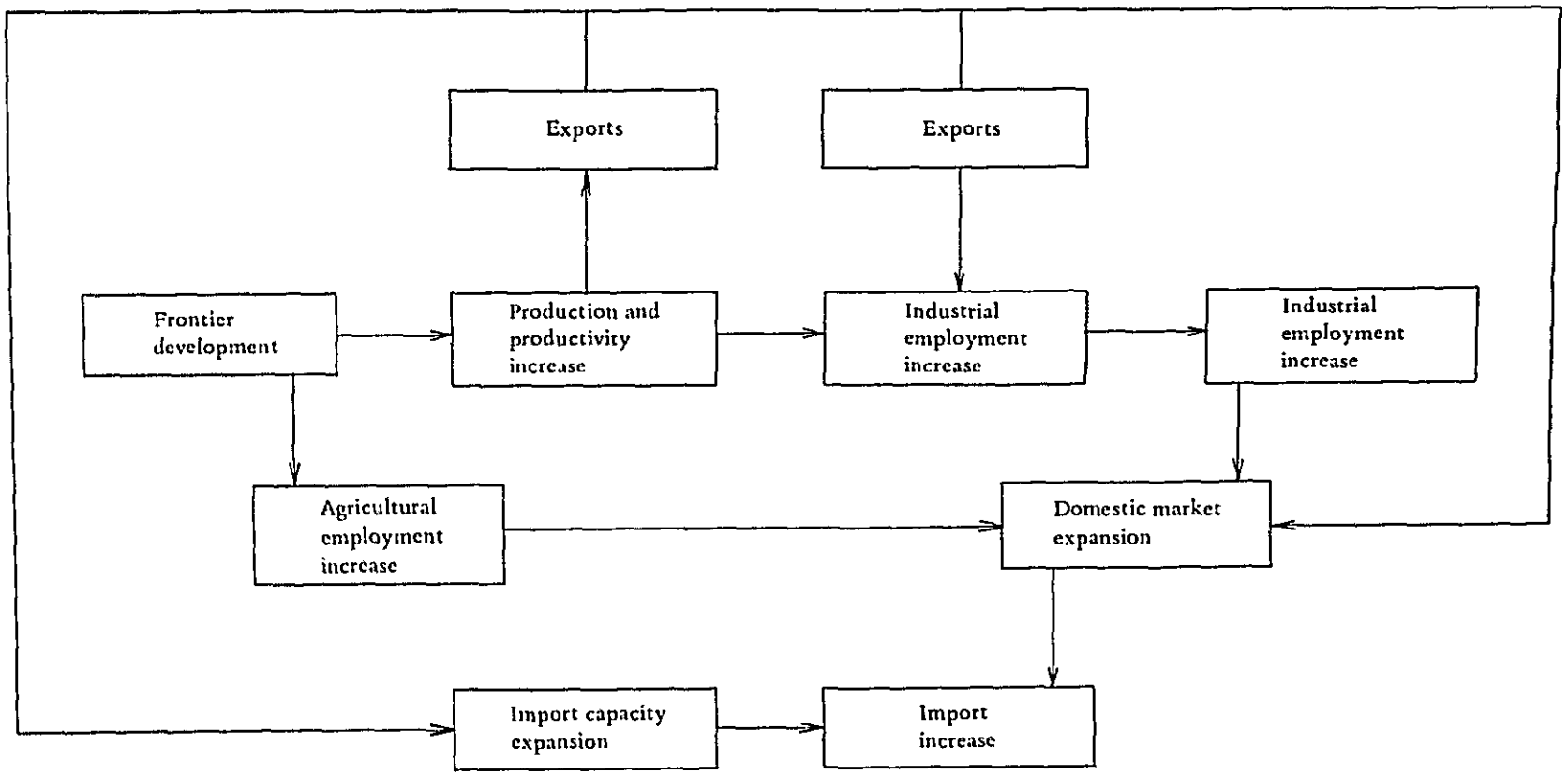
4. Econometric Models of the Brazilian Economy and Their Effectiveness

Econometric models are often drawn up to understand the over-all structure of a national economy, to clarify its characteristics and to serve as bases for projections of future growth. In Brazil, econometric models serve these same purposes but because of the lack of statistical data to be used as the basis for such models, problems of reliability, etc., the majority of Brazilian economists have not constructed econometric models of their country's economy. Therefore, those models which do exist will be introducted here and future research topics will be discussed.

4-1 Development Strategy of Delfim Netto

Although this is not an econometric model, it shows a model for one type of development strategy in the form of a flow chart.

Fig. 8-6 Simplified Brazil's Development Strategy by Delfim Netto



Source: "Veja" Dec. 29, 1971

The starting point in this strategy is frontier development. The resulting increase in agricultural production and productivity will serve as the impetus for increased export capacity. This (1) influences the expansion of import capacity and industrial production and (2) leads to increased employment and the resulting higher purchasing power. Such results will mean an expanded domestic market and economic growth. Therefore, it can be said that the export capacity of agricultural products is the key to economic growth.

4-2 "An Econometric Model Applied to the Brazilian Economy" by G. Tintner, I. Consigliere and José T.M. Carneiro (University of Southern California)

Tintner has devised an effective model for Brazilian economic policies but because usable statistical data were limited, it is a simplified macromodel of the Keynesian type.

Variables

1. Endogenous variables

C = national consumption (nominal)

Y = GNP (nominal)

P = price index

X = GNP (real)

D = total employment

2. Exogenous variables

N = population

G = government spending (nominal)

I = fixed capital formation (nominal)

L = inventory fluctuations (nominal)

E = exports (nominal)

M = imports (nominal)

W = monthly industrial wages

Equations

1. Consumption function: $\frac{C_t}{N_t P_t} = a + b \frac{C_{t-1}}{N_{t-1} P_{t-1}}$ ..... (1)

2. Formula of GNP (nominal): $Y_t = C_t + K_t$ ..... (2)

Therefore, $K_t = G_t + I_t + L_t + E_t - M_t$

3. GNP (real): $X_t = Y_t / P_t$ ..... (3)

4. Employment demand explained by the marginal production theory:

$$\frac{dX_t}{dD_t} = \frac{W_t}{P_t} \qquad \ldots\ldots (4)$$

5. Production coefficient:

$$\log X_t = d + f \log D_t \qquad \ldots\ldots (5)$$

The explanations of these equations are omitted here but the results obtained are as follows:

1. Consumption coefficient

$$\frac{C_t}{N_t P_t} = 5.39 + 0.4014 \frac{Y_{t-1}}{N_{t-1} P_{t-1}} \qquad R = 0.52$$

2. Production coefficient

$$\log X_t = 4.05 + 0.695 \log D_t$$

The above results change in a flexible manner in such a way that it is uncertain by what percentage the endogenous variables will change when there is an increase by 1% in one exogenous variable with the other conditions remaining constant.

The results are as follows when "K" is substituted for "G + I + L + E - M" and "fD/S" for "dX/dD" from the original model and the fractions are rounded off.

$$C = aNP + bY \qquad (1)$$

$$Y = C + K \qquad (2)$$

$$XP = C + K \qquad (3)$$

$$fXP = WD \qquad (4)$$

$$\log X = d + f \log D \qquad (5)$$

When the total of the partial differentials of the equation concerned are substituted in each of the structural equations, it is possible to determine the absolute change in the endogenous variables when one of the exogenous variables changes.

For example, when N changes and W and K remain constant:

$$dC = a(PdN + NdP) + bdY \qquad (6)$$

$$dY = dC \qquad (7)$$

$$PdX + XdP = dY \qquad (8)$$

$$f(Pd + XdP) = WdD \quad (9)$$

$$dX/X = f\frac{dD}{D} \quad (10)$$

The results can be summarized as follows:

Endogenous variables	N	W	G	K I	L	E	M
Y	0.58	0.40	0.31	0.31	0.03	0.18	-0.18
X	0.40	-0.42	0.20	0.20	0.02	0.12	-0.12
C	0.85	0.59	0.23	0.23	0.02	0.13	-0.13
P	0.18	0.82	0.11	0.11	0.01	0.06	-0.06
D	0.58	-0.60	0.30	0.29	0.03	0.17	-0.16

This table shows the percentage change in the endogenous variables on the left side when there is a 1% change in the exogenous variables along the top of the table. For example: if the population increases by 1%, the nominal GNP (Y) increases by 0.58%.

This model can be applied to the aims of economic policies. For example: for the government expenditures column "G", the nominal GNP = Y will increase by 0.31% if G increases by 1%.

From the table, it is evident that the elasticities of G and I and E and M are almost the same, and X and D show negative changes when the wages (W) increase by 1%.

4-3 "A Simulation Model"

By T.H. Naylor (Duke University), M. Fioravante (FGV), J.V. Monterio (Pontifica Universidade Cafolica do Rio de Janeiro) and M. Shubik (Yale University) have constructed a simulation.

One aim of model is applicable policy simulation experiments to test the results of alternative economic policies in accordance with Brazilian economic trends. The model is composed of 16 equations (five behavioral equations and eleven formulas). The variables consist of four exogenous and nine endogenous variables. All of the monetary data are deflated and are for the Cruzeiro's prevailing rate in 1953. The variables and equations fo for the model are as follows.

Variables

Endogenous variables

B = unfavorable trade balance (Cr$1 billion)

C = public and private consumption (")

C_p	=	public consumption	(Cr$1 billion)
D	=	government deficit	(")
G	=	government spending	(")
GDP	=	gross domestic product	(")
CDP	=	changes in GDP	(")
I	=	total domestic fixed capital formation	(")
Ip	=	total private fixed capital formation	(")
K	=	capital stock value	(")
M	=	imports of goods and services, main payments abroad	(")
P/P	=	percentage change of GDP implicit deflator (P in 1953 = 100)	(")
S	=	total domestic savings	(")
T	=	direct and indirect taxes	(")
Y	=	domestic production according to main costs	(")
Y_d	=	domestic disposable income	(")

Policy variables

C_g	=	public consumption expenditures	(Cr$1 billion)
I_g	=	total public investment	(")
O	=	other government revenues	(")
Q	=	currency supply	(")
R	=	implicit exchange rate	(Cr$ per US dollars)
T_d	=	direct taxes	(Cr$1 billion)
T_i	=	indirect taxes	(")
U	=	government subsidy	(")
V	=	government transfer payments	(")

Exogenous variables

L	=	manpower scale	(unit: 1 million persons)
t	=	1947, 1948 and 1949	
W	=	depreciation	(Cr$1 billion)

X = goods and services import capacity (Cr$ 1 billion)

Model

Production function

$$\log X = .803 + .022t + .728 \log L \quad (0.15)$$
$$+ .272 \log K \qquad \ldots\ldots (1)$$

Consumption function

$$C_p = -5.514 + .882Y_d - .431\ P/P \quad (.015) \quad (.141)$$
R2 = .997
S.E. = 10.218 D.W. = 2.536
$\ldots\ldots$ (2)

Investment function

$$I_p = 33.269 - .581\ P/P + .635\ 6DP \quad (.141) \quad (.156)$$
K2 = .635)
S.E. = 14.025 D.W. = 2.352
$\ldots\ldots$ (3)

Import function

$$\log M = -.805 + 1.109 \log I - .097 \log R \quad (.142) \quad (.028)$$
R2 = .887
S.E. = .083 D.W. = 1.7758
$\ldots\ldots$ (4)

Price setting formula

$$P/P = 3.039 + .575\ Q/Q - .146\ 6DP \quad (.165) \quad (.115)$$
R2 = .834 S.E. = 9.9363
$$+ .403\ (P/P) - 1 \quad (.155)$$
D.W. = 2.377
$\ldots\ldots$ (5)

Equivalent formulas

$$C = C_p + C_g \qquad \ldots\ldots (6)$$
$$I = I_p + I_g \qquad \ldots\ldots (7)$$
$$D \equiv C_g + I_g + V + u - T - O \qquad \ldots\ldots (8)$$

$$G \equiv C + I \quad \ldots\ldots \quad (9)$$

$$B \equiv M - X \quad \ldots\ldots \quad (10)$$

$$S \equiv CDP - C \quad \ldots\ldots \quad (11)$$

$$GDP \equiv Y + T_i - U + W \quad \ldots\ldots \quad (12)$$

$$CDP \equiv GDP - GDP_{-1} \quad \ldots\ldots \quad (13)$$

$$K \equiv K_{-1} + I \quad \ldots\ldots \quad (14)$$

$$T \equiv T_i + T_d \quad \ldots\ldots \quad (15)$$

$$Y_d \equiv GDP - T - O + V + U \quad \ldots\ldots \quad (16)$$

The production function is assumed to be as follows to meet estimates:

$$Y_t = m\,\lambda^t L^{\alpha} K^{\beta} (\alpha + \beta = 1) \quad \ldots\ldots \quad (17)$$

In the World Bank model, the GNP is used instead of the GDP and equations (12) and (11) can be shown as follows:

$$GNP \quad Y + T_i - U + W + F \quad \ldots\ldots \quad (18)$$

$$S \quad GNP - C \quad \ldots\ldots \quad (19)$$

Naylor, et al. carried out simulation concerning the Brazilian economy for 20 years from 1949 through 1968 on the basis of this model. A comparison was made of the simulation results and the actual values of the variables P/P, GDP, Y, C, S, I, G and M. The average differences were small for the GDP (3.7%), C (3.6%) and G (0%) and especially large for P/P (31.9%). However, as the following table shows, there was an improvement over the World Bank model values and this model evidently can be used for simple policy simulation experiments to test the results of various types of fiscal and monetary policies.

Comparison of Predictions of the World Bank Model and this Model (Average values of absolute error percentages are used as evaluation standards.)

World Bank model		This model	
P/P	45.3%	P/P	31.9%
GNP	3.6%	GDP	3.7%
Y	3.4%	Y	4.4%
C	4.0%	C	3.6%
S	11.2%	S	12.2%
I	15.7%	I	7.9%
G	4.9%	G	0.0%
M	18.1%	M	12.6%

4-4 "Econometric Models of Brazil: A Critical Appraisal" by T.H. Naylor, M. Shubik and R. Zerkowski

The four models evaluated by Naylor, et al. are as follows with references:

(1) The Ten-Year Plan model

8. Ministério do Planejamento, Basca macroecônomics do plano decenal, ed. mimeografada, 1966

9. Ministério do Planejamento, Estrutura geral e estratégia de desenvolvimento. Plano Decenal de Desenvolvimento Econômico e Social, March, 1967

(Numbers are from the list of papers given by Naylor.)

(2) The Tintner model

12. Naylor, Thomas H., Fiovante, Moacyr and Monteiro, Jorge V.A., "A comment on Tintner's econometric model of Brazil." Revista Brasileira de Economia, (24):1, Jan./March, 1970

14. Tintner, Gerhard, et al., "An econometric model applied to the Brazilian economy." Revista Brasileira de Economia (24):1, Jan./March, 1970

(3) The World Bank model

(4) The ECLA model

Naylor comments on each of the above models but his comments are directed mainly towards the methods used in drawing up the econometric plans from the available statistical data and no characteristics of the Brazilian economy obtained by means of the models are given. Therefore, these comments are not introduced here.

The ECLA model, constructed by Professor Takao Fukuchi of International Christian University (Japan) has been highly evaluated as the "most innovative model." The special feature of this model is that, unlike other macromodels, there is breakdown among fields and regions. For example, industry is divided into three fields: mining and manufacturing, agriculture and tertiary industries. The regions are the North, the Northeast, the East, the South and the Central.

The model is composed of eleven fundamental equations but each equation has one form for each region. These equations are as follows.

1. Manufacturing production coefficient (of "i" region)

2. Mining and manufacturing net output (")

3.	Agriculture net output	(of "i" region)
4.	Tertiary industry net output	(")
5.	Agricultural employment	(")
6.	Mining and manufacturing employment	(")
7.	Total mining and manufacturing employment	(")
8.	Tertiary industry employment	(")
9.	Capital stock of manufacturing industry	(")
10.	Population	(")
11.	Population shift from "i" region to "j" region	

Fukuchi estimated the parameters of as many as 66 equations and obtained forecast values of the endogenous parameters in the model for 1970 and 1980. This ECLA model is the first econometric model for the Brazilian economy with breakdowns into regions and fields. While the other three models mentioned before are highly simplified and provide an understanding of only the fundamental mechanism of the Brazilian economy because of the lack of statistical data, the ECLA model opens new possibilities and makes maximum use of the available statistical data. Naylor comments that the capital stock data are unreliable but this is true for many countries in the world. The ECLA model has also been highly evaluated by Professor Pastore of São Paulo University. It may be said that this model is the only one worthy to be called an econometric model of the Brazilian economy.

4-5 Other Models

Naylor also mentions the following models:

(1) Fishlow and associates:
The Three-Year Plan model

(2) Furtado and Maneschi:
A simulation model of development and stagnation in Latin America

(3) Maneschi and Abreu:
A study of the behavior of real private investment in Brazilian economy between 1948 and 1964

(4) Maneschi and Nunes:
On the estimation of production functions for the Brazilian economy

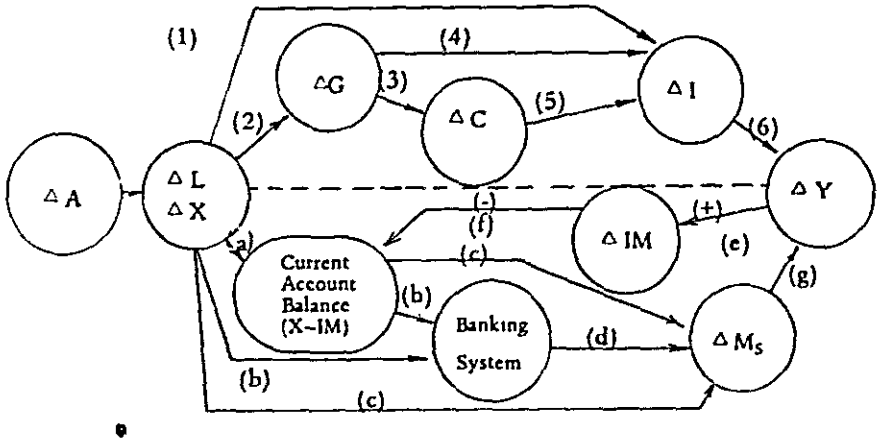
(5) Delfim Netto and Pastore:
A model of the Brazilian monetary sector

Among the above plans, model building by Pastore (5) will be explained later.

4-6. "The Money Supply, Exports and Income in an Open Economy, Mexico, 1939-63" by Charles Schotta (The University of California)

Although this is a model of the Mexican economy, Schotta's analysis of the development of the economy of Mexico focuses attention on the actual power to raise the income growth rate, as well as complex regional and technical factors. He points out that the relation between the international currency mechanism and domestic currency supply is of little attention and he emphasizes the need to make models which fully reflect currency factors. He introduces the Currency analysis model of an export-oriented economy developed by J. J. Polak and S. J. Prais, and he considers to continue this model with the Keynesian multiplier model. The basic concept is shown in Fig. 8-7.

Fig. 8-7 Response of System to Exogenous Change in Exports



ΔA = Exogenous change in export earnings.

ΔX = Change in exports.

ΔG = Change in government cash receipts.

ΔI = Change in private gross domestic investment.

ΔL = Change in long-term capital liabilities to foreigners.

ΔM_s = Change in internal money supply.

ΔC = Change in private consumption expenditures.

ΔY = Change in money gross national product.

ΔIM = Change in import expenditures.

The upper half of the diagram shows the effects and the lower half concerns the currency. The response started by ΔA extends upwards and downwards via ΔL and ΔX.

It is considered that this model can also be applied to the Brazilian economy and it is given here for reference.

The above sections have given examples of models related to the Brazilian economy. Investigations should be continued concerning both over-all macromodels and the detailed definitions of various individual functions.

4-7 "Observations on Monetary Policies in the Brazilian Stabilization Program" by A. C. Pastore

Professor A. C. Pastore of São Paulo University is an expert in monetary and fiscal theory under former Finance Minister Delfim Netto.

The following is a simple explanation of Chapter 3;

The supply of funds in an explanation of the inflation phenomenon is emphasized and there is a short-term change in the inflation rate via the cushion provided by the inherent readjustment of various prices; however the corresponding fund supply rate influences the long-term economic structure.

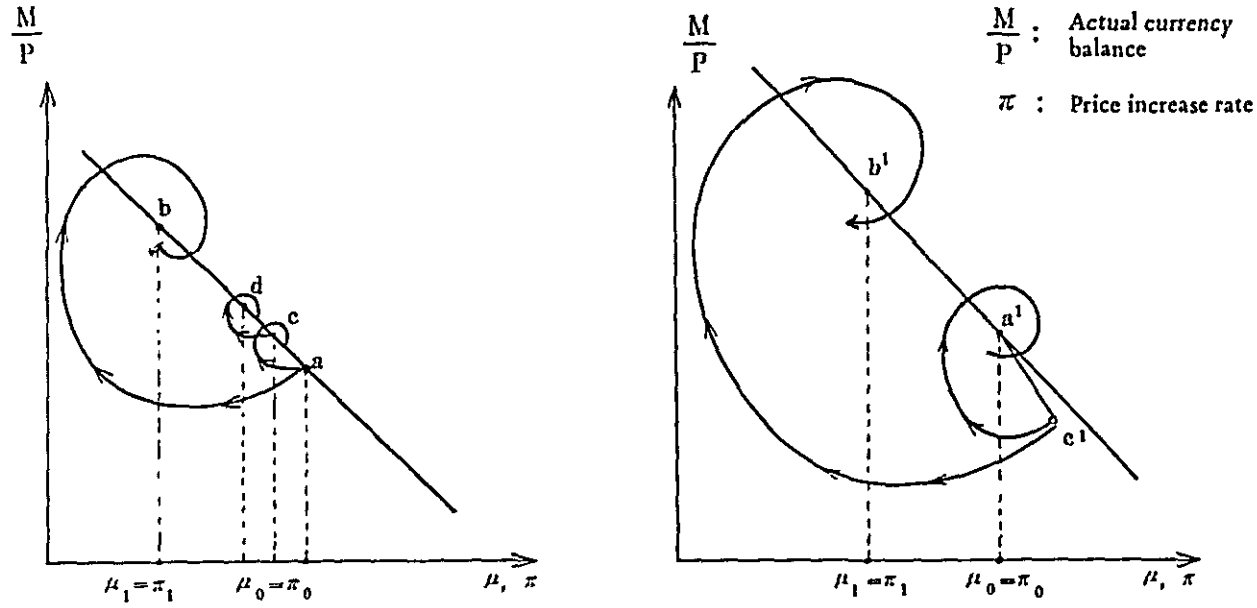
An increase in the rate of supply of funds when changing from one stage to another will result in an increase in inflation but it requires about one year until the change of stages is completed and several years until a point of equilibrium is achieved. The long period between stages shows that there is the same period with a rather large amplitude between the income rate and actual currency.

Pastore writes that if only the inflation phenomenon is observed, without understanding the stage discrepancies among the rate of supply of funds, the real inflation rate and the predicted inflation rate, in such cases, actual inflation is not observed, and the causes of inflation are misjudged. This gives the illusion that the supply of funds plays no role in reducing the inflation rate and general price policies is used to curb the unsuppressed inflation.

In Fig. 8-8 μ (fund supply rate) and π (price increase rate) are plotted as the abscissa and M/P (actual currency balance) as the ordinate. (A) shows the economy when the economic structure does not absorb the suppressed inflation and (B) shows the case when the suppressed inflation must be absorbed.

In (A), there is stability when the fund supply rate is at the point μ_o and when the inflation rate reaches the same level, the relation between

Fig. 8-8 Trajectories of M/P and π under Various Hipotheses Concerning the Behavior of μ and Corrective Inflation



M/P and π is at the point "a" on the diagonal line in the figure. Gradualism is shown by the small curves on the diagonal line. As the relation advances to "c" and "d", the inflation rate decreases and this causes the change in M/P to decrease. However, when the rate of supply of funds is set at a new level, μ_1, by means of a drastic method, the inflation rate decreases if the funds supply rate maintains at that level but the actual currency balance shows a large curved movement.

In (B), the a' - c' shift indicates a rise in the inflation rate and a simultaneous decrease in the actual amount of currency because of the elimination price ceilings.

Here there are two choices. One is the case when the fund supply rate is maintained at the same level, μ_0. In this case, the inflation rate converges towards the equilibrium point near a'. The other choice is when the currency authorities bring about corrective inflation. When the currency supply rate is lowered to μ_1, the trajectory of π and M/P makes a large curve towards b'.

Pastore claims that, on the basis of the above relations, the government should absorb all suppressed inflation and after absorption, the inflation rate will decrease in accordance with the concept of gradualism.

In addition, Pastore also comments on the significance of control of the currency base to suppress inflation, as well as means to achieve gradualism such as promotion of an open market and control of interest rates, creation of a security market, and crawling peg system.

Chapter 9

SUMMARY AND CONCLUSIONS

1. Summary

The chapters in this section have clarified various issues related to Brazilian agriculture, industry, technology transfer and supply of growth funds through comparative analyses with experiences in Japan. The results can be summarized as follows:

1-1 The development of Brazilian agriculture has been brought about mainly by expansion into the vast, undeveloped interior and the application of technological measures such as mechanization to reduce labor inputs. Much of the success of this was due to entrepreneurs, and the agricultural financing and price policies of the government have been directed at encouraging entrepreneurship. In Japanese agriculture, efforts were made from the beginning of the Meiji Period to establish land-saving techniques and government land investments were concentrated on land reform to enhance the effects of the land-saving technology. Further, the government was established many experimental research stations to develop such techniques. However, the rapid decreases in the farming population from the latter half of the 1950s have made it imperative to modernize agriculture by means of labor-saving technology and to adapt these new techniques to the land-saving measures of the past. The amount of government financing (institutional financing) in Japanese agricultural capital formation is greater than in Brazil and various policies such as price policies have been implemented under government leadership. In contrast, Brazilian government policies have been aimed at promoting entrepreneurial agriculture and although they have been very effective in the more developed areas such as the Southeast, they have not always shown such results in backward areas such as the Northeast where it is difficult for the entrepreneur to realize his ideas as he desires. Therefore, it is desirable that a system including infrastructure investment and the introduction of agricultural technology be established first for the underdeveloped areas. In the advanced areas, the development of entrepreneurial agriculture depends to a large extent on international market trends and in addition to expansion into the interior, it will be necessary to improve international competitive power by increasing productivity through technological improvements.

1-2 The process of import substitution in light industry products has now been almost completed in Brazil and the stage of heavy and chemical industrialization has been reached. Of the total equipment investment in 1971, the basic industrial goods industries such as steel and chemicals accounted for about 40% and when the intermediate industrial goods industries are added, the figure reaches 68%, which indicates the advances being made in heavy and chemical industrialization. However, the percentage for the capital goods industries such as industrial machinery, heavy machinery and shipbuilding was only 3%. In addition, 68% of the total equipment investment in all fields of industry went for the import of machinery. In Japan, however, the capital goods industries and the basic production goods industries had already attained a certain level by the latter

half of the 1950s. Because of the severe foreign currency situation, the import of foreign machinery was kept to a minimum and the policy was to develop the domestic capital goods industry. In Japan, the so-called "investment generates investment" mechanism took effect and equipment investment increased through mutual action and reaction in the industries related to equipment investment. In Brazil, while investment incentives have been increasing because of insufficient industrial capacity, the underdevelopment of the domestic capital goods industry means that the country continues to be dependent on imported machinery. This situation hinders the expansion of the "investment generates investment" mechanism. Another main difference between Japan and Brazil is the proportion of heavy and industrial products among total exports. In Japan, the figure rose to 36% in 1955 but it was only 8% in Brazil in 1971. This is due to differences in natural conditions but it also results from the lack of accumulated technical experience and the remarkable inter-sectoral unbalances in Brazil. Brazil and Japan also differ in respect to corporate structure in the private sector. In Japan, large industrial groups including banks and trading firms compete fiercely to expand their shares in the market, and this leads to dynamic economic development. In Brazil, however, the scale of individual companies is small by international standards and there is none of the severe equipment investment competition found among industrial groups in Japan. The Brazilian Government plays a major role in the basic industries in contrast to Japan where there is strong private initiative in industry.

1-3 In Brazil, the promotion of science and technology has started as a major strategic measure for economic development. This is evident from the rather large number of pages devoted to science and technology in the First National Development Plan. This plan adopts the wide-ranging notions that technology transfer in Brazil is closely related to international relations from the standpoints of economic development, international division of labor and the price structure, and that foreign economic policies, industrial policies and scientific and technological policies are inseparable. The technology transfer policies are based on accurate knowledge of the technological needs of domestic industry and the domestic research and development capacities for science and technology. Priorities have been decided in accordance with importance in execution of economic policies, the characteristics of the industrial sector and know-how supply and demand relations. This stress on science and technology in Brazil can be compared with the emphasis placed on scientific and technological policies related to economic growth in Japan's Income Doubling Plan of 1960. However, in Japan almost all technology imports were by wholly-Japanese-owned companies, while in Brazil 70% of such imports were by enterprises partly owned by foreign investors. Therefore, promotion of the development of independent technology in Brazil, as strongly advocated in the Basic Plan for the Development of Science and Technology (PBDCT--1973) is highly desirable. The development of human resources will be indispensable in achieving an autonomous technology.

1-4 Future growth in Brazil can be said to be closely related to a decrease in the dependence of foreign investment and an increase in the dependence on domestic savings. The problems in this respect are as follows:

(1) As was pointed out in the First National Development Plan, the establishment of money and investment markets is a basic factor but, at the same time, incentives for private savings are also important.

(2) Although there must be efforts to reduce the budget deficit, attempts in this direction have already been effective since the proportion of budget deficit to the GNP has steadily dropped from 4.3% in 1963 before the revolution to 0.3% in 1971.

(3) It is essential to set the ratio of the foreign debt balance to the GDP at an appropriate level as one means of measuring the capacity to import foreign capital. However, Brazil uses a method based on the coefficient of vulnerability (coeficient de vulnerabilidade) which takes into consideration both the level of foreign investment and the amount of imports, in place of the conventional debt service ratio (annual repayment of foreign debt/amount of exports plus income from invisible trade). According to this method, there has been a gradual decrease from 59% in 1968 to 34% in 1972.

(4) Another method to decrease dependence on foreign investment is to increase exports. In this connection, productivity increases, especially for agricultural products, and the related export corridors project are being promoted. Dependence on imports should be eliminated through the establishment of import substitution industries, and the structure of trade--especially that of exports--should be strengthened in accordance with the development of the international economy.

The following conclusions have been drawn from the above results.

2. Conclusions

2-1 Because of the differences between Brazil and Japan in natural conditions and the availability of resources, Brazil should adopt an economic development system which places a much greater emphasis on agriculture than that in Japan. However, it is also important at the same time to establish a heavy and chemical industrial base to permit the export of industrial products in the future.

2-2 In Japan, the government plays a big role in agriculture and private initiative is strong in industry, but in Brazil, the reverse is true. It will be necessary for Brazil to increase private initiative in industry and also expand the government role in agriculture.

2-3 There must be efforts to develop independent Brazilian technology to decrease the dependence on foreign capital but this will no doubt require government incentives and stronger educational policies to bring out the people's creativity and resourcefulness.

Part Three

RECOMMENDATIONS ON ECONOMIC COOPERATION BETWEEN BRAZIL AND JAPAN

Chapter 10

HISTORICAL RELATIONS BETWEEN BRAZIL AND JAPAN

The first two parts discuss comparative research on the economies of Brazil and Japan and in this part, the various fields of economic cooperation between Brazil and Japan are examined. First, it is necessary to outline the history and conditions of Brazil-Japan economic relations to facilitate determination and evaluation of the most desirable fields of economic cooperation between the two countries.

1. From Immigration to Investment

Diplomatic relations between Japan and Brazil were established in 1895 by a treaty of amity, commerce and navigation. Thirteen years later, on June 18, 1908, the Kasado Maru, carrying 781 Japanese immigrants, docked in the port of Santos. From that time until the present, about 250,000 Japanese immigrants, mostly farmers who settled in the interior, have gone to Brazil. Trade between the two countries started in around 1910 but the volume was small up to 1930. From the mid-1930s, Japan imported raw cotton from Brazil while Brazil imported raw silk, processed wool and sundries from Japan. However, the volume of Japan's imports from Brazil were much more than those of Brazil from Japan.

The relations between the two countries, after they were broken off during World War II, were resumed diplomatically and otherwise when the Peace Treaty was signed on May 20, 1952. Immigration to Brazil gradually increased from 1952, when 1,073 Japanese went to Brazil, and in 1955 the number of emigrants was 4,130. The postwar peak was reached in 1960 with 7,191, but after that there was a sharp decrease in keeping with the rapid economic growth and manpower shortages in Japan. In 1964, immigration declined below 1,000 and the level since then has been about 500 immigrants a year. Recently, the number of farmers immigrating has decreased and the number of technicians has increased. The last immigrant ship, the Nihon Maru, arrived in Santos harbor on March 27, 1973, carrying about 300 Japanese immigrants. This ended 65 years of immigration by ship, and since then airplanes have been used.

Postwar trade and economic cooperation between the two countries have gradually grown. In 1954, Japan purchased large amounts of Brazilian raw cotton and a historic high of US$150,000,000 in total trade was achieved. After this, there was considerable fluctuation but with the rapid growth of the Brazilian economy from 1968, trade sharply increased and in 1972, the total value of trade was US$600,000,000. Exports from Japan are mainly heavy industrial products such as steel and machinery and imports to Japan are mostly primary products such as iron ore, raw cotton, sugar, coffee and soybeans. From 1960 to 1963, Japanese exports exceeded her imports but this was reversed in 1964-67. Except for 1968, Japanese imports from Brazil continued to exceed her exports but from 1972, this was again reversed and the gap became larger in 1972.

Along with the increase in trade, Japanese private investment in Brazil has risen in recent years. In 1955, the Fuji Bank invested in the

Banco America do Sul and since that time, Japanese trading firms, banks and corporations in various industries have been set up in Brazil. The initial investment was concentrated in the period between 1954-1961 when Brazil was actively promoting import substitution industrialization. During this time, Japanese companies invested in the Usiminas Steelworks (one of the three largest postwar Japanese overseas investments), the Ishikawajima do Brasil Shipyards, etc. By 1961, 45 companies had advanced into Brazil with a total investment of US$158,000,000 (as of end of September, that year). From 1962, the Brazilian economy stagnated because of rapid increases in inflation and Japanese investment dropped off. After the Revolution in 1964, however, the investment of Japanese industry again became active. As of 1969, 84 Japanese companies were established and the total investment reached US$230,000,000 (end of March).

At the beginning of the 1970s when Brazilian economic growth started to climb, Japanese investment increased rapidly and reached boom proportions in 1973. In 1972, there were 92 Japanese companies in Brazil but by the end of March, 1973, the number had reached 236 and seems to have risen further to nearly 300 by the end of the year. The total investment rose from US$400,000,000 at the end of March, 1972 to US$569,000,000 at the end of March, 1973 and then rapidly increased to US$741,000,000 by the end of September. This represents over half of the total Japanese investment of US$1.630 billion in Latin America and is equivalent to about 9% of Japan's total overseas investment. A landmark in Japanese-Brazilian economic relations was the first issue of Brazilian bonds (10 billion yen) in Japan, in November, 1973.

Government-based economic cooperation is small compared with private investment but recently has tended to increase. From 1962 to 1966, four deferred payment credits were granted as the first governmental financial cooperation with Brazil. These were mainly for the Usiminas Steelworks. To date, there have been six yen loans.

From 1970, there was also a rapid increase in deferred payment exports. From US$45,810,000 in 1969, they have risen to US$158,000,000 in 1971 and US$219,000,000 in 1972.

In the field of technical cooperation, the Japanese Government had accepted 281 trainees and 83 students and had sent 80 experts to Brazil as of the end of March, 1972. In the private sector, 255 trainees had been brought to Japan and 14 management specialists and 366 technicians sent to Brazil as of the same date. To promote such technical cooperation, a basic agreement for technical cooperation between Japan and Brazil was concluded in September, 1970 and came into effect on July 15, 1971.

Other agreements established to aid relations between Japan and Brazil have been the Japan-Brazil air transport agreement (effective from October 19, 1962), Japan-Brazil immigration agreement (effective from October 29, 1963), Japan-Brazil cultural agreement (effective from November 17, 1964), and the Japan-Brazil taxation treaty (effective from December 31, 1967).

In February, 1967, the Brazil-Japan Joint Economic Commission (Comissão Economica Mista Brasil-Japão--CEMBJ) was established to discuss at the government level problems related to the promotion of economic, financial and technical cooperation between Japan and Brazil as well as other important economic and trade problems between the two countries. This committee was formed at the initiative of the Brazilian Government and has met four times to date.

First meeting: February 14-15, 1968, Tokyo
Second meeting: May 21-22, 1969, Rio de Janeiro
Third meeting: October 26-27, 1971, Brasilia
Fourth meeting: September 17-18, 1973, Tokyo

The Nipo-Brazilian Committee of Businessmen was established by the Japanese Federation of Economic Organizations and the Brazilian counterpart for discussions on the private level. The first meeting was held on November 9, 1973 in Tokyo.

The relations between Japan and Brazil have thus changed from relations predominantly concerned with immigration to cooperation in many fields including trade, capital, technology and culture.

2. A New Period in Relations between Brazil and Japan

Relations between Brazil and Japan thus have become much closer since the start of the 1970s and have now reached a new stage. Actually, there has been a "Brazil boom" in Japan since around 1970 and the interest in Brazil, particularly its economic growth, has risen. Under such conditions, the investment of Japanese enterprises in Brazil has become more active and there have been more visits to Brazil by prominent persons and delegations. In November, 1972, Kogoro Uemura, Chairman of the Japanese Federation of Economic Organizations, led a delegation to Brazil and from March 26 to April 8, 1973, the Japanese Industrial Fair (Feira Industrial Japonesa) was held in São Paulo, on which occasion the former foreign minister Aiichiro Fujiyama, was sent as the special representative of the Japanese Government.

Brazilian interest in Japan is also increasing. Starting in 1972, the Minister of Finance, Antonio Delfim Netto, and the Minister of Planning, João Paulo dos Reis Velloso, visited Japan for discussions on economic cooperation. In addition, the Minister of Commerce and Industry, Marcus Vinicius Pratini de Moraes, the Minister of Education and Culture, Jarbas Goncalves Passarinho, and the Minister of Mining and Power, Antonio Dias Leite Junior, also have visited Japan. Various economic delegations from the federal and state governments are also coming to Tokyo. In January, 1973, a delegation led by the Vice-Minister of Finance, Jose Flavio Pecora, came to Japan to explain the Brazilian economic situation to the Japanese Government. At that time, the Brazilian Embassy in Japan organized a "Seminar on Brazilian Economy" at the Japanese Federation of Economic Organizations.

The following five reasons can be given for the present close relations between Brazil and Japan.

The first is that the relations between Brazil and Japan are complementary. In the case of trade, Japan supplies Brazil mainly with industrial products and machinery while in exchange, Brazil provides raw materials and foodstuffs such as iron ore, raw cotton and soybeans to Japan. Japan also supplies Brazil with two things she lacks, capital and technology.

The second is that Brazil and Japan are drawn together by their high levels of economic growth. The very rapid growth of the Brazilian economy in recent years has offered many investment opportunities to Japanese companies. Brazilian enterprises, particularly in the petrochemical and electronics fields, find the possibility of inducing Japanese investment very attractive. As a result of the high economic growth in Japan during the 1960s, foreign currency reserves reached nearly US$20 billion in 1973. In order to avoid pressure to revalue the yen, it was necessary to increase capital exports. Difficulties in acquiring factory sites and raw materials in Japan also encourage expansion abroad. For such reasons, Brazil appealed to Japanese enterprises as an extremely favorable investment market with many advantages such as a large-scale domestic market, plentiful raw materials and the presence of large numbers of Brazilians of Japanese descent.

The third reason is the changes in the international environment affecting both countries. The major export market of both Brazil and Japan is the United States which absorbs 25% of Brazilian exports and 30% of Brazilian imports. Also, about 30% of Japan's foreign trade is with the United States. However, the dependence of Latin America on the United States has been decreasing in recent years and its trade pattern is tending to become more diversified in geographic terms. Brazil is no exception to this and expanded global trade policies will be necessary to promote expansion of exports in the future. Japan, as one of the world's most prominent importers of foodstuffs and raw materials, is attracting considerable attention as a strong export market for Brazilian agricultural products and iron ore. For Japan, excessive dependence on the American market presents many problems such as pressures to revalue the yen. Therefore, Japan must also diversify its export markets, and Brazil with its high level of economic growth offers a market with bright prospects for capital goods.

The fourth reason is the presence of Japanese people in Brazil. At present, there are approximately 700,000 persons of Japanese extraction active in almost every field of Brazilian society. Japanese immigrants are widely acknowledged for having made especially high contributions to Brazilian agriculture. Brazilians of Japanese extraction account for only 0.7% of the total population but farmers of Japanese origin (about 50% of the Japanese population is farmers) produce 92% of all tea, 91% of all ramie, 90% of all mint, 82% of all black pepper, 80% of all silkworm

coccons, 58% of all tomatoes, 44% of all eggs, 41% of all potatoes, 21% of all peanuts, 14% of all raw cotton and 9% of all coffee produced in Brazil (São Paulo Shimbun, "Brazil Lexicon"). The Japanese eagerness for education is reflected in the large number of second and third generation Japanese-Brazilians enrolled in Brazilian universities. They appear to have considerable influence in the promotion of Brazilian education. The advanced technical level of Japanese related companies such as the Usiminas Steelworks and the Ishikawagima do Brasil Shipyards is highly evaluated in the Brazilian industrial world. This favorable image of the Japanese and their activities in Brazil no doubt makes it easier for Japanese companies to invest in Brazil.

The fifth reason is the great geographical distance between the two countries which is an important factor in preventing political friction or problems between the two.

Because of the long distance between the two countries and the historically strong ties based on immigration, the complementary relations between Brazil and Japan have been strengthened as the economy expanded in recent years. The following four points show what Japan expects of Brazil.

First, with the internationalization of the Japanese economy, the importance of Latin America for Japan has gradually increased and the importance of Brazil is especially great as the leader of the region.

Second, while most of the countries of Latin America are imposing greater limits on foreign investment Brazil is still comparatively liberal in respect to foreign investment. It therefore provides the most promising investment market for Japanese enterprises. Another condition which benefits Japanese companies is the presence of 700,000 persons of Japanese extraction.

Third, Brazil with its vast wealth of undeveloped resources is highly attractive for Japan which is so poor in resources. It is also important for Japan to achieve diversification in its resource supply sources. Brazil which has many undeveloped areas has great potential as a supplier of food especially in view of the present world shortages and bleak outlook for the future.

Fourth, Brazil has a population of 100 million and a high economic growth rate which make it an effective export market for Japan but considering Brazil's geographical position, i.e., its proximity to North America, Europe and Africa, it cannot be overlooked as an export base to such areas. Brazil has particularly close and cultural relations with many African countries.

Brazil, on the other hand, expects the following from Japan:

First, Brazil is now trying to expand mineral and agricultural production and to promote exports. Japan is one of the world's most prominent importers of natural resources and foodstuffs and therefore a promising export market for Brazilian products.

Second, Brazil is actively advancing in the export not only of primary products but also of semi-manufactured and manufactured products and Japan is eyed as an export market for such products.

Third, Brazil wishes to avoid excessive dependence on one country when inducing foreign capital. Japanese investment, therefore, is welcome because its share of the total is at present small.

Fourth, in Brazil, the high technical level of Japanese companies established in the country is highly evaluated and the Brazilians desire technical cooperation with Japan in various fields including agriculture and forestry, fishing, mining, manufacturing, education and occupational training.

Fifth, in addition to direct investment, the Brazilians hope to obtain long-term, low-interest financing for undeveloped areas in the country as one form of financial cooperation from Japan.

Chapter 11

PRESENT STATUS OF ECONOMIC RELATIONS BETWEEN BRAZIL AND JAPAN

This chapter gives an outline, based mainly on statistics, of the present status of economic relations between Brazil and Japan from the standpoints of trade, investment and economic and technical cooperation.

1. Trade

As can be seen in Table 9-1, trade between Brazil and Japan has expanded steadily in recent years and in 1972 reached almost US$650,000,000. When the 1972 figures are compared with those of 1967, it can be seen that exports increased about seven times and imports about three times in five years. Japanese exports to Brazil have also increased rapidly over the last few years. In 1971, they were up 41.1% over the previous year and in 1972 up 68.1%. Imports rose by 2.4% in 1971 and by 11.8% in 1972. As a result, Brazil accounted for 20.0% of Japan's export trade with Latin America which was second only to Panama. In the case of imports, Brazil was in first place with 17.6%.

However, in terms of value, Brazil accounted only for 1.4% of Japanese exports and for 1.1% of imports in 1972. The Japanese share of Brazilian trade has risen to 6-7%.

More than half of the total Japanese exports consists of machinery and equipment; they are followed by iron and steel, metal products, chemicals and textile products. About 90% of all exports are heavy and chemical industrial products, while light industrial products are less than 10% (See Table 11-2).

The imports are as listed in Table 11-3. About 70% of the imports are raw materials with iron ore and raw cotton accounting for the largest proportions. Among the foodstuffs, imports of sugar, frozen shrimp and horse meat have increased. In 1972, chromium, soybeans and crude oil were added as imports.

The reason for the increase of Japanese exports in recent years has been the major expansion in exports of machinery in accordance with the export corridor program. Since imports of raw materials and foodstuffs from Brazil are also tending to increase, trade between Japan and Brazil is expected to exceed US$1 billion in 1974.

2. Private Investment

As is clear from Table 11-4, the total private investment from Japan in Brazil at the end of fiscal year 1972 (as of the end of March, 1973) reached US$569,000,000 and accounted for 58% of total Japanese private investment in Latin America. There has been a rapid increase in Japanese investment in Brazil. The annual approved figures rose from US$19,000,000 in fiscal 1970 to US$120,000,000 in fiscal 1971 and US$169,000,000 in fiscal 1972. In the first half of fiscal 1973 (April to

Table 11-1 Brazil-Japan Trade, 1950-1973

(Unit: US$1,000)

Year	Export	Import	Balance
1950	2,300	1,647	653
1951	21,647	32,303	-10,656
1952	10,950	15,458	-4,508
1953	21,738	39,115	-17,377
1954	78,244	73,832	4,412
1955	33,422	59,278	-25,856
1956	45,156	50,209	-5,053
1957	24,982	44,990	-20,008
1958	41,874	27,101	14,773
1959	37,352	36,356	996
1960	45,736	32,795	12,941
1961	86,029	61,269	24,760
1962	43,558	40,076	3,482
1963	56,275	38,387	17,888
1964	29,019	37,190	-8,171
1965	26,556	49,578	-23,017
1966	44,017	60,602	-16,585
1967	54,556	85,633	-31,074
1968	102,069	87,118	14,951
1969	120,541	148,283	-27,742
1970	166,731	217,853	-51,122
1971	235,211	223,063	12,148
1972	395,337	249,403	145,934
1973*	393,742	290,642	103,100

* January-September

Source: MOF, Outline of Foreign Trade.

Table 11-2 Japanese Exports to Brazil

(Unit: US$1,000)

Year		1970		1971		1972		Percent increase over previous year
Item	Quantity units	Quantity	Amount	Quantity	Amount	Quantity	Amount	
Total	-	-	166,731	-	235,211	-	395,337	168.1
Food products	-	-	250	-	406	-	472	116.3
Crude fuels	-	-	735	-	2,570	-	1,608	62.6
Light industrial products	-	-	13,885	-	22,382	-	33,712	150.6
Textile products	-	-	6,724	-	11,540	-	14.595	126.5
Synthetic fiber short-staples	m/t	1,391	1,540	3,549	3,198	3,998	3,553	111.1
Viscose short staples	m/t	1,612	1,037	2,508	1,536	2,432	1,512	98.4
Synthetic fiber thread	m/t	208	526	1,527	2,836	2,467	4,720	166.4
Synthetic fiber cloth	1,000 SM	5,111	2,426	5,776	2,578	6.283	3,056	118.5
Non-metallic ore products	-	-	843	-	3,152	-	5,738	182.0
Refractory bricks	m/t	143	78	6,139	1.619	11,233	2,864	176.9
Glass and glass products		-	462	-	1,156	-	2,416	209.0
Other light industrial products	-	-	6,317	-	7,690	-	13,379	174.0
Rubber products		338	913	404	898	1,954	3,498	389.5
Heavy and chemical industrial products	-	-	151,002	-	207,864	-	357,342	171.9
Chemical products	-	-	13,822	-	22,122	-	26,867	121.4
Organic compounds	-	-	4,579	-	5,594	-	11,234	200.8
Chemical fertilizers	m/t	1,785	150	6,734	415	74,563	2,048	493.5
Plastics materials	-	-	7,011	-	12,487	-	8,536	68.4

Table 11-2 (cont'd)

Year		1970		1971		1972		Percent increase over previous year
Item	Quantity units 1	Quantity	Amount	Quantity	Amount	Quantity	Amount	
Metal products	-	-	45,007	-	85,501	-	76,204	89.1
Iron and steel	m/t	191,017	41.333	506,676	76,719	257,930	59,856	78.0
Billets, sheets, etc.	m/t	29,925	2,255	149,347	12.170	0	0	0.0
Steel rods	m/t	1,864	407	16.271	2,458	3,025	666	27.1
Wire	m/t	2,857	541	11,540	2,154	10,867	2,053	95.3
Thick sheets	m/t	3,348	2,014	37,071	5,599	16.516	4,072	72.7
Thin sheets	m/t	88,988	22,423	168,128	30,301	146,749	30,862	101.9
Thin plate	m/t	11,538	2,673	19,558	5,227	13,903	3,724	71.2
Galvanized iron sheet	m/t	14,732	2,814	28,462	4,773	14,689	2,795	58.6
Steel bands	m/t	2,335	1,232	39,924	4,974	5,179	2,400	48.3
Iron and steel wire	m/t	1,666	651	3,297	1,538	4,837	2,138	139.0
Pipes and joints	m/t	12,502	2,629	14,256	3,598	12,992	4,023	111.8
Metal products	-	-	3,191	-	7,988	-	15,727	196.9
Iron and steel structural parts and construction materials	m/t	378	379	12,036	3,377	19,851	8,786	260.2
Machinery and equipment	-	-	92,172	-	100,240	-	254,271	253.7
(Types of machinery)	-	-	80,151	-	86,009	-	229,224	266.5
General machinery	-	-	30,811	-	46,877	-	129,516	276.3
Internal combustion engines, (except for aircraft)	-	-	2,657	-	2,954	-	4,554	154.2
Water turbines	NO	1	3,183	2	872	1	2,676	306.9
Agricultural machinery	-	-	1,804	-	3,198	-	13,999	437.7
Office equipment	-	-	4,922	-	8,322	-	13,980	168.0
Metal finishing machinery	-	-	1,559	-	1,616	-	11,962	740.2

Table 11-2 (cont'd)

Year		1970		1971		1972		Percent increase over previous year
Items	Quantity units	Quantity	Amount	Quantity	Amount	Quantity	Amount	
Textile machinery	-	-	2,123	-	8,148	-	5,126	62.9
Sewing machines	-	-	1,498	-	2,288	-	3,922	171.4
Mining and construction equipment	NO	225	1,502	284	2,846	827	6,789	238.5
Heating and cooling equip't	-	- -	1,325	-	2,302	-	11,438	496.9
Liquid pumps	NO	35,222	697	48,952	1,349	86,818	2,383	176.6
Loading equipment	-	-	1,143	-	381	-	17,423	4,600
Bearings	m/t	1,028	2,242	1,426	3,901	1,912	5,674	145.4
Cocks, valves (except for railways)	Kg	144,354	624	341,241	1,576	262,692	1,398	88.7
Electrical machinery	-	-	33,918	-	41,153	-	66,634	161.9
Electrical generators	NO	1,599	372	436	1,866	1,443	1,191	63.8
Motors	NO	37,205	137	50,486	884	64,205	4,745	536.8
Parts for circuits (accessories)	-	-	4,331	-	3,173	-	4,581	144.4
Distribution and control panels	NO	480	515	865	2,455	1,084	4,855	197.8
Radio receivers	NO	12,653	437	24,550	704	76,384	2,172	308.5
Wire communication equip't	NO	27,722	2,431	15,993	2,577	18,461	11,781	457.2
Communication equip't parts	-	-	5,107	-	1,999	-	5,547	277.5
Insulated wire	Kg	793,818	1,503	854,360	2,081	481,237	1,255	60.3
Thermionic tubes	1,000 NO	2,558	1,125	1,722	1,030	3,447	2,637	256.0
Electrical measuring instruments	NO	182,394	1,661	88,192	1,614	214,821	2,350	145.6
Electrical carbon and graphite products	-	-	1,583	-	1,466	-	1,455	99.2
Tape recorders	NO	172,994	5,042	180,710	4,853	309,192	8,569	176.6

Table 11-2 (cont'd)

Year		1970		1971		1972		Percent Increase over previous year
Items	Quantity units	Quantity	Amount	Quantity	Amount	Quantity	Amount	
Transport equipment	-	-	20,805	-	3,163	-	42,345	1,300
Rolling stock	-	-	122	-	317	-	3,077	970.7
Bicycles (parts)	-	-	912	-	1,672	-	2,881	172.3
Ships	-	-	18,896	-	8	-	34,320	29,000
Precision instruments	-	-	6,638	-	9,048	-	15,777	174.4
Cameras (units)	NO	44,762	1,330	63,652	1,596	89,542	2,904	182.0
Clocks	-	-	1,358	-	1,530	-	3,813	249.2
Re-exports: Commodities not classified by kind.	-	-	859	-	1,989	-	2,204	110.8

Source: MITI, White Paper on International Trade.

Table 11-3 Japanese Imports from Brazil

(Unit: 1,000 dollars)

Item \ Year	Quantity units	1970		1971		1972		Percent increase over previous year
		Quantity	Amount	Quantity	Amount	Quantity	Amount	
Total	-	-	217,853	-	223,063	-	249,403	111.8
Foodstuffs	-	-	65,339	-	48,980	-	59,851	122.2
Horsemeat	m/t	13,941	7,619	13,249	7,816	21,006	14,476	185.2
Frozen shrimp	m/t	657	1,706	1,076	3,244	1,929	6,935	213.8
Maize (except for feed)	m/t	34,942	2,593	127,944	9,352	0	0	0.0
Sugar	m/t	143,578	14,423	25,773	2,977	111,348	18,056	606.5
Coffee	m/t	31,854	21,549	17,467	9,811	23,904	18,365	187.2
Maize (for feed)	m/t	108,557	7,569	177,142	12,824	0	0	0.0
Vegetable oil residue	m/t	39,393	3,737	7,106	652	679	42	6.4
Crude materials	-	-	134,235	-	156,202	-	164,241	105.1
Textile materials	-	-	48,946	-	46,838	-	52,668	112.4
Raw silk	m/t	105	1,687	155	2,688	242	4,398	163.6
Raw cotton	m/t	99,771	44,846	82,020	42,395	68,993	46,599	109.9
Ramie	m/t	5,296	2,088	3,871	1,518	2,390	1,065	70.2
Metal ores	-	-	77,601	-	102,911	-	103,831	100.9
Iron ore	1,000m/t	6,779	76,366	8,997	99,263	9,335	100,032	100.8
Manganese ore	m/t	22,350	588	82,144	2,381	45,284	1,397	58.7
Chromium	m/t	0	0	0	0	40,305	1,412	-
Other crude materials	-	-	7,688	-	6,453	-	7,742	120.0
Peanuts	m/t	10,019	2,873	3,440	1,101	666	231	21.0
Soybeans	m/t	0	0	0	0	14,810	2,044	-
Fluorspar	m/t	0	0	22,670	1,345	5,165	232	17.2
Animal and vegetable oils and fats	m/t	1,789	1,337	1,364	1,277	2,678	2,000	156.6

Table 11-3 (cont'd)

Item \ Year	Quantity units	1970		1971		1972		Percent increase over previous year
		Quantity	Amount	Quantity	Amount	Quantity	Amount	
Exceptions to above	-	-	18,279	-	17,881	-	25,311	141.6
Crude and semi-crude oil	1,000Kl	0	0	0	0	59	1,276	-
Heavy oil	1,000Kl	0	0	104	2,997	142	3,238	108.0
Tankers	g/t	0	0	21,139	3,675	21,135	3,927	106.9
Precious and semi-precious metals	Kg	626,364	2,854	560,756	4,828	675,109	8,073	167.2
Iron and steel	m/t	114,216	11,907	13,055	3,161	3,204	2,917	92.3

Source: Same as Table 11-2.

September), the figure was already US$172,000,000 and the total Japanese investment in Brazil reached US$741,000,000 at the end of September, 1973. When this tempo increases, it is assumed that the total Japanese investment in Brazil will exceed US$1 billion in 1974.

Table 11-5 shows the various forms of Japanese investment in Brazil. The most common form is the acquisition of securities. This is followed by the loans, the purchase of real estate and the establishment of branches in that order, although there is very little of the latter two.

Table 11-6 shows the various types of industries which have invested in Brazil. In respect to the investment amounts, the investment for manufacturing is the largest with 61.7%. This is followed by finance and insurance with 13.1%, mining with 10.5% and commerce with 5.0%. Among the manufacturing industries, the metal industry including both ferrous and non-ferrous metals is the biggest investor with 17.0%. This is followed by transport equipment including shipbuilding and automobiles with 12.7%, textiles with 11.7% and machinery with 9.7%. Table 11-5 shows the number of industries which have invested in Brazil. The ranking in this case are commerce, machinery, electrical equipment, chemicals, metals and insurance.

Until the end of the 1960s, Japanese investment in Brazil was concentrated on manufacturing industries but at the start of the 1970s, investment spread to other fields including mining and construction. This trend toward diversification of investment is continuing. Approximately three-quarters of the Japanese companies established in Brazil are located in São Paulo state but in recent years, there have been advances into other areas.

In the capital structure of Japanese-related companies in Brazil, the percentage of Japanese capital in total investment is rather high. Of the 80 companies established up to 1969, Japanese participation exceeded 75% in 54 cases and was between 50 and 75% in 12 companies, 25 and 50% in 7 cases and under 25% in 7 cases. However, joint ventures with Brazilian companies have been increasing recently.

Table 11-8 shows foreign private investment in Brazil by country of origin, from the figures of the Banco Central do Brasil. As of the end of 1972, the total Japanese investment was US$193,000,000 which ranked sixth behind the United States, West Germany, Canada, Great Britain and Switzerland. This amount is much less than figures from Japanese sources (US$569,000,000 as of the end of March, 1973) but, the latter are based on approvals, and the former on registration with the central bank.

The points to be noted in the table are first that, while the shares of investment of the United States, West Germany, Canada and Great Britain all dropped from 1971 to 1972, those of Switzerland, Japan and France rose. The Japanese share of 4.3% in 1971 increased to 5.7% in 1972. Because of the recent rapid increase in Japanese investment, it can

Table 11-4 Japanese Private Investment in Brazil (Approval Basis)

Fiscal year	Investment in Brazil (A) (US$1,000,000)	Investment in Latin America (B) (US$1,000,000)	Percentage in Brazil (A) / (B) (%)
1951-58 total	33	49	67
1959	9	13	61
1960	19	23	83
1961	35	38	90
1962	26	29	90
1963	16	21	76
1964	29	44	66
1965	17	59	29
1966	22	55	40
1967	23	41	56
1968	12	41	29
1969	20	101	20
1970	19	46	41
1971	120	140	86
1972	169	288	59
1951-72 total	569	989	58

Source: MITI, White Paper on Economic Cooperation.

Table 11-5 Types of Japanese Investment in Brazil (on an approval basis as of end of March, 1973)

(Unit: US$1,000)

		Accumulated total	Balance
Acquisition of securities	Cases	197	187
	Amount	425,810	405,997
Loans	Cases	136	35
	Amount	139,720	103,340
Purchase of real estate	Cases	11	9
	Amount	2,820	2,624
Establishment of branches	Cases	3	2
	Amount	363	52
Total	Cases	347	233
	Amount	568,712	512,013

Source: MOF, Monthly Fiscal and Monetary Statistics, September, 1973.

Table 11-6 Japanese Investment in Brazil by Industrial Category (Total for 1951-72)

(Unit: US$1,000)

	No. of cases	Amounts	Percentages
Manufacturing	134	350,799	61.7
Foodstuffs	10	9,103	1.6
Textiles	27	66,773	11.7
Wood and pulp	6	9,751	1.7
Chemicals	12	8,733	1.5
Ferrous and non-ferrous	7	96,937	17.0
Machinery	29	55,080	9.7
Electrical machinery	22	20,704	3.6
Transport equipment	6	72,364	12.7
Others	15	11,354	2.0
Agriculture	11	2,307	0.4
Fishing and marine products	9	3,386	0.6
Mining	6	59,674	10.5
Construction	8	2,321	0.4
Commerce	46	28,691	5.0
Finance and insurance	22	74,592	13.1
Others	108	46,579	8.2
Branches	3	363	0.1
Total	347	568,712	100.0

Source: Same as Table 11-5.

Table 11-7 Japanese Companies Established in Brazil by Industrial Categories

Industrial category	Year of Initial Investment																			Total
	1954	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72*	
Finance & insurance	1	-	-	-	2	1	-	-	-	-	1	-	2	-	1	-	-	1	-	9
Commerce	-	2	4	3	-	-	-	1	-	-	4	-	-	2	3	1	2	-	-	22
Machinery	-	-	2	3	-	1	-	-	-	3	-	-	-	-	1	-	1	2	1	14
Transport equipment	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-	4
Iron & steel	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Electrical equipment	-	-	-	-	1	-	1	-	-	2	2	-	-	1	1	-	1	1	1	11
Chemicals	-	-	-	-	1	-	-	-	-	-	6	-	-	-	1	-	-	2	1	11
Foodstuffs	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-	1	5
Textiles	-	2	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	7
Misc. mfg.	-	-	2	-	1	1	-	-	-	-	-	-	-	1	-	1	-	2	3	11
Agriculture, forestry & fishing	-	-	-	1	-	1	1	1	-	-	-	-	-	-	-	1	-	-	-	5
Mining	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Services	-	-	-	1	-	-	3	-	-	-	-	-	-	1	-	-	1	-	-	6
Immigration	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2
Total	1	4	10	9	9	4	6	2	0	5	13	1	5	5	7	3	8	9	9	110

* First half of 1972

Source: MITI.

Table 11-8 Foreign Private Investment in Brazil, by Country

(Unit: US$1,000,000)

	End of Dec., 1971				End of Dec., 1972			
	Investment	Reinvestment	Total	%	Investment	Reinvestment	Total	%
United States	544.0	552.5	1.096.5	37.7	656.5	615.8	1,272.3	37.4
West Germany	238.2	93.2	331.4	11.4	271.7	100.6	372.3	10.0
Canada	235.8	58.4	294.2	10.1	236.0	69.3	305.3	9.0
Great Britain	81.1	192.0	273.1	9.4	85.4	195.4	280.8	8.2
Switzerland	158.5	33.4	191.9	6.6	193.1	60.8	253.9	7.5
Japan	119.7	5.2	124.9	4.3	185.6	7.1	192.7	5.7
France	39.3	90.6	129.9	4.5	43.4	121.8	165.2	4.8
Others	373.0	96.6	469.6	16.0	409.2	152.4	561.6	16.5
Total	1,789.6	1,121.9	2,911.5	100.0	2,080.9	1,323.2	3,404.1	100.0

Source: Banco Central do Brasil.

Table 11-9 Foreign Private Investment in Brazil, by Industry

(Unit: US$1,000)

	End of 1971		End of 1972	
	Total	%	Total	%
Mining	26.1	(0.9)	48.2	(1.4)
Manufacturing	2,383.7	(81.8)	2,802.2	(82.3)
Non-ferrous metals	61.6	(2.4)	105.9	(3.1)
Metals	213.6	(7.3)	267.0	(7.8)
Machinery	123.7	(4.2)	161.8	(4.8)
Electrical communication equipment	261.6	(9.0)	324.9	(9.5)
Transport equipment	405.5	(13.9)	475.7	(14.0)
Wood	4.0	(0 1)	6.0	(0.2)
Paper and cardboard	67.9	(2.3)	76.4	(2.2)
Rubber	103.7	(3.6)	114.4	(3.4)
Chemicals	624.5	(21.5)	684.6	(20.1)
Pharmaceuticals	113.4	(3.9)	138.3	(4.1)
Cosmetics	28.3	(1.0)	31.1	(0.9)
Plastics	17.8	(0.6)	21.0	(0.6)
Textiles	69.7	(2.4)	75.0	(2.2)
Clothing and footwear	12.0	(0.4)	11.3	(0.3)
Foods	135.4	(4.7)	161.1	(4.7)
Beverages	12.8	(0.4)	17.7	(0.5)
Tobacco	112.1	(3.9)	117.6	(3.5)
Publishing	6.9	(0.2)	6.1	(0.2)
Others	9.1	(0.3)	6.3	(0.2)
Construction	7.8	(0.3)	-	
Public utilities	157.4	(5.4)	154.4	(4.5)
Agriculture	20.7	(0.7)	24.4	(0.7)
Services	276.3	(9.5)	319.4	(9.4)
Others	39.5	(1.4)	55.4	(1.6)
Total	2,911.5	(100.0)	3,404.1	(100.0)

Source: Same as Table 11-8.

be assumed that it will continue to go up in the future. The second point is that, while the amounts of reinvestment of European and North American countries are rather high, those of Japan are very low. One reason for this is that Japanese companies must recover their foreign loans under the Japanese foreign exchange law.

Table 11-9 shows the various types of industry which are the object of foreign investment in Brazil. It is evident that while foreign investment is increasing in the manufacturing, mining and services industries, a decrease of investment in public utilities is evident.

3. Economic and Technical Cooperation

3-1 Large-scale Projects between Brazil and Japan

To the present, the large scale Brazilian/Japanese projects have been the Usiminas Steelworks (1958) and the Ishikawajima do Brasil Shipyards (1959). When the Brazilian economy started to make rapid growth at the beginning of the 1970s, economic cooperation between the two countries became much more active and decisions have already been made to go ahead with several large-scale projects. The main ones are as outlined below.

(1) Export Corridors Project

To promote the export of agricultural products such as soybeans, maize and beef, the Brazilian Government has adopted the Export Corridor (Corredores de Exportacão) project with a budget of about US$600,000,000. The major part of this project is to be completed by 1976. To arrange export corridors connecting the production areas for these agricultural products and the ports of Victoria, Santos, Paranagua, and Rio Grande, transport and harbor facilities are necessary. The Brazilian Government asked the Japanese Government to undertake a survey of this project and the OTCA sent a survey group to Brazil for this purpose in September, 1972. On the basis of this survey, it was decided that Japan will cooperate in every aspect of the project. A credit of US$36,000,000 has been granted for the purchase of machinery and equipment from Japan and a syndicate loan of US$220,000,000 was made by 24 city banks to assist in local costs.

(2) Tubarão Steel Mill Construction

The Brazilian Iron and Steel Holding Company, SIDERBRAS, has joined with the Kawasaki Steel Company and Finsider of Italy in a project to construct a steel mill at Tubarão in the state of Espirito Santo. When this mill is completed in 1977, it is to produce 3 million tons of slabs a year, two-thirds of which will be exported to Japan and Italy (on an equal basis). The total construction cost is estimated at US$750,000,000.

(3) Japan-Brazil Paper and Pulp Resources Development

Thirteen Japanese paper companies and the Brazilian government-supported Vale do Rio Doce Company--(CVRD) are to develop pulp resources in the states of Espirito Santo and Minas Gerais. Accordingly, two local companies have been established, CENIBRA (Celulose Nipo-Brasileira S.A.) and FLORNIBRA (Empreendimentos Florestais S.A.). Under this plan, an investment of US$834,000,000 will be made from 1974 for the Espirito Santo project. Eucalyptus trees will be planted along the Doce river and from 1981, 6,000,000 cubic meters of wood are to be obtained annually. Chip and pulp plants are to be constructed to process the wood. For the Minas Gerais project, a pulp plant is to be constructed. It will use the eucalyptus trees in Ipatinga, where the Usiminas Steelworks is located, as raw materials. The plant is expected to go onstream in 1976.

(4) Itaqui Steel Mill Construction

This project is for the construction by SIDERBRAS and Nippon Steel Corporation of a steel mill in Itaqui in the suburbs of São Luis, capital of Maranhão state. This plant is to produce 12,000,000 tons of blister steel annually utilizing the very promising iron ore resources (18 billion tons in reserve, Fe content: 69.5%) discovered at Carajas in Para state. For this purpose, it is planned to form a joint project between the above two companies and United States Steel. To supply electric power for this project and the Trombetas Bauxite Development Plan (a joint project between the Vale do Rio Doce Company and Japanese aluminium refining companies), ELETRONORTE (Centrais Electricas do Norte do Brasil) and the Electric Power Development Co., of Japan are planning to construct a hydro-electric power plant on the Tocantins river, a branch of the Amazon.

3-2 Government Assistance

Japanese government economic assistance to Brazil includes refinancing of debts, yen loans and deferred payment export credits.

(1) Refinancing of Debts

January, 1962: The Export-Import Bank of Japan granted credit to the Brazilian National Economic Development Bank (BNDE) for a total of US$17,500,000, consisting of US$9,200,000 in refinancing 75% of the commercial debts falling due from October 1, 1961 to December 31, 1962, and US$ 8,300,000 as a fund for the capital increase of the Usiminas Steelworks in 1962. Repayment was deferred for five years from March, 1962. Repayments were then to be made semiannually for eleven and one half years at an annual interest rate of 6%.

February, 1965: An agreement was concluded granting a refinancing of US$7,700,000 for 70% of debts falling due in 1963-65 and 40% of debts falling due in 1966. After a grace period of two and one half years, repayments were to be made over a period of five years at an interest rate of 5.75%.

March, 1965: Refinancing was granted for US$24,900,000 of debts for the Usiminas Steelworks falling due in 1964-65. After a three-year grace period, repayment was to be made in five years at an interest rate of 5.5%.

October, 1966: Refinancing was granted for US$13,300,000 of credits for the Usiminas Steelworks falling due in 1966. After a three-year grace period, repayment was to be completed in five years at an interest rate of 5.5%.

(2) Yen Loans

April, 1971: The Export-Import Bank of Japan in cooperation with the World Bank granted a loan of US$1,900,000 for the project to construct the Marimbondo River Power Plant. Repayment is to be made over 10 years after a four-year grace period. The interest rate is 7%.

October, 1972: A loan of US$178,570,000 was given for the project to expand the capacity of Brazil's three largest steel mills. After a three-year grace period, repayment is to be made over 12 years at an interest rate of 7%.

November, 1973: A loan of 7.2 billion yen was given to the Minas Gerais Power Company (CEMIG). Repayment is to be made over a period of 10 years at an interest rate of 7%.

November, 1973: A loan of 12 billion yen was made to Furnas Power Company (FURNAS Centrais Electrices S.A.). The repayment period is 10 years and the interest rate 7%.

November, 1973: An untied loan of 5 billion yen was made to the Brazilian National Economic Development Bank (BNDE). After a three-year grace period, repayments are to be made over seven years at an interest rate of 6.5%.

November, 1973: The Marimbondo Power Plant loan was increased by 47 million yen from 590 million yen to 637 million yen. Conditions remain the same.

Table 11-10 shows the total amounts of yen loans made by Japan to various countries as of the end of October, 1973. The figure for Brazil is US$43,900,000 or 6.3% of the whole.

(3) *Deferred Payment Exports*

As can be seen from Table 11-11, deferred payment exports from Japan to Brazil have been expanding since 1969. As Japanese companies invest in Brazil, there has been a remarkable increase in deferred payment exports of industrial machinery.

3-3 Technical Cooperation

As of the end of 1971, the Japanese Government through the OTCA had accepted 281 trainees related to agriculture, public utilities postal services, etc. from Brazil and had sent 80 experts on agriculture, welfare and other matters to Brazil. There had also been 83 Brazilians who had been given scholarships for study in Japan up to that time.

For private sector training, in areas such as communication equipment and heavy electrical machinery, 255 Brazilians had been brought to Japan by the OTCA as of the end of 1971. Fourteen management experts were sent to Brazil by the International Management Association of Japan, and 66 experts connected with the Japan Chamber of Commerce and Industry also were dispatched.

A Textile Industry Technical Training Center was established in Recife in 1962 as an overseas technical training center. In 1970, a dying course was added and since management of the center was turned over to Brazil in July, 1970, a total of 31 experts have been sent.

Table 11-12 compares Japanese assistance to Brazil with that of other DAC countries. It is evident that Japanese technical assistance is much less than that of the United States and West Germany. Loans also show a net deficit because of repayments of credits to Brazil. Therefore, it is necessary to increase government financial assistance to Brazil in parallel with increasing private investment.

Table 11-10 Yen Loans to Various Countries
(Commitments as of End of October, 1972)

Country	Commitment (US$1,000,000)	Percentage
Indonesia	825.5	21.4
India	721.8	18.7
South Korea	393.5	10.2
Pakistan	297.0	7.7
Thailand	267.8	6.9
Brazil	243.9	6.3
Taiwan	176.2	4.6
Malaysia	167.0	4.3
Philippines	146.0	3.8
Burma	122.2	3.2
Peru	74.5	1.9
IDB	53.4	1.4
Nigeria	50.0	1.3
Mexico	47.6	1.2
Sri Lanka	44.9	1.2
Turkey	42.4	1.1
South Vietnam	37.3	1.0
Yugoslavia	35.0	0.9
Iran	17.0	0.4
Paraguay	16.5	0.4
BCIE	13.4	0.3
Ethiopia	12.0	0.3
Singapore	10.8	0.3
Argentina	10.2	0.3
Chile	6.2	0.2
Tanzania	5.6	0.1
Kenya	5.6	0.1
Khmer	4.2	0.1
Uganda	2.8	0.1
Colombia	2.6	0.1
Afghanistan	2.0	0.1
Nepal	1.0	0.02
30 countries and 2 international organizations	3,855.9	100.0

Source: Same as Table 11-4.

Table 11-11 Japanese Export Credits to Brazil

(Unit: US$1,000)

Item	1969	1970	1971	1972
Total	45,811	93,563	158,144	219,072
Ships	796	35,111	30,045	64,657
Rolling stock	-	30,480	-	-
Textile machinery	-	692	55	-
Electrical machinery	17,298	9,348	1,541	-
Communication equipment	13,828	11,701	17,676	27,036
Industrial machinery	3,521	5,325	108,827	127,379
Iron and steel products	10,386	906	-	-

Source: Same as Table 11-4.

Table 11-12 Assistance to Brazil by DAC Countries (in 1971)

(Unit: US$1,000)

Item / Country	Disbursement (net amounts)					
	Donations	(Technical cooperation)	Loans	Total	Trainees accepted	Experts sent
Australia	-	(-)	-	-	-	-
Austria	30	(30)	-	30	5	46
Belgium	334	(334)	-	334	82	26
Canada	196	(163)	2,195	2,391	-	24
Denmark	11	(11)	236	225	4	4
France	-	(-)	4,900	4,900	346	143
West Germany	13,083	(11,869)	13,159	26,242	519	278
Italy	66	(66)	3,075	3,009	50	13
Japan	564	(509)	12,559	11,995	103	64
Netherlands	455	(455)	225	230	26	80
Norway	20	(20)	-	20	5	-
Sweden	-	(-)	990	990	18	-
Switzerland	162	(19)	-	162	12	-
Great Britain	634	(634)	1,392	758	166	73
United States	36,000	(18,000)	68,000	104,000	-	
DAC total	51,555	(32,110)	61,957	113,512	1,336	751

Source: same as Table 11-4.

Chapter 12

PROPOSALS

In the comparisons between the Japanese and Brazilian economies, and the analysis of the relations between the two countries, a clear picture has been given of the points of similarity and of difference between the two economies and also major issues and facts related to economic cooperation. Finally, proposals will be made concerning methods of Brazilian and Japanese economic cooperation and some fields in which such cooperation is desirable. These proposals are based on the analysis in this report.

1. Methods of Economic Cooperation

First, previous analyses have shown that there are basic points of difference as well as many similarities between the economies of Japan and Brazil. Points of difference include physical conditions such as the size of the land and endowment of natural resources, as well as differences in subjective conditions of economic development (ability to manage corporate enterprises, educational levels and technology absorption capacities) and in industrial structure, domestic saving and regional disparities. These points present urgent problems for which Brazil must find solutions. However, the solutions concerning managerial abilities, education, technology, etc. will take time and require steady, dedicated efforts, while such problems as change of the industrial structure, expansion of capacity to save and correction of regional disparities must be confronted and solved immediately. Therefore, Japan should first offer cooperation to solve these more urgent problems.

Second, there appear to be two points of particular importance in the change of the industrial structure: (1) raising agricultural production and productivity, and (2) heavy and chemical industrialization. In relation to the first point, Japan has already cooperated in the development of Brazilian agriculture, mainly in respect to the infrastructure, via the export corridors project, but more direct contributions to agricultural growth will be needed. Although colonies of Japanese Brazilians in the Southeast and South, especially in São Paulo state, have already made a considerable contribution in this direction, Japan, in cooperation with persons of Japanese extraction in Brazil, should aid in the expansion of agriculture in other areas, particularly the Central-west and North. Naturally, Japan has already assisted in the agricultural development in immigrant and adjacent areas through the Japan Emigration Service but the the work of this agency has been concentrated mainly on the after-care of immigrants and immigrant areas and it has not taken much initiative in the field. Fortunately, an economic cooperation agency is to be formed in the middle of this year by combining the Japan Emigration Service and the Overseas Technical Co-operation Agency. In the future it will be necessary to reform immigrant services so that they are more closely connected with the mainstream of Brazilian agriculture. Actual fields for Japanese cooperation are the development of the vast "cerrado" (a savanna type area of low shrubs) and the improvement of experimental research.

Japan has cooperated in the heavy and chemical industrialization of Brazil via Japanese companies established in the country. Typical examples are the Usiminas Steelworks and Ishibras Shipyards. Brazil has now started to promote the export of industrial products along with agricultural and mining products. To increase the share of industrial products among total exports, it will be necessary to shift emphasis gradually from products of light industry to those of heavy industry just as Japan did during the 1960s. This will require the establishment of a heavy and chemical industrial base and in this respect, Japan should cooperate in the development of the retarded capital goods industry and in particular, the machinery industry. Naturally, since Brazil places greater weight on agriculture than does Japan, there is also the opinion that a balanced growth for both agriculture and industry should be emphasized but it must be remembered that because of the relative underdevelopment of the iron and steel industry in Brazil there is a serious shortage of products of that industry, which would require early attention within future industrial development planning. Also, there are many technological and financial problems related to heavy and chemical industrialization and the Brazilian government should naturally establish strong policies, including fiscal and financial incentives.

Third, to expand savings, Japan is cooperating with Brazil by increasing direct investment, issuing Brazilian government bonds, etc., but the fact that Japanese reinvestments in Brazil are much lower than those of the European and North American countries is a problem. To enable Japanese subsidiaries and joint ventures in Brazil to improve performance in this aspect of reinvestments, however, it will be necessary for Japan to revise its Foreign Exchange Law and related regulations.

Attempts are being made to develop the capital market as one means of increasing domestic savings and Japan should cooperate with Brazil in the development of a securities market, making good use of experience gained in Japan. The monetary correction used by the Brazilian government against inflation is unique means to protect the real value of savings from being decreased by inflation and this is one instance where Japan can learn from Brazil.

Fourth, if Japan is to cooperate in the correction of regional disparities, she must first gain a clear understanding of the North-South problem which exists in Brazil. In the developed areas of the South, the per capita income has reached US$1,000 which is near the level in developed countries but in the underdeveloped North and Northeast, the per capita income is only US$200-300 and the backwardness of the infrastructure is particularly conspicuous. This contrasts sharply with the situation in Japan where there are almost no regional disparities in income and infrastructure. Naturally, the Brazilian government has drawn up plans such as PIN and PROTERRA, and also invested a total of more than US$1 billion annually through regional development agencies such as SUDENE and SUDAM to correct these regional differences but the development of these regions will take time because of the vast areas involved.

Japan should take positive measures to aid Brazil in its efforts to correct regional disparities. Japan should not take the attitude that the country does not need official assistance since the per capita income is already US$500 but should extend cooperation including low-interest soft loans for improvement of infrastructure, etc. in underdeveloped areas. The same concepts centered on private investment used in the developed South regions ought not to be applied to the North and Northeast. In view of the problems which Japan has encountered in Southeast Asia, the current emphasis on private investment in Brazil-Japan economic cooperation should be changed.

Fifth, other fields for Japanese cooperation are those which will raise the management, educational and technological levels which are basic prerequisites for Brazilian economic development. Japan does transfer management techniques to Brazil via Japanese companies established in the country but in such cases, more Brazilians of Japanese extraction should be trained for management positions. Since American type management methods are already widespread in Brazil, it will be necessary to manage companies by adjusting to these techniques. To raise the the educational level, cooperation could be given to develop educational media such as television and to further scientific and technological education. Japan should also improve her technological cooperation by such measures as establishing training programs for skilled workers, dispatching experts and accepting trainees to aid in the improvement of technology levels in Brazil. Another method would be to send statisticians since Brazil is lagging in the improvement of her general statistics.

Sixth and last, it is essential to establish a well-structured system for these fields of cooperation between the two countries. At present, there are two organizations for cooperation between Brazil and Japan--the Joint Brazil-Japan Economic Committee (CEMBJ) at the government level and the Nipo-Brazilian Committee of Businessmen at the private level--but considering the Brazil's importance for Japan, a joint economic committee at the cabinet level should be held as soon as possible. To promote personnel exchanges, a "Japan-Brazil Cultural Exchange Fund" should be established to promote a brisk exchange of scholars and students. In addition, respective national information centers should be established in Brasilia and Tokyo to facilitate the flow of cultural and other information between the two countries.

2. Desired Fields of Cooperation between Brazil and Japan

The desirable fields of cooperation and projects between Japan and Brazil are as follows:

2-1 Research in the Cerrado Area

The cerrado plateau in central Brazil covers an area of 1,300,000 square kilometers which is equivalent in size to the whole of Western

Europe. About 80% of the cerrado is in three states, Mato Grosso, Goiás and Minas Gerais. At present, the only activity in the area is subsistence farming but if this area could be used more effectively, Brazilian agricultural production would increase remarkably. Japan should cooperate in such activities as soil and crop surveys and land improvement in the cerrado.

2-2 Development of a Capital Goods Industry

As is explained above, Brazil is far behind Japan in regard to development of the capital goods industry and in particular, the machinery industry. This could become a serious constraint in the future as heavy and chemical industrialization progresses. The backwardness in the capital goods industry results in increases in machinery imports and is a main cause of pressure on the balance of payments. Therefore, Brazil must quickly develop a capital goods industry and Japan can offer technological and capital cooperation to assist in this aim. It is hoped that Brazil will adopt positive policies to promote this type of industry.

2-3 Development of Anti-pollution Technology

As urbanization and heavy industrialization advance, Brazil is faced with pollution problems and counter-measures will soon be necessary. Japan's experience in this field could prove very useful to Brazil and this is another area where Japan should adopt positive cooperative measures.

2-4 Establishment of a Transport System

In Brazil, the railway and marine transport systems are far less developed than the road system and as the volume of goods transported increases, transport costs will probably become a problem. It is therefore necessary for Brazil to establish national and regional transport systems as soon as possible. Since the oil crisis, Brazil has recognized the importance of electrified railways and the part played by this means of transport should increase in a country so rich in hydro-electric power potential. It is also impossible to ignore the importance of coastal shipping in the transport of heavy materials. Japan should take an active part in aiding Brazil to establish a modern transport system including the redevelopment of railways.

2-5 Transport Corridors in the North and Northeast

An indispensable factor in the development of North and Northeast regions is the improvement of the infrastructure and particularly the transport network which is poor compared to other areas. To aid in the development of these underdeveloped areas, Japan should construct transport

corridors from the hinterland to the coast at the same time as developing export corridors in the South and Southeast. Of particular importance is cooperation in the eastern Amazon region where there has been considerable progress recently in development, and Japan should contribute to the infrastructure such as the construction of railways by providing low-interest soft loans.

2-6 Establishment of a Statistical System

During our comparative study on Brazil and Japan, we have found that Brazil is behind in the field of statistics. There is a conspicuous lack of statistics concerning investment and savings, and equipment investment. In Brazil, national income statistics and input-output table are being rapidly compiled mainly by the IBGE (Instituto Brasileiro de Geografia e Estatística) and the Getulio Vargas Foundation. Japan should also cooperate with Brazil in this field by sending experienced statisticians and accepting statistical trainees.

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Tables Showing Organization and Functioning of the Government of Japan

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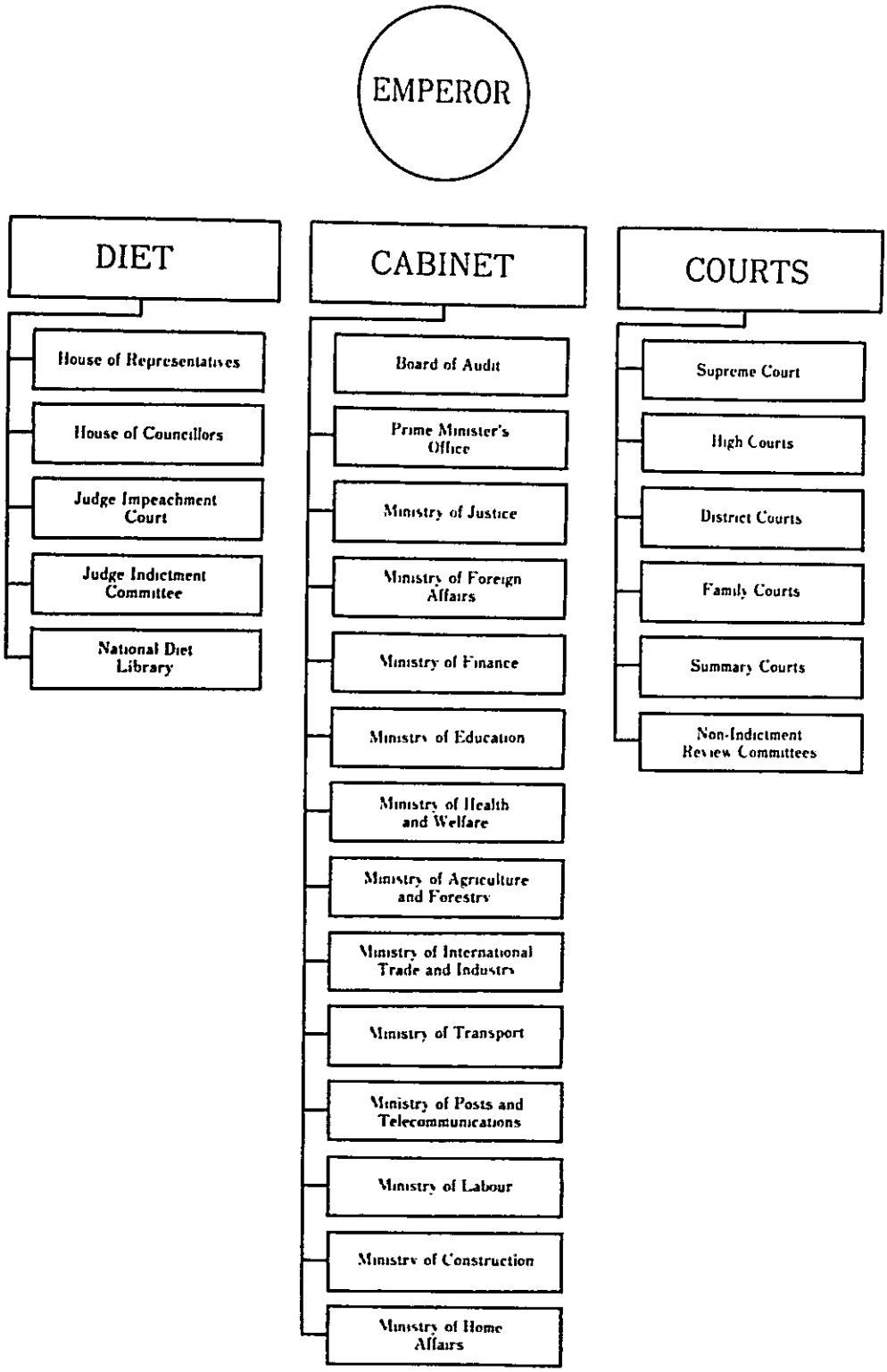
Notes:

——— internal divisions and external organs
----- local branch offices
~~~ auxiliary organs
~~~

I. Organizations of the Government of Japan

(1) Total System of the Government of Japan



Emperor

The Emperor, who is the symbol of Japan and of the unity of the people of Japan, has no powers related to government, but he performs such acts in matters of State, with the advice and approval of the Cabinet, as the promulgation of amendments of the Constitution, laws, Cabinet Orders and treaties, the convocation of the Diet, the dissolution of the House of Representatives, the proclamation of general election of members of the Diet, the attestation of the appointment and dismissal of Ministers of State, etc., and of full powers and credentials of Ambassadors and Ministers, the awarding of honors, and the reception of foreign Ambassadors and Ministers.

He also appoints the Prime Minister and the Chief Judge of the Supreme Court as designated by the Diet and the Cabinet respectively.

In this respect, the position of the Emperor in post-war Japan differs from that in the prewar days when the Emperor was the source of sovereign power.

The Imperial Throne is dynastic and descendant from father to son.

Diet

The Diet, composed of two Houses, namely the House of Representatives and the House of Councillors, is the highest organ of state power and the sole law-making organ of State.

The House of Representatives is composed of 491 members who are elected directly by the people from 124 so-called medium constituencies (usually 3 - 5 members per constituency).

The term of office of members of the House of Representatives is four years, but shall be terminated, before the full term is up, if the House is dissolved.

The House of Councillors is composed of 252 members, who are also elected directly by the people, of which 100 come from the national constituencies and 152 from the 47 prefectural constituencies (2 - 8 members per prefectural constituency). Their term of office is six years, and a half of them is elected every three years.

The universal suffrage is guaranteed, and there is no discrimination because of race, creed, sex, social status, family origin, education, property or income.

The Diet begins its 150 day ordinary session from mid December every year, which may be extended only once by the Diet. The Cabinet may determine to convoke extraordinary sessions whenever necessary.

Cabinet

Executive power is vested in the Cabinet, which consists of the Prime Minister and nineteen Ministers of State (including four Ministers without portfolio, the Chief Cabinet Secretary, and the Director General of the Prime Minister's Office) and is collectively responsible to the Diet. The Cabinet has to resign en masse when the post of Prime Minister becomes vacant or when the first session of the Diet is convoked after a general election of members of the House of Representatives. If the House of Representatives passes a non-confidence resolution or rejects a confidence resolution, the Cabinet has also to resign en masse, unless the House of Representatives is dissolved within ten days.

The Prime Minister, who is designated from among the members of the Diet by a resolution of the Diet and appointed by the Emperor, must be a civilian. Usually he is the President of the ruling party (now the Liberal Democratic Party...conservative).

He appoints the Ministers of State and may dismiss them as he chooses. The Prime Minister, representing the Cabinet, submits bills to the Diet, reports to the Diet on general national affairs and foreign relations and exercises control and supervision over various administrative branches.

The Cabinet has the Prime Minister's Office and twelve Ministries, which are established by the respective Establishment Laws and are enumerated in the National Government Organization Law, as well as the Cabinet Secretariat, Cabinet Legislation Bureau, National Personnel Authority, and National Defence Council.

There is the Board of Audit, composed of three commissioners, of which independent status is guaranteed under the Constitution.

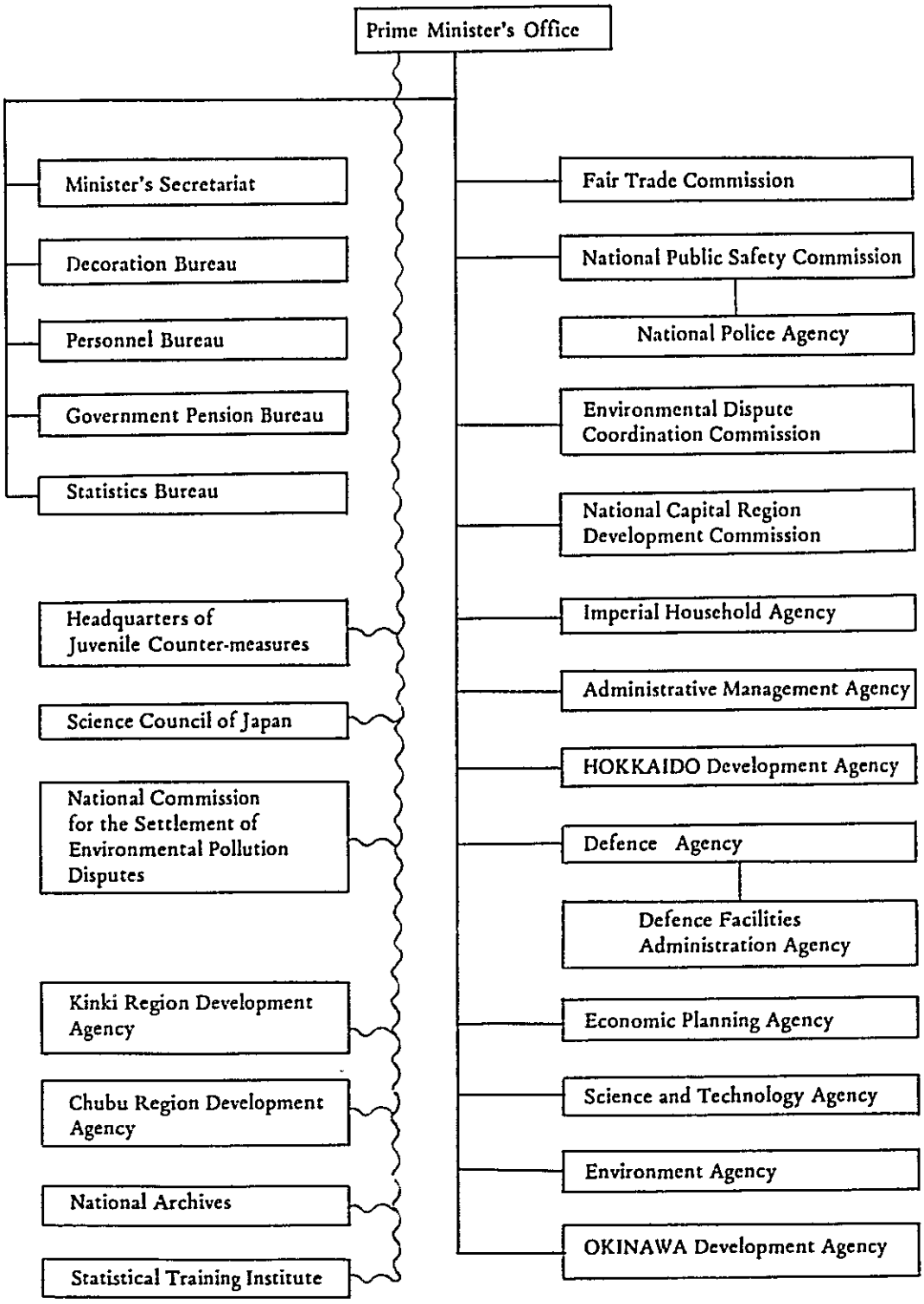
Judiciary

The whole judicial power is vested in the Supreme Court and in such inferior courts as High Courts, District Courts, Family Courts and Summary Courts.

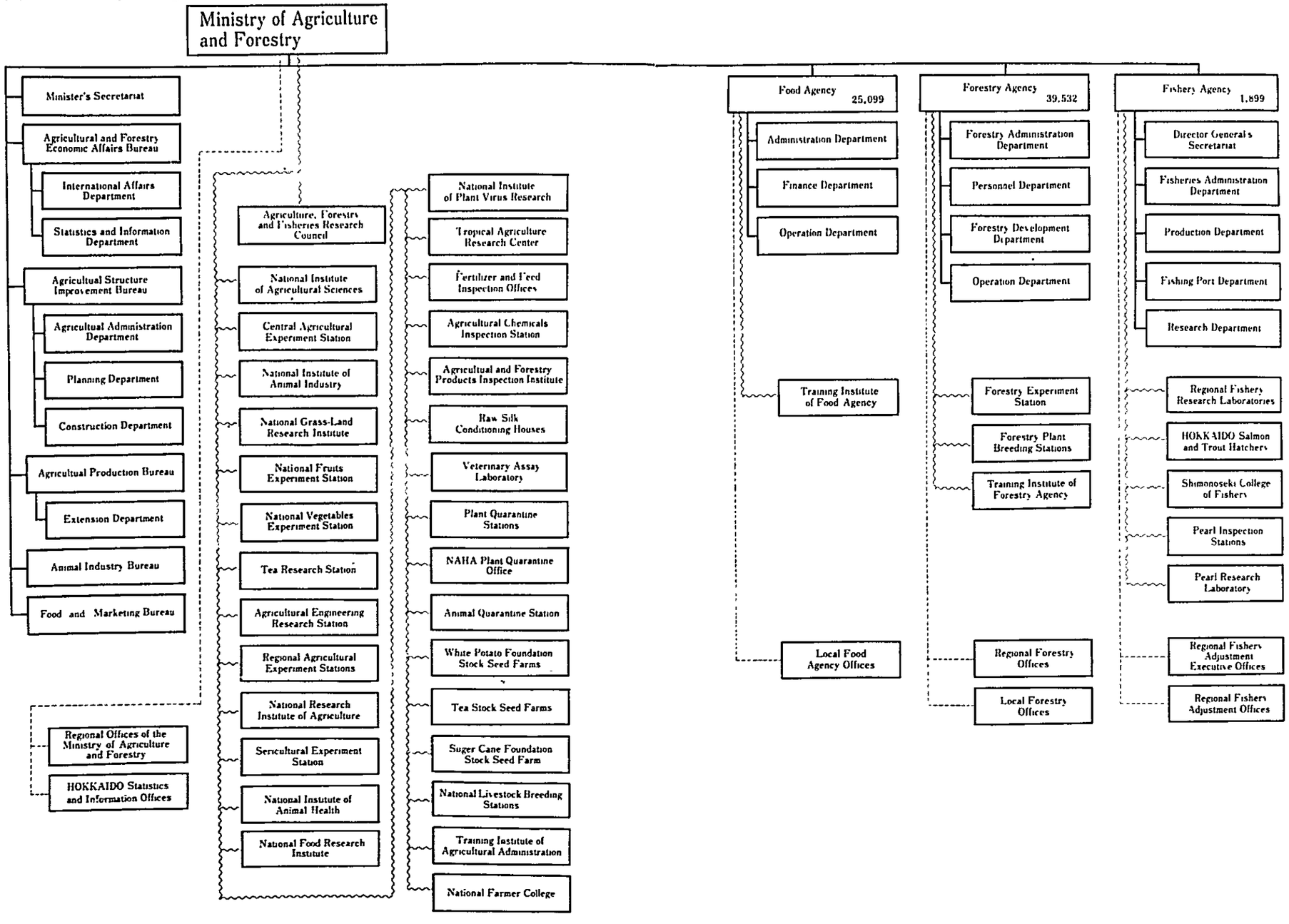
No extraordinary court can be established, nor can any organ of the Executive have final judicial power.

The judges of the Supreme Court, except the Chief Judge who is appointed by the Emperor, are appointed by the Cabinet. The judges of inferior courts are also appointed by the Cabinet, but only from a list of persons nominated by the Supreme Court.

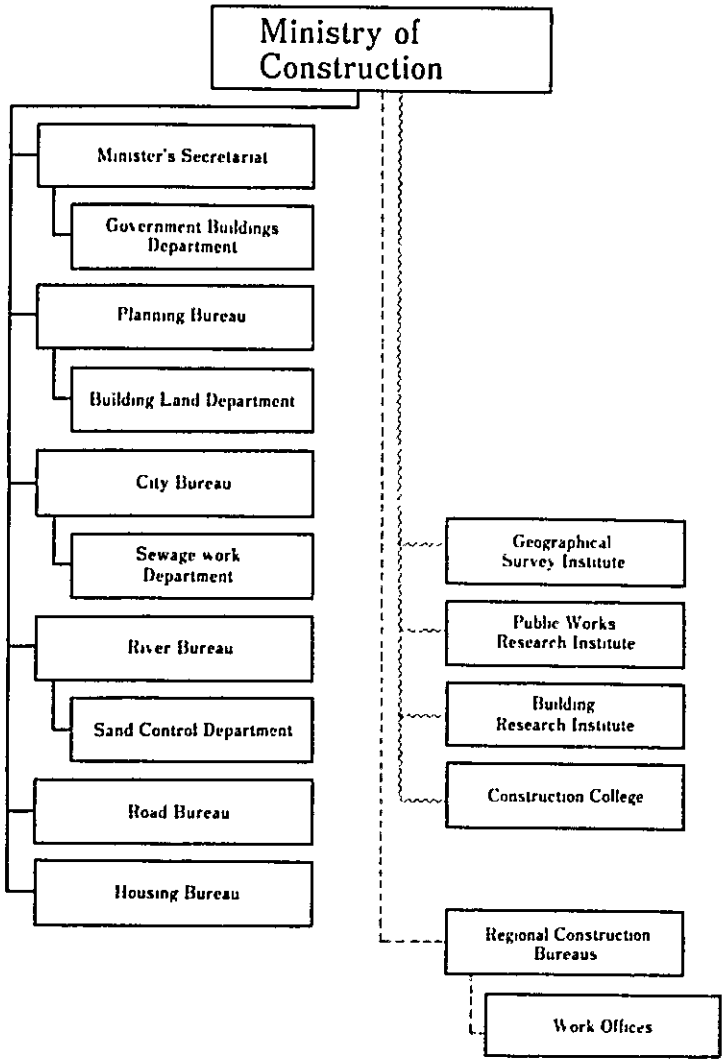
(2) Prime Minister's Office



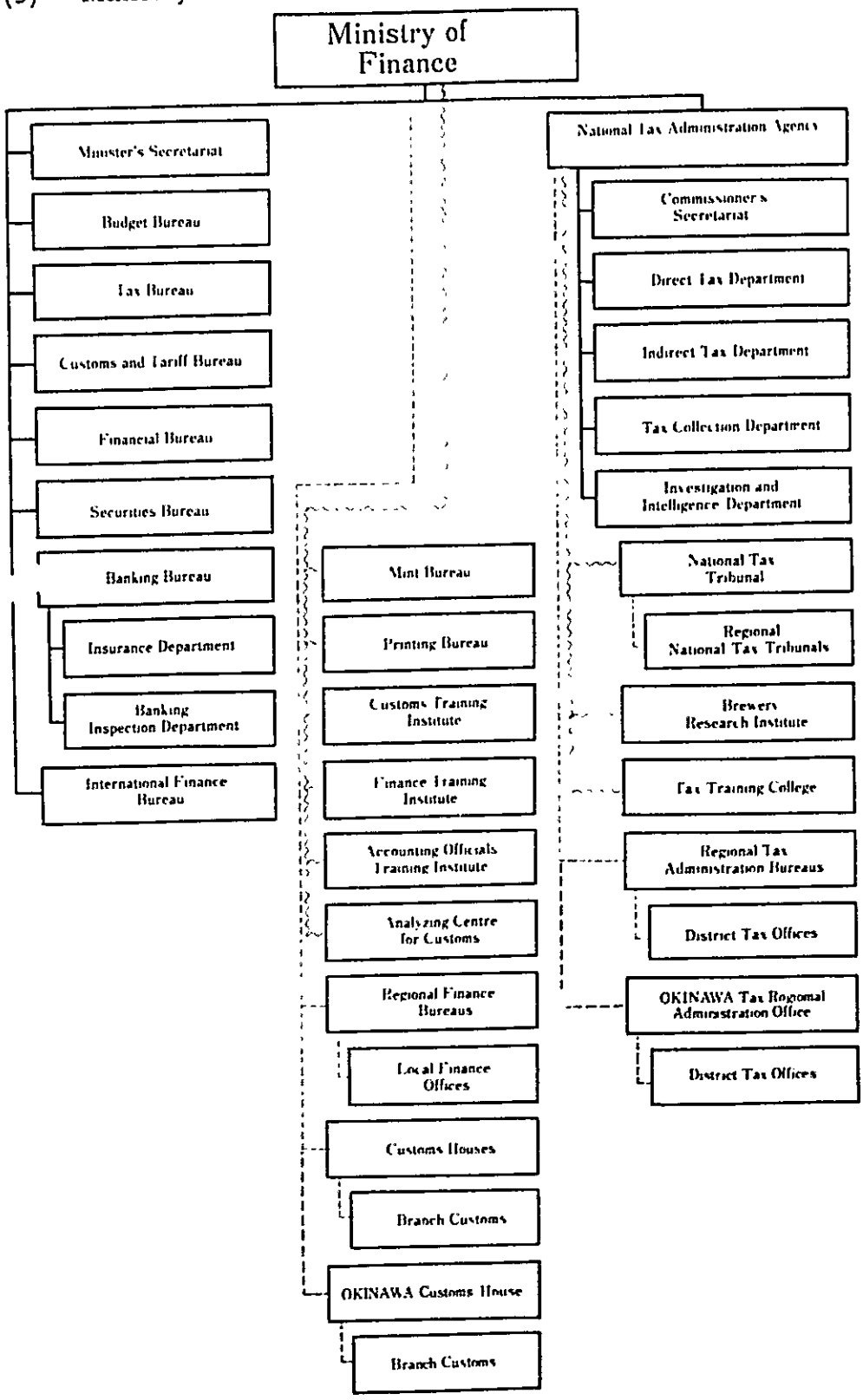
(3) Ministry of Agriculture and Forestry



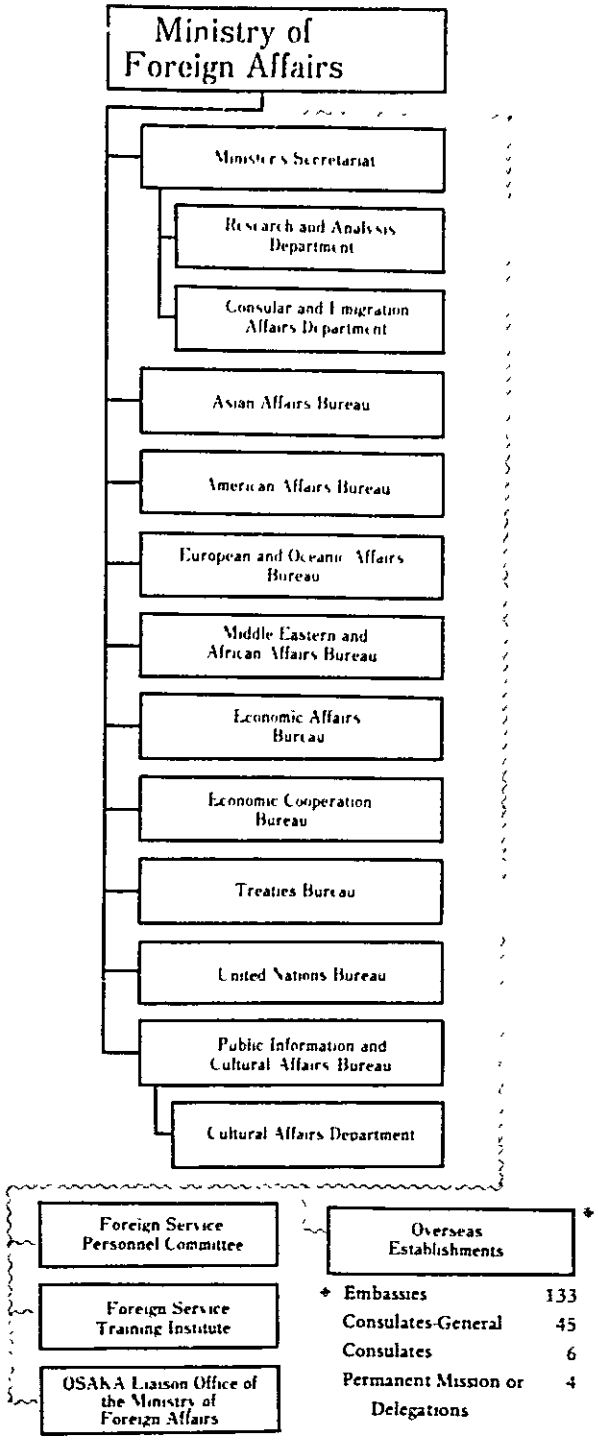
(4) Ministry of Construction



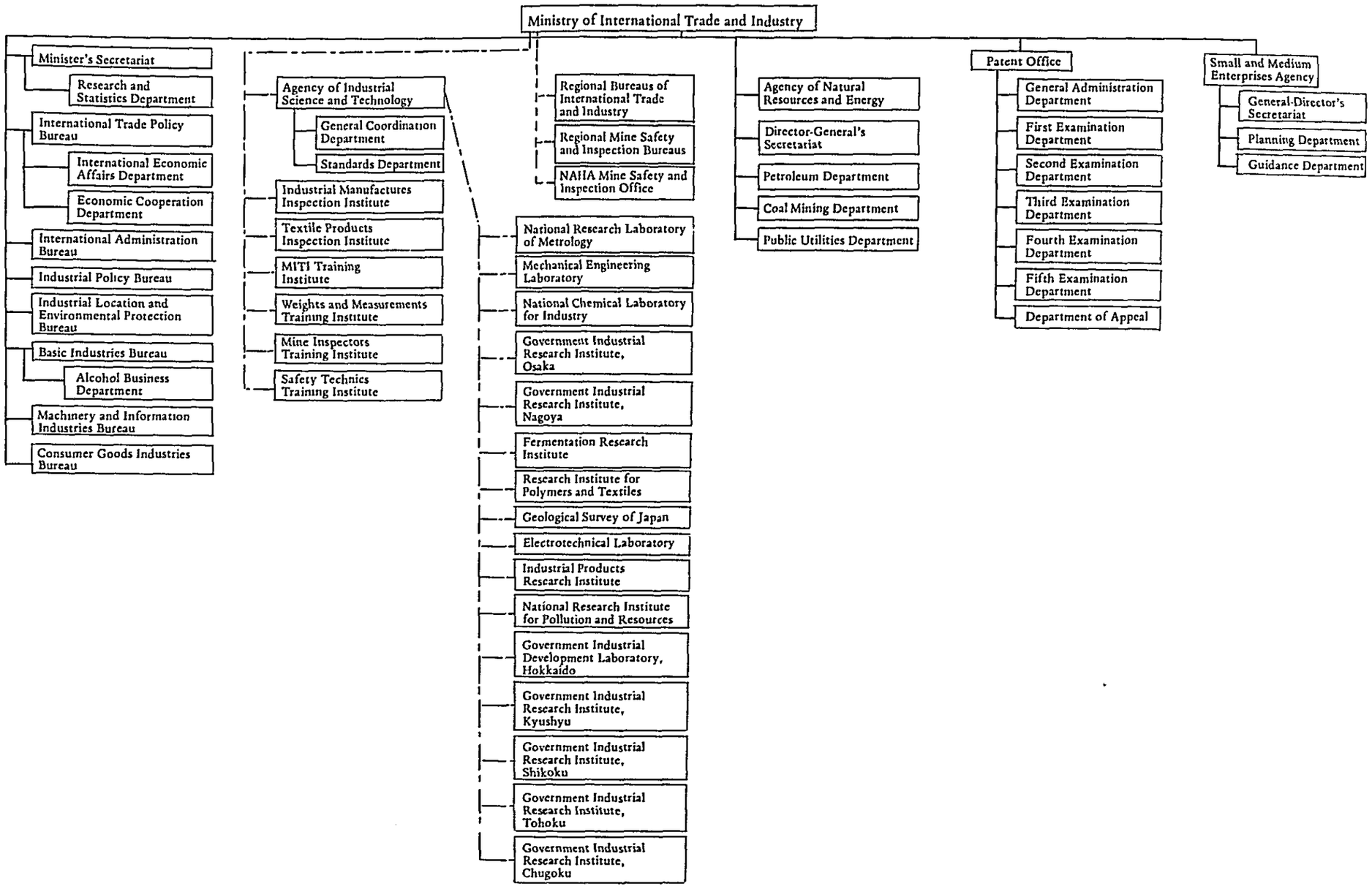
(5) Ministry of Finance



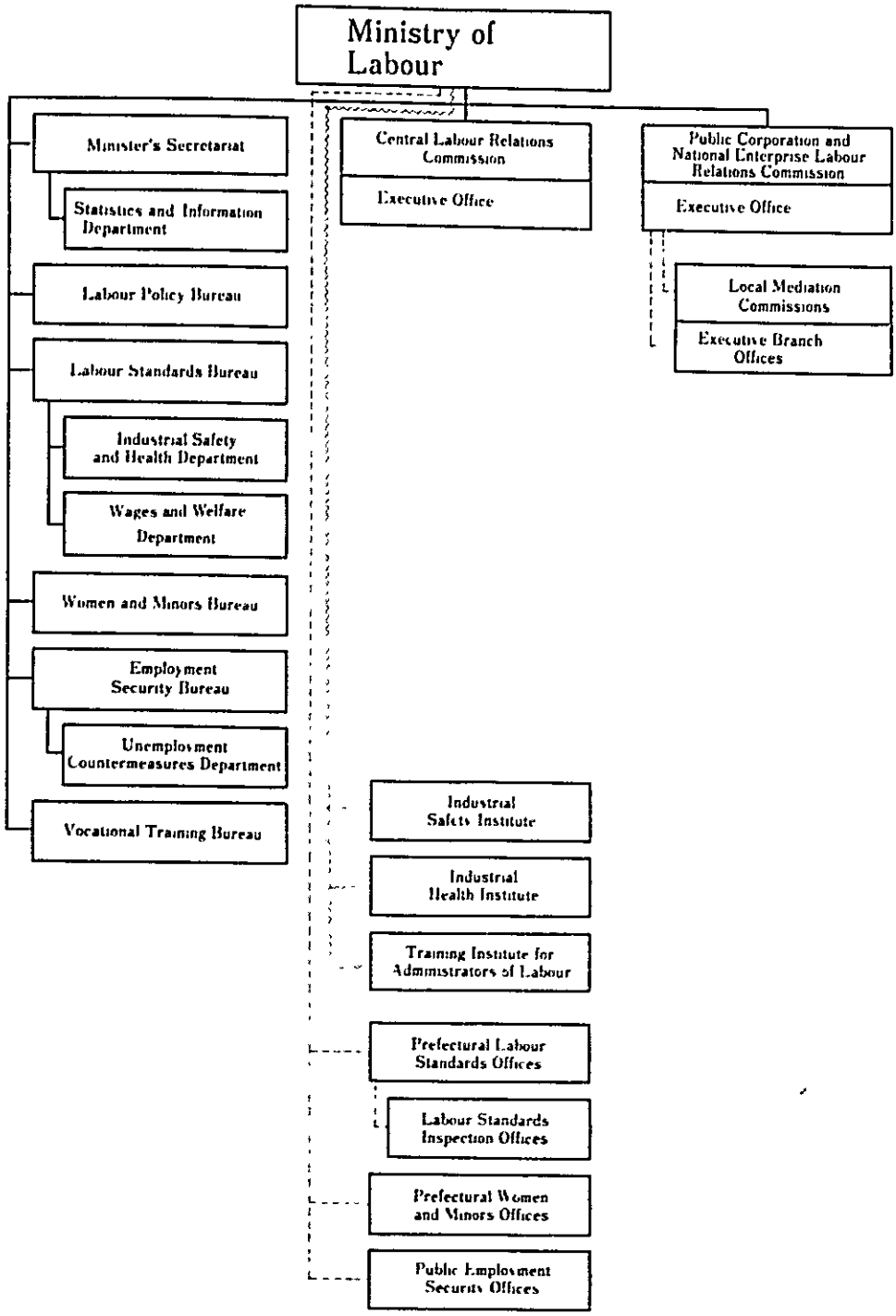
(6) Ministry of Foreign Affairs



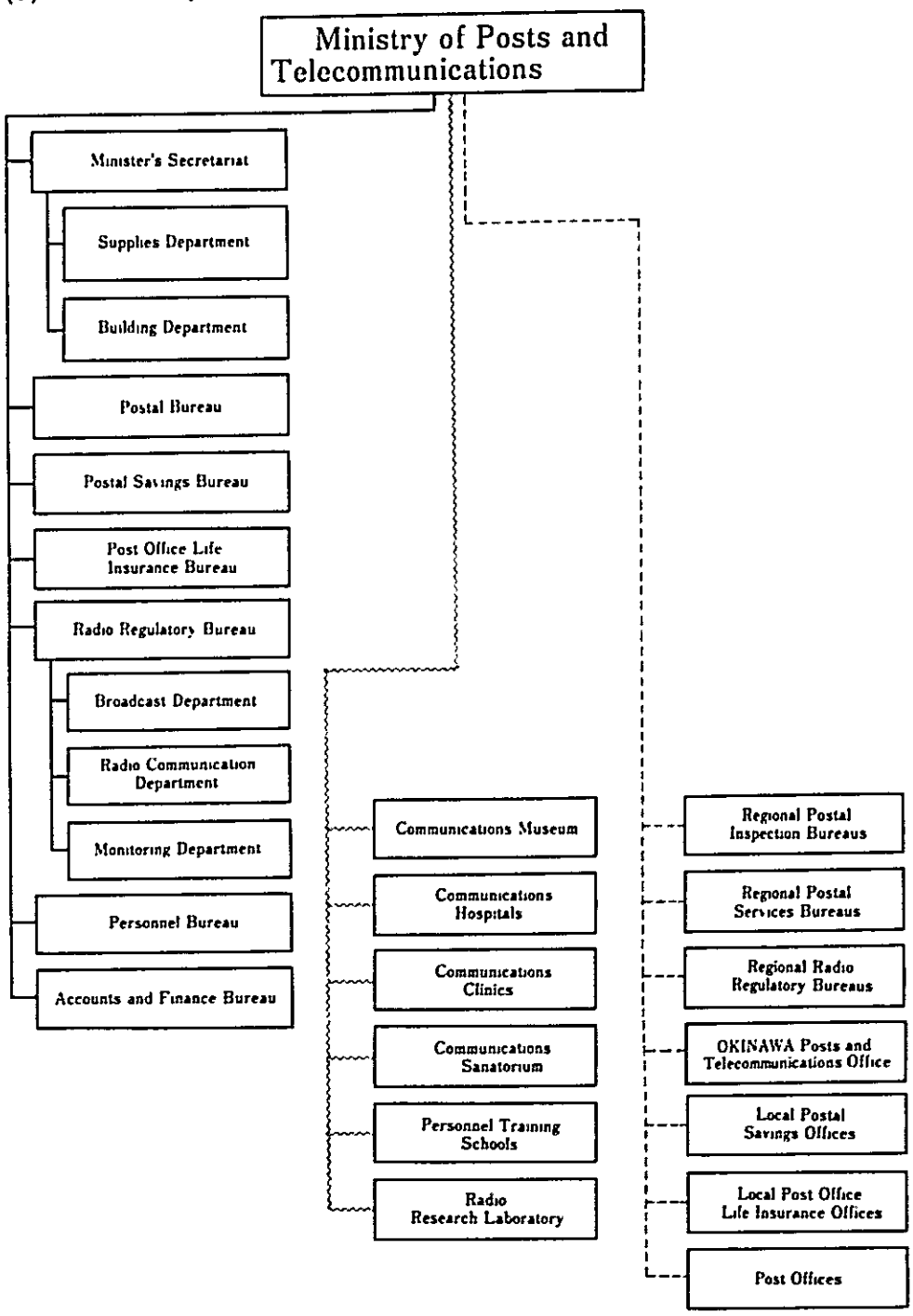
(7) Ministry of International Trade and Industry



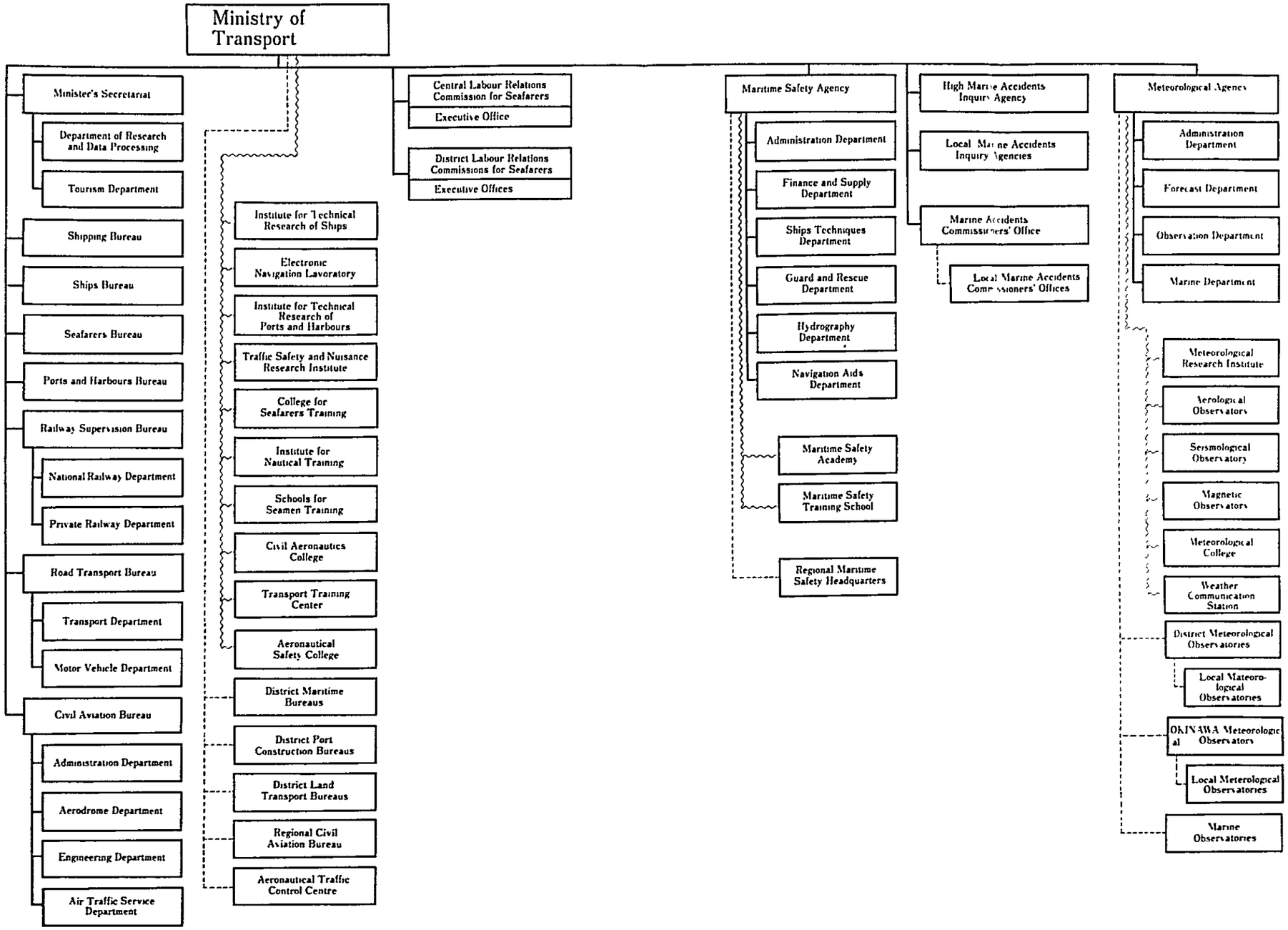
(8) Ministry of Labor



(9) Ministry of Posts and Telecommunications



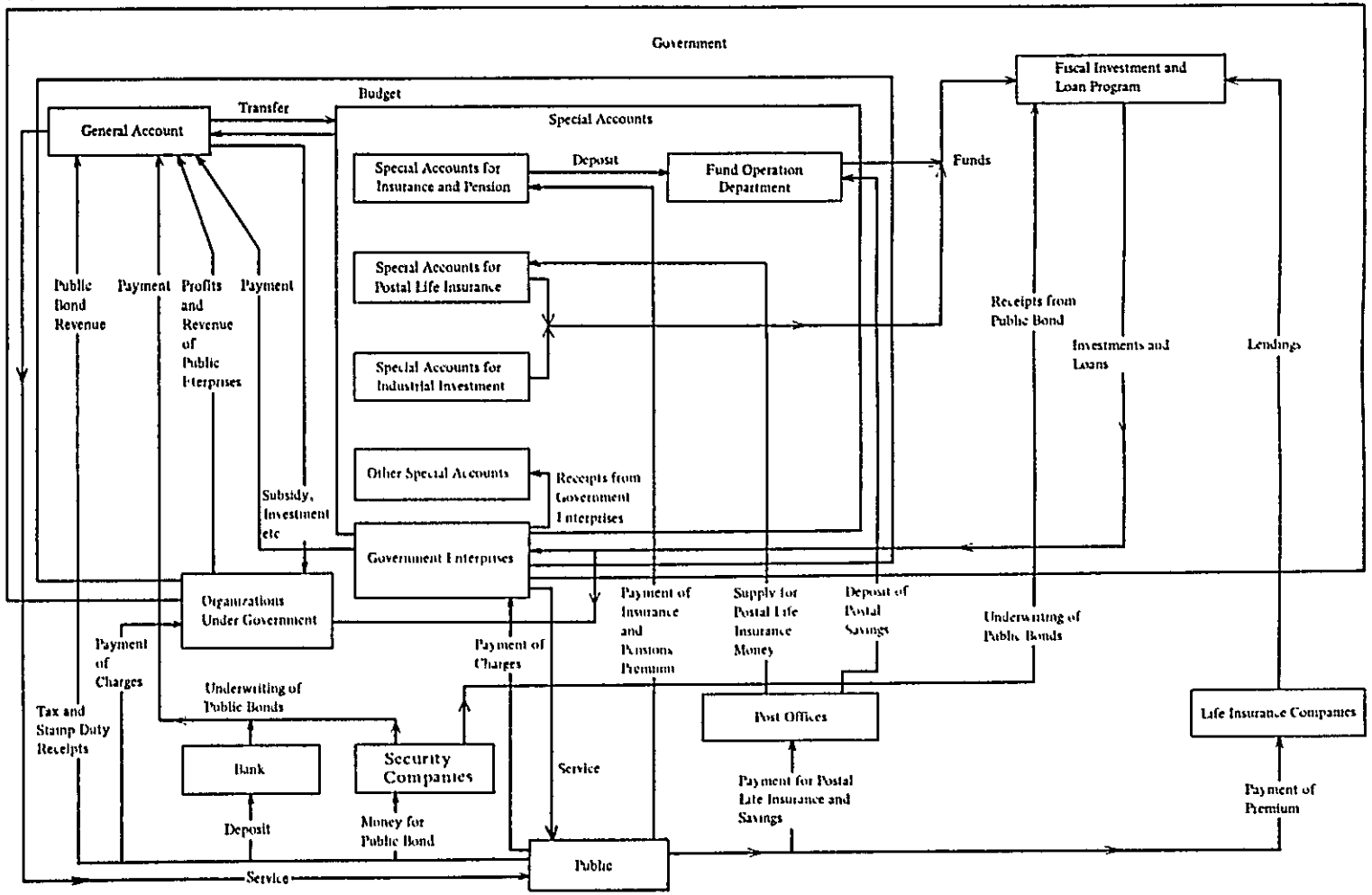
(10) Ministry of Transport



II. System of Administrative Process of Japan

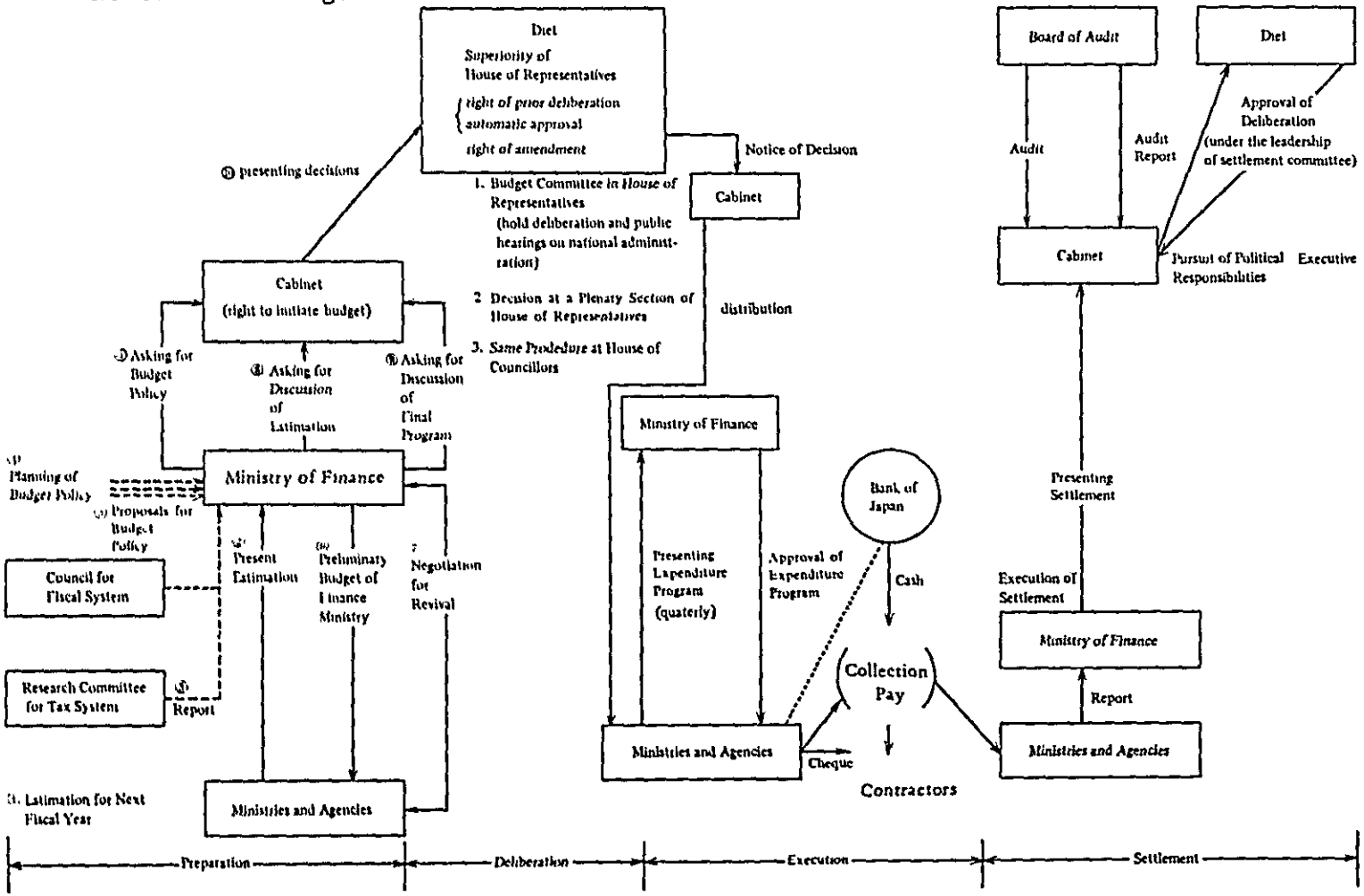
(1) Working System of Government Finance

(Translation from "White Papers of Japan 1971 - 1972" by Japan Institute of International Affairs)



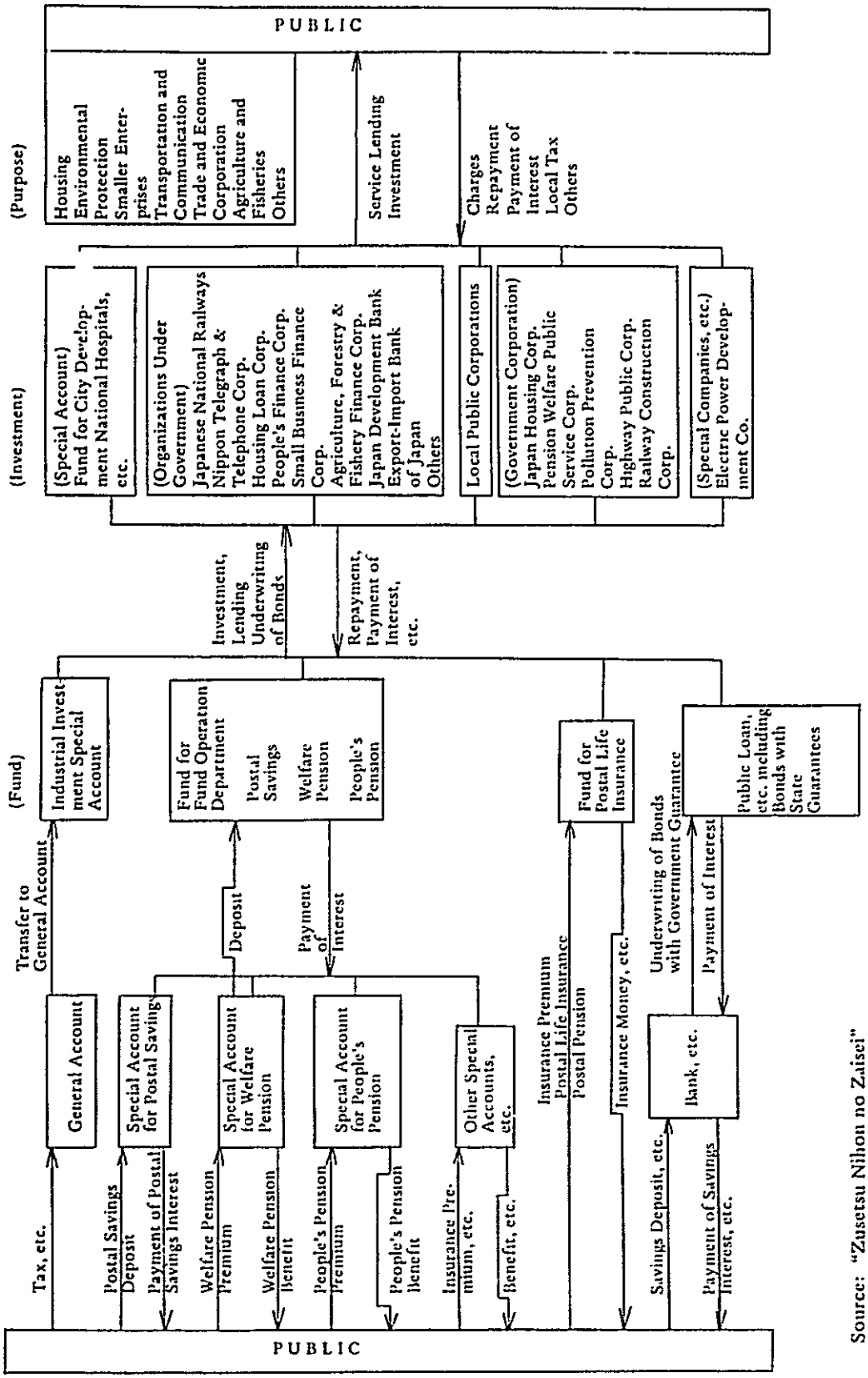
Source: Hiroshi Yonesato(Ministry of Finance) ed. "Zusetsu Nihon no Zaisei" (The Finance of Japan Illustrated), Tôyô Keizai Shinposha 1973.

(2) Working System of Preparation, Execution and Settlement of Government Budget



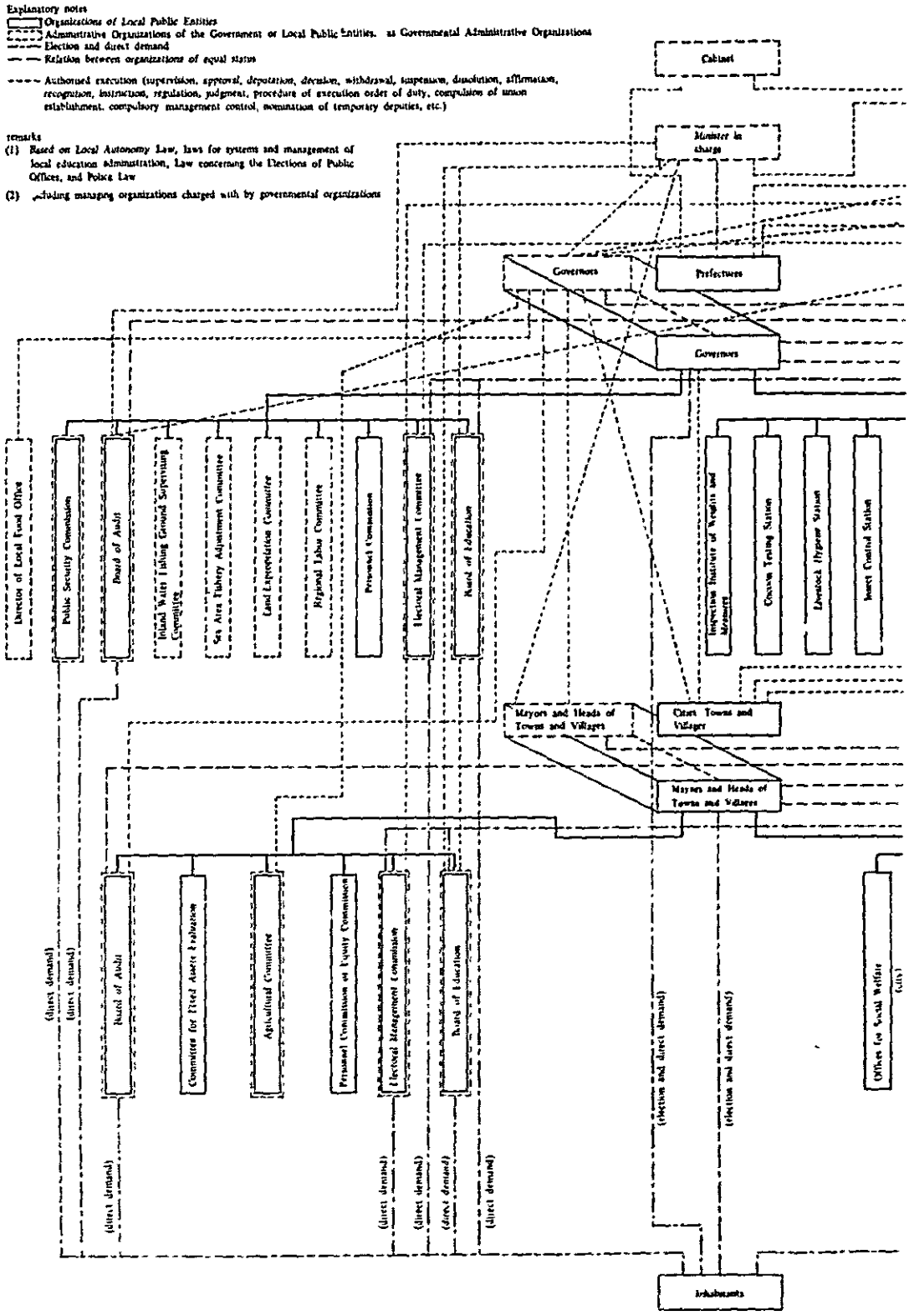
Source: Zusetsu Nihon no Zaisei

(3) Working System of Government Fiscal Investment and Loan

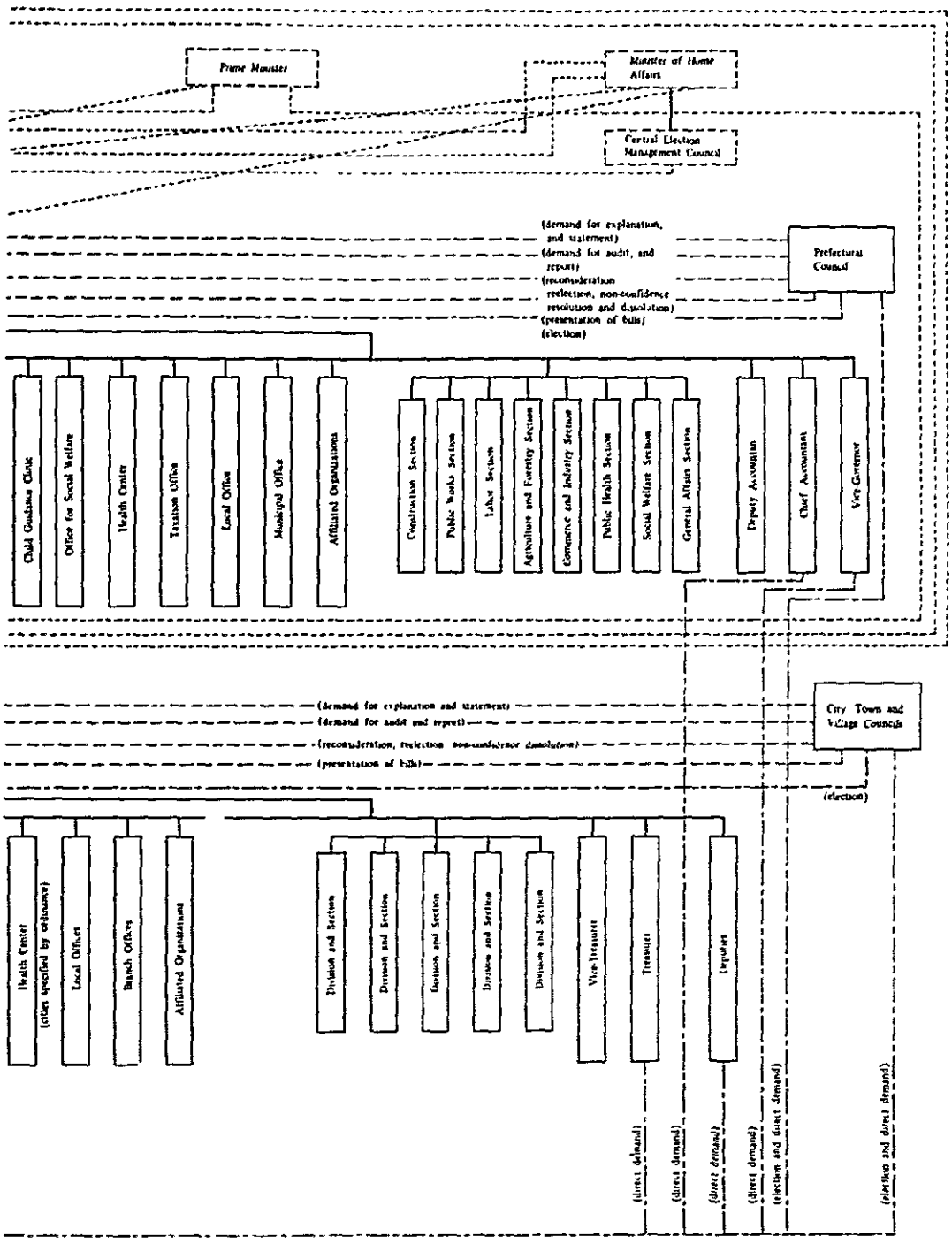


Source: "Zusetsu Nihon no Zaisei"

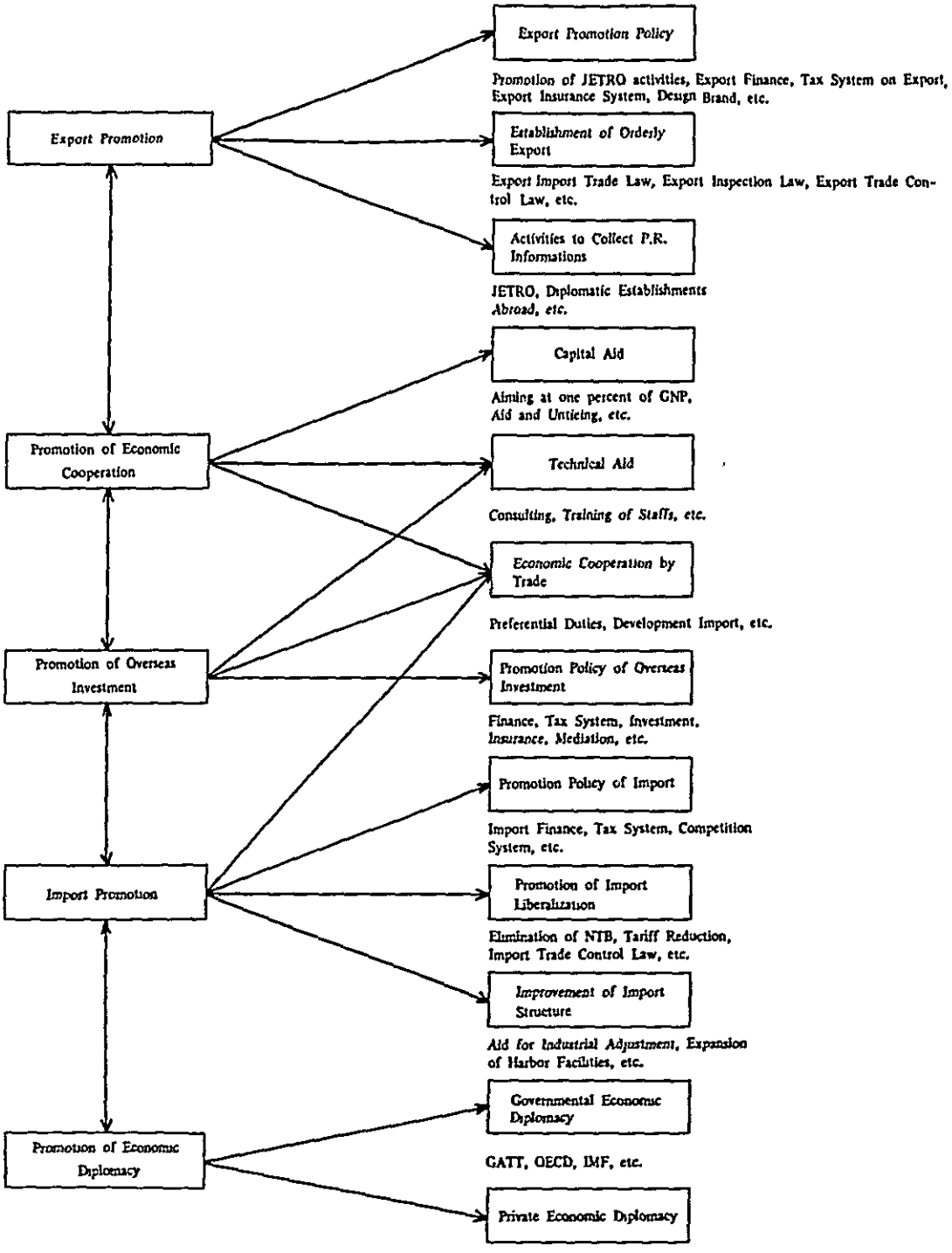
(4) Administrative System of Prefectures and



Municipalities in Relation to the Government

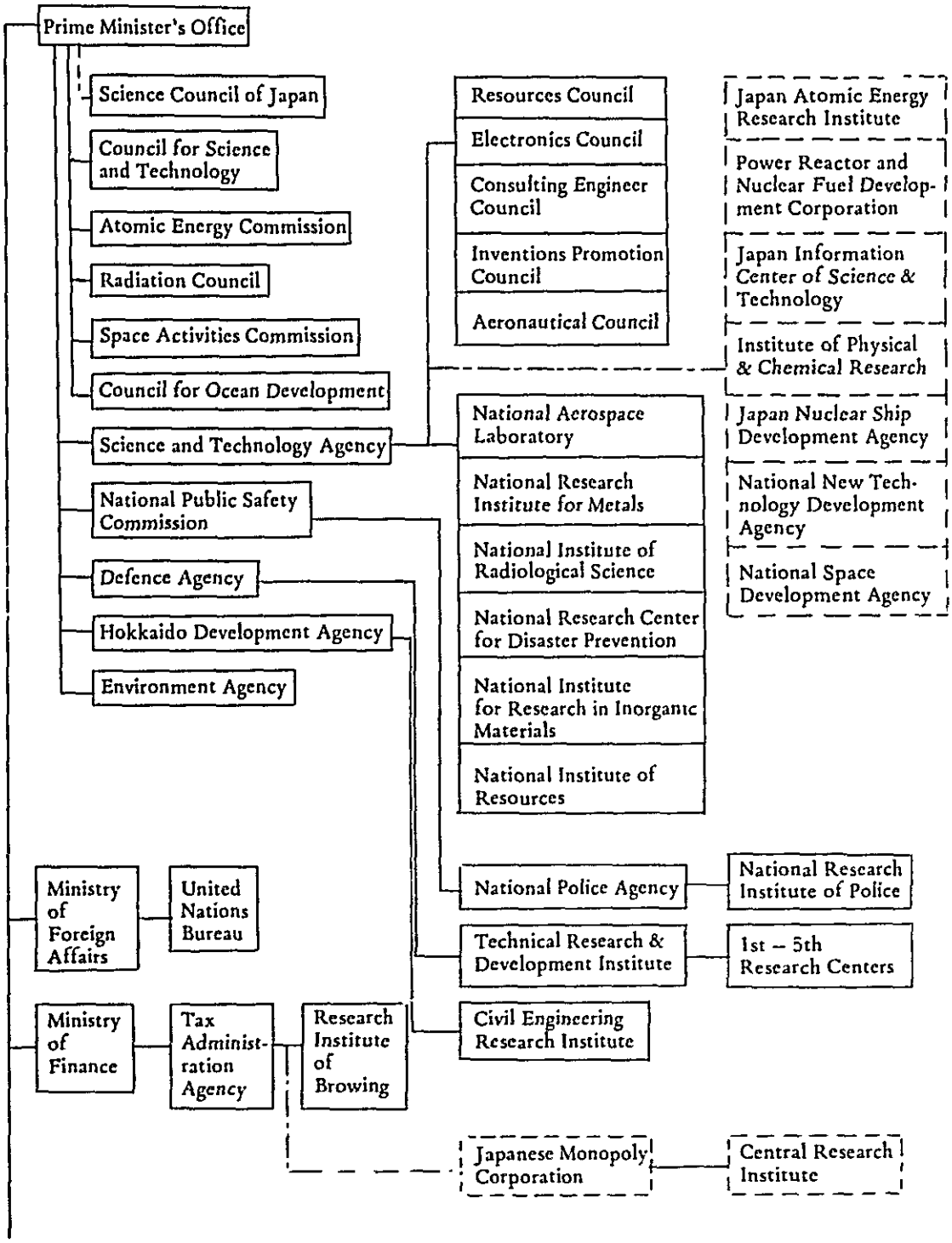


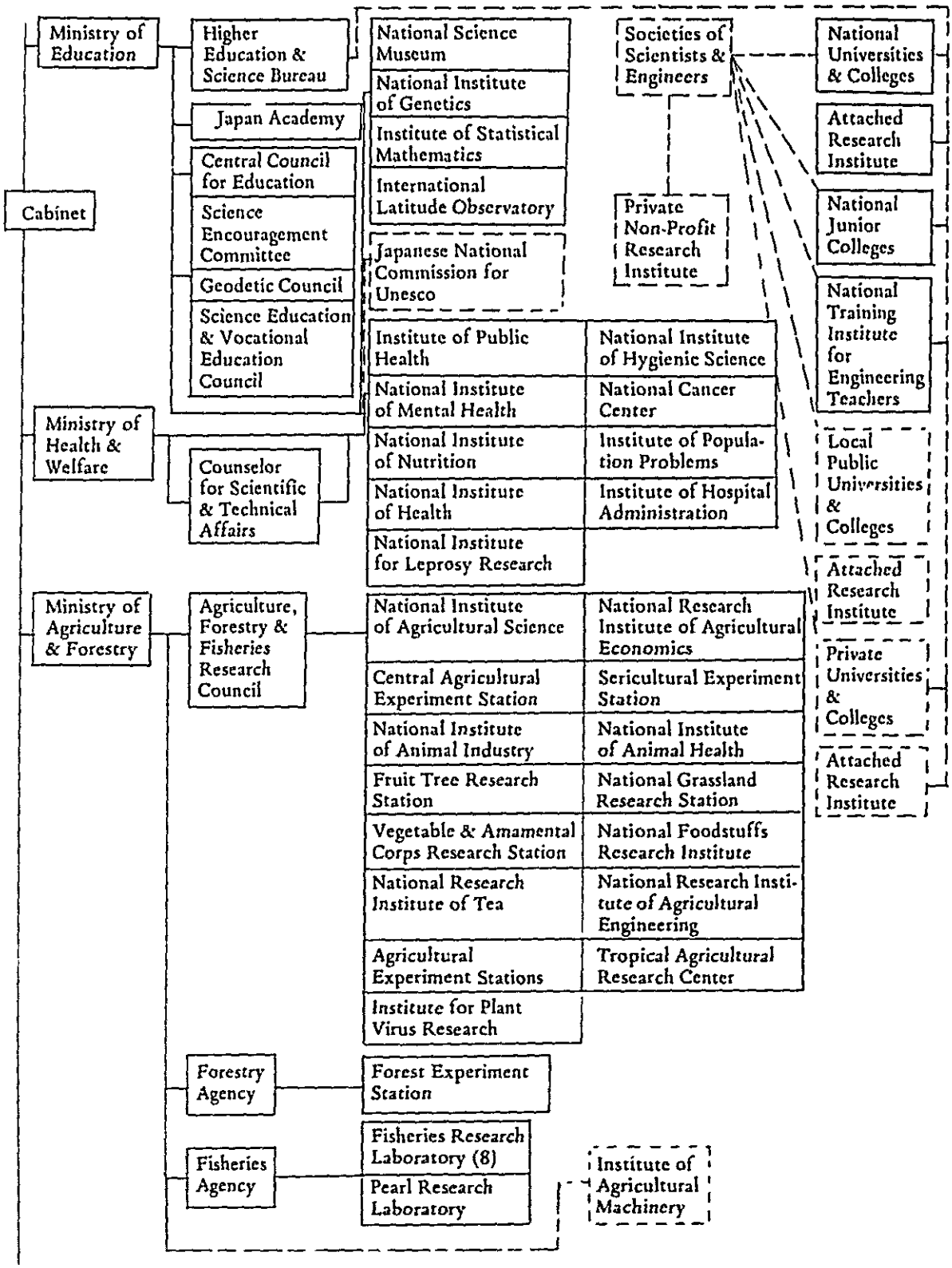
(5) Total System of International Trade Policy

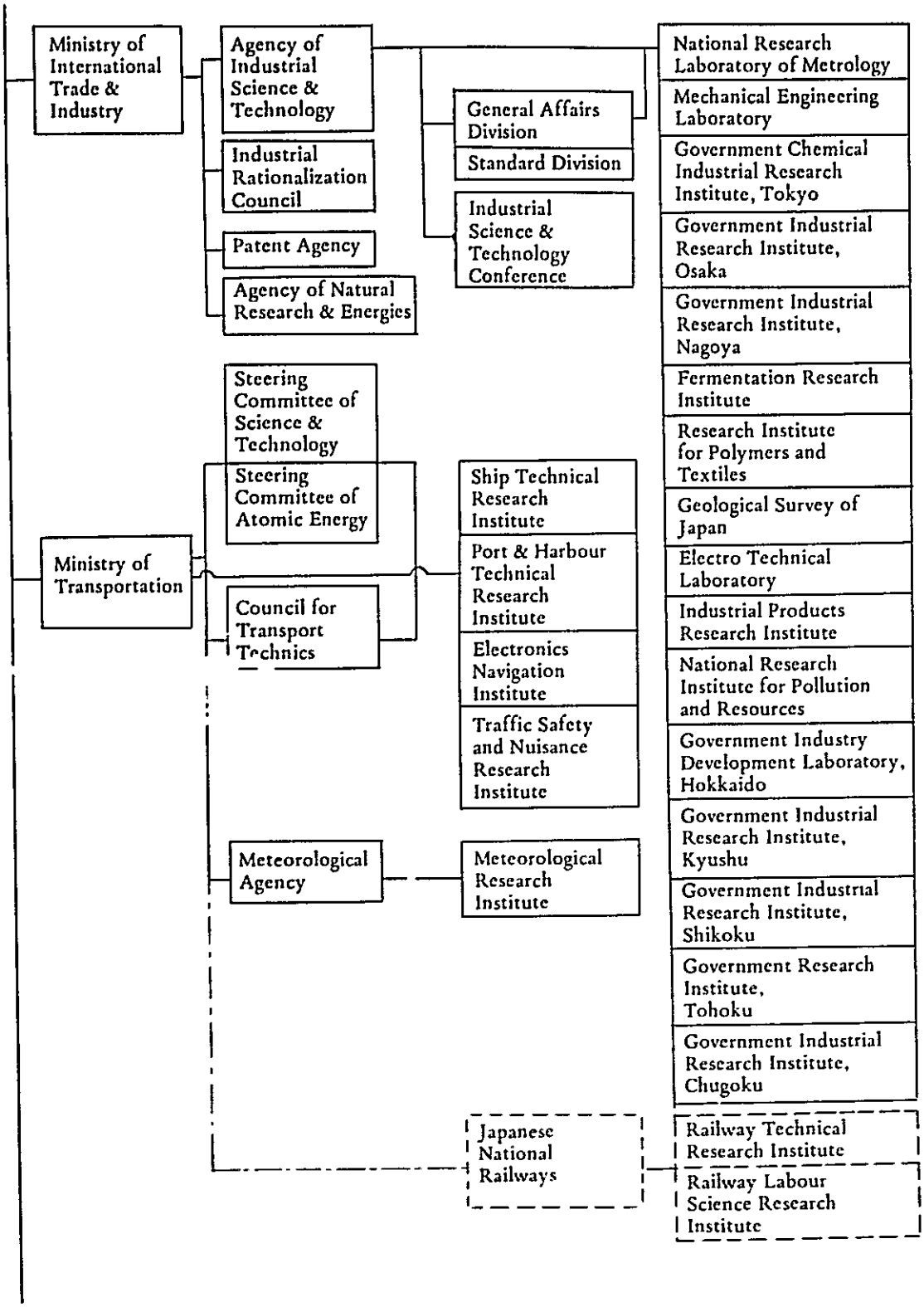


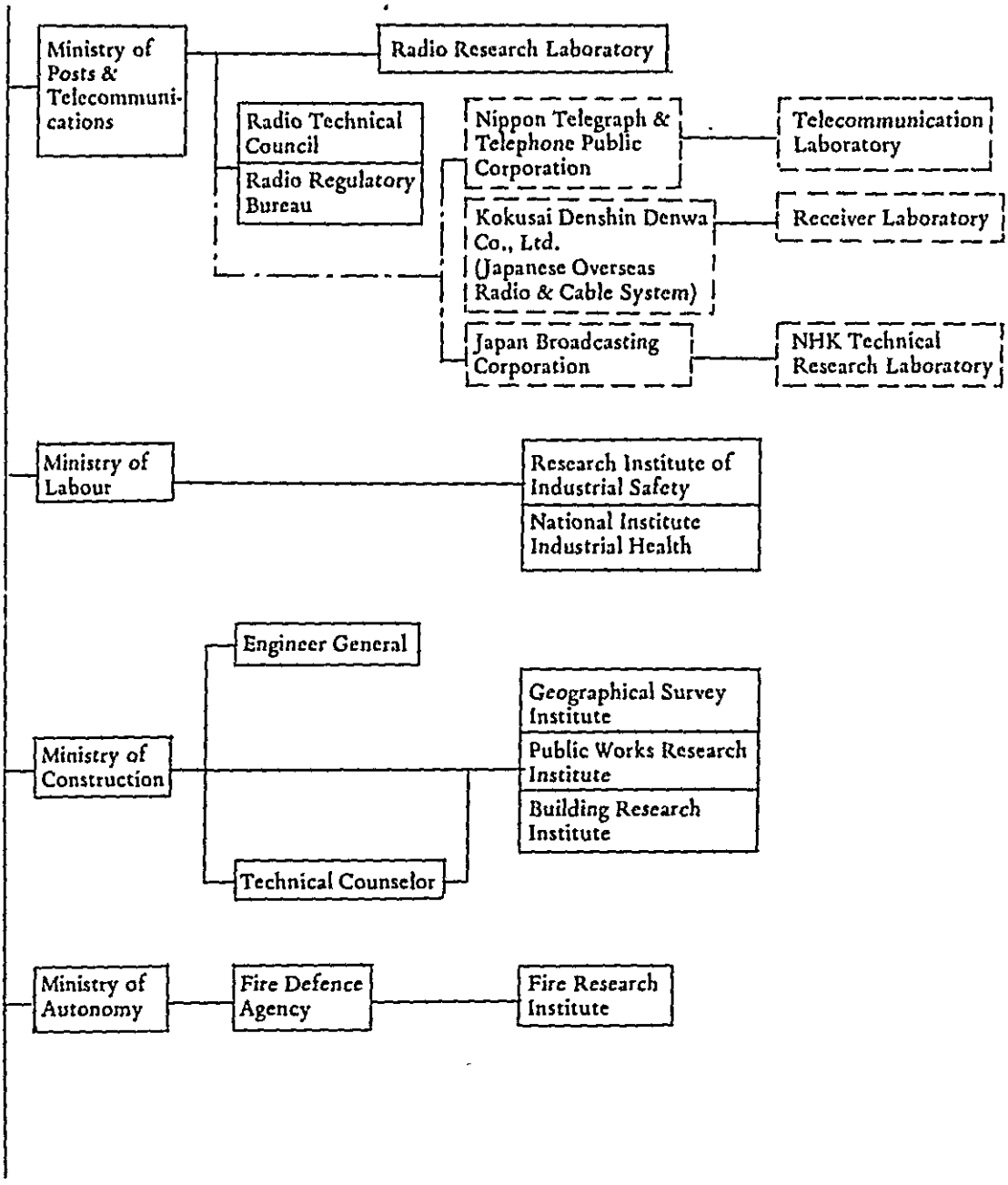
Source: *Yōgorō* Komatsu ed. : Shinban Nihon Bōeki Zusetsu (New edition, Japan's International Trade Illustrated)

(6) Total System of Technology Transfer in Japan




Cabinet
Ministry of Education
Higher Education & Science Bureau
Japan Academy
Central Council for Education
Science Encouragement Committee
Geodetic Council
Science Education & Vocational Education Council
National Science Museum
National Institute of Genetics
Institute of Statistical Mathematics
International Latitude Observatory
Japanese National Commission for Unesco
Societies of Scientists & Engineers
Private Non-Profit Research Institute
National Universities & Colleges
Attached Research Institute
National Junior Colleges
National Training Institute for Engineering Teachers
Local Public Universities & Colleges
Attached Research Institute
Private Universities & Colleges
Attached Research Institute
Ministry of Health & Welfare
Counselor for Scientific & Technical Affairs
Institute of Public Health
National Institute of Hygienic Science
National Institute of Mental Health
National Cancer Center
National Institute of Nutrition
Institute of Population Problems
National Institute of Health
Institute of Hospital Administration
National Institute for Leprosy Research
Ministry of Agriculture & Forestry
Agriculture, Forestry & Fisheries Research Council
National Institute of Agricultural Science
National Research Institute of Agricultural Economics
Central Agricultural Experiment Station
Sericultural Experiment Station
National Institute of Animal Industry
National Institute of Animal Health
Fruit Tree Research Station
National Grassland Research Station
Vegetable & Amamental Corps Research Station
National Foodstuffs Research Institute
National Research Institute of Tea
National Research Institute of Agricultural Engineering
Agricultural Experiment Stations
Tropical Agricultural Research Center
Institute for Plant Virus Research
Forestry Agency
Forest Experiment Station
Fisheries Agency
Fisheries Research Laboratory (8)
Pearl Research Laboratory
Institute of Agricultural Machinery


Ministry of International Trade & Industry
Agency of Industrial Science & Technology
Industrial Rationalization Council
Patent Agency
Agency of Natural Research & Energies
General Affairs Division
Standard Division
Industrial Science & Technology Conference
National Research Laboratory of Metrology
Mechanical Engineering Laboratory
Government Chemical Industrial Research Institute, Tokyo
Government Industrial Research Institute, Osaka
Government Industrial Research Institute, Nagoya
Fermentation Research Institute
Research Institute for Polymers and Textiles
Geological Survey of Japan
Electro Technical Laboratory
Industrial Products Research Institute
National Research Institute for Pollution and Resources
Government Industry Development Laboratory, Hokkaido
Government Industrial Research Institute, Kyushu
Government Industrial Research Institute, Shikoku
Government Research Institute, Tohoku
Government Industrial Research Institute, Chugoku
Steering Committee of Science & Technology
Steering Committee of Atomic Energy
Ministry of Transportation
Council for Transport Technics
Ship Technical Research Institute
Port & Harbour Technical Research Institute
Electronics Navigation Institute
Traffic Safety and Nuisance Research Institute
Meteorological Agency
Meteorological Research Institute
Japanese National Railways
Railway Technical Research Institute
Railway Labour Science Research Institute



Source: "Handbook of Technology Transfer"