MACRO ECONOMIC EFFECTS OF FOREIGN AID*

SHŌICHI YAMASHITA

This paper is a quantitative analysis of the relationship between foreign aid and economic growth in seven Asian developing countries. The aims of the study are: (1) to elucidate economic effects of foreign aid in the recieving countries; (2) to estimate the total amount of aid which will be required by these countries up to 1970; and (3) to clarify the degree of dependency on foreign aid of each country in the past and the future.

INTRODUCTION

In recent years the total net financial flow from advanced (DAC member) to developing countries has reached some ten billion dollars per year,[1] a sum which is roughly estimated one quarter of the gross investment made in developing countries. As H. B. Chenery and others have pointed out, "In most of the underdeveloped world significant increases in per capita income depend largely on the availability of external resources."[2]

It has been commonly recognized that economic assistance to a developing country promotes the transformation of a poor and stagnant economy into one capable of achieving self-sustaining growth. At the same time, it contributes to world economic development by expanding the markets of the donor countries into the developing countries. While to date, there have been a considerable number of studies of a descriptive nature in the field of economic assistance, those which have utilized quantitative analysis have been extremely limited. Accordingly, our study attempts to make some contributions to quantitative studies by emphasizing the importance of external resources, a factor which has thus far been left more or less out of consideration in the economic growth theories.

We are deeply interested in the economic effects of foreign aid on the recipient countries. While the ultimate aim of our study is to measure these effects, there are a variety of approaches by which to assess them. We will, then, confine our measurement here to the macro-economic aspects of foreign

* This paper was originally published as a part of *Foreign Aid and Economic Growth of Developing Asian Countries,* by Yukio Shibuya & Shōichi Yamashita, I.A.E.A. Occasional Papers Series No. 2, Tokyo, Institute of Asian Economic Affairs, 1968.

1 Total official and private flow to developing countries and multilateral agencies in 1965 was 10.29 billion dollars and in 1966 was 9.86 billion dollars. (OECD, *Development Assistance Efforts and Policies,* 1967 review, Sept. 1967.)

2 H. B. Chenery & A. M. Strout, *Foreign Assistance and Economic Development,* AID, 1965, p. 1.

aid on the recipient countries, since it is not possible to take into account every aspect or utilize every method.

The main aims of our study are as follows:

(1) Projection into 1970 of foreign aid requirements of the developing Asian countries.

(2) Measurement of the degree of dependence on foreign assistance for each country.

(3) Measurement of the economic effects of foreign aid on the recipients.

We selected seven developing Asian countries as recipients: China (Taiwan), India, Korea (South), Malaya (Federation of), Pakistan, the Philippines and Thailand. Although this study was also applied to Burma and Ceylon, adequate results could not be obtained, so these countries were excluded from the report. For other Asian countries not listed here the analysis could not be undertaken, mainly because of the unavailability of adequate statistical data.

I. MODELS AND METHODS

1. Positive Model

In this study we specify two models, the positive and the normative models. First, we construct a basic model according to macro-economic theories in order to be able to estimate the economic structure of each country. This model is then applied to each country and revised according to the peculiarities of the economy. The revised model and its structural parameters are thus determined. Let us call this a "positive model." Second, from the positive model we drop one structural equation. The endogenous variable in the dropped equation in turn is assumed to be an exogenous variable the value of which is determined outside the model. We call this the "normative" or "decision" model. Various assumptions for our projections are assigned to the selected policy variables as in Table 1, and the effects of aid on the recipients are measured and compared with respect to each country (Table 2). Notations used in our model are as follows:

Y gross national product
C total consumption expenditure
C_p private consumption expenditure
C_g government expenditure
S domestic savings
I gross investment
K capital stock
M imports and factor income paid abroad
E exports and factor income received from abroad
L net inflow of foreign capital (foreign assistance)
N total population
(subscript $t-1$ indicates the previous period's figures of each variable)

Our basic model consists of six structural equations and four identities.

The structural equations include production, private consumption, government expenditure, investment, import, and export functions, expressed respectively as:

$$Y \equiv C+S \quad (1)$$
$$L \equiv M-E \quad (2)$$
$$I \equiv \Delta K \quad (3)$$
$$C \equiv C_p+C_g \quad (4)$$
$$Y=\alpha_0+\alpha_1 K+\alpha_2 N \quad (5)$$
$$C_p=\beta_0+\beta_1 Y+\beta_2 C_{p-1}+\beta_3 N \quad (6)$$
$$C_g=\gamma_0+\gamma_1 Y+\gamma_2 C_{g-1}+\gamma_3 N \quad (7)$$
$$I=\delta_0+\delta_1 Y+\delta_2 L \quad (8)$$
$$M=\mu_0+\mu_1 Y+\mu_2 L \quad (9)$$
$$E=\lambda_0+\lambda_1 E_{-1} \quad (10)$$

In this model we have ten endogenous variables—Y, C, C_p, C_g, I, M, E, L, S, and K—and ten equations. The number of relationships is exactly equal to the number of unknown variables. Our basic model is thus complete. The predetermined variables are five: four lagged endogenous variables—C_{p-1}, C_{g-1}, E_{-1}, and K_{-1}—and one exogenous variable—N.

One feature of this model is that the net inflow of foreign capital (foreign assistance) is given by the trade gap—the required imports minus the predicted export—as in equation (2). So far two approaches have been proposed for calculating foreign aid requirements; one is a target-type gap approach, and the other is an absorptive capacity approach. The former aims to estimate how much external resources (assistance) should be provided to achieve the growth target of the developing countries. The latter aims to calculate how much resources can be productively utilized in these countries.

Our model is based on the former, the target-type gap approach. This approach is called "gap" analysis, because the calculation of the foreign aid requirements is made by the investment-saving gap or the trade gap (import-export gap). We accept here the principle of social accounting that both gaps be equal *ex post*. The system outlined above is the model in which foreign aid has a direct influence on investments and imports, and these variables affect the others simultaneously.

2. *Normative Model*

Let us drop one equation, e. g., production function (5) and rebuild a system which has nine relationships. Assuming that the number of endogenous variables is still ten, that is, Y, C, C_p, C_g, I, M, E, L, S, K, we have ten unknown variables and 9 independent relationships. There is therefore one degree of freedom, and if we are to determine all endogenous variables, it is necessary that the value of one unknown variable, Y, be given from outside the system. Then we can examine: given Y, what values are to be expected for the remaining variables? We call this type of model the "normative model" as mentioned above[3] on which it may be assumed that the values of

[3] We can find this type of normative model in, for instance, S. Chakravarty, "The Mathematical Framework of the Third Five-Year Plan," in P.N. Rosenstein-Rodan ed., *Capital Formation and Economic Development*, London, George Allen & Unwin, 1964.

some endogenous variables are given politically or exogenously.

We consider the following four possibilities about the assumption of this policy variable to be determined exogenously: (1) the growth rates of GNP are given, (2) the growth rates of private consumption, (3) the growth rates of investment and, (4) the volume of foreign capital inflow (foreign aid). Each case based on these assumptions for the simulation analysis is shown in Table 1. In the beginning we had planned to calculate every case in the table, but it was possible to examine only six cases in all, because of the limitation on available funds, time, and other reasons. So in this section we set out to explain the two possibilities relating to actually examined cases, i.e., (1) where the growth rates of GNP are given, and (2) where the volume of foreign aid is given.

(1) The Growth Rate of GNP Given

If gross national product of the period t, Y_t, is given, C_{pt} can be derived from equation (6) and C_{gt} from equation (7), while M_t, I_t, and L_t can also be determined from equations (2), (8) and (9) simultaneously. E_t is obtained by (10) all the explanatory variables of which are exogenous. In this case the volume of foreign aid required, L_t, is estimated as follows:

$$L \equiv M - E$$

$$= \frac{1}{1-\mu_2}\{(\mu_0-\lambda_0)+\mu_1\bar{Y}-\lambda_1 E_{-1}\} \tag{11}$$

(where $\bar{Y}$ indicates the predetermined Y)

On the other hand, it is possible also to estimate L_t by the saving investment gap approach as follows:

$$L \equiv I - S \tag{12}$$

$$= \frac{1}{1-\delta_2}\{\delta_0-(1-\delta_1)\bar{Y}+C\} \tag{13}$$

The value of (11) is expected to be theoretically equal to the value of (13). Accordingly, if the target growth rate of GNP is given, the required volume of foreign aid for accomplishing the target can be calculated.

(2) Foreign Aid Given

If the volume of foreign aid is predicted or given, M_t can be derived from equation (2) and E_t, which is obtained by only exogenous and predetermined variables. The level of GNP is determined by substituting the results obtained above into (9), C_{pt} and C_{gt}. It is also determined by equations (6), (7) and (8) respectively. GNP will be derived, for instance, from (2) and (9),

$$Y = \frac{1}{\mu_1}\{(\lambda_0-\mu_0)+(1-\mu_2)\bar{L}+\lambda_1 E_{-1}\} \tag{14}$$

or by using (3), (5) and (8),

$$Y = \frac{1}{1-\alpha_1\delta_1}\{\alpha_0+\alpha_1(K_{-1}+\delta_0+\delta_2\bar{L})+\alpha_2 N \tag{15}$$

It is therefore possible for the effects of foreign aid on economic growth to be estimated in various cases, e.g., when foreign aid is discontinued or when it is expected to continue.

3. Methods of Estimation and Sources of Data

The above basic model is a simultaneous equation system which consists of ten endogenous, six predetermined variables, and ten relationships, and in which the endogenous variables are the explanatory variables in the structural equations. So we must avoid the well-known difficulties which occur when the direct least squares method is applied to estimate the structural parameter in such equations including endogenous variables as the explanatory ones. Therefore, in this study the two stage least squares method was applied, which purges the correlation between the explanatory variables and the disturbance term in our model.

In order to determine the positive models of each country and to estimate the structural parameters of each model, national accounts statistics during the sixteen years, 1950 to 1965, were used. There are many problems in the data used in the study, and it seems desirable to mention them.

But as we have little space in which to deal with these problems, we should like to mention briefly here only the steps of treatment. First, we changed the current price data into constant 1963 prices by using deflators, and converted the resulting figures into U. S. dollars at the official exchange (selling) rate of 1963. Our figures in this report are all shown in constant U. S. dollars of 1963.[4]

It will also be necessary here to clarify the data employed for estimating the production function (5). As the explanatory variables of the production function we employ the capital stock and labor force according to the macro-economic theory. Since for the countries concerned here we could not obtain complete data for both variables, we prepared the data of the two series by means of the following calculations and substituted the computed values for the observed vaues. We calculated capital stock for the beginning period by using the traditional capital-output ratio k,

$$K_0 = kY_0 \tag{16}$$

Where k=capital-output ratio, K_0=capital stock of beginning period, Y_0= GNP of beginning period.

This capital-output ratio k is averaged over the observed period, i. e.,

$$k = \frac{\Delta K}{\Delta Y} = \frac{\sum_{j=1}^{t} I_j}{Y_t - Y_0} \tag{17}$$

The beginning year for each country is 1950, and for most countries the terminal year is 1964 or 1965. The capital stock of each year is calculated as follows:

$$K_t = K_0 + \sum_{j=1}^{t} I_j \tag{18}$$

4 See S. Yamashita ed., "Ajia shokoku no kokumin shotoku tōkei 1950–1965" (National Accounts Statistics of Asian Countries 1950–1965), Institute Document KEISEI 41–13, Institute of Asian Economic Affairs, 1967 (mimeographed). The original data, every deflator used here, the degree of handling, etc., may be found in the statistics presented in this volume.

It is necessary to note that our capital stock does not take depreciation into account, so that this figure indicates gross capital stock.

It was not possible to obtain data concerning the number of employed in most of these countries. For this reason we substituted tatal population for the number of employed. Our production function differs, therefore, to some extent from the theoretical one usually employed.

4. Each Case of Prediction

Originally we intended to estimate all the 17 cases listed in Table 1, but in the course of study it was found that only six cases were actually possible, mainly because of the limitations of time. The six calculated cases are indicated by an asterisk on the column number in Table 1:

Case-1 (Assumption A, Column 1 in Table 1)

The prediction is made on the assumption that the growth rate of GNP is given for the prediction period 1965-1970, and it is the same as the actual trend rate during 1950/52 to 1962/64, that is,

$$Y_t = Y_0(1+\hat{g})^t \tag{19}$$

(where Y_0=actual GNP of 1964, $\hat{g}$=actual compound rate of growth during 1950/52-1962/64.)

Case-2 (Assumption A, Columu 3 in Table 1)

This assumes that GNP increases at a constant growth rate during the prediction period 1965-1970, which is the target growth rate in the present economic plan of each country, namely,

$$Y_t = Y_{1964}(1+\bar{g})^{t-1964} \tag{20}$$

(where $\bar{g}$=target growth rate)

Case-3 (Assumption D, Column 11 in Table 1)

This is based on the assumption that each country can not expect to receive any foreign aid (net capital inflow from abroad) in the future, that is, each country is obliged to restrict the volume of imports to the export volume,

$$L_t = 0 \quad \text{(const.)} \tag{21}$$

Case-4 (Assumption D, Column 12 in Table 1)

This assumes that the annual expected amount of future foreign aid is the same as the average amount in the past, 1960-1964,

$$L_t = \hat{L} \quad \text{(const.)} \tag{22}$$

(where $\hat{L}$=average of annual amount of foreign aid actually received during 1960-1964.)

Case-5 (Assumption D, Column 13 in Table 1)

This assumes that the amount of foreign aid is expected to increase 5% per annum,

$$L_t = \hat{L}(1+0.05)^t \tag{23}$$

Case-6 (Assumption D, Column 17 in Table 1)

This is the case where a country had not received any foreign aid during the period 1950-1964,

Table 1. Schedule of Prediction

	Growth Rate of Population (Period)	(Assumption A) Growth Rate of GNP Given				(Assumption B) Growth Rate of Private Consumption Given			(Assumption C) Growth Rate of Investment Given			(Assumption D) Volume of Net Capital Inflow from Abroad (Foreign Aid) Given						
		Actual Growth Rate (%) (Period)	(1)+1% (%)	Target Growth Rate[1] (%) (Period in Plan)	Growth Rate of per Capita GNP is 4% (%)	Actual Growth Rate (%)	(1)+1% (%)	Target Growth Rate[1] (%)	Actual Growth Rate (%)	(1)+1% (%)	Target Growth Rate[1] (%)	$L_t=0$ (during 1965–1970)	Actual Volume of Aid[3] ($\hat{L}$) (in million U.S.$)	$L_t=\hat{L}(1+0.05)^t$ (in million U.S.$)	$L_t=\hat{L}(1-0.05)^t$ (in million U.S.$)	Actual Trade Gap (in million U.S.$)	$L_t=0.05Y_t$	$L_t=0$ (for Past Period)
		1*	2	3*	4	5	6	7	8	9	10	11*	12*	13*	14	15	16	17*
China (Taiwan)	3.4 (50~65)	7.2 ($^{51}/_{53}$~$^{61}/_{63}$)	8.2	7.0 (65~68)	7.4	6.9	7.9	5.6	12.1	13.1	10.7	$L_t=0$ (Const.)	84.4	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	22.2	$L_t=0.05Y_t$	$L_t=0$ (Const.)
India	2.0 (50~60)	2.4 ($^{50}/_{52}$~$^{58}/_{60}$)	3.4	5.5 ($^{65}/_{66}$~$^{70}/_{71}$)	6.0	1.1	2.1	4.4	9.5	10.5	9.3	$L_t=0$ (Const.)	869.4	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	446.8	$L_t=0.05Y_t$	$L_t=0$ (Const.)
Republic of Korea	2.1 (50~63)	5.6 ($^{53}/_{55}$~$^{62}/_{65}$)	6.6	7.1 (67~71)	6.1	5.6	6.6	6.8	6.4	7.4	10.1	$L_t=0$ (Const.)	230.2	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	275.8	$L_t=0.05Y_t$	$L_t=0$ (Const.)
Malaysia	3.1 (55~64)	4.7 ($^{55}/_{57}$~$^{62}/_{64}$)	5.7	4.8 (65~70)	7.1	4.4	5.4	6.4	12.5	13.5	4.3	$L_t=0$ (Const.)	19.1	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	101.0	$L_t=0.05Y_t$	$L_t=0$ (Const.)
Pakistan	2.1 (50~65)	5.8 (59~64)	6.8	6.6 (65~70)	6.1	5.0	6.0	5.2	18.0	19.0	8.6	$L_t=0$ (Const.)	388.8	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	507.6	$L_t=0.05Y_t$	$L_t=0$ (Const.)
Philippines	3.3 (50~65)	5.2 ($^{50}/_{52}$~$^{62}/_{64}$)	6.2	6.2 (67~70)	7.3	4.6	5.6	(6.8)[2]	7.9	8.7	(5.3)	$L_t=0$ (Const.)	44.2	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	83.4	$L_t=0.05Y_t$	$L_t=0$ (Const.)
Thailand	3.4 (50~65)	7.6 ($^{57}/_{59}$~$^{63}/_{65}$)	8.6	8.5 (66~71)	7.4	4.9	6.9	(7.6)	13.3	14.3	(12.1)	$L_t=0$ (Const.)	43.6	$\hat{L}(1+0.05)^t$	$\hat{L}(1-0.05)^t$	42.7	$L_t=0.05Y_t$	$L_t=0$ (Const.)

Note: 1) The target growth rates are taken from the following economic plans of the countries indicated:
China (Taiwan).....Fourth Four-Year Plan for Economic Development of the Province of Taiwan 1965–1968.
India.....Fourth Five Year Plan, A Draft Outline, 1965/66–1970/71.
Republic of Korea ...The Second Five-Year Economic Development Plan 1967–1971.
Malaysia .....First Malaysia Plan 1966–1970.
Pakistan .....The Third Five Year Plan 1965–1970.
Philippines .....Four-Year Economic Program for the Philippines, 1967–1970.
Thailand .....Summary of the Second Five-Year Plan 1967–1971.

2) The figures in parentheses indicate the growth rate calculated as the required rate for achieving the target growth rate of GNP on the assumption of $I_t=I(Y_t)$ and $C_{pt}=C_p(Y_t)$, respectively.

3) The actual volume of foreign aid (in Column 12) is an annual average of capital inflow from DAC member countries in the period 1960–1964.

Source: OECD, *Geographical Distribution of Financial Flow to Less Developed Countries 1960–1964*, Paris, 1966.

$L_t=0$ (const.) (24)

(where $t=1950$–1964)

The results computed in these cases for each country are summarized in Table 2.[5]

Table 2. A Comparison of Results, by Country

(Unit: GNP: in millions of 1963 U.S. dollars; Per capita GNP: in 1963 U.S. dollars)

		GNP (Y)			Per Capita GNP (y)		
	Case[1)]	Actual GNP in 1964 (in million U.S.$) Y_{64}	Predicted GNP in 1970 (in million U.S.$) Y_{70}	Annual Growth Rate (%) g	Actual Y in 1964 (U.S.$) y_{64}	Predicted Y in 1970 (U.S.$) y_{70}	Annual Growth Rate (%) r
		1	2	3	4	5	6
China (Taiwan)	Case 1	2,198.8	3,337.0	7.2%	182.2	227.1	3.7%
	2	2,198.8	3,293.6	7.0	182.2	224.2	3.5
	3	2,198.8	3,328.9	7.16	182.2	226.6	3.1
	4	2,198.8	3,381.1	7.4	182.2	230.1	4.0
	5	2,198.8	3,388.1	7.5	182.2	230.6	4.0
	6	(2,167.4)	—	(7.5)	(179.6)	—	(3.9)
India	Case 1	42.460.2	48,953.2	2.4	90.0	92.2	0.4
	2	42,460.2	60,318.3	5.5	90.0	113.6	4.0
	3	42,460.2	41,849.1	Δ1.2	90.0	78.8	Δ2.2
	4	42,460.2	43,066.0	0.2	90.0	81.1	Δ1.8
	5	42,460.2	43,481.1	0.4	90.0	81.9	Δ1.6
	6	(37,993.0)	—	(1.9)	(80.6)	—	(Δ0.1)
Republic of Korea	Case 1	3,927.5	5,603.6	5.6	142.1	178.1	3.8
	2	3,927.5	6,013.0	7.1	142.1	191.1	5.1
	3	3,927.5	5,569.1	5.5	142.1	177.0	3.7
	4	3,927.5	6,040.3	7.4	142.1	192.0	5.1
	5	3,927.5	6,128.1	7.7	142.1	194.8	5.6
	6	(2,295.4)	—	(0.6)	(83.1)	—	(Δ1.7)
Malaysia	Case 1	2,345.7	3,090.9	4.7	300.3	329.5	1.6
	2	2,345.7	3,137.4	4.8	300.3	334.5	1.8
	3	2,345.7	2,554.6	2.4	300.3	272.3	Δ1.6
	4	2,345.7	2,812.0	3.1	300.3	299.8	Δ0.03
	5	2,345.7	2,830.9	3.2	300.3	301.8	0.1
	6	(2,251.2)	—	(1.1)	(288.2)	—	(0.3)
Pakistan	Case 1	9,561.1	13,409.7	5.8	94.9	117.5	3.6
	2	9,561.1	14,029.8	6.6	94.9	112.9	4.4
	3	9,561.1	8,812.5	Δ1.3	94.9	77.2	Δ3.5
	4	9,561.1	9,851.1	0.5	94.9	86.3	Δ1.6
	5	9,561.1	10,204.7	1.1	94.9	89.4	Δ1.0
	6	(7,626.8)	—	(1.1)	(75.7)	—	(Δ1.0)
Philippines	Case 1	4,550.8	6,168.5	5.2	145.3	162.1	1.8
	2	4,550.8	6,528.9	6.2	145.3	171.6	2.8

5 The positive model of each country and its structural parameters are shown in Chapter II in Y. Shibuya & S. Yamashita, *op. cit.* In addition, some findings and the implications of these results are described in the same chapter.

	3	4,550.8	5,544.1	3.4	145.3	145.7	0.0
	4	4,550.8	5,775.6	4.1	145.3	151.8	0.7
	5	4,550.8	5,854.2	4.3	145.3	153.9	0.9
	6	(4,324.8)	—	(4.8)	(138.8)	—	(1.5)
Thailand	Case 1	3,609.7	5,545.7	7.6	121.5	153.4	4.0
	2	3,609.7	5,781.6	8.5	121.5	159.9	4.7
	3	3,609.7	4,594.3	4.1	121.5	127.1	0.8
	4	3,609.7	4,706.3	4.5	121.5	130.2	1.1
	5	3,609.7	4,744.4	4.7	121.5	131.2	1.3
	6	(3,386.8)	—	(6.2)	(114.0)	—	(3.1)
Total	Case 1	68,653.8	86,108.6	3.8	100.8	111.1	1.6
	2	68,653.8	99,102.6	6.3	100.8	127.9	4.1
	3	68,653.8	72,252.6	0.9	100.8	93.2	Δ1.3
	4	68,653.8	75,632.4	1.6	100.8	97.6	Δ0.5
	5	68,653.8	76,631.5	1.9	100.8	98.9	Δ0.3
	6	(60,045.4)	—	( )	(88.2)	—	( )

Note: 1) Assumptions of each case are as follows:

Case 1.....$Y_t=Y_{64}(1+g)^{t-1964}$ where g: actual growth rare of GNP in annual average during 1650–1964.

Case 2.....$Y_t=Y_{64}(1+g)^{t-1964}$ where g: target growth rate

Case 3.....$L_t=0$ (const.) where t: 1965–1970

Case 4.....$L_t=L$ (const.) where L: annual average of aid from DAC in the actual records during 1960–1964.

Case 5.....$L_t=L(1+0.05)^t$

Case 6.....$L_t=0$ (const.) where t: 1950–1964.

II. SOME IMPLICATIONS OF THE RESULTS

1. General Features of the Results

The results of our predictions are summarized in Table 2 and are compared for each country in terms of the growth rate of GNP and of per capita GNP. GNP in the base year of prediction (1964) is shown in Column 1, the predicted GNP in 1970 in Column 2, and the annual average growth rate of GNP during the period 1964–1970 in Column 3. Assuming that the growth rate of total population predicted during the period is the same as the rate for 1950–1964, we calculated per capita GNP for each case. The results are shown in Columns 4, 5, and 6 of Table 2.

We have little space to explain either the findings or implications obtained from our prediction for each country individually. What we would like to examine in this paper are the results as a whole. Of the seven developing Asian countries taken up here, per capita GNP averaged 100.8 dollars in 1964. Supposing that both the growth rate of GNP and of population in the future follow their actual trends (Case-1), per capita GNP will increase at an annual rate of 1.6% and be 111.1 dollars in 1970. In the case of each country achieving the target growth rate of its economic plan—6.3% on the average—(Case-2), 127.9 dollars of per capita GNP will be achieved in 1970. In other words, the annual growth rate of per capita GNP is 4.1% during the period. This

implies that the target growth rates are somewhat higher that the actual trends in these countries.

Another possible situation we need to consider here is the case where no foreign aid is granted to these developing countries (Case-3). In this case, GNP will increase at the low annual rate of 0.9% as a whole over the predicted period, but per capita GNP will fall year after year to 93.2 dollars in 1970—the annual rate decreases to minus 1.3%. We need to pay attention to the serious situation which would arise in developing Asian countries if aid to this area were to come to a close. Even if the same annual average of aid as in the past is granted to these countries, per capita GNP will still decrease over this period and will average 97.6 dollars in 1970.

If these countries had not received any foreign aid during the period 1950–1964, their per capita GNP would have been only 88.2 dollars in 1964 as shown by Case-6. From the above results we find that the developing Asian countries were greatly dependent on foreign aid in the past, and will continue to rely on it quite heavily in the future.

2. *Foreign Aid Requirements of Developing Asian Countries in 1970*

In the previous section we explained briefly the results of our prediction as a whole. Let us now examine these results from some other points of view. One of the main aims of this study is to estimate the future foreign aid needs of developing Asian countries. We made two projections with regard to this matter: (1) foreign aid necessary to maintain the present actual growth trend of GNP (Case-1); and (2) foreign aid needed to achieve the the target growth rate in the present economic plan (Case-2) for each country. Table 3 shows the projections for 1970 covering these seven Asian countries.

The table shows that imports for the seven countries in Case-1 will need to be a total of 13.58 billion dollars in 1970. Assuming that exports from each country continue to increase at the same rate as the present actual rate, the total volume of exports is expected to be 7.74 billion dollars that year. In 1970, therefore, these seven countries together will need about 5.84 billion dollars of net capital inflow from abroad (foreign aid).

In Case-2, in which the target growth rates are achieved for each economy during this period, the total amount of imports of the seven countries will amount to 15.60 billion dollars in 1970. Supposing that the expected volume of exports is the same as in Case-1, foreign aid requirements of these countries as a whole will amount to about 7.86 billion dollars in 1970.

In 1965 net official financial flow to all developing countries from DAC member countries (including multilateral agencies) was 10.29 billion dollars, and 9.86 billion dollars in 1966,[6] of which capital inflow to these seven Asian countries totaled 2 billion dollars.[7] According to the forecast by OECD[8] the

6 OECD, *Development Assistance Efforts and Policies,* 1967 Review, Paris, 1967.

7 The annual average inflow to seven countries was $1.68 billion during 1960–1964. See OECD, *Geographical Distribution of Financial Flow to Less Developed Countries 1960–1964.* Paris, 1966.

8 OECD, *Economic Growth 1960–1970, A Mid-Decade Review of Prospects,* Paris, 1966.

Table 3. Foreign Aid Requirements of Seven Developing Asian Countries in 1970

(in millions of 1963 U.S. dollars)

		Growth Rate of GNP	Predicted GNP in 1970	Required Volume of Imports in 1970	Predicted Volume of Exports in 1970	Foreign Aid Requirements in 1970
		r	Y_{70}	M_{70}	E_{70}	L_{70}
China (Taiwan)	1)	7.2%	3,337.0	610.4	593.4	17.0
	2)	7.0	3,293.6	614.0	593.4	20.6
India	1)	2.4	48,953.2	4,199.6	2,210.4	1,989.2
	2)	5.5	60,318.3	5,635.8	2,210.4	3,425.4
Republic of Korea	1)	5.6	5,603.6	1,543.5	774.8	768.7
	2)	7.1	6,013.0	1,772.7	774.8	997.9
Malaysia	1)	4.7	3,090.9	2,340.3	1,336.3	1,004.0
	2)	4.8	3,137.4	2,332.5	1,336.3	996.2
Pakistan	1)	5.8	13,409.7	2,517.6	797.3	1,720.3
	2)	6.6	14,029.8	2,749.8	797.3	1,952.5
Philippines	1)	5.2	6,168.5	1,250.1	1,130.8	119.3
	2)	6.2	6,528.9	1,318.9	1,130.8	188.1
Thailand	1)	7.6	5,545.7	1,122.8	900.9	221.9
	2)	8.5	5,781.6	1,177.8	900.9	276.9
Total	1)		86,108.6	13,584.3	7,743.9	5,840.4
	2)		99,082.6	15,601.5	7,743.9	7,857.6

Note: The Rates of GNP, 1) and 2), indicate the following cases:
1) The case of actual trend growth rate in the period 1950–1965.
2) The case of target growth rate in the present economic plan.

total GNP of OECD member countries is expected to increase at an annual rate of 4.6% during the latter half of the 1960's. If the "one percent target" which was proposed in the recommendation on "Growth and Aid" adopted by UNCTAD in 1964 is achieved in this period, funds available will total about 12.5 billion dollars in 1970. Assuming that the seven Asian countries get a 20% share of this amount, some 2.5 billion dollars of aid will be offered to these countries in 1970. Comparing this with the needs set out in Table 3, we find that there is a great gap between supply and demand for such aid. Though the difference between the DAC definitions on aid and our own must be taken into account, this great gap implies that first the resources of developed countries available for aid for developing countries may have to be so distributed among developing countries that the optimal efficiency of each can be attained; and second that self-help efforts of the recipient countries themselves may have to be emphasized.

Since the recommendation on "Growth and Aid" of the 1964 UNCTAD and on "Assistance and Development Efforts" of the 1965 DAC, the foreign aid policy of the Japanese Government nas been directed toward raising the amount of foreign aid grants to the 1% level. In 1965, Japan extended economic aid of the order of 485.9 million dollars, which represented 0.73%

of its national income. In 1966, Japan's foreign aid increased 11% on the 1965 figure, totaling 538.8 million dollars.[9]

But the aid provided by Japan was not enough to meet the demand of the Asian countries. Japan's 1966 national income is estimated at about 78 billion dollars. Assuming that this increases at the rate of 8.2% in real terms (11.3% nominal), which is the same as the target growth rate set in the present Economic and Social Development Plan (1966–1971), the national income of Japan in 1970 will be about 107 billion dollars (120 billion dollars nominal). Even if Japan offered 1% of her national income, this would still be only about 1.07 billion dollars (1.2 billion dollars at current price levels) in 1970. The aid needs of seven Asian countries are estimated at six to eight times this amount! It should be understood that the degree and level of assistance will be still far from satisfactory, so far as Japan's capacity to meet the total aid needs of these countries is concerned. As for Japan's foreign aid policy itself, it is obvious that there is room for considerable improvement both in quality and quantity.

3. *Degree of Dependence on Aid*

In order to estimate the effects of foreign aid on the economic growth of developing countries, we examined some instances in which predictions were based on the assumption that the desired amount of aid is given. The measurement of the degree of dependence on aid meets our aim in this regard. In this section we will establish some criteria, and examine the degree of dependence on aid both in the past and, hypothetically, in the future.

The degree of dependence is measured by comparing the non-aid growth path with the actual growth path. In other words, it is assumed that the difference between the two growth paths would depend on the amount of foreign aid recieved. In order to estimate the degree of dependence, we defined the following ratio by using the growth rate of per capita GNP in each case.

a. Degree of dependence on aid in the past, ϕ_1

$$\phi_1=\frac{r_0-r_6}{r_0} \qquad (r_0>0) \tag{25}$$

where r_0=the actual growth rate of per capita GNP during 1950–1964, r_6=the calculated growth rate of per capita GNP in the non-aid case in the same period (in our Case-6)[10]

It is assumed that the past growth achieved in these developing countries has partly depended on the foreign aid received. We have given (r_0-r_6) as the measure of the contribution of foreign aid to the growth rate of per capita GNP of each country. But this measure is too simple to evaluate the relative differences of contributions by the different stages of economic

9 Ministry of Foreign Affairs of Japan, *Japan's Foreign Aid,* Japan Reference Series No. 2-67, Tokyo, 1967.

10 The subscripts appended to "r" indicate the case number in our prediction.

development. For instance, even if the degree of contribution of aid as indicated by the measure (r_0-r_6) is equal in any two contries, the effect would differ when the stages of economic development differ. In order to discriminate among them, the value (r_0-r_6) is divided by r_0 as shown in equation (25).[11]

Extending the idea employed in equation (25), the following equation was derived and the degree of dependence on future aid was measured.

Degree of future dependence on aid, ϕ_2

$$\phi_2=\frac{r_1-r_3}{r_1} \qquad (r_1>0) \tag{26}$$

where r_1=the growth rate of per capita GNP in the actual trend during 1965–1970 (Case-1 in our prediction), r_3=the growth rate of per capita GNP in the case of non-aid in the same period (Case-3)

For convenience, we set up the following three criteria, and the dependence of these seven countries on aid was evaluated according to the criteria.

Criteria of Dependence on Aid

	Criterion	Remark
A	$\phi>1$	The degree of dependence on aid is very high.
B	$1\geqq\phi\geqq0.2$	The degree of dependence is medium.
C	$\phi<0.2$	ϕ is almost zero. For the countries coming under this criterion C, self-sustained growth is assumed to be possible without foreign aid.

Table 4 shows the Degree of dependence on foreign aid both past and future for each country, and contains some evaluations based on the above criteria. From the results shown in Table 4 we arrive at the following interesting conclusions. In Asia, (1) there are countries where the economy grows at a slow pace and is extremely dependent on foreign aid (AA Type). India and Pakistan fall into this category. On the other hand, Taiwan's economy is now at the stage of self-sustaining growth (CC Type). (2) Korea (Republic of) is another type of country, where the economy is about to "take-off" after being highly aid-dependent, and its dependence will be greatly decreased (AC Type). Malaysia, however, which has been minimally dependent is likely to increase its future dependence on aid (CA Type). (3) Finally there is the group of countries including the Philippines and Thailand which are trying to speed up their economic growth while expecting further economic assistance for development (BB Type).

4. *Some Measures of Effects of Foreign Aid*

In this section we will consider the effect of foreign aid from another point of view, namely the marginal efficiency of aid. There are two means

11 Suppose $\phi_1=(1-r_6/r_0)$, then criteria A, $(\phi_1>1)$, in Table 4 indicates that the growth rate of per capita GNP, which had been a positive value in the past, would decrease to a minus value.

of measuring aid results: one is by marginal productivity and the other by the concept of elasticity. There have been few empirical studies employing either of these tools except those done by H. B. Chenery and A. M. Strout,[12] notwithstanding the abundance of theoretical works. Our study may make a contribution in this field.

First, we will examine the marginal productivity of aid by employing the results of Case-4, covered above.

Table 4. The Degree of Dependence on Aid

	PAST (1950–1964)[1]					FUTURE (1964–1970)				
	Actual Growth Rate of per Capita GNP	Growth Rate of per Capita GNP in Case 6	Difference of Growth Rate	Degree of Dependence	Evaluation[2]	Growth Rate of per Capita GNP in Case 1	Growth Rate of per Capita GNP in Case 3	Difference of Growth Rate	Degree of Dependence	Evaluation[2]
	r_0	r_6	r_0-r_6	$\phi_1=\frac{r_0-r_6}{r_0}$	—	r_1	r_3	r_1-r_3	$\phi_2=\frac{r_1-r_3}{r_1}$	—
China (Taiwan)	4.0%	4.0%	0%	0	C	3.7%	3.7%	0%	0	C
India	0.5	0.1	0.4	0.80	B	0.4	Δ2.2	2.6	6.50	A
Republic of Korea	3.5	Δ1.8	5.3	1.51	A	3.8	3.7	0.1	0.03	C
Malaysia	0.5	0.5	0.0	0	C	1.6	Δ1.6	3.2	2.00	A
Pakistan	3.6	Δ1.0	4.6	1.28	A	3.6	Δ3.5	7.1	1.97	A
Philippines	1.9	1.5	0.4	0.21	B	1.8	0.0	1.8	1.00	B
Thailand	4.1	3.1	1.0	0.24	B	4.0	0.8	3.2	0.80	B

Note: 1) The periods of observation are as follows:
China .....1951–1963 Malaysia .....1955–1963 Thailand.....1957–1964
India .....1950–1960 Pakistan 1959–1964
Korea.....1953–1965 Philippines.....1950–1964
2) Criteria of evaluation are as follows:
A.....$\phi>1$, B.....$1\geqq\phi\geqq0.2$, C.....$\phi>0.2$

Marginal productivity can be expressed by β, representing the increment of GNP with respect to total aid as follows:

$$\beta=(Y^4_{70}-Y^4_{65})/\sum_{66}^{70}L \tag{27}$$

where Y^4_{70}=the predicted GNP of 1970 in Case-4.
Y^4_{65}=the actual value of GNP in 1965.
$\sum L^4$=the accumulated volume of aid during 1966–1970 in Case-4.

This expression uses the concept of extra income per extra unit of aid. We take β to be an indicator of aid effects in this sense.

Table 5 shows the results of calculation of β in seven developing Asian countries. According to Table 5 a higher productivity of aid is recorded in three redundant countries, i.e., Malaysia, the Philippines and Thailand which are going through the process of industrialization. By contrast, the product-

12 H. B. Chenery & A. M. Strout, *op. cit.*, pp. 28–32.

ivity of India and of Pakistan is 0.6 and 0.4, respectively.

Table 5. The Productivity of Accumulated Aid[1)]

(in millions of 1963 U.S. dollars)

	GNP in 1965[2)]	GNP in 1970	Increment of GNP	Accumulated Volume of Aid	Productivity of Aid
	Y_{65}	Y_{70}	ΔY	$\sum_{66}^{70} L$	$\Delta Y/\Delta L$
China (Taiwan)	2,203.5	3,381.1	1,177.6	590.8	1.99
India	39,160.4	43,066.0	3,905.6	6,085.8	0.64
Republic of Korea	4,472.5	6,040.3	1,567.8	1,151.0	1.36
Malaysia	2,307.3	2,812.0	504.7	133.7	3.77
Pakistan	8,864.3	9,851.1	986.8	2,332.8	0.42
Philippines	4,574.4	5,775.6	1,201.2	265.2	4.53
Thailand	3,699.8	4,706.3	1,006.5	261.6	3.85

Notes: 1) The figures in this table are based on the results of prediction of Case 4.
2) The GNP figures listed for China, and Malaysia are those for 1964; that of Korea, for 1966.

Next, to estimate the efficiency of aid we will consider the elasticity of foreign aid, η, as another measure. Let us define η as follows:

$$\eta=\frac{\Delta Y^5}{Y_{70}^5}\Big/\frac{\Delta L^5}{L_{70}^5} \tag{28}$$

where ΔY^5=increment of GNP during 1965-1970 in Case-5
ΔL^5=increment of foreign aid during 1965-1970 in Case-5
Y_{70}^5=GNP of 1970 in Case-5
L_{70}^5=volume of foreign aid of 1970 in Case-5

The results for each country are shown in Table 6. The elasticity of aid to Korea and Taiwan, where the economy is regarded as approaching the

Table 6. Elasticity of Foreign Aid[1)]

(in millions of 1963 U.S. dollars)

	GNP in 1965[2)]	Predicted GNP in 1970	Increment Rate of GNP	Volume of Aid in 1965[2)]	Volume of Aid in 1970	Increment Rate of GNP	Elasticity of Aid	Order
	Y_{65}	Y_{70}	$\frac{Y_{70}-Y_{65}}{Y_{70}}$	L_{65}	L_{70}	$\frac{L_{70}-L_{65}}{L_{70}}$	η	—
China (Taiwan)	2,203.5	3,388.1	0.3496	84.4	113.1	0.2537	1.378	2
India	37,207.5	43,481.1	0.1443	869.4	1,165.1	0.2583	0.5686	7
Republic of Korea	4,479.4	6,128.1	0.2690	253.8	308.5	0.1773	1.5172	1
Malaysia	2,307.3	2,830.9	0.1850	19.1	25.6	0.2539	0.7286	5
Pakistan	8,916.0	10,204.7	0.1263	408.2	521.0	0.2165	0.5834	6
Philippines	4,771.4	5,854.2	0.1850	46.4	59.2	0.2162	0.8557	4
Thailand	3,705.8	4,744.4	0.2189	45.8	58.4	0.2158	1.0144	3

Notes: 1) The figures in this table are based on the results of prediction of Case 5.
2) Y_{65} and L_{65} of India are 1961 figures. The figures for China, and Malaysis are taken from those for 1964; for Korea, for 1966.

stage of "take-off," is quite high, the values being 1.51 and 1.37 respectively. On the other hand, the Indian and Pakistani economies are inelastic in relation to aid. The relative elasticity between aid and GNP is 0.5 to 0.6, respectively. As shown in Table 6, Korea's elasticity is highest, followed by Taiwan, Thailand, the Philippines, Malaysia, Pakistan, and India in that order.

5. *Concluding Remarks: An Overall Evaluation*

So far we have examined the effects and efficiencies of foreign aid from various points of view—the degree of dependence on aid, the marginal productivity of aid, and the elasticity of aid—separately. Putting these various results together, we can derive an evaluation of the absorptive capacity of these countries.

Arranging these countries by combining the degree of dependence on aid with the elasticity of aid, we arrive at some interesting results as shown in the following Table 7:

Table 7. Evaluation (1): the Degree of Dependence on Aid and the Efficiency of Aid

Degree of Dependence \ Efficiency of Aid	$\eta>1$	$1\geqq\eta\geqq0.7$	$\eta<0.7$
$\phi_2<0.2$	Taiwan Korea		
$0.2\leqq\phi_2<1$		Thailand	
$\phi_2\geqq1$		Malaysia Philippines	India Pakistan

From another combination—per capita GNP and the efficiency of aid—we also find some tendencies among these countries as shown in Table 8.

Table 8. Evaluation (2): Per Capita GNP and the Efficiency of Aid

Per Capita GNP \ Efficiency of Aid	$\eta>1$	$1\geqq\eta\geqq0.7$	$\eta<0.7$
$y>200$ dollars		Malaysia	
$200\geqq y\geqq100$	Taiwan Korea	Thailand Philippines	
$y<100$			India Pakistan

Summing up our investigation, the seven developing Asian countries can be roughly classified into three groups. The criteria of classification used here, and the countries coming under the criteria, are as follows:

Group 1: Countries whose economies are considered to be now at the stage of self-sustained growth and satisfy the conditions of (a) low dependence on aid ($\phi_2<0.2$), and (b) high efficiency of aid ($\beta>1.5$ and $\eta>1.3$). Taiwan and Korea fall into this category.

Group 2: Countries whose economies are on the way to economic de-

velopment and are more heavily dependent on foreign resources for their industrialization. The conditions of (a) high dependence on aid ($\phi_2 \geqq 1$), and (b) high efficiency of ($\beta > 1.5$ and $1.3 > \eta > 0.7$) must be satisfied. Malaysia, the Philippines and Thailand fit into this category.

Group 3: Countries whose economies grow at a slower pace, and depend heavily on foreign aid. The conditions of (a) high dependence on aid ($\phi_2 \geqq 1$), and (b) low efficiency of aid ($\beta < 1$ and $\eta < 0.6$) are satisfied. India and Pakistan come under this category.

6. Further Considerations

Because of various limitations, it was necessary to use simple models for the analysis: there were some obstacles which prevented the use of more complete models. The major obstacle was the unavailability of ordinary data for the Asian countries under consideration. Since the purpose was to make an international comparison, the range of our model had to be limited by the data available for different countries. The limitations of time and inadequate facilities for data processing were other limiting factors. In addition, it was very difficult to obtain adequate data on foreign aid, which we demanded. Consequently, in this paper foreign aid was assumed to be "net capital inflow" as measured by the "trade gap."

Foreign aid can be classified into three types: grants, tied loans and untied loans. The original intention was to study how particular types of aid have different effects on different economies. But this aspect had to be given up because of the theoretical difficulty of formulating a model which takes into account the differences in the types of aid.[18] The problem of efficient distribution of foreign aid among industries is also interesting, a subject which is left for later study because of the difficulty of securing sufficient input-output tables (except for a few countries) essential for that kind of study.

The main deficiency of our model, it seems to us, is that it neglects the dynamic role of foreign aid in the recipient country. In other words, it assumes the economic structure of the recipient country to be unchanged. This assumption may limit the validity of our prediction, since it is conceivable that the economic structure of the recipient country would change to some degree under the impact of foreign aid.

18 Using opportunity cost concept, G. Ohlin estimates a "grant-element" of loan when the interest rate and the terms of maturity are given. See, G. Ohlin, *Foreign Aid Policies Reconsidered,* OECD, 1966, pp. 101–102.