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JAPAN'S ROLE IN FUTURE WORLD ECONOMY \*

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## 1. Introduction -- A Comparative Study

In evaluating the Japan's role in future world economy, we first review the recent growth pattern and its international implications and analyze basic assumptions for world projection. The Japan's growth potential in the 1980's is then discussed in the context to this international environment and various constraints to growth. Finally we evaluate the role of Japan and its likely pattern of contributions.

During both pre- and post-war periods Japan has succeeded in accelerating its growth rate as shown in Chart 1. The chart indicates Japan has kept growing twice as fast as the Western world and in particular since the mid-1950's its growth rate rose to as high as ten percent or more accompanied by an extremely high rate of investment. The aim to catch up with advanced industrial nations in terms of per capita income has almost been achieved, though there is still a wide gap between the U.S. and Japan. In terms of purchasing power parity recently published by I.B. Kravis et al., as shown in Table 1. The per capita GDP for both countries stand at about 4800 and 2900 dollars respectively in 1970 international prices. While this estimate for Japan in purchasing power parity is surprisingly higher than that in official exchange ratio, its figures still indicate the existence of a wide gap between the two countries. Because of the lower proportion of private consumption, the table shows that Japan's per capita consumption belongs to the

lowest group in industrial nations. This would probably imply that Japan has still to grow faster in order to catch up with countries with higher consumption levels.

The Japan's phenomenal rapid growth since the mid 1950's has given various impacts upon world economy. The most important contribution is a persistent expansion of its imports in the world market in particular for raw materials. In terms of its share in the world trade, Japan's import has risen to 8 percent at present from 4 percent in the 1950's, implying that the Japan's contribution to the growth of world trade is now about 0.7 percent as against the growth rate of world trade of about 8 percent in normal years.

With respect to real output, the Japan's share in OECD countries stands at 8.7 percent in 1968 which contributes about 0.9 percent in growth rate of real GDP as compared with average growth rate of about 5 percent of total OECD in recent years. Zero growth in Japan thus implies nearly one percent fall in growth rate of total OECD countries.

A detailed cross-country analysis has become available in the context to the Japanese growth, since we have recently developed a simplified world econometric model covering 8 industrial and 5 developing countries and other related areas. The annual model consists of 13 national macro-economic models and two world-trade matrices, i.e. one related to foreign trade and other related to foreign prices. Each national model has standardized

structural equations on expenditures, capacity, prices and financial transactions, so that impacts of autonomous changes can be consistently followed through international trade network. Though the model is still provisional, we can roughly analyze the backward and forward linkage of the Japan's economy in the world market.

The backward effects of three nations' autonomous expenditures are indicated in Table 2 as cross-impact multipliers for Japan, U.S. and France. Because of the small responses for the first and second years, the multipliers in table are related to the third year when the effects tend to become significant. The table indicates that the Japan's impact is the largest on the U.S., while that on European countries as a whole is about half the U.S. It should be noted also that the multiplier for Japan stands at 3.5 while that for the world at 5.1, thus implying a relatively higher external impact than that of the U.S. The highest ratio of external impact for France is due to its strong impacts on the U.S., Germany and Japan.

These multipliers are then converted to elasticity coefficients as in Table 3 so that we can analyze the impacts in the context to the shares of different countries. Unlike the previous table, the U.S. has a lower coefficient while smaller countries such as Korea, Iran indicate the highest coefficients. Indonesia, Germany and France also show higher values. Since these coefficients are subject to the share of Japan in the

world economy, we revised them for 1980 under the assumption of growth rates indicated in the right column. Generally with growing share of Japan in the world market, the sensitivities of foreign countries tend to increase. The U.S. sensitivities of 0.12 in 1967, for instance, rises to 0.21 in 1980, while a rapidly growing country like Korea keeps the same highest sensitivity. The U.K.'s coefficient doubles though it is very low in 1967.

A forward linkage can be estimated in a similar way as shown in Table 4. Since the left column shows Japan's row elements of cross-impact multiplier matrix, we can easily derive Japan's dependency ratios on foreign autonomous expenditures by multiplying the latter values to the corresponding elements of the matrix. Under the same assumption on growth rates, the Japan's dependency on foreign economic policy tends to decline because of the increase in its share in the world economy. The dependency on the U.S. policy falls from 37.1 to 27.6 percent while the dependencies tend to rise or remain constant for such rapidly growing countries as Brazil, Iran, Indonesia and Korea.

## 2. Assumptions on World Economy

The evaluation on Japan's role in future heavily depends on basic assumptions on world economy. Since unstable political climate is likely to continue in middle-east, some developing countries and socialist countries, we present here two different assumptions: a) rather optimistic assumption and b) pessimistic assumption. Under the assumption (a) the world economy is assumed to return to the normal state of development after the oil-crisis and the present stagnation in a few years. The present price structure will be continued, though sometimes readjusted slightly. The food supply will not be much affected by weather conditions and behaviors of socialist countries. The present managed floating system of exchange rates will continue. The assumption (b) is based on more pessimistic views such as more uncertainties in supplies of primary products, including crude oil and foods accompanied by the higher prices, political instabilities in both developed and developing countries, etc. Cost-push type inflationary forces will still remain rather strong, so that demand management policies of major countries will be rather restrictive and their long-term policy tend to be inward-looking and the promotion of world trade and capital movement will be somewhat restricted.

### 3. Japan's Growth Potential

Though depending partly on the above external environments, the Japan's growth potential depends more on its efforts to overcome its internal problems. This is particularly the case as the Japan's dependency on foreign policies tend to fall gradually as observed in Table 4.

A growing pessimism in recent years especially after the oil-crisis is related to balance of payments, pollution control, supply of energy and primary resources, which are discussed in the following.

As for the balance of payments, Japan will be able to absorb the impacts from import prices in the long-run as far as its competitiveness continues in the world export market. Various empirical studies indicate continuous high income elasticity of the Japanese export in the world trade especially with respect to steel, shipbuilding, automobiles, electronics, industrial plants, etc. Although the present exchange rate is likely to be adjusted as the economy recovers from the recession, the high income elasticity of export will still be a stable factor for balance of payments.

In a more pessimistic case of assumption (b) above, a gradual, down-ward adjustment of the exchange rate might become necessary. But even in this case the extent will be very limited as far as the competitiveness does not change significantly.

With respect to pollution control, the most of the views are concerned about the rise in cost and fall in profit due to pollution abatement investment. Our empirical study [4], however, suggests that this micro-economic pessimism tends to neglect macro-economic aspect in which expansionary impacts of pollution abatement investment play a vital role in economic growth. As shown in Table 6, our simulation analysis of the pollution abatement investment indicates that its income effect is greater than that of the price effect in terms of both production and capacity. Though the anti-pollution investment is unproductive per se, expansionary forces of aggregative demand and visitage effect of induced productive investment jointly increase productive capacities which tend to check the overall rise in price levels. The structural changes in Table 7 indicate rising shares for general and electric machineries and falling shares for food and textiles. Surprisingly, the shares of pulp and paper, chemical, primary metals and electric power are not much affected, since both effects of price and income happen to be cancelled with each other. Although this analysis is related to medium-term period and the long-run price effect is likely to become more significant, our result implies that the ordinary pessimism is rather against an empirical evidence.

As for the third problem about energy and primary resources, adjustment of technology and production structure to save those resources is usually carried out partly by price-mechanism and



partly by government policy. Since prices for imports are now twice as high as the 1970 level, the adjustment policy is needed both for domestic prices and production structure for coming several years. In the course of these adjustments consumption of oil and other resources with extremely high prices is likely to be saved depending upon the government policies and increased possibilities for alternative resources and technologies.

An experimental study on saving crude oil imports [5] has been conducted recently and the result is shown in Table 8. The study aims at the extent of saving oil import with a linear programming-type input-output model under realistic constraints with respect to balance of payments, unemployment, sectoral demand, etc. The table indicates that even for the short-term period the crude oil imports can be saved by 5.7 percent only by adjusting sectoral output and trade components (Case 1) and by 14.1 percent by reducing total final demand, adjusting sectoral components and introducing technical changes (Case 2). A further reduction of final demand (Case 3) on the same assumption as Case 2 results in the saving of 21.5 percent, which, however, bring about a serious unemployment.

The above simulation implies that the structural adjustment of output and foreign trade can substantially save crude oil imports even for short period when technological adjustment is very limited. It also suggests that a further saving can be made for a longer period through a similar structural adjustment

accompanied by greater technical changes without reducing economic growth rate.

In summing up the above discussions on the growth constraints it can be stated that the Japan's future growth potential appears to be still strong as far as its socio-economic policies are properly carried out.

#### 4. Japan's Role

If the above observations on the Japan's growth potencial are supported, what would be its actual growth pattern under the different assumptions made in Chapter 2. Since the quantification is not an original aim of the present paper, we shall only deal with its likely patterns. Under the optimistic assumption the growth rate is likely to be higher than the Western countries even in the 1980's. "Growth inertia" may continue in that case. Under the pessimistic assumption, however, the growth rate will be lowered but still a little higher than the Western countries. This trend is probably accompanied by a higher rate of price increase.

For the reference we indicate in Chart 2 and Table 9 per capita GDP growth rates based on the same real purchasing power as noted before for three countries by employing OECD's growth rates [7]. The Japan's growth rate ( $J_1$ ) seems very high as it was estimated before the "oil crisis", while the alternative estimate ( $J_2$ ) by J.E.R.C. is based on a less optimistic assumption recently made. In either case it seems likely that the gaps of the per capita GDP of three nations tend to be substantially narrowed in the late 1980's. With respect to per capital consumption, however, the Japan's level will be still the lowest among the three on the basis of 6 percent growth.

As Japan's per capita income approaches to the level of the U.S. toward the end of 1980's, is there any resemblance in

production structure between the two countries? On the contrary, Japan will be heavily specialized to more land- and resource-saving, environment-oriented industries and technologies with declining shares in agriculture, textiles, and heavy basic industries as shown in Table 10. Probably the demand structure will not be as different as the supply structure, except that the share of private consumption will be still lower and that of productive investment be a little higher.

This implies that the Japan's contribution to the world economy in future is not only in its larger demand for world market, such as greater amount of imports of food, textiles, various sundry goods for daily living, crude materials, etc., but also in its expanded supply capacity in engineering products, industrial plants, system-oriented technologies, etc. which will account for the major shares in Japan's exports. As noted by K.E. Boulding, the Japan's contributions to the world economy will be made typically in such area where there is a greater need for saving land and space, energy and primary materials, etc. so that cleaner and more sophisticated technologies and their products with higher value-added ratios will dominate. There is a strong possibility that Japan will serve as a typical model in post-industrial and "space-ship earth" era in terms of density of population, technological capabilities and scale of market.

With respect to labor, Japan has already dealt with labor shortage since 1960's by substituting more capital and accelerating

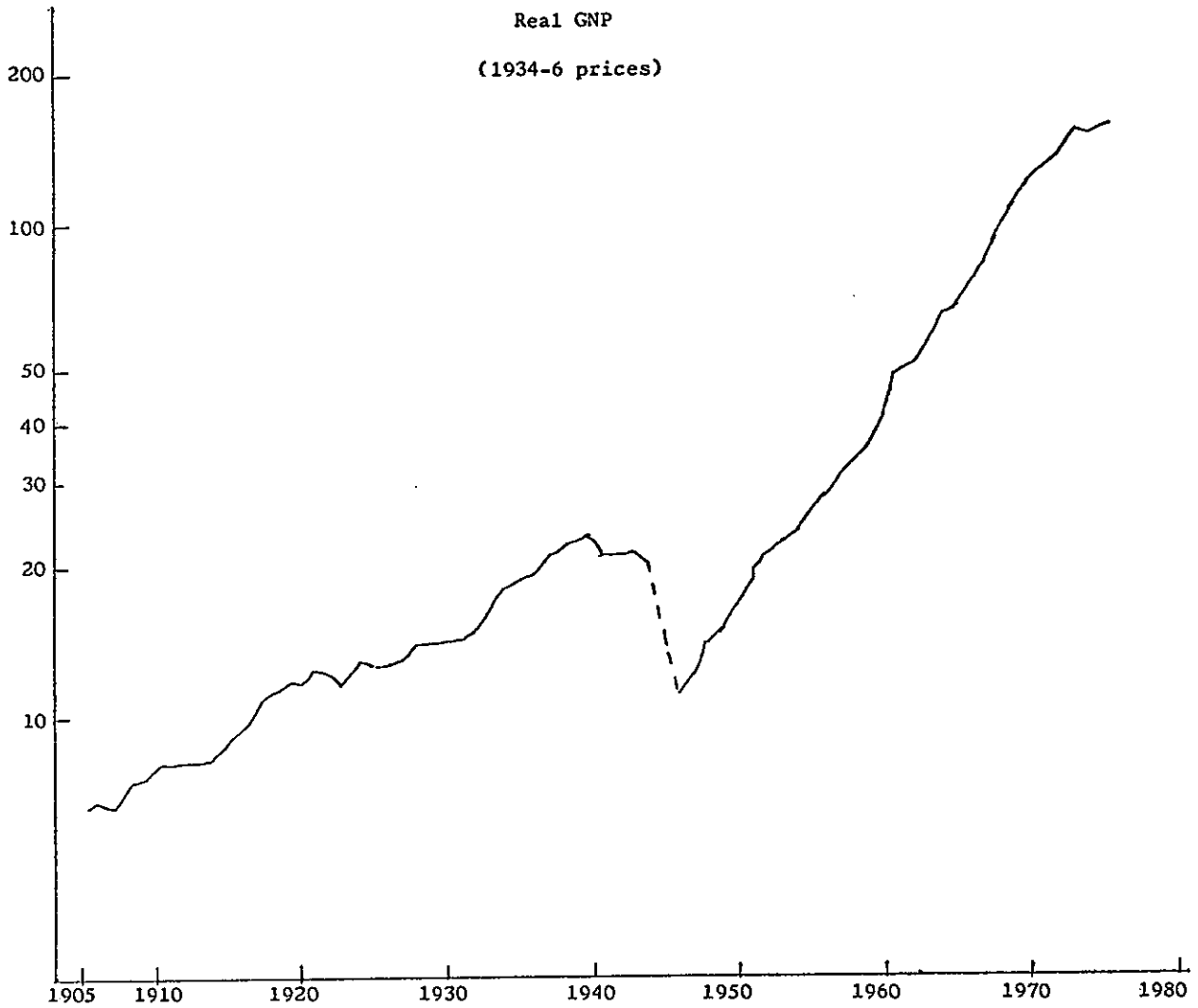
the rate of investment. In view of further extended education and training opportunities in future, labor shortage will concentrate on unskilled labors which will be met partly by more automated machines and equipments. But the shortage likely continues, thus giving more pressures upon labor intensive sectors from many developing nations. A problem of foreign workers will be confronting Japan in the 1980's though to a less extent than in Europe.

Finally, with respect to foreign investment, direct investment abroad in heavy industries such as petrochemicals, steel, pulp etc. will eventually be fostered in the forms of joint-ventures despite some social, political problems. This is naturally due to the comparative advantage in terms of cost of land, raw materials and pollution control. Similar types of international collaborations are expected to increase for development of primary resources such as iron ores and timbers. Although the amounts for those will increase, they would not have too strong pressures on the balance of payments.

## References

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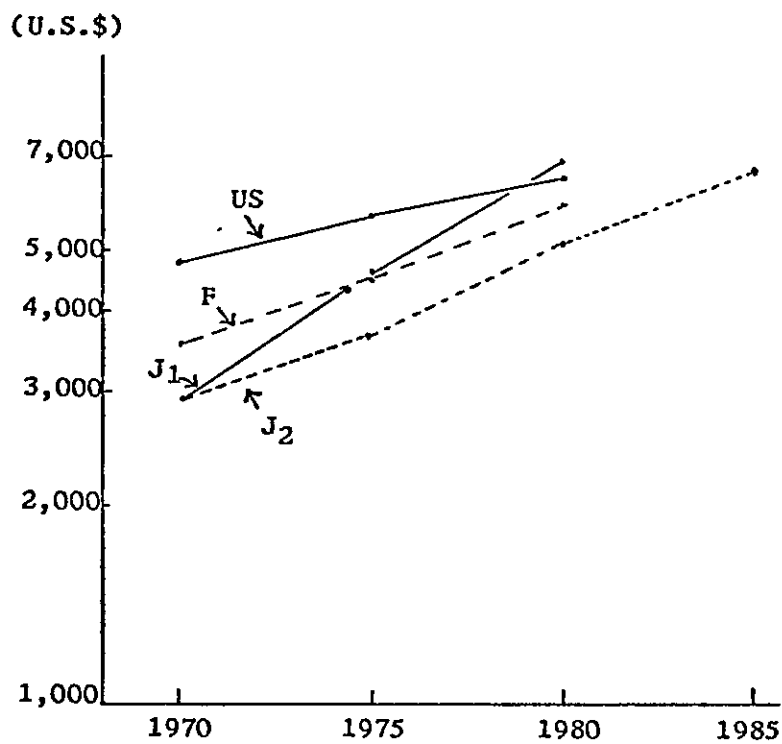
Chart 1  
Real GNP  
(1934-6 prices)



Note: 1) Source: Ohkawa & Resovsky: Japanese Economic Growth: Trend Acceleration in Twentieth Century 3 .  
2) Linked in 1952 and '65.  
3) Pre-war series excludes inventory changes.

Chart 2

Per Capita GDP at Real Purchasing Power  
for U.S., France & Japan



Note: US = USA, F = France

J<sub>1</sub> = Japan (OECD's growth rate)

J<sub>2</sub> = Japan (JERC's growth rate)



Table 1  
 Comparison of Per Capita GDP and Consumption  
 in Real Purchasing Power, 1970  
 (in 1970 prices)

	Per capita consumption at RPP	Per capita GDP at RPP	Per capita GDP at official exchange rate
U.S.	3295	4801	4801
France	2238	3599	2902
Germany	2015	3585	3080
Japan	1591	2952	2003
U.K.	2050	2895	2143
Italy	1516	2198	1699

Source: I.B. Kravis et al.: A System of International Comparisons of  
 Gross Product and Purchasing Power (1975). [2]

Table 2

Cross-Impact Multipliers of Autonomous Expenditure  
for Japan, U.S.A. and France

(1963 billion U.S. dollars)

	Japan	U.S.A.	France
Japan	3.456	0.439	0.284
U.S.A.	0.884	4.993	0.731
Canada	0.081	0.150	0.061
U.K.	0.086	0.077	0.100
France	0.131	0.164	1.818
Germany	0.256	0.229	0.293
Italy	0.025	0.036	0.003
Australia	0.063	0.061	0.032
Korea	0.030	0.014	0.005
India	-0.032	-0.026	-0.031
Indonesia	0.022	0.015	0.013
Iran	0.027	0.012	0.005
Brazil	0.012	0.014	0.012
Total	5.107	6.178	3.326
External impact ratio	1.48	1.24	1.83

Source: [6]

Table 3  
Sensitivities of Foreign Countries to  
Japan's Autonomous Expenditure in Terms of Elasticity

	1967	1980	JERC: GNP growth rate (%)
Japan	3.456	3.456	8.7
U.S.A.	0.121	0.214	3.3
Canada	0.151	0.215	5.0
U.K.	0.089	0.187	2.0
France	0.125	0.175	5.2
Germany	0.228	0.368	4.0
Italy	0.042	0.072	3.4
Australia	0.248	0.333	5.5
Korea	0.558	0.552	8.0
India	-0.071	-0.131	3.0
Indonesia	0.220	0.204	8.5
Iran	0.342	0.226	10.0
Brazil	0.049	0.048	8.0
Total	0.373	0.588	4.2
Total, ex. Japan	0.130	0.215	3.8

Note: (1) Sensitivity is defined as  $\frac{\Delta Y_i}{Y_i} / \frac{\Delta A_J}{Y_J}$  for county i, where

$\Delta A_J$  and  $\Delta Y_J$  is Japan's autonomous expenditure and GNP, respectively.

- (2) GNP growth rate is based on Japan Economic Research Center estimates for developed countries, except for Australia [1]. For other countries including Australia, recent trends are extrapolated.

Table 4

Japan's Dependency on  
Foreign Autonomous Expenditures, 1967 and 1980

(%)

	Multipliers, from abroad to Japan	Japan's dependency on foreign policies	
		1967	1980
Japan	3.456	40.1	52.6
U.S.A.	0.439	37.1	27.6
Canada	0.512	3.2	2.9
U.K.	0.093	1.0	0.7
France	0.284	3.4	3.3
Germany	0.657	8.6	6.9
Italy	0.374	2.6	2.0
Australia	0.652	1.9	1.9
Korea	0.417	0.3	0.3
India	0.216	1.1	0.8
Indonesia	0.192	0.2	0.3
Iran	0.091	0.1	0.1
Brazil	0.160	0.4	0.6
Total	-	100.0	100.0

Source: [6]

Table 5

Sectoral Impacts of Pollution Control in Terms  
of Growth Rate of Output 1972 - 1977

(%)

	Case A	Case B
1. Agriculture	3.9	3.8
2. Mining	8.7	8.7
3. Food	7.7	7.5
4. Textiles	6.1	6.0
5. Pulp & paper	10.2	10.2
6. Chemicals	10.1	10.2
7. Primary metals	9.9	10.3
8. Metal products	11.4	11.7
9. Machineries	10.7	12.2
10. Electric machineries	14.4	15.4
11. Transport equipments	10.6	11.0
12. Other manufacturing	11.1	11.7
13. Construction	12.0	12.2
14. Electric power & gas	10.6	10.4
15. Trade	10.6	10.7
16. Real estate	8.2	8.3
17. Transport & communication	11.4	11.6
18. Finance	10.2	10.3
19. Services	10.2	10.2
20. Unallocated	10.1	10.2
Total	10.4	10.7

Note: Case A denotes standard simulation and Case B pollution control simulation.

Table 6  
Components of Sectoral Output

	(%)			
	1967	1972	1977	
			Case A	Case B
1. Agriculture	4.6	3.5	2.5	2.5
2. Mining	.6	.6	.5	.5
3. Food	6.5	5.1	4.6	4.4
4. Textiles	3.5	2.5	2.2	2.1
5. Pulp & paper	1.9	1.7	1.7	1.7
6. Chemicals	5.3	4.3	4.5	4.5
7. Primary metals	10.3	8.6	8.4	8.4
8. Metal products	2.3	2.6	2.8	2.8
9. Machineries	5.0	5.9	6.0	6.3
10. Electric machineries	5.2	6.6	7.6	7.8
11. Transport equipments	6.6	5.9	5.9	5.9
12. Other manufacturing	11.5	11.4	11.7	11.6
13. Construction	8.6	10.3	11.0	11.0
14. Electric power & gas	1.7	1.9	1.9	1.9
15. Trade	8.1	8.4	8.5	8.4
16. Real estate	1.2	2.3	2.1	2.1
17. Transport & communication	5.1	5.6	5.8	5.8
18. Finance	2.5	2.6	2.6	2.6
19. Services	7.6	8.9	8.8	8.7
20. Unallocated	1.9	1.1	1.1	1.1
Total	100.0	100.0	100.0	100.0

Note: Case A denotes standard simulation and Case B pollution control simulation.

Table 7

Effects of Pollution Control on Total Output and Capacity  
(1965 billion yen)

	1972	1973	1974	1975	1976	1977
1. Increase in						
Total output	731	2,134	2,638	1,876	1,702	580
Price effect	-32	-250	-624	-620	-640	-970
Income effect	763	2,384	3,262	2,496	2,342	1,550
2. Increase in						
Total capacity	150	919	2,105	3,065	3,721	4,218
Price effect	-6	-74	-296	-578	-802	-1,081
Income effect	156	993	2,401	3,643	4,523	5,299

Table 8

Saving Effects of Crude Oil Imports under Optimum Production  
and Trade Policies, 1974

	Saving effect of oil imports (%)	Rate of increase in oil imports (%)	Rate of increase in real final demand (%)	Net exports (1000 billion yen)	Total employment (million)
Case 1	5.7	2.9	10.1	0.11	53.00
Case 2	17.9	-10.5	6.2	1.27	52.35
Case 3	21.5	-14.3	-1.1	2.48	51.42



Table 9

Forecast of Per Capita GDP at Real Purchasing Power  
(1970 U.S. prices)

	1970	1975	1980	1985
U.S.A.	4801	5621	6557	
		(3.2)	(3.4)	
France	3599	4463	5902	
		(4.4)	(5.7)	
Japan (1)	2952	4613	6827	
		(9.3)	(8.1)	
Japan (2)	2952	3731	5063	6678
		(4.8)	(6.3)	(5.7)

Note: For U.S.A., France and Japan (1), the rates of growth of OECD's per capita GDP [7] are used on the basis of the 1970 estimates by Kravis et al [2].

For Japan (2), the rates of increase by Japan Economic Research Center [1] are used on the same basis for 1970.

Table 10

## Forecast of Industrial Structure by J.E.R.C.

(%)

	1965	1975	1985
1. Agriculture	6.8	3.2	2.0
2. Mining	.8	.6	.6
3. Food	8.2	5.6	5.0
4. Textiles	4.0	2.5	1.5
5. Pulp & paper	1.8	1.7	1.4
6. Chemicals	4.3	5.3	4.5
7. Primary metals	7.0	8.9	7.5
8. Metal products	2.1	2.6	3.1
9. Machineries	3.9	5.7	6.6
10. Electric machineries	3.4	6.2	8.2
11. Transport equipments	4.5	6.1	6.3
12. Other manufacturing	10.5	11.4	11.8
13. Construction	9.5	9.4	9.8
14. Electric power & gas	1.9	1.9	2.1
15. Trade	8.5	8.4	8.9
16. Real estate	2.8	2.4	2.7
17. Transport & Communication	5.3	5.6	5.9
18. Finance	2.9	2.6	2.3
19. Services	10.3	8.8	9.1
20. Unallocated	1.5	1.1	.7
Total	100.0	100.0	100.0