

THE RISE AND FALL
OF RIM-PAC COUNTRIES

----- a research by a long-term econometric
model of post-war RIM-PAC relations-----

by

Hiroshi Ohnishi

Faculty of Economics,
Kyoto University,
Kyoto, 606 JAPAN

THE RISE AND FALL
OF RIM-PAC COUNTRIES

----- a research by a long-term econometric
model of post-war RIM-PAC relations-----

by
Hiroshi Ohnishi

The Outline of the Model

If we want to talk about post-war RIM-PAC countries, we can't neglect the rise and fall of great powers: that is the long-term declining of US power and the rapid growth of Japanese economy. And recently we're being surprised at the development of East Asian market. So, from the bird's eyes view, we can say that in the long run super-powers can't remain their high economic position and the growth rates of developing economies are higher than advanced countries.

To show such a historical law -- rise and fall of the different stage economies, I think we must analyse the positive factors of economic growth and the negative for each RIM-PAC country. We can assume the higher stages the economies reach at, the greater the negative factors become.

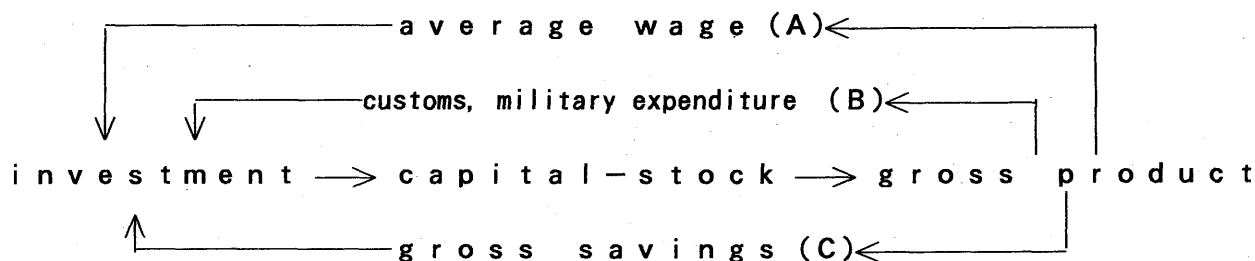
In my opinion, these negative factors are two, while there is one positive factor. Those are following:

- (A) Higher wages caused by economic growth make domestic firms to move their capital to foreign countries in pursuit of lower wages. This is a trend of capital movement from advanced countries to developing countries, and the most important cause of rise and fall of different stage economies.
- (B) Too much military expenditure and too much dependence on protective policies that can be done by strong political power against foreign countries prevent the countries' effort to invest or to

rationalize of productive process. For example, because US could put much influence on other countries' policies by his own military superpower, still now he can't avoid the tendency to increase military expenditure and use "power-politics" in the diplomatic world in the interest of American businesses. Such military holding is in the short run very effective and beneficial for them, but in the long run decreases the national fund for investment and at last lowers its growth rate.

(C) Though above two are negative, higher savings caused by great economic power are the origin of its capital formation. Of course, this factor is positive.

These three causalities may be shown by the following figure and the detailed flow-chart is in the APPENDIX II of this paper.



To investigate these three factors analytically, we built up a long-term econometric model of post-war RIM-PAC relationships (named JAUL-model, which equations are listed in APPENDIX I). And for the special purpose of investigation the model must have the following characters.

- (i) We must include at least several countries that exist at the different stages-of-growth. So, our model has three sectors: US, Japan and 'ASEAN'. And the datum of 'ASEAN' are made by summing up three countries: Philippine, Thailand and Indonesia. Malaysia was excluded because of the difficulties of getting its historial datum. Other East Asian countries will be included in the next stage of our research.
- (ii) Our model must cover the long-term, because the 'rise and fall' needs long periods. So, the estimating and simulating period has been set from 1952 to 1990. And if include the forecasting period, the total period is from 1952 to 2010, that is over one half century.
- (iii) The international interaction such as capital movement should be incorporated in the model explicitly. (the above factor(A))
- (iv) Especially some of such interactions are expected to be political, for example military pressure and protective policies. (the above factor(B))
- (v) To show that these rise-and-falls are historically inevitable, such paths made by the model may be autonomous. If so, the number of the exogenous variable of the model must be limited. In our case only seven besides one unimportant dummy variable.

Effects of Supply and Demand Shocks

- (1) First, I estimated the long path of the effects of the temporary one billion dollars decrease of savings and increase of consumption in

1952 in Japan. This simulation is very important because the decrease of consumption at the same time, and by the estimation we can compare the effects of the former with the latter. So as to Japanese economy, the initial effects caused by the increase of consumption but in the long run supply side negative effects caused by the decrease of savings let its GDP be smaller, shown as Fig.1-1. It is very interesting that the long path shows the waves, whose periodical looks like 5 years or 10 years.

Fig.1-1 can clear one more important fact, that Japanese negative effects cause negative effects in 'ASEAN' and US. We guess these are because wage-cut in Japan prevents the capital movement from Japan to 'ASEAN' and US. So, We can't underestimate the effects of capital movements in RIM-PAC area, and in this sense we can say these countries have positive interdependence. Though by the demand-side export-import analyses some economists say international economy is zero-sum game, by the supply-side capital-movement analyses we can say plus-sum game.

On the other hand, Fig.1-2 and 1-3 show the effects if the decrease of savings happen in 'ASEAN' or US. In these figures, we can see almost same paths. If I add some comments on these figures, the effects of Japanese decrease of savings are greater than the others. I think this is because of high sensitivity of Japanese economic structure and its character of supply-initiated growth rather than demand-initiated.

One more comment of mine is on Fig.1-2. This figure shows the effects on US are greater than on 'ASEAN', though the direct impact in

Fig.1-1

EFFECTS 1 bn \$ DECREASE OF JPN'S
SAVINGS IN 1952 (bn \$)

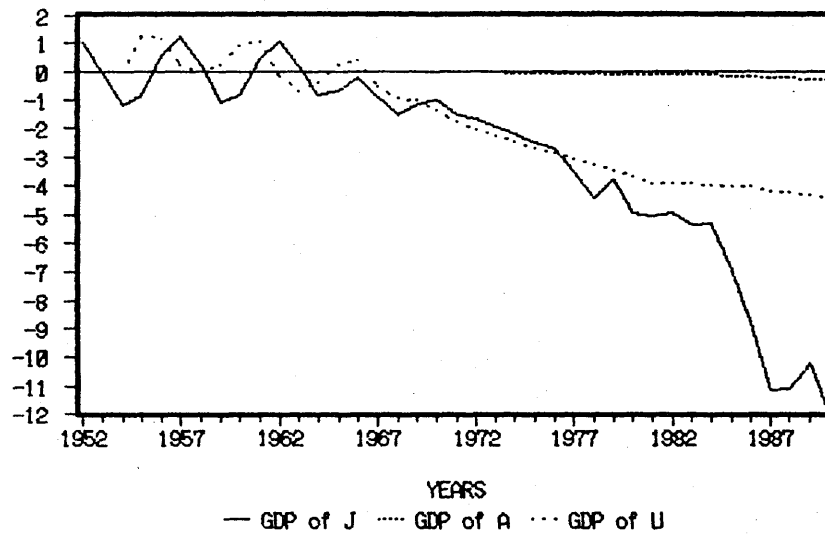


Fig.1-2

EFFECTS OF 1 bn \$ DECREASE OF ASEAN'S
SAVINGS IN 1952 (bn \$)

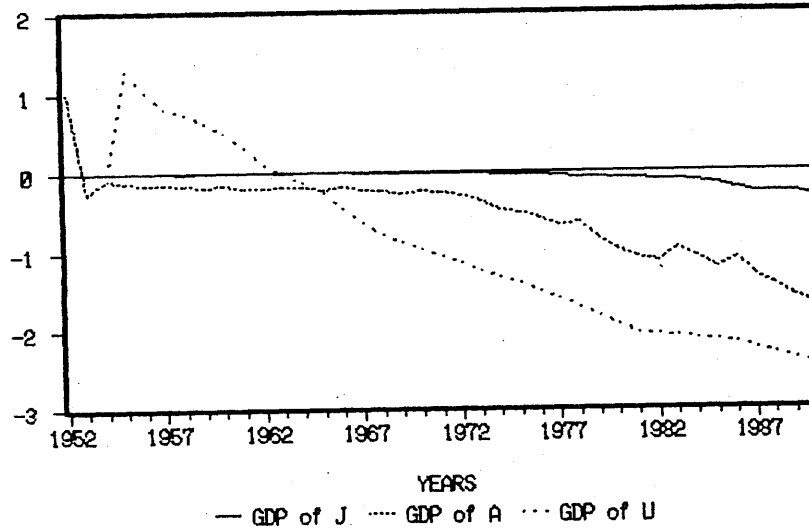
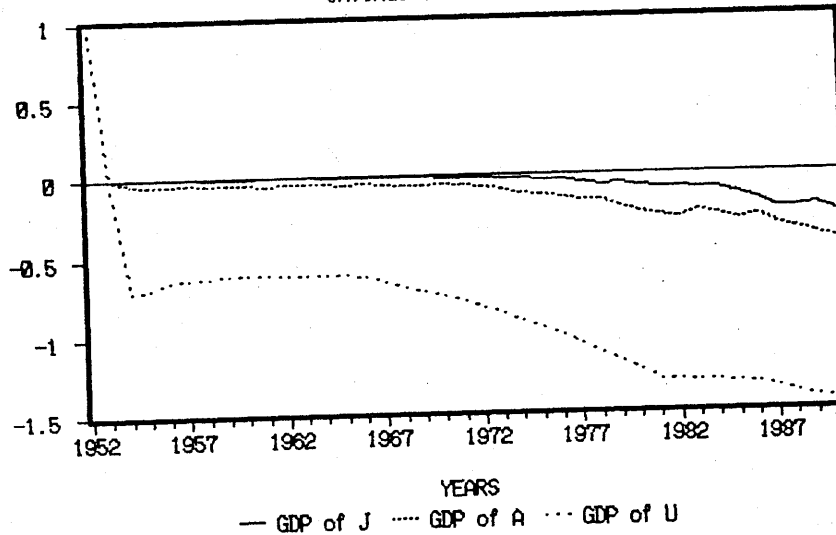


Fig.1-3

EFFECTS OF 1 bn \$ DECREASE OF US'S
SAVINGS IN 1952 (bn \$)



1952 is on 'ASEAN'. This means that US's overdependence on other countries' economy. In older days many economists said US's cold cause Japanese pneumonia. But to some extent we must exchange the subject of this sentence for the object. Anyway we can explain why US helped other countries economy after WWII by some aids like as Marshall-plan. Of course, as such interdependence can be found out between Japan and other countries, Japanese foreign aid policies espeically including recent international policy cooperation can be explained in the same way.

(2)The second type of simulation is to investigate the effects of 1 billion dollars increses of GDPs mean only the increses of demand because this changes are done with no change of suply-side (capital stock K and population N). Fig.2-1, 2-2 and 2-3 show the effects if these increses happened in 1952.

All these figuers show the absolute value of the effects on US are greater than on the others, showing US's dependence on the other economies. But about the sign of these effects, it is notable that US's initial positive effect of this impact turns to negative after the 2nd period. This is because the increase of US's wage level caused by the initial increase of US's GDP pushes its capital out of the country

Not negative but small effects on Japanese economy we can recognize in Fig.2-1, and we may guess the causality is similar to US's effects in Fig.2-3.

Fig.2-1

EFFECTS OF 1 bn \$ INCREASE OF JPN'S GDP
IN 1952 (bn \$)

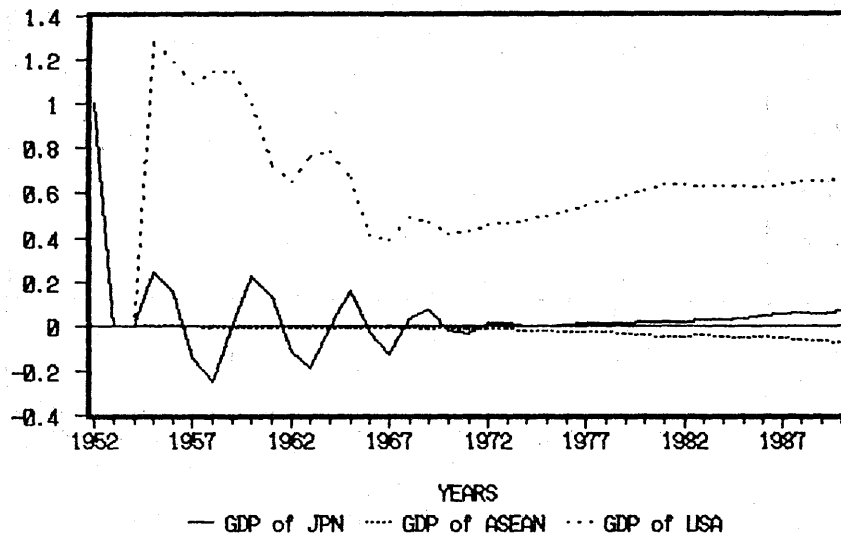


Fig.2-2

EFFECTS OF 1 bn \$ INCREASE OF ASEAN'S
GDP IN 1952 (bn \$)

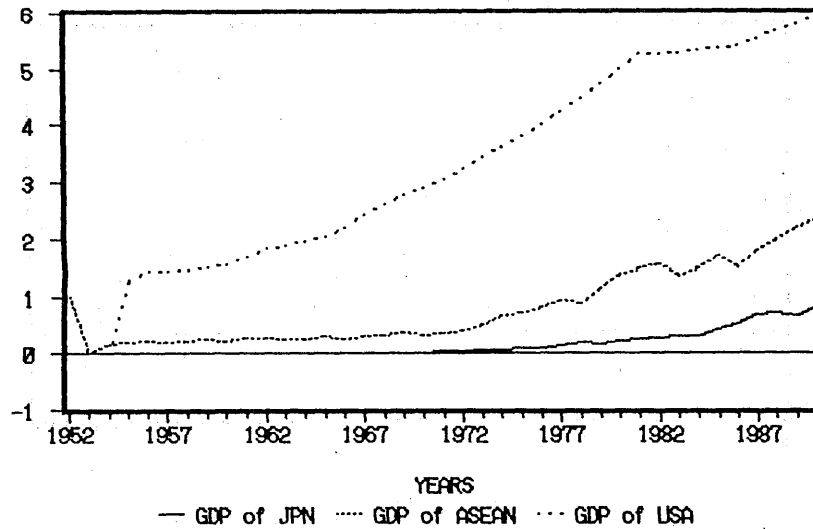


Fig.2-3

EFFECTS OF 1 bn \$ INCREASE OF US'S GDP
IN 1952 (bn \$)

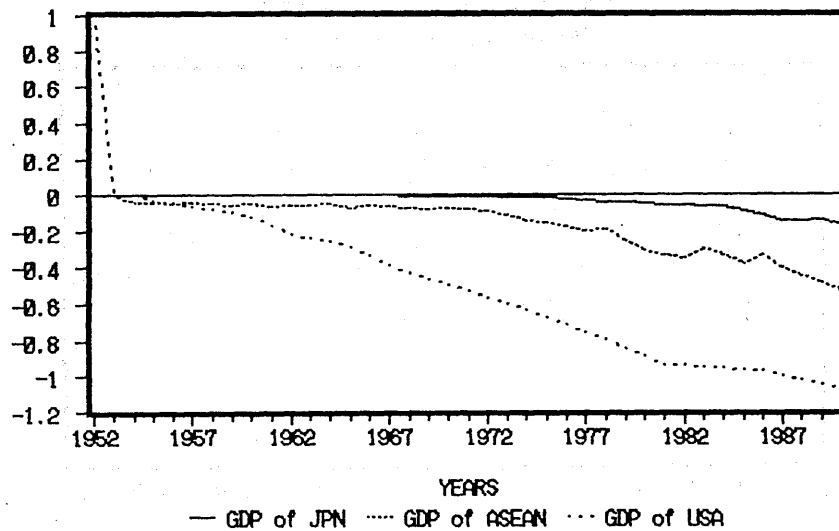


Fig.3-1

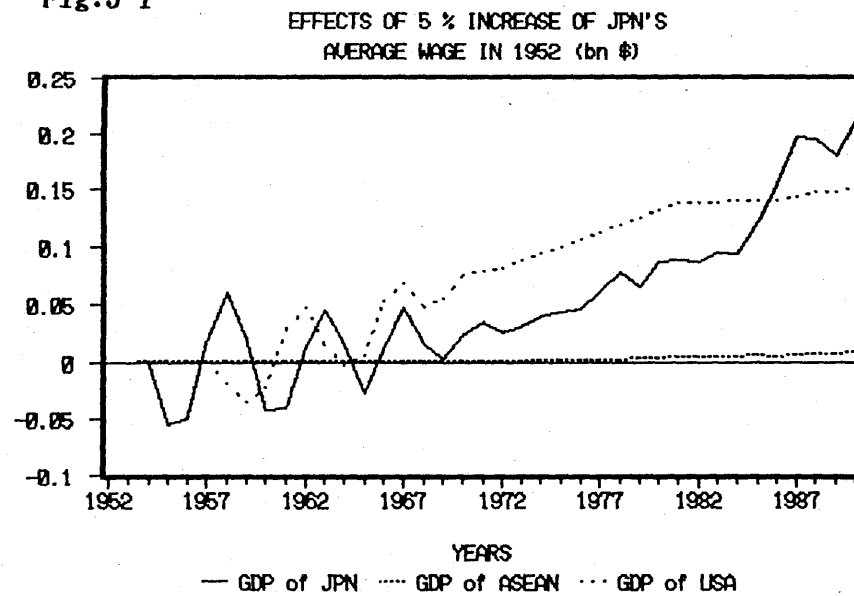


Fig.3-2

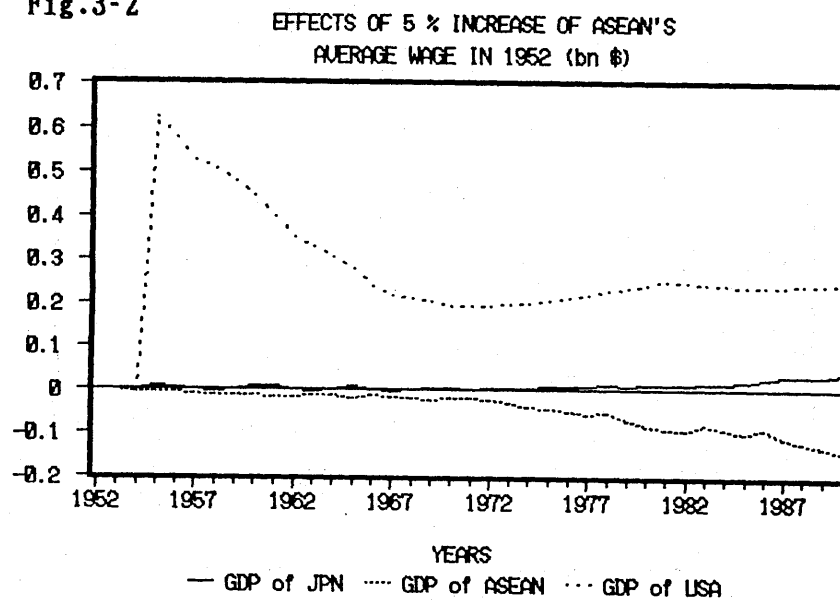
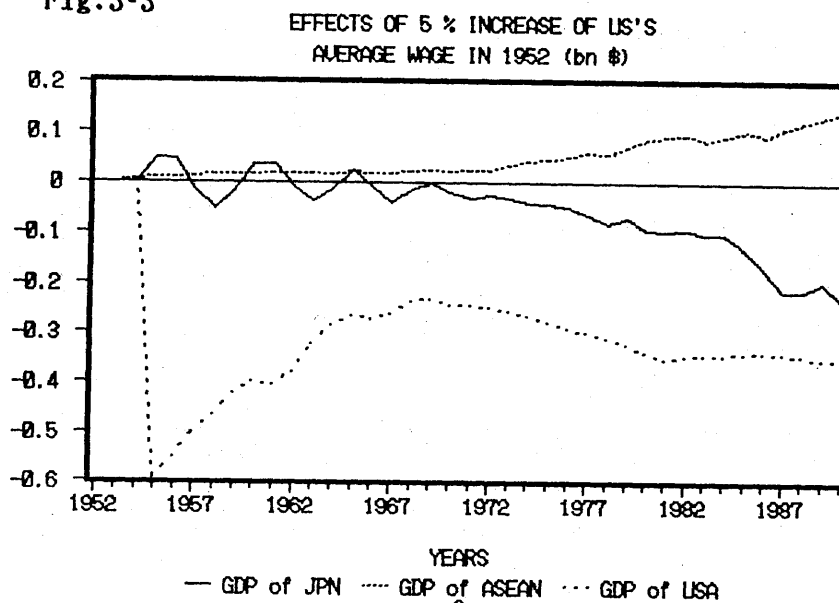


Fig.3-3



(3) Because we saw the importance of capital movement caused the increases of wage level, we must investigate the effects themselves by the change of wage level directly. Fig.3-1, 3-2 and 3-3 show the results by the simulations of 5 % impact increases of wage level of three economies in 1952.

The most notable point is that the economy that grows by its wage increase is only Japan although ordinary effects are negative like 'ASEAN' or US. So we can't neglect Japanese growing power.

The second notable is that in all the simulations the signs of effects on Japanese and US economy are same while the signs on 'ASEAN's economy differ from the others'. This means Japan and US coexist in one community of interests. These relationships we can see in all the other simulations.

Effects of International Politics

The above three types of simulations are about on the international effects but the effects caused by domestic policies. However we can investigate the effects caused by international policies. In this section we'll research the political-type international policies: they are military expenditures and custom duties.

(4) In our model military expenditures and custom duties have negative effects on their economies as they decrease capital investment through the causality(B) already mentioned at page 1 and 2.

But the negative causalities could be estimated at only 'ASEAN's

Fig.4-1

EFFECTS OF 1 bn \$ INCREASE OF ASEAN'S
MILITARY EXPENDITURE IN 1952 (bn \$)

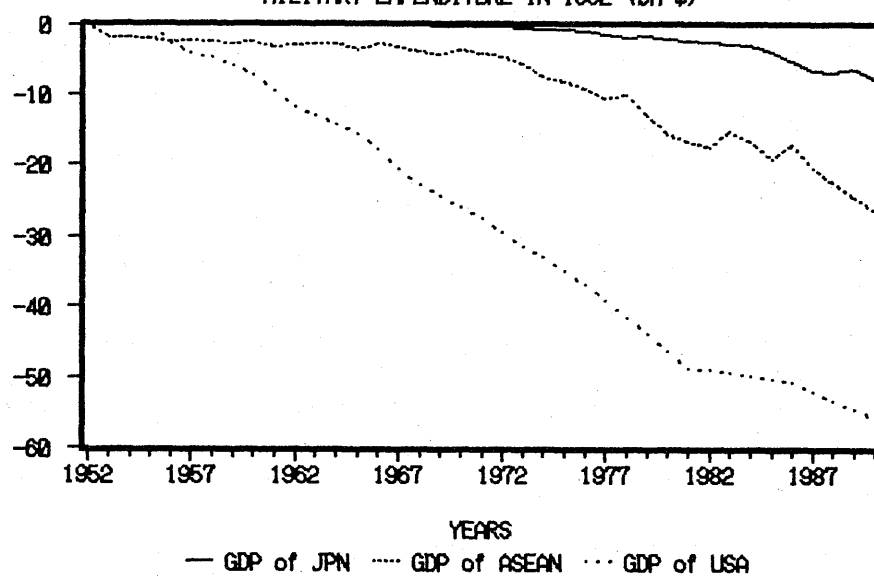
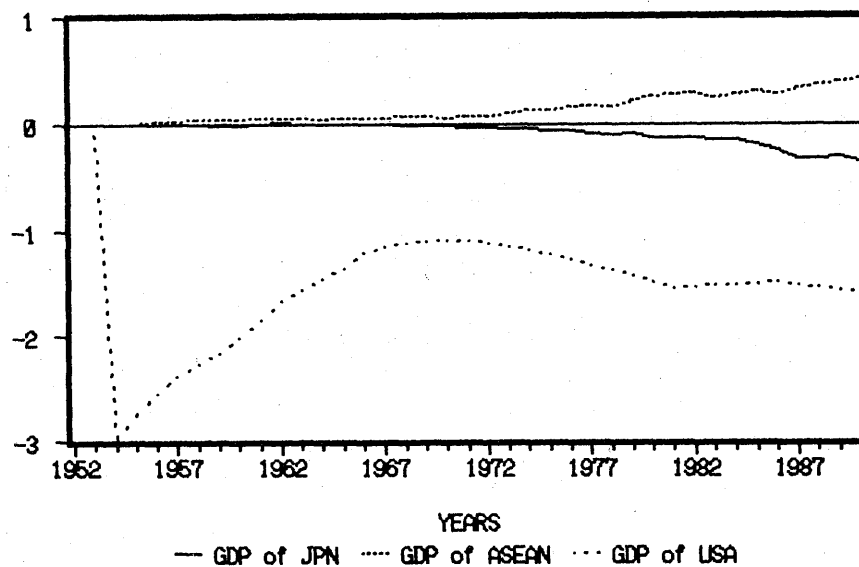


Fig.4-2

EFFECTS OF 1 bn \$ INCREASE OF US'S
MILITARY EXPENDITURE IN 1952 (bn \$)



and US's investment equations while the coefficient of military expenditure in Japanese investment function could not be estimated significantly.

Thus, we'll examine the effects of 1 billion dollars increase of military expenditure of 'ASEAN' (Fig.4-1) and of US (Fig.4-2). In both figures almost all effects are negative. So, we can say military expansions are not beneficial for the whole world. For example US's military expansion slowed down Japanese growth rate too as shown in Fig.4-2. Therefore we can't explain Japanese rapid growth as a result of the slowdown of US economy caused by greater burden of military expenditure. Rather than saying so, we must explain it as a result of the smaller waste such as military expenditure in Japan itself.

Additionally speaking, it also is interesting that in Fig.4-2 only 'ASEAN's economy gets positive effects while the others' negative. By this results, we may say 'ASEAN's economy is relatively independent on other economies, especially on US economy.

(5) Different from the former simulation, causalities related to the increase of custom duties could be estimated at only Japanese and 'ASEAN's investment equations while couldn't at US's. But almost all other characteristics are same as the simulations of military expenditure. Long-term effects of one hundred million dollars increase of Japanese and 'ASEAN's custom duties in 1952 are equally negative as shown in Fig.6-1 and 6-2.

Though actual effects of custom duties must include the effects of the decrease of imports (or favorable turn of balance of payment),

Fig.5-1

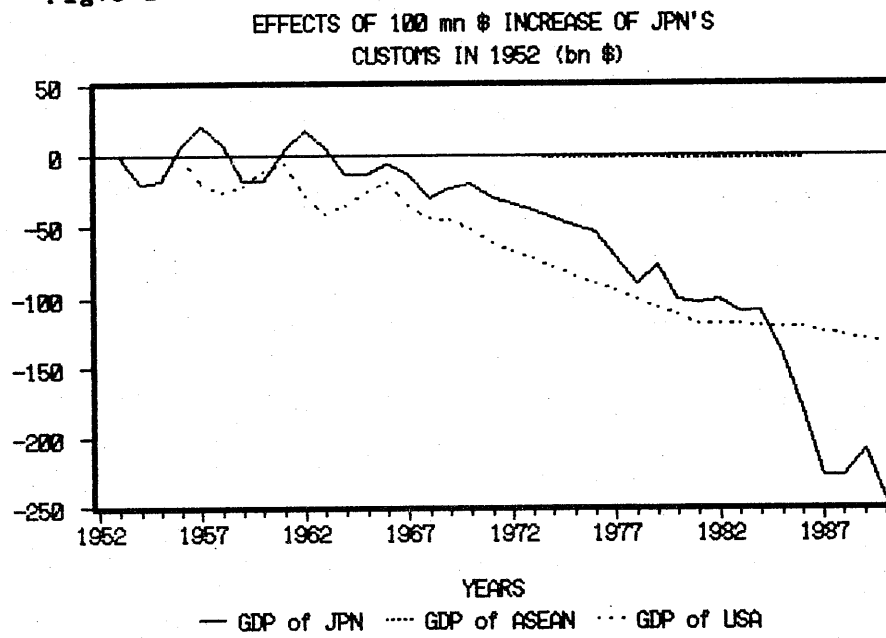
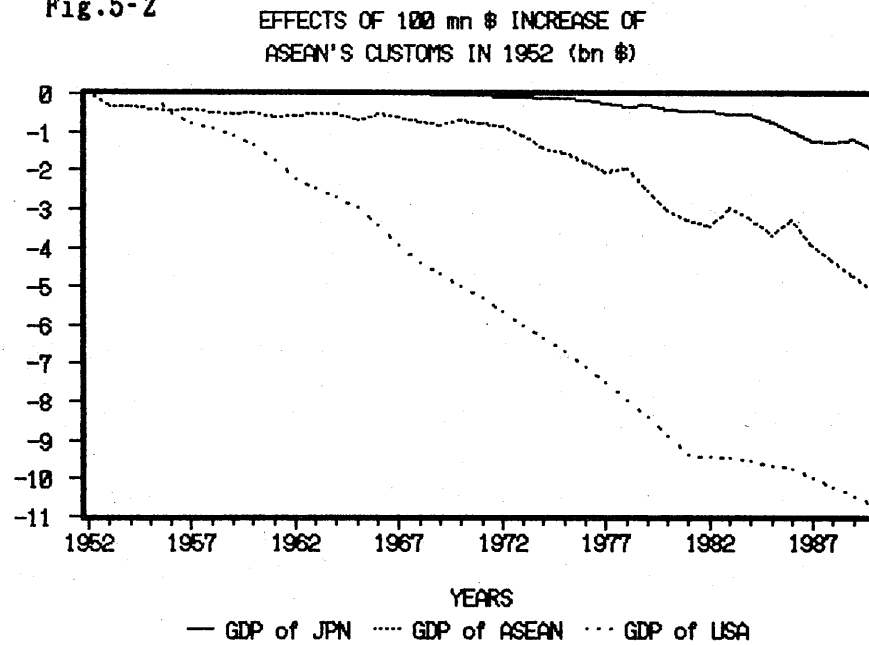


Fig.5-2



our simulation doesn't consider the latter effects because in our model how customs affect on imports are unknown. So, we must pay our attention to this point.

Effects of International Trades

(6) As the simulation(5) showed the necessity to investigate the efficiency of trade policies, we've measured the effects of 1 billion dollars increase of each economy's balance of payment in 1952 as shown in Fig.6-1, 6-2 and 6-3.

By the way, if balance of payment becomes better, total demand will become greater and investments will be stimulated by the reduction of custom duties that can be done under favorable trade conditions. So, we can regard these effects consist of demand-pull elements and supply-push(investment) elements. From this point of view, if we compare Fig.2 (simulation(2)) with Fig.6 (simulation(6)), we can find the similar paths in these three figures.

Of course, though above two side effects are initially positive, they are not necessarily positive in the long run. But in usual cases, we can guess when the signs of supply-side effects are plus (minus), the signs of demand-side plus (minus). Thus, we don't need to wonder why the absolute values of the effects in Fig.6-2 and 2-3 are negative and why the absolute values of the effects in Fig.6-2 and 6-3 are multiplied of them in Fig.2-2 and 2-3.

By the way, the effects of the favorable turn of Japanese trade conditions (shown in Fig.6-1) are completely same as the effects of

Fig.6-1

EFFECTS OF 1 bn \$ INCREASE OF JPN'S
BALANCE OF PAYMENT IN 1952 (bn \$)

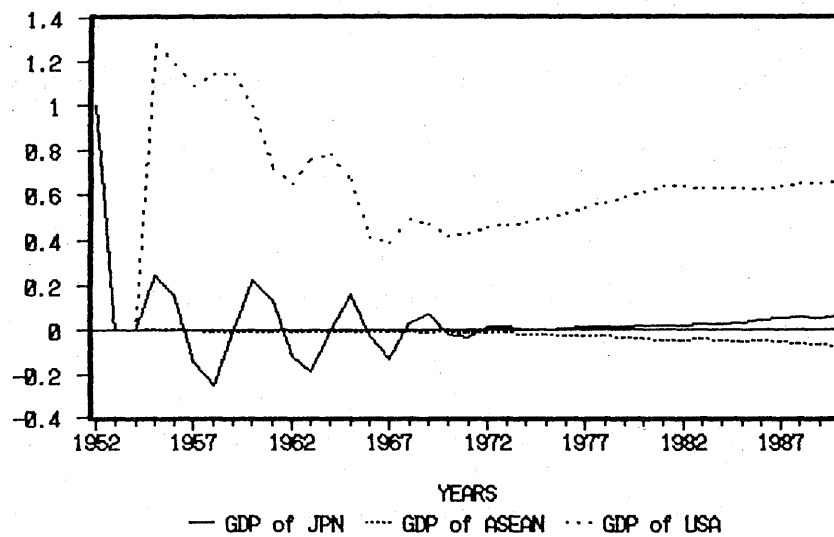


Fig.6-2

EFFECTS OF 1 bn \$ INCREASE OF ASEAN'S
BALANCE OF PAYMENT IN 1952 (bn \$)

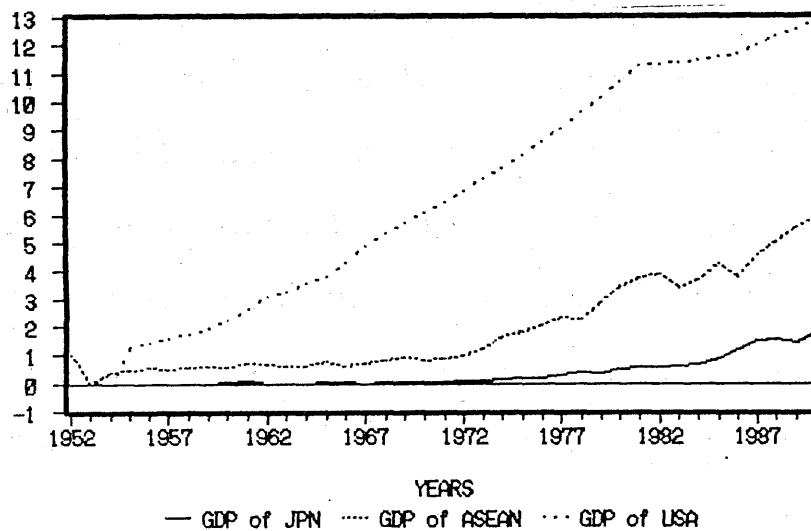
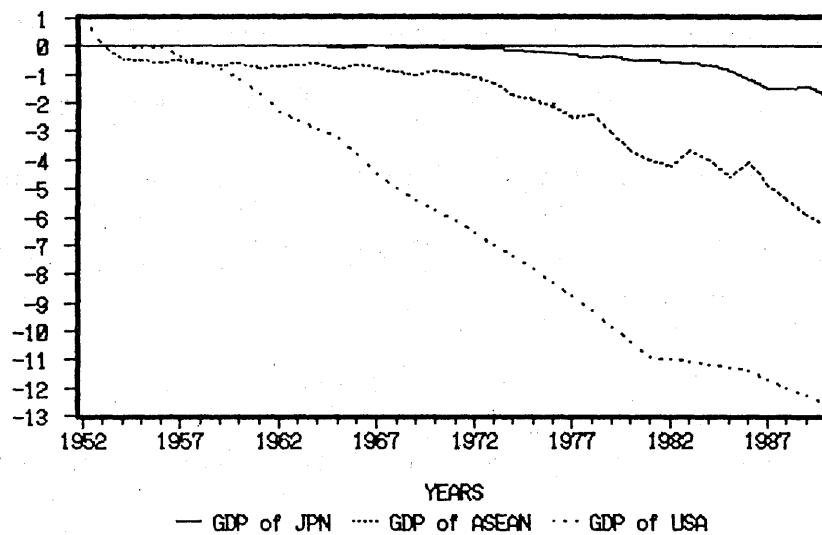


Fig.6-3

EFFECTS OF 1 bn \$ INCREASE OF US'S
BALANCE OF PAYMENT IN 1952 (bn \$)



the increase of Japanese GDP (shown in Fig.2-1). This is because the second type causality (balance of payment→custom duties→investment) doesn't exist until 1964. Check our custom duties equations of Japan (30) that are listed in the APPENDIX I of this paper.

Finally, by Fig.6-3, we can recognize the lack of US growth power again.

(7) By combining Fig.6-1 ,6-2 and 6-3, we can estimate the effects of additional exports of one country to the others. Fig.7-1, 7-2 and 7-3 show them of Japan to 'ASEAN', of Japan to US, and of 'ASEAN' to Japan respectively. By the Fig.6-3 we can say US's additional imports are beneficial for total RIM-PAC economies, so Fig.7-2 and 7-3 are showing positive effects.

On the other hand, Fig.7-1 shows the effects of additional exports of Japan to 'ASEAN' are negative. It comes from the difference of the effects between by the change of Japanese trade condition and by 'ASEAN's.

Consequently, by our simulations we've found the policies for the global interests may be additional exports of Japan to US: of 'ASEAN' to Japan. So, we can summarize the best order as 'ASEAN'→Japan→US. We can assume the order of activeness of these countries on the basis of this order.

Effects of International Immigrations

Already in above section we've studied the effects of the inter-

Fig.7-1

EFFECTS OF ADDITIONAL 1 bn \$ EXPORTS
OF JPN TO ASEAN IN 1952 (bn \$)

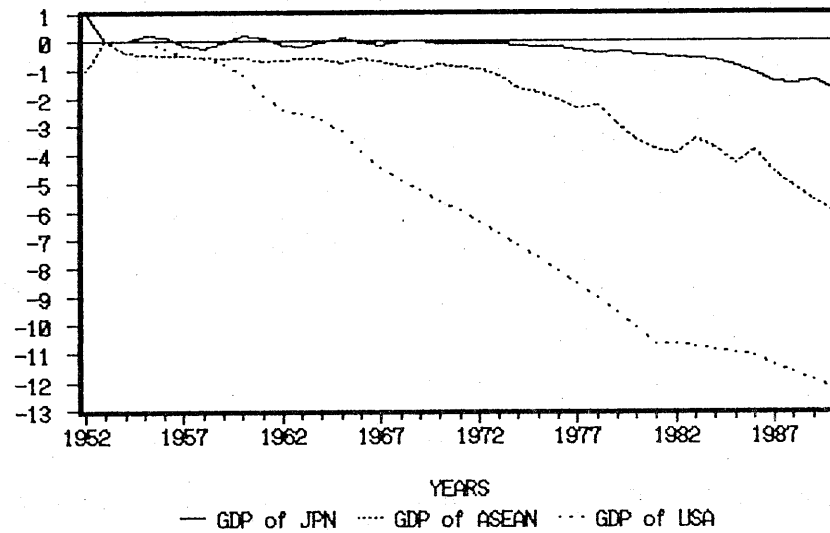


Fig.7-2

EFFECTS OF ADDITIONAL 1 bn \$ EXPORTS
OF JPN TO US IN 1952 (bn \$)

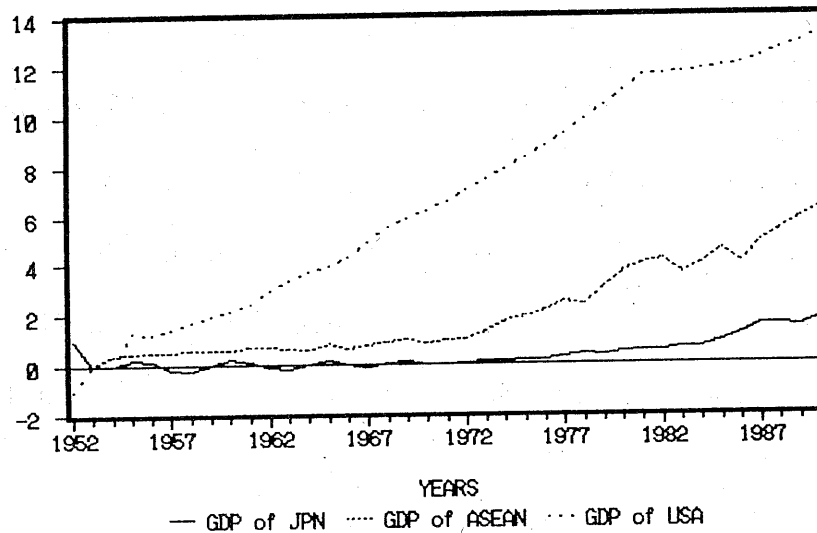
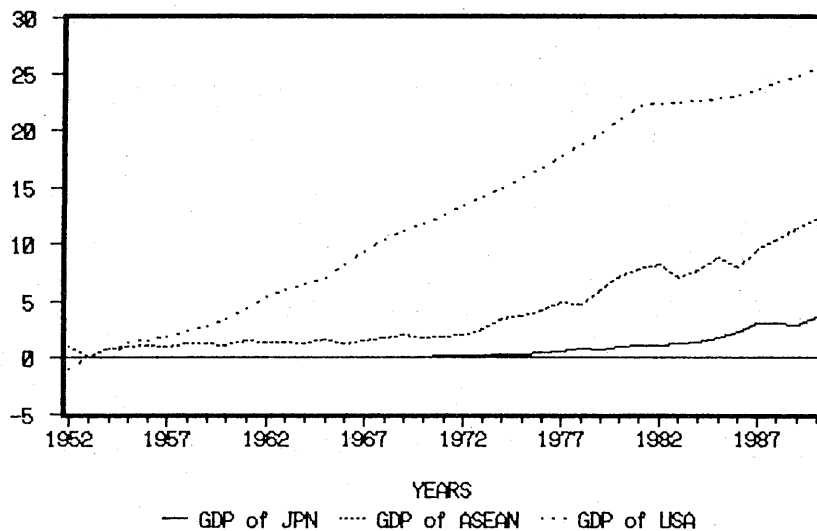


Fig.7-3

EFFECTS OF ADDITIONAL 1 bn \$ EXPORTS
OF ASEAN TO US IN 1952 (bn \$)



national movement of products. However, not only these products but also populations themselves can be moved from one country to another. This is the purpose that in this section we'll examine. For this purpose, first we'll estimate the effects of the increase of each country's population. Then, we'll calculate the effects of international immigrations.

(8) Fig. 8-1, 8-2 and 8-3 show the effects of one hundred thousand increase of each economy's population. And it is notable that only the increase of US's population has negative effects on 'ASEANS's GDP. We guess this is because the initial increase of US's total exports caused by the increase of US's GDP lowers 'ASEAN's gravity for US's total exporting. Thus, 'ASEAN' can raise custom ratio with smaller pressure by US but such dependence on political protection weakens the effort of 'ASEAN's investor in some cases. So, increase of US's population doesn't have positive effects on all the RIM-PAC countries necessarily.

The second characteristic is about the size of effects. The total effects on three RIM-PAC economies in 1990 are 6.16 billion dollars (effects of increase of Japanese population), 1.02 ('ASEAN') and 0.59 (US). So, we can recognize Japan as the most desirable country that must receive the immigration.

On the other hand, US is probably in saturation to accept more immigration. This estimate is consistent with the fact US is full of unemployed persons.

Fig.8-1

EFFECTS OF 100,000 INCREASE OF JPN'S
POPULATION (SUSTAINED CHANGE) (bn \$)

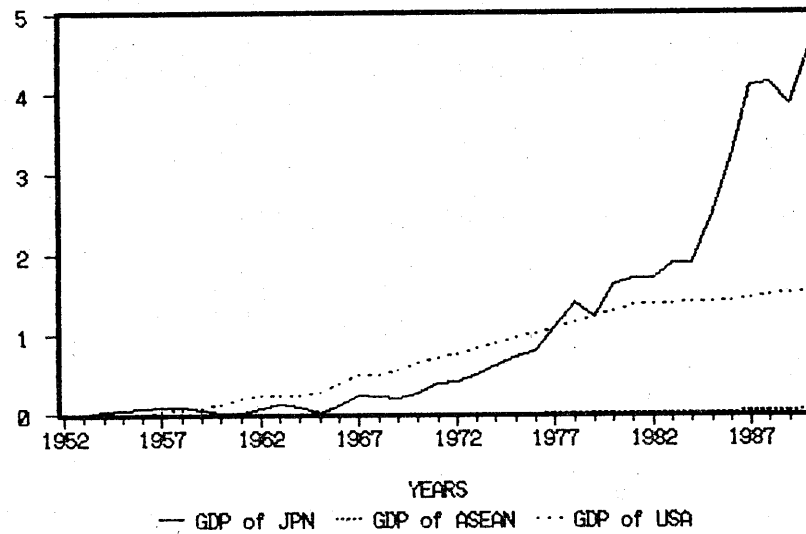


Fig.8-2

EFFECTS OF 100,000 INCREASE OF ASEAN'S
POPULATION (SUSTAINED CHANGE) (bn \$)

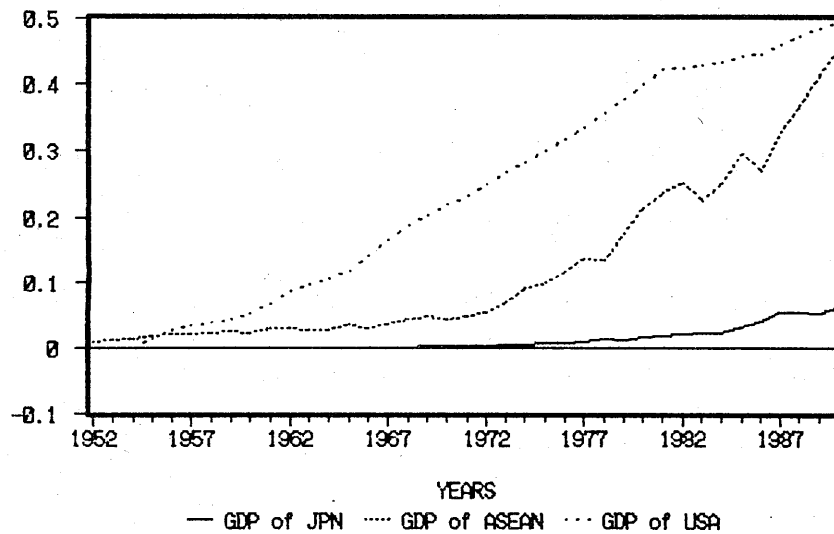
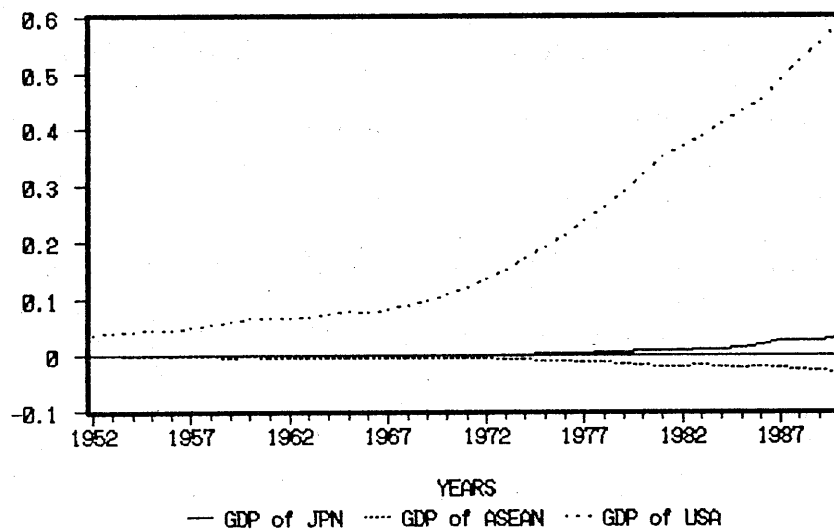


Fig.8-3

EFFECTS OF 100,000 INCREASE OF US'S
POPULATION (SUSTAINED CHANGE) (bn \$)



(9) Fig.9-1, 9-2 and 9-3 were made by combining Fig.8-1, 8-2 and 8-3. In these simulations we assumed that population tends to shift from lower wage countries to higher wage countries. So, we estimated the effects of one hundredthousand immigrations from 'ASEAN' to Japan (Fig.9-1), from 'ASEAN' to US (Fig.9-2) and from Japan to US (Fig.9-3). Though now Japanese wage level is higher than US, we assumed the third immigration from Japan to US because US wages were higher than Japanese at the early phases of this simulation period.

By the analyses of Fig.9-1 and 9-3, we can say that because Japan has the strongest growing power, the effects of the immigrations to Japan are positive while them from Japan negative. Especially it is notable that though US's population increases in Fig.9-3, US's GDP decreases. We can guess this is because the decreasing Japanese GDP pulls down US's GDP by way of international capital movement. Consequently, the desirable directions of immigration are to Japan from other countries.

On the other hand, Fig.9-2 shows the negative effects on 'ASEAN's economy because 'ASEAN's population decreases. Besides, it is interesting that the effects on US changed from positive to negative, and then from negative to positive. This is because of the change of which has the larger absolute value the negative effects of the decrease of 'ASEAN's population or the positive of the increase of US's. But of course because of the negative total effects on three economies, we can't recommend the immigration from 'ASEAN' (or Japan) to US. As US is full of unemployed persons, it has no more capacity to receive immigrations.

Fig.9-1

EFFECTS OF 100,000 IMMIGRATION
FROM ASEAN TO JPN (bn \$)

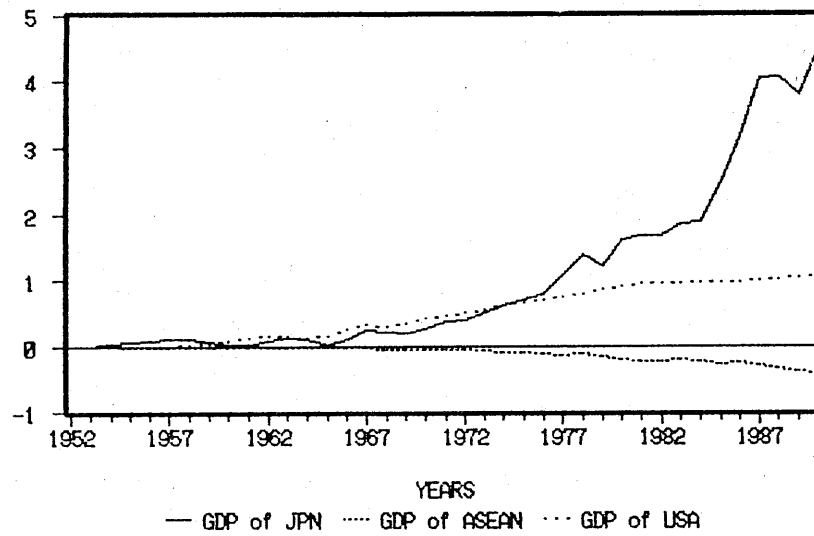


Fig.9-2

EFFECTS OF 100,000 IMMIGRATION
FROM ASEAN TO US (bn \$)

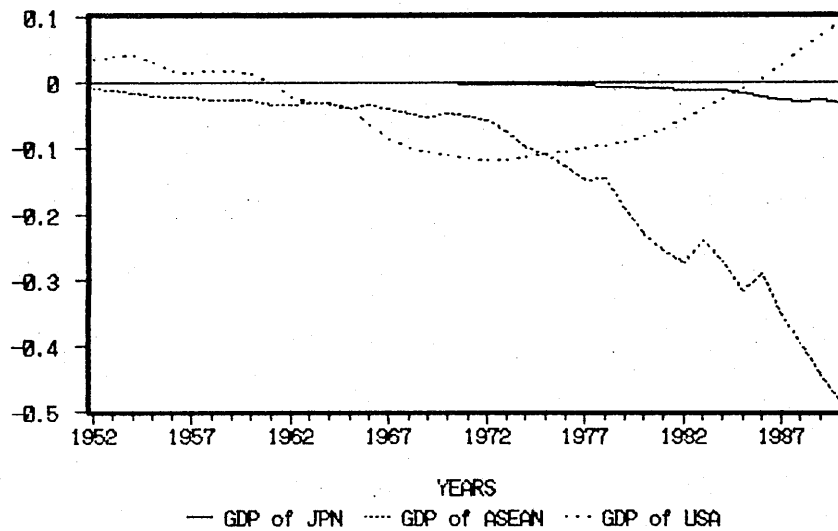
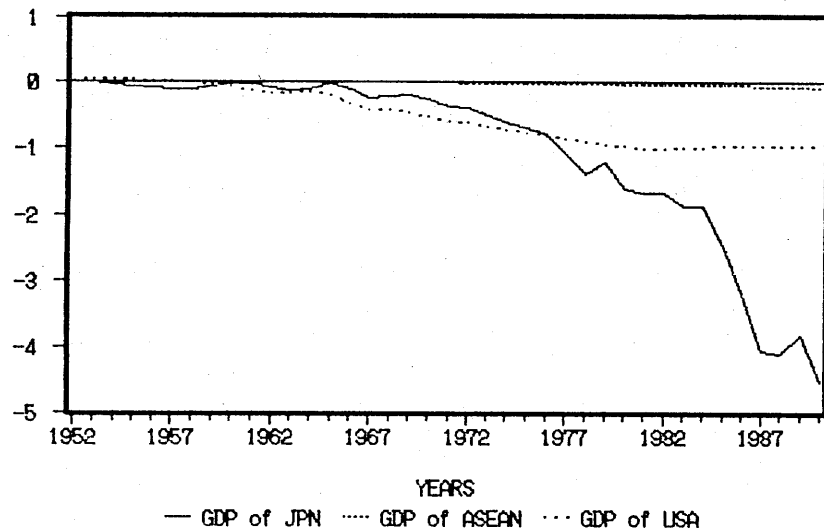


Fig.9-3

EFFECTS OF 100,000 IMMIGRATION
FROM JPN TO US (bn \$)



Forecasting the Future

Another interesting simulation test is for the forecast of the future of RIM-PAC area. How weak shall US economy in 2010 ? How strong Japan ? How ASEAN ? Our model can investigate such future situations.

According to our simulation test, the situations of these three sectors in 2010 are measured as shown in Table 1. By this table, we can expect the continuation of the boom in 'ASEAN' countries. Besides

Table 1 2010's situations of RIM-PAC countries

	GDP(bn \$)			GDP per capita(\$)		
	Japan	'ASEAN'	USA	Japan	'ASEAN'	USA
1991	3618	254	5673	29286	849	22450
2000	6614	639	8004	51237	1826	30072
2010	12079	1763	11084	91732	4457	39414
annual growth rate						
2000/1991	6.9	10.8	3.9(%)	6.4	8.9	3.3
2010/2000	6.2	10.7	3.3	6.0	9.3	2.7

Ratio of Trade Balance to GDP(%)

	Japan	'ASEAN'	USA
1991	1.8	-4.5	-1.2
2000	1.3	-3.5	-1.4
2010	1.0	-3.1	-1.6

, the ratio of GDP per capita between Japan and US will become 2.3 : 1.0 in 2010 while the ratio in 1991 was 1.3:1.0. This means the law of 'rise and fall' can't be stopped at least until 2010.

One more proof of American difficulties between 1991 and 2010 is shown in the 3rd section of this table. That is US's trade balance (ratio to GDP) will go from bad to worse, while 'ASEAN' balance to better. So as to Japanese trade balance, its excess of exports over imports will decrease.

The Rise and Fall with Forecasts

(10) By using the result of our forecast, we can calculate the long-term series of growth rate of three economies from 1951 to 2010 as shown in Fig.10-1. In the Fig.10-1, three long paths are showing the rise and fall of these economies. There are some characteristics as follows:

First: 70s (and partially 60s) was a high growth rate period for all the economies. I think it was one phase of medium-term economic cycle.

Second: The periodical of the longest cycle of 'rise and fall' of superpowers are one or two hundred years. So, we must see this figure from the longer perspective. From that we can recognize the long term declining of US and Japanese growth rates while rising of 'ASEAN's. By using OLS method, we've estimated growth rate equations as functions of time series only. The equations are:

Fig.10-1

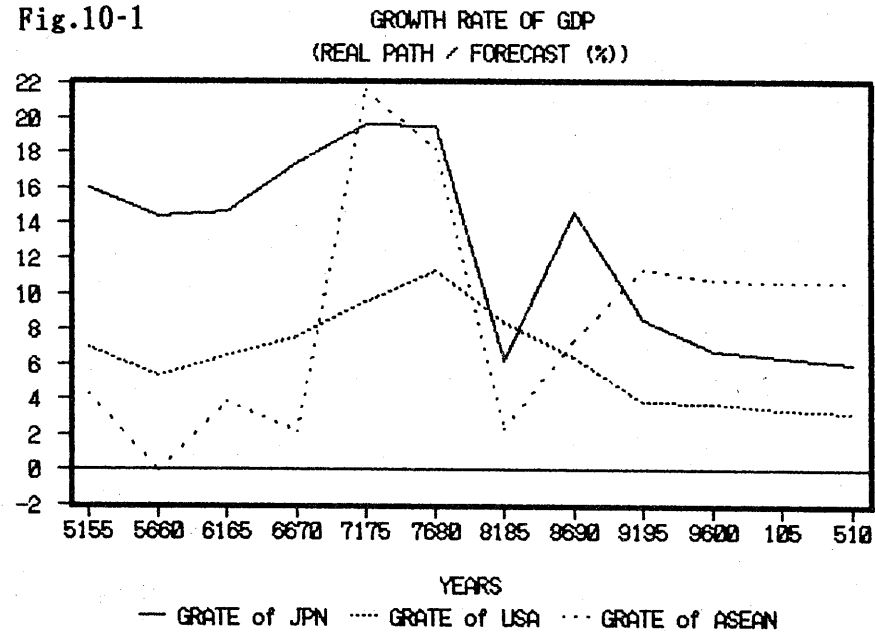
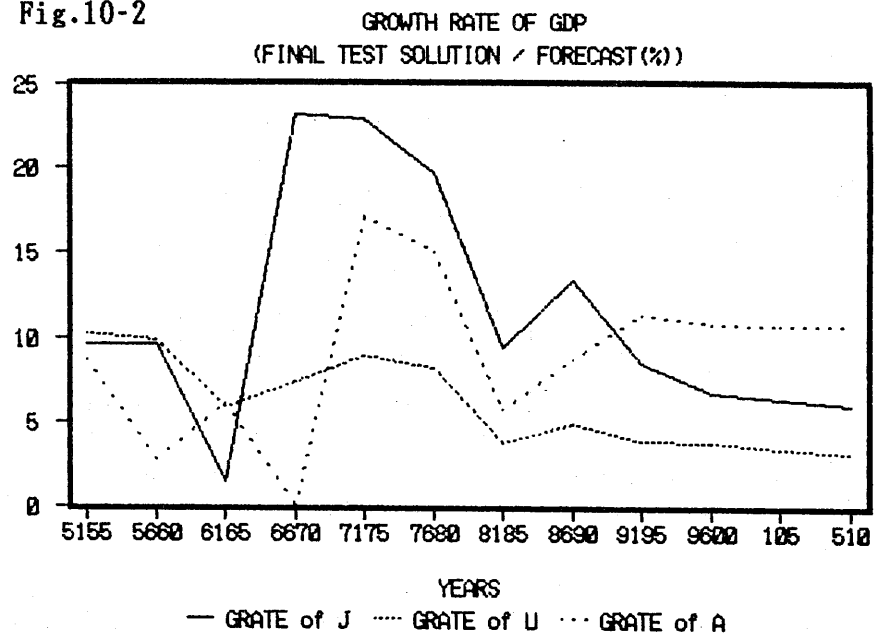


Fig.10-2



$$GR_j = 19.550 - 1.0829TIME$$

$$(8.2556) \quad (-3.3655)$$

$$R^2=0.5311, \quad DW=1.9735, \quad F(1,10)=11.33$$

$$GR_a = 3.9997 + 0.70941TIME$$

$$(1.0186) \quad (1.3297)$$

$$R^2=0.1502, \quad DW=1.7512, \quad F(1,10)=1.77$$

$$GR_u = 8.7940 - 0.37725 TIME$$

$$(6.2227) \quad (-1.9647)$$

$$R^2=0.2785, \quad DW=0.5702, \quad F(1,10)=3.86$$

Where GR: economic growth rates of each economy

TIME: when 1951-55 TIME = 1 , when 1956-60 TIME = 2

when 1961-65 TIME = 3, etc

So, we mustn't be stolen our eyes on only Japan-US relations, though many theorists are. The most important fact is that both US and Japan are declining and 'ASEAN' rising. Until 90's 'ASEAN's growth rate has surpassed Japanese.

The next notable point is that Japanese declining speed is faster than US's. If the speeds of two countries are constant, sooner or later we'll have to experience the second opposite surpass.

Fig.10-2 was drawn by using the datum of final test solutions and forecasts. Except for the earliest phase of Japanese growth path, not so different paths we can observe in this figure.

(11) We can describe such rise-and-falls by using the datum of custom ratios to GDP, because these ratios represent the economic competi-

Fig.11-1

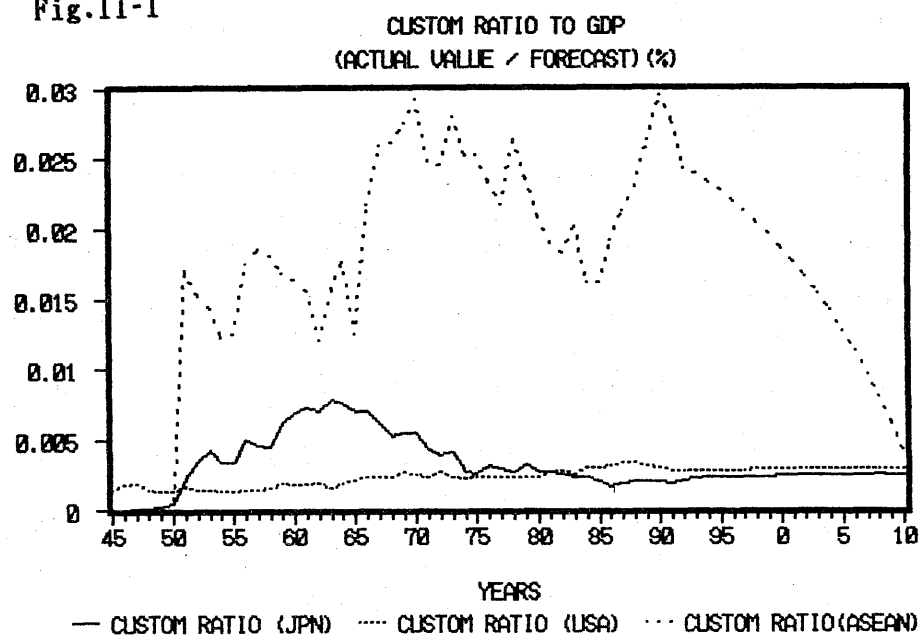
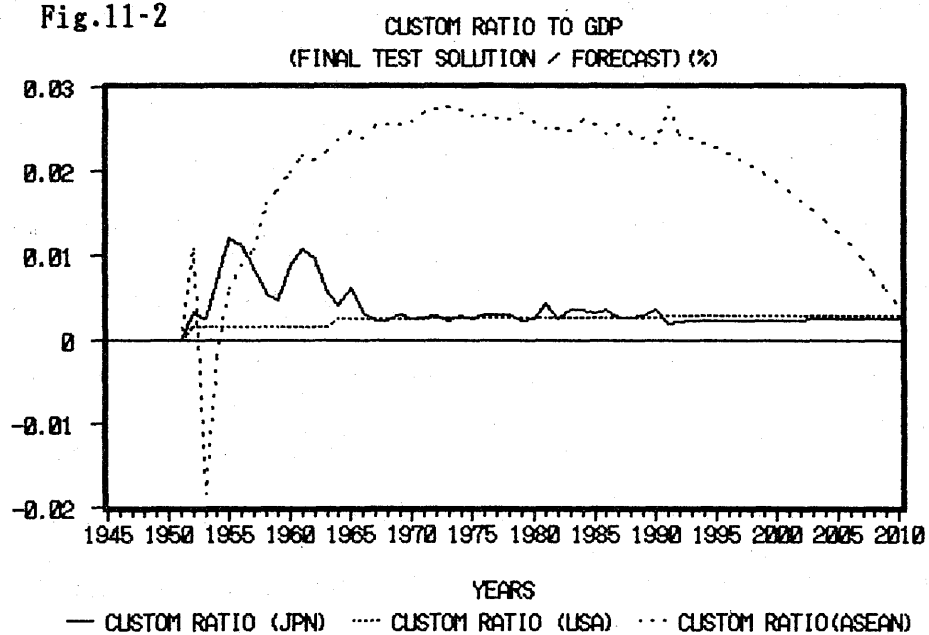


Fig.11-2



tiveness against foreign countries. Thus, by observing Fig.11-1 that also covers the forecasted period, for US economy we can say the period from 1945 to 2010 is in a declining stage because the ratio is constantly increasing.

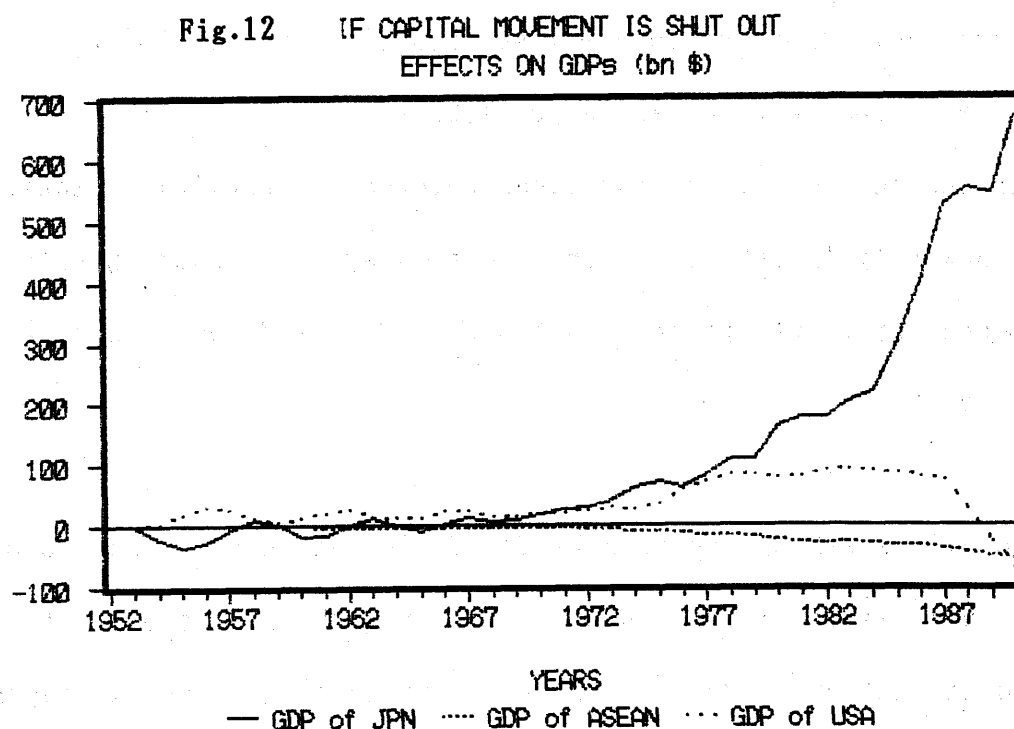
On the other hand, Japanese path shows increase in the early stage until the former half of 60's, and in the next decrease, but after the 2nd half of 80s increase like as US. So, we can say at least after the 2nd half of 80s Japan stays in the declining stage.

Finally, 'ASEAN's path rised until around 70s and after that declining when we neglect small waves. In this sence in 70s 'ASEAN' turned into the rising stage from its stagnant.

As same as Fig.10-2, Fig.11-2 was drawn by using the datum of final test solutions until 1990. Though some turning points are little different from Fig.10-2, we can observe almost same paths in Fig.12-2. As the final test solutions may be probably fundamental series without additive deviations, in one sence Fig.11-2 expresses more important paths rather than Fig.11-1.

(12) Though both US and Japan are in the declining stage, we must not neglect that each severity is significantly different because the period when Japan entered this stage wasn't so old like US. In other words, while a lot of weaknesses of US economy we've found out at the above simulations, Japanese weaknesses that we've known are only few. For example, US has been weak even in its growing power itself, while we can guess Japanese weaknesses comes from only the recent capital outflow.

We can identify this difference by Fig.12. This figure shows the effects on GDPs of each country when all the international capital movement is shut out. And the reason why Japanese path is positive is that by this 'shut out' Japanese capital remains inside the domestic territory. But so as to US, at 1989 the path turned to negative. So, already US economy has fallen into the dependence on other economies in this sence, and this is the most important difference from Japanese economy. To reach at this type of declining stage Japan may take several decades.



Conclusions

In this study, we have examined the rise and fall of RIM-PAC countries by using a long-term econometric model. Ending this paper let me rewrite some interesting conclusions. They are:

- (i) By incorporating international transactions both economic and political, our model can describe the rise and fall of RIM-PAC countries.
- (ii) The above simulation tests made it clear that three economies had much interdependence than it had been believed.
- (iii) While US economy doesn't have much vitality, in some cases Japan and other cases 'ASEAN' show their vitalities. We can guess the difference comes from the difference of stages-of-growth.
- (iv) The law of rise and fall will not be stopped at least until the early stage of the 21st century.
- (v) At around 2010 Japanese GDP will surpass US's and its GDP per capita will become twice as large as US's.
- (vi) After the second half of 80s Japan entered the declining stage. Thus, now only 'ASEAN' is in the rising stage. The most important difference of growth power is between 'ASEAN' and two advanced countries.

Additionally speaking, we've kept the following question not to be answered: what is the most consistent theory with this model. I think in the point that our model incorporates the factor(B), we can regard it as Paul Kennedy's model. But the person who laid stress on the factor(A) is V.I. Lenin as well as neoclassical theorists. Lenin said in the long run international movements are the most important matters and cause uneven development among capitalist countries. In this sense, our model can be called as Lenin-Kennedy model. We must consider the reality of the 'rise and fall' in the context of uneven de-

velopment of post-war RIM-PAC economy.

REFERENCE

P.Kennedy, The Rise and Fall of the Great Powers, Random House, NY, 1

987.

V.I.Lenin, Imperialism; the Last Stage of Capitalism, C.P. of Great
Britain, London, 1917.

APPENDIX I

THE EQUATIONS OF THE JAPAN-ASEAN-USA-LINK MODEL (JAUL-Model)

I. INVESTMENT-PRODUCTION BLOCK

(1) PRODUCTION (JAPAN)

$$\ln Y_j / N_j = -1.0314 + 0.89150 \ln K_j / N_j$$

(-10.455) (52.836)

$$\bar{R}^2 = 0.9862 \quad DW = 0.1024 \quad F(1, 38) = 2791 \quad (1952-91)$$

(2) PRODUCTION (ASEAN)

$$AR1 \quad \ln Y_a = -10.956 + 0.92622 \ln K_a + 0.86454 \ln N_a$$

(-3.6498) (12.648) (3.2683)

$$\bar{R}^2 = 0.9168 \quad DW = 1.5600 \quad F(2, 37) = 212 \quad (1951-90)$$

(3) PRODUCTION (USA)

$$AR1 \quad \ln Y_u / N_u = -0.60006 + 0.84533 \ln K_u / N_u$$

(-3.8460) (30.295)

$$\bar{R}^2 = 0.9918 \quad DW = 1.9055 \quad F(1, 44) = 5279 \quad (1946-91)$$

(4) POPULATION (JAPAN)

$$N_j = N_j$$

(5) POPULATION (ASEAN)

$$N_a = N_a$$

(6) POPULATION (USA)

$$N_u = N_u$$

(7) CAPITAL FORMATION (JAPAN)

$$I_j = 256.76 + 1.7431(S_j + BC_j)_{-1} - 26.967R_j - 7525.3(CD_j/Y_j)_{-1}$$

(2.6358)(19.865) (-2.4635) (-1.2210)

$$\bar{R}^2 = 0.9688 \quad DW = 2.0003 \quad F(3, 36) = 404.6 \quad (1952-91)$$

(8) CAPITAL FORMATION (ASEAN)

$$I_a = 5.0400 + 0.84970(S_a + BC_a) - 73.692ME_a/Y_a - 143.88CD_a/Y_a$$

(2.3487)(67.618) (-1.8410) (-2.1047)

$$\bar{R}^2 = 0.9924 \quad DW = 1.7693 \quad F(3, 36) = 1705 \quad (1951-90)$$

(9) CAPITAL FORMATION (USA)

$$AR1 \quad I_u = 98.00 + 0.57872(S_u + BC_u)_{-1} - 895.19(ME_u/Y_u)_{-1}$$

(2.6197)(19.063) (-2.2049)

$$\bar{R}^2 = 0.9279 \quad DW = 1.8817 \quad F(2, 37) = 252 \quad (1952-91)$$

(10) CAPITAL STOCK (JAPAN)

$$K_j = (1 - D_j) K_{j-1} + I_{j-1}$$

(11) CAPITAL STOCK (ASEAN)

$$K_a = (1 - D_a) K_{a-1} + I_{a-1}$$

(12) CAPITAL STOCK (USA)

$$K_u = (1 - D_u) K_{u-1} + I_{u-1}$$

II. DISTRIBUTION BLOCK

(13) DOMESTIC SAVINGS (JAPAN)

$$S_j = 4.9699 + 0.21132 Y_{j-1}$$

$$(0.7984) (38.727)$$

$$\bar{R}^2 = 0.9746 \quad DW = 1.4991 \quad F(1, 38) = 1500 \quad (1952-91)$$

(14) DOMESTIC SAVINGS (ASEAN)

$$AR1 \quad S_a = -2.9983 + 0.31029 Y_{a-1}$$

$$(-1.8037) (17.232)$$

$$\bar{R}^2 = 0.8823 \quad DW = 1.8289 \quad F(1, 38) = 286 \quad (1952-90)$$

(15) DOMESTIC SAVINGS (USA)

$$AR1 \quad S_u = 37.419 + 0.15942 Y_{u-1}$$

$$(1.0610) (13.943)$$

$$\bar{R}^2 = 0.7793 \quad DW = 2.0034 \quad F(1, 38) = 137 \quad (1952-91)$$

(16) WAGE LEVEL (JAPAN)

$$W_j = 116350 (Y_j / N_j)_{-1}$$

$$(40.927)$$

$$\bar{R}^2 = 0.9639 \quad DW = 1.3038 \quad (1952-91)$$

(17) WAGE LEVEL (ASEAN)

$$W_a = 0.98278 + 3449.3 (Y_a / N_a)_{-1}$$

$$(3.4597) (5.2292)$$

$$\bar{R}^2 = 0.4398 \quad DW = 2.1197 \quad F(1, 38) = 31.2 \quad (1952-91)$$

(18) WAGE LEVEL (USA)

$$W_u = 62.852 + 166795 (Y_u / N_u)_{-1}$$

$$(2.3705) (12.822)$$

$$\bar{R}^2 = 0.6232 \quad DW = 1.7811 \quad F(1, 38) = 50.22 \quad (1952-91)$$

III. INTERNATIONAL TRADE & CAPITAL MOVEMENT BLOCK

(19) BALANCE OF CAPITAL (JAPAN)

$$BC_j = -89.987 - 17.962 (W_j / (25 * W_a + 4 * W_u))_{-1} + 11.663 R_j$$

$$(-3.5237) (-2.5098) \quad (3.9260)$$

$$\bar{R}^2 = 0.6276 \quad DW = 0.6844 \quad F(2, 37) = 33.86 \quad (1952-91)$$

(20) BALANCE OF CAPITAL (ASEAN)

$$\ln BC_a = -6.6407 - 2.0862 \ln (25 * W_a / (4 * W_u + W_j))_{-1}$$

$$(-7.4165) (-7.8061)$$

$$\bar{R}^2 = 0.6313 \quad F(1, 34) = 60.94 \quad (1952-91)$$

(21) BALANCE OF CAPITAL (USA)

$$BC_u = 131.47 + 1212.5 (W_a / W_u)_{-1} - 19.047 R_j + 68.805 D_{8588}$$

$$(3.0857) (1.9499) \quad (-3.2149) \quad (3.9993)$$

$$\bar{R}^2 = 0.6765 \quad DW = 1.3441 \quad F(3, 36) = 28.19 \quad (1952-91)$$

(22) BALANCE OF TRADE (JAPAN)

$$AR1 \quad BP_j / Y_j = 0.07923 - 0.0000063748 (W_j / (Y_j / N_j))_{-1}$$

$$(3.9606) \quad (-4.1895)$$

$$\bar{R}^2 = 0.3013 \quad DW = 1.7184 \quad F(1, 38) = 17.80 \quad (1952-91)$$

(23) EXPORT (ASEAN)

$$EX_a = -2.7654 + 0.25360 Y_a$$

$$(-6.3326) (58.3647)$$

$$\bar{R}^2 = 0.9884 \quad DW = 0.9567 \quad F(1, 39) = 3406 \quad (1951-91)$$

(24) IMPORT (ASEAN)

$$AR1 \quad IM_a = -3.6148 + 0.28233 Y_a$$

$$(-1.1394) (12.3347)$$

$$\bar{R}^2 = 0.7717 \quad DW = 1.6267 \quad F(1, 39) = 136 \quad (1952-91)$$

(25) BALANCE OF TRADE (ASEAN)

$$BP_a = EX_a - IM_a$$

(26) EXPORT (USA)

$$AR1 \quad EX_u = -23.525 + 0.075101 Y_u$$

$$(-1.6026) (15.297)$$

$$\bar{R}^2 = 0.8330 \quad DW = 0.8119 \quad F(1, 39) = 200 \quad (1952-91)$$

(27) IMPORT (USA)

$$IM_u = -39.012 + 0.095126 Y_u$$

$$(-12.333) (75.303)$$

$$\bar{R}^2 = 0.9930 \quad DW = 0.6358 \quad F(1, 39) = 5671 \quad (1951-91)$$

(28) EXPORT FROM USA TO ASEAN

$$EX_{ua} = 28.864 Y_a$$

$$(44.228)$$

$$\bar{R}^2 = 0.9671 \quad DW = 1.0210 \quad (1952-91)$$

(29) BALANCE OF TRADE (USA)

$$BP_u = EX_u - IM_u$$

IV. INTERNATIONAL POLITICS BLOCK

(30) CUSTOM DUTIES (JAPAN)

$$CD_j / Y_j = -0.0019920 + 13.738 (K_j / N_j)$$

$$(-1.3878) \quad (4.7934)$$

$$\bar{R}^2 = 0.6283 \quad DW = 0.9141 \quad F(1, 12) = 22.98 \quad (1950-63)$$

$$CD_j / Y_j = 0.0040347 - 0.00051752(BP_j / BP_u)_{-1} - 0.080178 (BP_j / Y_j)_{-1}$$

$$(13.181) \quad (-1.2979) \quad (-3.9201)$$

$$\bar{R}^2 = 0.3374 \quad DW = 0.6636 \quad F(2, 25) = 7.87 \quad (1964-91)$$

(31) CUSTOM DUTIES (ASEAN)

$$CD_a / Y_a = 0.032131 - 0.0005133(EX_{ua} / EX_u)_{-1} - 0.078601 (BP_a / Y_a)_{-1}$$

$$(17.650) \quad (-6.5748) \quad (-3.4113)$$

$$\bar{R}^2 = 0.5497 \quad F(2, 37) = 24.80 \quad (1951-91)$$

(32) CUSTOM DUTIES (USA)

$$CD_u / Y_u = 0.00157 \quad (1952-63)$$

$$AR1 \quad CD_u / Y_u = 0.0019215 + 0.0098848(IM_u / Y_u)_{-1}$$

$$(6.5460) \quad (2.3299)$$

$$\bar{R}^2 = 0.2492 \quad DW = 2.0857 \quad F(1, 26) = 7.70 \quad (1964-91)$$

(33) MILITARY EXPENDITURE (JAPAN)

$$ME_j = 0.19700 + 0.0082885 Y_j_{-1}$$

$$(11.167) \quad (31.188)$$

$$\bar{R}^2 = 0.9828 \quad DW = 1.2273 \quad F(2, 16) = 973 \quad (1952-69)$$

$$AR1 \quad ME_j / Y_j = 0.0089413 + 0.00093547(Y_j / (Y_a + Y_u))_{-1}$$

$$(19.162) \quad (1.1720)$$

$$\bar{R}^2 = 0.8938 \quad DW = 2.1228 \quad F(1, 20) = 133.4 \quad (1970-91)$$

(34) MILITARY EXPENDITURE (ASEAN)

$$ME_a / Y_a = 0.92131(Y_a / (Y_j + Y_u))_{-1}$$

$$(25.587)$$

$$\bar{R}^2 = 0.3535 \quad DW = 1.1435 \quad (1952-91)$$

(35) MILITARY EXPENDITURE (USA)

$$AR1 \quad ME_u / Y_u = 0.045784 + 0.0054308(Y_u / (Y_j + Y_a))_{-1}$$

$$(10.517) \quad (8.2104)$$

$$\bar{R}^2 = 0.8335 \quad DW = 1.4380 \quad F(1, 38) = 194 \quad (1952-91)$$

* "AR1" : estimated by ML assumed 1st order serial correlation of the errors.

$\bar{R}^2$: coefficient of determination revised by D.F..

DW : durbin watson ratio

F (•) : F value

lnx : natural logarithm of x

THE LIST OF VARIABLES

	JAPAN	ASEAN	UNITED STATES
Population	N j	N a	N u
Gross National Product	Y j	Y a	Y u
Domestic Savings	S j	S a	S u
Gross Capital Formation	I j	I a	I u
Capital Stock	K j	K a	K u
Balance of Trade	B P j	B P a	B P u
Export		E X a	E X u
Export from U.A. to ASEAN			E X u a
Import		I M a	I M u
Balance of Capital Movement	B C j	B C a	B C u
Military Expenditure	M E j	M E a	M E u
Custom Duties	C D j	C D a	C D u
Average Depreciation Rate	D j	D a	D u
Interest Rate (%)	R j		R u
Average Wages (Industry)	W j	W a	W u

Dummy Variable (1985~88=1, others=0) D 8588

* unit; W j ~~yen~~[¥]/month
W a dollar/day
W u dollar/week
R j percent
N j, a, u thousand
D j, a, u no unit
Dummy Variable no unit
others billion dollars

APPENDIX II

FLOW CHART OF THE JAUL-MODEL

