

[共同研究：経済開発の理論と現実]

# On A Rapid Growth Of The Malaysian Economy : A Time-series Analysis (1970-1985)

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## I. Introduction

Malaysia experienced the fastest economic growth among ASEAN countries in the post war period, with a notable exception of the city state of Singapore. Our analysis attempts to identify factors which enabled such a rapid growth of the Malaysian national economy from 1970 to 1985. We are particularly interested in comprehending whether Malaysian export-led growth strategy and Japanese direct investment in Malaysia generated a positive impact upon Malaysia's economic growth. Analytically, our study focuses on trilateral relations between Japan, the United States, and Malaysia in the context of international trade and investment as well as of regional integration of ASEAN countries.

Our analysis covers an important historical period over which Japan established a strong presence in Malaysia while the U. S. global hegemony gradually declined. At the beginning of 1970s, the United States suffered from a growing trade deficit which ultimately led to the breakdown of the Bretton Woods system. From the late 1980s on, Japan dramatically expanded its overseas direct investment due to a large Japanese Yen appreciation against the U. S. dollar in the consequence of the Plaza agreement. Our target period for analysis signifies the evolutionary process of U. S. declining and Japan's rising.

Methodologically, our application of time-series analysis techniques demonstrates how to capture the dynamics of economic development by using a very limited number of variables of aggregate data. Our techniques serve as an exemplar for similar country/case studies. We have obtained annual data from Robert Summers and Alan Heston, "A New International Comparisons of Real Product and Prices: Estimates For 130 Countries (1950-85)", *Review of Income and Wealth*, 1988, No. 1 and No. 2. Our data set includes five variables of seven countries (Malaysia, Japan, the United States, the Philippines, Singapore, Thailand, and Indonesia): (1)exchange rate [XR], (2)real gross domestic product in 1980 international prices [GDP], (3)the percentage of domestic consumption of GDP [C%], (4)the percentage of domestic investment of GDP [I%], and (5)the percentage of government expenditure of GDP [G%]. Our approach does not use other variables such as Malaysia's "export" and "import" with Japan and the

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In order to build a reliable model, we attempt to maximize a total variance explained by such a model. In time-series analysis, random sampling is not a concern by definition. Autocorrelation is identified in terms of the size of *rho*, whereas multicollinearity among independent variables is detected by a cross correlation matrix. The statistical significance of these variables is judged in terms of the size of *t*-value, with the degree of freedom given. A series of similar models with or without one year lag, and with aggregate data in either percentile or real terms are tested.

Given our data set, we will rely on the below orthodox Keynesian macro-economic model<sup>1)</sup>. We have chosen this model because development is a process in which a large number of political, economic actors are engaged in strategic interaction. In such a world, it is not relevant to use empirical regularities among aggregate data as a base for model building, on the ground that the ordinary least square method of regression analysis over a large number of time-series variables cannot capture simultaneous co-determination among these variables; different models could take an identical form of regression equation. Therefore, analysts must not create a list of explanatory variables on the basis of their tuition and empirical regularities.

## II. The Supply Side

**Hypothesis 1:** If Malaysia's growth was generated by an export-led strategy, its domestic investment was primarily made in the export sector and the related infrastructure to facilitate such exports, whereas the domestic consumption and the government expenditure did not contribute to growth. The following model was tested with regard to the Malaysian economy:

$$\text{Growth} = b_0 + b_1 \cdot C\% + b_2 \cdot I\% + b_3 \cdot G\%$$

Cross Correlation Matrix

	(DV)	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>
(DV)	1.000	-.897	-.915	.771
b <sub>1</sub>		1.000	-.850	-.662
b <sub>2</sub>			1.000	.668
b <sub>3</sub>				1.000

The above findings indicate that there exists a high level of multicollinearity among the independent variables. We cannot effectively estimate the size of their

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1)  $GNP = C + I + G + (E - M)$   
 $GNP - (E - M) = C + I + G$   
 $GDP = C + I + G$   
 $\{GDP_{(t)} - GDP_{(t-1)}\} = \{C_{(t)} - C_{(t-1)}\} + \{I_{(t)} - I_{(t-1)}\} + \{G_{(t)} - G_{(t-1)}\}$   
 $\Delta \text{Growth} = \Delta C + \Delta I + \Delta G$   
 \*(t-1) signifies to use data with one year lag.

impact upon growth in terms of multivariate regression analysis. The following bivariate analyses were tested instead in order to identify a direction of the impact of explanatory variables and to compare their relative sizes :

Number One :  $\text{Growth} = b_0 + b_1 \cdot \Delta C\%$

$\rho = .33$ ,  $\text{RSQ} = .307$ ,  $b_1 = -60.49$ ,  $t\text{-value} = -2.398$

Number Two :  $\text{Growth} = b_0 + b_1 \cdot \Delta I\%$

$\rho = .37$ ,  $\text{RSQ} = .729$ ,  $b_1 = 35.80$ ,  $t\text{-value} = 5.912$

Number Three :  $\text{Growth} = b_0 + b_1 \cdot \Delta G\%$

$\rho = .12$ ,  $\text{RSQ} = .0635$ ,  $b_1 = -38.60$ ,  $t\text{-value} = -.939$

All of these three models have a very low level of  $\rho$ , or autocorrelation. These findings support Hypothesis I that domestic direct investment generated a large positive impact upon growth. Investment explained 73% of the total variance of growth and its impact has a high level of effectiveness ( $t\text{-value} = 5.91$ ) and efficiency ( $b_1 = 35.80$ ). Consumption has a weak negative association with growth ( $\text{RSQ} = .31$ ) with a high level of effectiveness ( $t\text{-value} = -2.398$ ) and efficiency ( $b_1 = -60.49$ ). Government expenditure produced little impact ( $\text{RSQ} = .064$ ). Based on these findings, we have identified that investment brought about growth, whereas consumption exerted a high detrimental effect and government expenditure virtually had no influence. In other words, it is concluded that Malaysia's growth over the target period was driven by an export-led strategy in which the private sector played a primary role.

**Hypothesis 2:** Malaysia relied on Japanese direct investment to sustain a growing level of its domestic investment. It is well-known that Malaysia itself did not possess a size of national capital accumulation for investment to generate a rapid growth rate. Given a low country-risk of Malaysia, Japanese investors are hypothesized to have responded to shifting exchange rates and to have relocated a part of their productive facilities to Malaysia. Such a corporate behavior was inevitable because the Yen was gradually appreciated against the dollar and, as a result, their exports from Japan became less competitive to developed countries, particularly to the United States. The following model was tested :

Malaysia  $I\% = b_0 + b_1 \cdot (100/\text{JAPAN XR})$

$\rho = .27$ ,  $\text{RSQ} = .538$ ,  $b_1 = 49.21$ ,  $t\text{-value} = 4.041$

These findings support our Hypothesis 2. The Japanese exchange rate variable explains 54% of the total variance of Malaysia's domestic investment with a high level of effectiveness ( $t\text{-value} = 4.401$ ). These figures mean that Japanese multinationals increased its direct investment as the Yen gradually became appreciated against the dollar.

**Hypothesis 3:** Japanese multinational corporations made intra-industry arrangements, or an international division of labor through their own corporate operations. Japanese investment in ASEAN countries needed to be coordinated in ways to enhance such a regional integration. Then, statistically, we first have to be able to observe that the Japanese exchange rate variable is significantly associated with domestic investment variables of ASEAN countries. Second, we also have to be able to find a large variance of Malaysia's domestic investment pattern explained by the domestic investment patterns of other ASEAN countries in which Japanese investors played a significant coordinating role. The following models were tested:

Number 1-1:

$$\begin{aligned} \Delta_{\text{PHILIPPINES}}I\% &= b_0 + b_1 \cdot (100/\Delta_{\text{JAPAN}}XR) \\ rho &= .37, RSQ = .729, b_1 = .0007, t\text{-value} = 5.909 \end{aligned}$$

Number 1-2:

$$\begin{aligned} \Delta_{\text{SINGAPORE}}I\% &= b_0 + b_1 \cdot (100/\Delta_{\text{JAPAN}}XR) \\ rho &= .00, RSQ = .027 \end{aligned}$$

Number 1-3:

$$\begin{aligned} \Delta_{\text{THAILAND}}I\% &= b_0 + b_1 \cdot (100/\Delta_{\text{JAPAN}}XR) \\ rho &= .00, RSQ = .001 \end{aligned}$$

Number 1-4:

$$\begin{aligned} \Delta_{\text{INDONESIA}}I\% &= b_0 + b_1 \cdot (100/\Delta_{\text{JAPAN}}XR) \\ rho &= .00, RSQ = .899, b_1 = .0008, t\text{-value} = 10.761 \end{aligned}$$

These findings indicate that Japanese multinationals invested in the Philippines and Indonesia in response to a large appreciation of the Yen over the target period. In both countries, the Japanese exchange rate variable possesses a very high level of effectiveness, while the explained variance is higher for Indonesia ( $RSQ = .899$ ) than for the Philippines ( $RSQ = .729$ ).

The following models were tested to see whether Japanese multinationals coordinated their investment in Malaysia with that in Indonesia and the Philippines respectively:

Number 2-1:

$$\begin{aligned} \Delta_{\text{MALAYSIA}}I\% &= b_0 + b_1 \cdot \Delta_{\text{PHILIPPINES}}I\% \\ rho &= .00, RSQ = .048 \end{aligned}$$

Number 2-2:

$$\begin{aligned} \Delta_{\text{MALAYSIA}}I\% &= b_0 + b_1 \cdot \Delta_{\text{INDONESIA}}I\% \\ rho &= .06, RSQ = .127 \end{aligned}$$

These findings show that there existed little coordination of Japanese direct investment behavior in the ASEAN region. Combined with our findings concerning Hypothesis 1, we can conclude that Malaysia's growth did not rely on effective demand generated by Japanese investment in the Philippines and Indonesia, and resulted

primarily from its own domestic investment, particularly Japanese direct investment.

Based on the above analyses, it is possible to conclude that Japanese multinationals developed bilateral economic ties respectively with Malaysia, the Philippines, and Indonesia. However, during our target period (1970-1985), Japanese multinationals did not integrate these three ASEAN developing economies through their intra-industry arrangements for an international division of labor. This interpretation coincides with our general knowledge that Japan used Indonesia primarily as one of the major sourcing sites for energy and natural resources to support the metropolitan manufacturing industries.

### III. The Demand Side

Our discussion so far has revealed the supply-side dynamics of the Malaysian economy; Japanese direct investment played a dominant role in generating Malaysia's growth. Now, we are turning into the demand side. In testing Hypothesis One, we could not use multivariate regression analysis, which included Malaysia's domestic consumption, investment and government expenditure as the independent variables, due to a high level of their multicollinearity. Although we relied upon three bivariate analyses, we still could not know whether or not exogenous variables, particularly international economic factors, influenced Malaysia's growth performance.

**Hypothesis 4:** The ASEAN region provided the major source of effective demand for Malaysia's growth. If this is the case, exports to the ASEAN region exerted positive trickling down effects upon Malaysia's growth, and we have to be able to observe a large variance of Malaysia's growth explained by these ASEAN factors. The following model was tested:

$$\Delta_{\text{MALAYSIA}}I\% = b_0 + b_1 \cdot \Delta_{\text{ASEAN}}C + b_2 \cdot \Delta_{\text{ASEAN}}I + b_3 \cdot \Delta_{\text{ASEAN}}G$$

where:

$$\begin{aligned} \text{ASEAN}C &= \text{PHILIPPINES}C\% \cdot \text{PHILIPPINES}GDP + \text{SINGAPORE}C\% \cdot \text{SINGAPORE}GDP \\ &\quad + \text{THAILAND}C\% \cdot \text{THAILAND}GDP + \text{INDONESIA}C\% \cdot \text{INDONESIA}GDP \\ \text{ASEAN}I &= \text{PHILIPPINES}I\% \cdot \text{PHILIPPINES}GDP + \text{SINGAPORE}I\% \cdot \text{PHILIPPINES}GDP \\ &\quad + \text{THAILAND}I\% \cdot \text{THAILAND}GDP + \text{INDONESIA}I\% \cdot \text{INDONESIA}GDP \\ \text{ASEAN}G &= \text{PHILIPPINES}G\% \cdot \text{PHILIPPINES}GDP + \text{SINGAPORE}G\% \cdot \text{SINGAPORE}GDP \\ &\quad + \text{THAILAND}G\% \cdot \text{THAILAND}GDP + \text{INDONESIA}G\% \cdot \text{INDONESIA}GDP \end{aligned}$$

#### Cross Correlation Matrix

	$b_1$	$b_2$	$b_3$
(DV)	.868	.794	.815
$b_1$		.871	.972
$b_2$			.944

We cannot use multivariate regression analysis due to a high level of multicollinearity.

linearity among the independent variables. Instead, the following three bivariate models were tested.

Number 1 :

$$\Delta_{\text{MALAYSIA}}\text{I}\% = b_0 + b_1 \cdot \Delta_{\text{ASEAN}}\text{C}$$

$$\rho = .00, \text{RSQ} = .631, b_1 = .00039, t\text{-value} = 4.710$$

Number 2 :

$$\Delta_{\text{MALAYSIA}}\text{I}\% = b_0 + b_1 \cdot \Delta_{\text{ASEAN}}\text{I}$$

$$\rho = .02, \text{RSQ} = .480, b_1 = .754, t\text{-value} = 3.463$$

Number 3 :

$$\Delta_{\text{MALAYSIA}}\text{I}\% = b_0 + b_1 \cdot \Delta_{\text{ASEAN}}\text{G}$$

$$\rho = .00, \text{RSQ} = .071, b_1 = -.00048, t\text{-value} = -.955$$

These findings demonstrate that a large portion of effective demand for the Malaysian economy was generated outside the ASEAN region. First, the sum of domestic consumption of the ASEAN region exerted a large influence over Malaysia's growth performance ( $\text{RSQ} = .631$ ;  $t\text{-value} = 4.710$ ), but without a meaningful impact ( $b_1 = .00039$ ). This finding is consistent with our general understanding that Malaysian exports consisted largely of low value-added consumer goods of the light industries over the target period (1970-1985) which did not function as an engine of growth.

Second, 48% of Malaysia's growth is accounted for by the sum of domestic investment of the four ASEAN countries with a high level of effectiveness ( $t\text{-value} = 3.463$ ) and efficiency ( $b_1 = .754$ ). These figures show that Malaysia's growth in part depended on a level of ASEAN-wide investment. It seems that the Malaysian economy produced necessary capital goods for the ASEAN region at an early industrialization stage. Yet, more than a half of the total variance remains unexplained.

Third, the government expenditure of the four ASEAN countries actually had no influence ( $\text{RSQ} = .071$ ) on Malaysia's growth, whereas the regression coefficient and the  $t\text{-value}$  have a minus value. These figures show that the four ASEAN governments did not procure Malaysian goods in order to facilitate their own industries in competing with Malaysian counterparts.

**Hypothesis 5:** The U. S. market was only the major export outlet for the ASEAN economies, while the Japanese market was closed. If this is the case, U. S. consumption has to be positively associated with Malaysian growth, while Japanese consumption is negatively so. The following two bivariate models were tested because the U. S. and Japanese economies were highly interdependent and so were their consumption patterns :

Number 1 :  $\Delta_{\text{MALAYSIAN}}\text{I}\% = b_0 + b_1 \cdot \Delta_{\text{US}}\text{C}$   
 $\rho = .00, \text{RSQ} = .105, b_1 = -1.02, t\text{-value} = -1.237$

Number 2 :  $\Delta_{\text{MALAYSIAN}}\text{I}\% = b_0 + b_1 \cdot \Delta_{\text{JAPANESE}}\text{C}$

$$rho = .00, RSQ = .064, b_1 = -.78, t\text{-value} = -.944$$

These findings are statistically insignificant. Two RSQ ratios are so small that these models cannot be reliable. These results were so calculated because Malaysian exports to the U. S. and Japanese markets occupied a very small proportion of the two countries' markets; the fluctuation patterns of Japanese and U. S. consumption as the percentage of their real GDP did not capture trickling-down effects of their consumption upon Malaysian growth. Unfortunately, without export and import data, our analysis on the demand side of the Malaysian economy is necessarily inconclusive.

## VI. Conclusion

Henceforth, our study has demonstrated heuristic utilities and their limits of time-series analysis, particularly in applying the techniques for development studies in which multicollinearity and autocorrelation are inherent impediments for statistical testing and impact measurement. We also have presented how to multiply implications in terms of a combined usage of bivariate regression analyses over a single variable.

Our analysis has explored factors on both supply and demand sides of the Malaysian economy which generated its rapid economic growth over the target period (1970-1985). A limited number of variables notwithstanding, our time-series analyses have identified that Japanese direct investment explained Malaysia's growth on the supply side. The supply-side analysis has focused on Japanese direct investment in Malaysia but did not deal with Japanese official development assistance as a major possible input to the Malaysian economy. Thus we cannot identify whether or not Japanese direct investment was the determinant; our combined usage of bivariate analyses, by definition, did not reveal an interaction effect of Japan ODA and investment.

Considering the identified patterns of Japanese investment in the ASEAN region, it has been found that Japanese multinationals built up Malaysia's bilateral economic relations with the Philippines and Indonesia over the target period (1970-1985). However, our study has shown that these ties did not yet develop into intra-industry arrangements by Japanese multinationals for an international division of labor, or economic integration of the ASEAN region. Our findings are consistent with a general understanding that, in our target period (1970-1985), Japanese multinationals used Malaysia as an off-shore site to produce parts and contents of manufacturing products whose destination was assembly facilities in Japan, and that they used Indonesia as a site for natural resources sourcing for their productive activities in Japan. But, given a drastic Yen appreciation since the middle of 1980s, it is highly questionable whether Japanese multinationals still rely primarily on bilateral ties with ASEAN countries. We have to update our data set in order to see whether or not the regional integration under Japanese capital has emerged.

Having focused on relations of exchange rate and investment, however, our analysis does not capture other political and economic factors related to the business climate

of ASEAN countries, such as political stability and various forms of regulation policy. These considerations are anticipated to be particularly important to analyze investment patterns and economic development processes of Singapore and Thailand.

Lastly, our case study on the Malaysian economy has shed light on the mechanism how the Japanese economic involvement created a solid foundation for the big bang of their presence in the Southeast Asia over the last several years. Japanese approach toward Malaysia controlled a linkage between investment, production and growth, or the supply side dynamics of the Malaysian economy. However, a more balanced approach also has to emphasize efforts on the demand side by opening the Japanese domestic market for exports from Malaysia. Such a dual track strategy will not only facilitate Malaysian economic development but also enhance a level of effectiveness of Japanese control over the Malaysian economy.