PROJECTIONS OF ECONOMIC GROWTH AND INTRA-REGIONAL TRADE FOR THE DEVELOPING ECAFE REGION, 1960-1970

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Introduction

This thesis aims at making a study of the potential possibilities of economic growth and expansion of intra-regional trade within the developing ECAFE region for the 1960's.

Projections for economic growth and foreign trade of developing Asian countries have previously been attempted by FAO, EEC, ECAFE, and others;[1] however, the projections for foreign trade and for economic growth in each country were determined separately, and therefore the interdependence of economic growth of each country within the region was not necessarily made clear. Furthermore, the majority of the developing countries in the area have now laid long-term plans dating

1 (1) ECOSOC, U. N., "Evaluation of Long-Term Economic Projections: A Preliminary Report by the Secretary-General," *Document* (E/3379), New York, June, 1960.
(2) ECE, U. N., *Economic Survey of Europe in 1960*, Geneva, 1961, Chap. V.
(3) U. N., *World Economic Trends, Study of Prospective Production of and Demand for Primary Commodities, 23rd May*, 1962.
(4) ECAFE, *Projections of Foreign Trade of the ECAFE Region up to 1980* (E/CN. 11/DPWP. 8/L. 4), Bangkok, 1963.
(5) ECAFE, *Economic Bulletin of Asia and the Far East*, Bangkok, Vol. XIV, No. 3 (Dec., 1963), pp. 8–37.
(6) ECAFE, *Review of Long-Term Economic Projections for Selected Countries in the ECAFE Region*, E/CE. 11/CAEP. 2/L. 4 & Add. 1, 18 September, 1964.
(7) FAO, *Agricultural Commodities Projections for 1970*, Rome, May, 1962.
(8) Thorkil Kristensen and Associates, *The Economic World Balance*, Copenhagen, Munksgaard, 1960, p. 250.
(9) P. N. Rosenstein-Rodan, "International Aid for Underdeveloped Countries," *The Review of Economics and Statistics*, Vol. XLIII, No. 2 (May, 1961), pp. 107–138.
(10) Bela A. Balassa, *Trade Prospects for Developing Countries*, The Economic Growth Center, Yale University, Homewood, Illinois, Richard D. Irwin, Inc., 1964.
(11) New Directions for World Trade, *Proceeding of a Chatham House Conference Bellagio, 16–24, September, 1963*, London, Oxford University Press, 1964.

back to the beginning of the 1960's, in the place of the medium-term plans of the past. But these plans pay little attention to the fact that the economic growth of the countries concerned is interdependent on intra-regional trade, and that the possibility of realization of these development plans is dependent not only on various domestic factors but also on the economic development of other countries. Therefore, this study intends to consider the relationship between the economic growth and intra-regional trade of the developing ECAFE countries, in accord with recent tendencies in the theory of the development of underdeveloped countries. In the opinion of the writer, economic growth attained through an increase in exports to countries outside the region and expansion of intra-regional trade may be considered as a unified form of economic growth through exports of primary products and industrialization with the object of expanding the domestic market, which have hitherto been discussed.

The study on the interdependence of economic growth in developing ECAFE countries standing on the above-mentioned vision will need regional economic growth models. However, as regards the method, economic projections for developing countries in the past have been conducted within the limit of the economy of a country, and there has been no example of the practical application of dynamic growth models for a group of countries. This thesis indicates an instructive example of the application in the field of study on the theory of the development of underdeveloped countries.

The developing ECAFE countries in this study are limited to the fourteen countries: Burma, Cambodia, Ceylon, China (Taiwan), Hong Kong, India, Indonesia, the Republic of Korea, Laos, Malaysia, Pakistan, the Philippines, Thailand, and South Viet-Nam, and the socialist countries such as Mainland China, North Korea, North Viet-Nam are excluded. Japan is naturally excluded from the list of developing countries in Asia, but it is included in the endogenous sector of models for the purpose of analysing Japan's interdependence with the region under survey. The inclusion of Mainland China within the endogenous sector of models for the purpose of analysing the interdependence of China and Japan as well as developing countries in Asia is left as a problem to be studied in the future.

I. REGIONAL ECONOMIC GROWTH MODEL

There is an abundance of literature dealing with economic growth

models,[1] but very few of the models are applicable to developing ECAFE countries. Some computable macro-economic growth models are found in the United Nations' *Problems of Long-Term Economic Projection.*[2]

1 A. Selected literature on economic growth models is as follows:

(1) R. F. Harrod, *Towards a Dynamic Economics*, London, Macmillan, 1952.

(2) Trygue A. Haavelmo, *A Study in the Theory of Economic Evolution*, Amsterdam, North-Holland Pub., 1954.

(3) H. J. Bruton, "Growth Models and Underdeveloped Economics," *Journal of Political Economy* (Aug., 1955), pp. 322–336.

(4) Robert M. Solow, "A Contribution to the Theory of Economic Growth," *The Quarterly Journal of Economics*, Vol. LXX, No. 1 (Feb., 1956), pp. 65–94.

(5) Joan Robinson, *The Accumulation of Capital*, London, Macmillan, 1956.

(6) Evsey D. Domar, *Essays in the Theory of Economic Growth*, New York, Oxford University Press, 1957.

(7) Charles Bettelheim, "Le problème de la maximation de la croissance économique," *Revue Economique*, No. 1 (Janvier, 1957), pp. 3–39.

(8) Kenneth K. Kurihara, *The Keynesian Theory of Economic Development*, London, George Allen & Unwin, 1959, p. 219.

(9) Nicholas Kaldor, *Essays on Economic Stability and Growth*, London, Gerald Duckworth, 1960.

(10) Maurice Dobb, *An Essay on Economic Growth and Planning*, London, Routledge and Kegan Paul, 1960.

(11) Leif Johansen, *A Multi-Sectoral Study of Economic Growth*, Amsterdam, North-Holland Pub., 1960.

(12) James E. Mead, *A Neo-Classical Theory of Economic Growth*, London, George Allen & Unwin, 1960.

(13) Jan Tinbergen and others, *Mathematical Models of Economic Growth*, New York, McGraw-Hill, 1962.

B. Selected literature on models of long-term projections for economic growth is as follows:

(1) National Bureau of Economic Research, Conference on Research in Income and Wealth, *Long-Range Economic Projection* (Studies in Income and Wealth, Vol. 16), N. Y. Princeton, Princeton University Press, 1954.

(2) Lawrence R. Klein and Arthur S. Goldberger, *An Econometric Model of the United States, 1929–1952*, Amsterdam, North-Holland Pub., 1955.

(3) Stefan Valavanis-Vail, "An Econometric Model of Growth; U. S. A., 1869–1953," *American Economic Review*, Vol. XLV, No. 2 (May, 1955), p. 208.

(4) P. J. Verdoorn, "Complementarity and Long-Range Projections," *Econometrica*, Vol. XXIV, No. 4 (Oct., 1956), pp. 429–450.

(5) Hollis B. Chenery, "Patterns of Industrial Growth," *American Economic Review*, Vol. L, No. 4 (Sept., 1960), pp. 634 ff.

(6) Office Statistique des Communautés Européennes, *Les méthodes de prévision du développement économique à long term*, Paris, Nov.–Dec., 1960.

(7) Laurence R. Klein, "A Model of Japanese Economic Growth," *Econometrica*, Vol. 29, No. 3 (July, 1961), pp. 277–292.

(8) L. M. Goreux, "Economic Growth and Commodity Projections," *Monthly Bulletin of Agricultural Economics and Statistics*, Vol. 10, Nos. 7/8 (July-August, 1961), pp. 1–17.

However, these models are limited to economic plans of a single country, and they do not attempt to analyse the interdependence of economic growth of underdeveloped countries within a region. The theory of international trade has approached this problem in the form of the generalization of the multiple-country theory by the traditional two countries-two commodities models or a foreign trade matrix.[1]

It is felt, however, that the simplest approach to this problem is to analyse the interdependence of economic growth of each country through using the dynamic input-output model analysis.[2] J. Tinbergen suggested a model of r region and h sector.[3] But input-output tables are still not available in complete form for most of the developing Asian countries, and furthermore there will be difficulties in finding data to make a matrix of capital coefficients for the purpose of designing a dynamic input-output model. In view of the time and considerable volume of work needed to compile data, immediate realization cannot be expected. Within the limits of available data, it is possible to produce the plan of a regional economic growth model for m countries and one sector as a first approach. This model will be explained as follows.

When the gross domestic product of countries within the region during a certain period t is expressed by the symbol x_t, exports to countries inside the region by e, total imports by m, private consumption expenditure by c_p, government consumption expenditure by c_g,

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2 ECAFE, *Problems of Long-Term Economic Projections, With Special Reference to Economic Planning in Asia and the Far East*, New York, 1963, pp. 7–27.

1 Some examples are given below.

(1) L. A. Metzler, "A Multiple-Region Theory of Income and Trade," *Econometrica* (Oct., 1950).

(2) Harry G. Johnson, *International Trade and Economic Growth*, London, George Allen & Unwin, 1958, pp. 65–149.

(3) Harry G. Johnson, *Money, Trade and Economic Growth*, London, George Allen & Unwin, 1962, pp. 75–103. Literatures on this problem are indicated in detail in the cited work of Harry G. Johnson, pp. 99–103.

2 Leading examples analysing positively the network of international trade by the method of static input-output analysis are given below.

(1) W. Beckerman, "World Trade Multiplier and the Stability of World Trade, 1938 to 1953," *Econometrica* (July, 1956), pp. 239–252.

(2) Anthony Y. C. Koo and C. C. Liang, "The Role of Japan in the Intraregional Trade of the Far East," *The Review of Economics and Statistics*, Vol. XXXV, No. 1 (Feb., 1953), pp. 31–40.

3 Jan Tinbergen, "Multi-Regional and Multi-Sectoral Dynamic Input-Output Model for the Medium Term," Appendix to Chapter VI, in U. N., *Programming Technique for Economic Development, With Special Reference to Asia and the Far East*, Bangkok, 1960, pp. 115–120.

gross domestic capital formation by Δs, and exports to countries outside the region by f, the formula (1.0) is obtained. Needless to say, the formula (1.0) indicates the national economic balance of countries within the region.

$$(1.0) \quad x_t = e_t - m_t + c_{pt} + c_{gt} + \Delta s_t + f_t$$

Now, let it be supposed that exports within the region to which a country belongs is a linear function of the gross domestic product of the other countries and that the total imports of the country is a linear function of gross domestic product of the country concerned. In the same manner, as regards functions of private consumption expenditure and government consumption expenditure, the linear function of gross domestic product of the country concerned is supposed. Further, as to the investment function, a linear relationship is supposed between capital stocks and gross domestic products. Of course, actually, there will exist some cases where non-linear function is considered more adequate than a linear one, but here, a linear relationship is supposed for the convenience of simplification. The defects of linear function must be corrected to some extent by the modification of estimated parameters.

Taking the above-mentioned relation of functions into consideration, the equation (1.0) will be transformed to (1.1) when it is replaced by matrix symbols.

The symbols.

x: column vector of m element which indicates gross domestic product of m countries within the region.

A: a_{ij} coefficient matrix of an $m \times m$ order which denotes the coefficient of export from country i to country j within the region.
$(i, j = 1, 2 \ldots\ldots m)$

B: diagonal matrix of an $m \times m$ order which indicates the total import coefficient b_{ij} of a country within the region.
$\begin{cases} i, j = 1, 2 \ldots\ldots m \\ b_{ij} = 0 \quad i \neq j \end{cases}$

C: diagonal matrix of an $m \times m$ order which indicates the private marginal propensity to consume c_{ij} of a country within the region.
$\begin{cases} i, j = 1, 2 \ldots\ldots m \\ c_{ij} = 0 \quad i \neq j \end{cases}$

c^0: column vector of an m element which indicates the dimension parameter of private consumption expenditure function.

G: diagonal matrix of an $m \times m$ order which indicates the government marginal consumption expenditure propensity g_{ij} of a

country within the region.

$\begin{cases} i, j=1, 2.....m \\ g_{ij}=0 \quad i \neq j \end{cases}$

g^0: column vector of an m element which indicates the dimension parameter of government consumption expenditure function.

K: diagonal matrix of an $m \times m$ order which indicates the marginal gross capital coefficient of a country within the region.

$\begin{cases} i, j=1, 2.....m \\ k_{ij}=0 \quad i \neq j \end{cases}$

f: column vector of an m element which indicates the growth path of export of m countries to outside the region.

$$(1.1) \quad x_t=Ax_t-Bx_t+c^0+Cx_t+g^0+Gx_t+K\Delta x_t+f(t)$$

The f function which indicates the m countries' exports to outside the region is not necessarily linear, but the time paths of its development are supposed to have been predetermined exogenously. If the time paths of exports of the countries to outside the region are determined exogenously, it may be possible to obtain the growth paths of the gross domestic product (x), private and government consumption expenditures (c_p & c_g), gross domestic capital formation (Δs), intra-regional trade (e), total imports (m), as endogenous variables in this model.

For the analysis of the model, (1.1) can be changed as follows:

$$(1.2) \quad [I-(A-B+C+G)]x_t-K\Delta x_t=[c^0+g^0+f(t)]$$

where I denotes a unit matrix, in accordance with the ordinary matrix notation.

For the simplification,

$$(A-B+C+G)\equiv P \quad \text{and}$$
$$[c^0+g^0+f(t)]\equiv R_t,$$

(1.2) will become

$$x_t=Px_t+K(x_{t+1}-x_t)+R_t.$$

This can be arranged as

$$Kx_{t+1}=(I-P)x_t+Kx_t-R_t.$$

For the simplification,

$$(I-P)\equiv Q$$

it then follows,

$$Kx_{t+1}=(K+Q)x_t-R_t.$$

When K^{-1} (K^{-1} is nonsingular) is premultiplied both sides of the above equation, the following reduced form will be obtained:

$$(1.3) \quad x_{t+1}=(I+K^{-1}Q)x_t-K^{-1}R_t$$

The next procedure is to find out the m characteristic roots of $K^{-1}Q$ and an associated vector $X \neq 0$, which satisfy the following,

$K^{-1}QX=X\Lambda$, and
$(I+K^{-1}Q)X=X(I+\Lambda)$

Where Λ is a diagonal matrix of an m characteristic root of $K^{-1}Q$, and X is a matrix of an $m\times m$ order whose kth column is a characteristic vector associated with a characteristic root λ_k. If Λ and X, which satisfy the above-mentioned conditions, are obtained, it then follows:

(1.4) $x_t=X(I+\Lambda)^tX^{-1}(x_0-Q^{-1}R)+Q^{-1}R,$

where x_0 is a vector which indicates the initial value of gross domestic product of m countries within the region. Consequently, when the initial values of gross domestic product and the growth paths of outer-exports of m countries within the region are given in this regional economic growth model, the growth paths of gross domestic product, investments, private and government consumption expenditures, intra-regional trade and total imports will be obtainable.

In the above model, it is implicitly assumed that there is a certain fixed relation between capital stocks and the domestic production level in each country within the region. If we relax this rigid assumption and introduce the possibilities of under-capacity growth, where the domestic production is below the level of operation which is constrained by capital stocks, the regional economic growth model may be much more generalized. This problem may be dealt with by applying linear programming techniques in which there has been marked progress in recent years.

II. LINEAR PROGRAMMING MODEL FOR REGIONAL ECONOMIC GROWTH

In linear programming models, procedures are taken to maximize or minimize the objective function which complies with certain linear constraints. Consequently, as opposed to the aforementioned simple regional economic growth model, the linear programming models will become "intentional" projection models of the economic behaviour unit.

A linear programming model for regional economic growth has been set up as follows;

(2.0) $x_t=Ax_t-Bx_t+c^0+Cx_t+g^0+Gx_t+\Delta s_t+f_t.$

The symbols are the ones used in the case of the simple regional economic growth model: x denotes a column vector of gross domestic product of m countries within the region; Δs a column vector of gross domestic capital formation (the increase in capital stocks); f a column vector of exports to countries outside the region; A a_{ji} matrix of intra-

regional exports coefficient; B a diagonal matrix of total imports coefficient; C and G diagonal matrix of private and government consumption expenditures coefficient; c^0 and g^0 vectors of dimension parameters of private and government consumption expenditures functions.

(2.0) may be expressed as

$$x_t=(A-B+C+G)x_t+\Delta s_t+(c^0+g^0+f_t).$$

For the simplification,

$(A-B+C+G)\equiv P$, and

$(c^0+g^0+f_t)\equiv R_t$, it then follows,

$$x_t=Px_t+\Delta s_t+R_t.$$

For the simplification,

$(I-P)\equiv Q$ is put, and then the above equation may be transformed, as follows

$$(I-P)x_t=\Delta s_t+R_t,$$

$$(2.1)\quad Qx_t=\Delta s_t+R_t.$$

This equation represents the balance which is required in gross domestic product, investments, consumption, exports and imports of countries within the region.

Supposing that the increase in gross domestic product is within the range limited by the activity level of investment, the following condition (2.2) will become necessary:

$$(2.2)\quad \Delta s_t\geq K\Delta x_t.$$

In this formula, K indicates a matrix of capital coefficient, as in the aforementioned case. Attention should be given to the fact that, if the formula (2.2) is formed by the sign of equality instead of the sign of unequality, (2.1) and (2.2) will be replaced by the aforementioned simple regional economic growth model. However, in the linear programming model, it may be necessary to take steps to prevent the gross domestic capital formation of these countries from becoming negative. In order to check the possibility of this arising negative accumulation, it will be enough to add the following equation to the aforementioned constraints,

$$(2.3)\quad \Delta s_t\geq 0.$$

Consequently, the next question is that of how to select objective functions to maximize or to minimize under the conditions of (2.1), (2.2), and (2.3). Viewed from our purpose of economic projections of countries within the region for 1970, it is desirable to establish objective functions which will maximize the capital stock or gross domestic product of countries within the region in the goal year. In other words, it is to analyse the efficient paths of capital accumulation which will maximize

capital stock or gross domestic product of all countries within the region in the target year t.[1]

Following this purpose, linear programming model for regional economic growth can be summarized as follows:

$$\text{Maximize } V's_t \text{ subject to } \quad Qx_t = \Delta s_t + R_t$$
$$\Delta s_t \geq K\Delta x_t$$
$$\Delta s_t \geq 0.$$

Where s_t denotes a column vector of capital stocks of m countries within the region in the target year t, and V' weight. The symbol means the transposed.

It is instructive to change the above-mentioned weight of objective functions of the linear programming model according to the purpose of the projections. For instance, when the reciprocal of marginal gross capital coefficient in each country within the region is used as weight, the efficient growth paths of the regional economy in order to maximize the target year's GDP in the region as a whole may be obtained.

In the above, we have explained projection models for the regional economic growth. It will be necessary to refer to some problems on the methodology concerning our projection models.

1. The following literature is useful as to linear dynamic programming models:
   (1) J. von Neumann, "A Model of General Equilibrium," *Review of Economic Studies*, Vol. XIII B(1) (1945), p. 1.
   (2) N. Georgescu Rogen, "Relaxation Phenomena in Linear Dynamic Models," in Koopmans ed., *Activity Analysis of Production and Allocation*, New York, Wiley, 1951, p. 116.
   (3) Robert Dorfman, Paul A. Samuelson and Robert M. Solow, *Linear Programming and Economic Analysis*, New York, McGraw-Hill, 1957.
   (4) Samuel Karlin, *Mathematical Methods and Theory in Games, Programming, and Economics*, London, Addison-Wesley Pub., 1959.
   (5) Oskar Lange, *Introduction to Econometrics*, London, Pergamom Press, 1959, Chap. III.
   (6) Robert M. Solow, "Competitive Valuation in Dynamic Input-Output System," *Econometrica*, Vol. 27 (1959), pp. 30–53.
   (7) David Gale, *The Theory of Linear Economic Models*, New York, McGraw-Hill, 1960.
   (8) Kenneth K. Kurihara, *Macroeconomics and Programming*, London, George Allen & Unwin, 1964, pp. 53–92.
   (9) G. F. Hadley, *Nonlinear and Dynamic Programming*, London, Addison-Wesley, 1964.
   (10) P. N. Rosenstein-Rodan, *Capital Formation and Economic Development*, London, George Allen & Unwin, 1964.

III. SOME PROBLEMS ON METHODOLOGY OF MODELS

Economic projections for the developing ECAFE countries conducted in the past were mostly carried on as a link in the chain of development plans in each country or in the form of investigation into the possibility of realization of development plans.[1] At present, development plans of the developing region in Asia have mostly been formed based on econometric models. This tendency is expected to be strengthened by the development of techniques of econometric model analysis and electronic computers.

There are not a few persons who have some doubts about the possibility of applying the econometric model analysis to developing countries, but it is undeniable that, with the progress in repletion of statistics and data, the sphere of model analysis will gradually become wider.[2] Naturally, all problems concerning economic development of developing countries at present may not be solved by the method of econometric analysis, but conversely, this will afford no basis for denying extensively the effectiveness of model analysis.

The regional economic projection model, which we have introduced above, is an example of model analysis on the possibility of economic growth of developing countries. Naturally, the analysis of the complicated aspects of economic development of developing Asian countries by this simple macro-model is not possible, but this will give a clue to prospects for economic growth of these countries. In this model, the economy is unified in a single macroscopic sector, but it will be possible to approach the problems of economic growth of a group of countries, which include the mutual relation of industrial sectors, by dividing into multiple sectors. This model supposes boldly a linear relationship in various economic variables, but when replaced by a nonlinear relationship, this will become a more realistic one.[3] Further, it will be possible to suppose more complicated functional relations by the increase in explanatory variables of functions through the prolongation of observation

1 Institute of Asian Economic Affairs, *Ajia Keizai no Chōki Tembō* (Long-Term Projections for the Asian Economy), Research Material No. 68, Tokyo, 1964, pp. 21–76.

2 An example of the application of most ambitious econometric models to long-term projections for the Indian economy is found in Takeo Fukuchi, *Indo Keizai Sōgō Moderu no Kenkyū* (Study on Aggregate Models of Indian Economy), Research Materials No. 52, Tokyo, Institute of Asian Economic Affairs, 1963.

3 An example is found in, C. Almon, "Numerical Solution of a Modified Leontief Dynamic System for Consistent Forecasting or Indicative Planning," *Econometrica*, Vol. 31, No. 4 (Oct., 1963), pp. 665–678.

period. These model analysing techniques are closely related to various problems such as the treatment of statistical data, the method of estimating parameters, the computing capacity and costs of electronic computers, etc., but models will possibly be compelled to become more complicated, more diversified, and larger. This simple model is only the initial stage of the development towards large-scale models.

Consequently, attention should be paid to the fact that projections for the economic growth of developing Asian countries to be mentioned later are subject to many conditions as to the methodology of model analysis.

IV. WORKING HYPOTHESES AND RESULTS OF PROJECTIONS

Prior to projections, the estimation has been made on structural parameters of economic projection models for the developing ECAFE region. Owing to the limitation of statistical data, the estimation of matrix of intra-regional export coefficients was based on the average for three years of 1959, 1960, and 1961; the trend of exports to countries outside the region based on the time series data for the period from 1955 to 1962; other parameters based on the time series data of national accounts for the period from 1950 to 1961. However, as regards some countries where data for the observed period were insufficient, the supplement was made through the international comparison. For the estimation, the least square method was adopted as a first approach, alternative methods were reserved for another occasion. Consequently, it is necessary to give attention to the problems of bias to be found in parameters estimated by the least square method.[1] For the projection for economic balance of the developing ECAFE region for the year of 1970 by the above-mentioned projection model, the vector x_0 of gross national product of Asian countries in 1960, the base year (in the strict sense, the average for 1959, 1960, and 1961), were taken as the initial values, and the trend of exports of these countries to countries outside the region was given as exogenous variables of the model. Next, when the growth paths of these exports to countries outside the region were predetermined, the procedure was by deciding the gross domestic product, consumption, investments, intra-regional trade, etc. of these countries as endogenous variables. In this case, some amendment was made to the structural parameters of the projection models, and through repeated re-computation a possible rate of economic growth was estimated.

1 J. Johnston, *Econometric Methods*, New York, McGraw-Hill, 1963, pp. 148–295.

In the economic projections for the developing ECAFE region, the working hypotheses of Case I and Case II were established to observe the relation between the region and Japan. Case I is that the Japanese economy is supposed to maintain almost the same rate of growth as in the 1950's, and Case II that some slowing-down in the rate of growth is supposed due to the advance of the marginal gross capital coefficient. In other words, when compared with Case I, Case II supposes that owing to a larger increase of productive capacity than the expansion of domestic market in the Japanese economy, Japan's capacity of capital exports to the developing ECAFE countries becomes greater.

The intra-regional trade of 14 developing ECAFE countries in the base year accounted for only about 20 per cent of total exports and about 16 per cent of total imports, but when Japan is included, the ratio advanced to about 30 per cent each.

This fact means that the relation of mutual complement between developing ECAFE countries and Japan is fairly close, and the rate of connection of these countries is relatively high in imports compared with exports. Actually, Japanese trade with these 14 countries in the ECAFE region registered excess exports of about $400 million, reflecting Japanese exports of capital to these countries (including reparations payments). As is widely known, the weak relation of mutual complement in these developing countries indicates the special characters of the industries and trade structure of the region. However, in the projections, the hypothesis of strengthened regional connection was not introduced, and the result of the projection in the case when structural parameters of the past were extrapolated has only been presented, pointing out where the questions exist.

According to the result of projections in Case I, the scale of gross domestic product of the 14 countries under survey in 1970 is estimated to reach about $98,300 million at 1960 prices, private consumption expenditure about $74,600 million, government consumption expenditure about $11,600 million, gross capital formation $14,900 million, exports about $11,600 million, imports about $14,700 million, and the deficit in the trade balance about $3,100 million. The ratio of intra-regional trade in total exports and imports of these 14 countries is estimated to remain at about 20 per cent and about 16 per cent, respectively. However, being supported by the high rate of growth of the Japanese economy of about 9.2 per cent on an annual basis, the rate of connection of exports of these countries to Japan will advance to about 36 per cent, whilst the rate of connection of imports from Japan will remain

almost unchanged at about 30 per cent, bringing about the improvement in the deficit in the balance of trade with Japan from about $400 million in the base year to about $70 million.

The result of projections in Case II makes a contrast with that of Case I. Owing to the anticipated slowing-down in the economic growth of Japan to the annual rate of about 8.7 per cent, the connection rate of exports of the 14 countries to Japan will decline to some extent. However, on the other hand, the deficit in the trade balance will be made up for by the increase in the capital exports of Japan to these countries; therefore, the connection rate of imports from Japan will tend to increase. As net exports of capital of Japan to these countries will reach about $150 million during the estimation period, and the capital formation in these countries will also advance to $15,000 million, some decline of exports will be offset, resulting in the expansion of economic scale; gross domestic product is expected to increase to about $98,400 million, government consumption expenditure to about $11,600 million, private consumption expenditure to about $74,700 million, but the deficit in the trade balance will register about $3,200 million, an increase of about $100 million. It is worthy of note that, compared with Case I, Case II will show some increase in the economic growth rate of developing Asian countries, resulting in some degree of expansion of intra-trade.

It is instructive to compare the above-mentioned result of aggregate economic projections with the trend of actual results in the 1950's and the target of the development plans of each country in the 1960's. The average annual rate of growth in the 14 developing countries in Asia in the 1960's is about 4.0 per cent for gross national product, about 4.3 per cent for investments, about 3.6 per cent for private consumption expenditure, about 5.2 per cent for government consumption expenditure, about 4.8 per cent for exports, and about 4.5 per cent for imports. The rate of economic growth of 4.0 per cent is lower than the target of 5 per cent suggested by the United Nations, but somewhat greater than the rate of about 3.8 per cent in the 1950's. In view of the fact that development plans of these countries anticipate an increase of about 5.3 per cent, the estimated value may be said to approach to the trend based on actual results of the past but to be considerably below the trend scheduled in the plan. This point may be well proved when it is considered that the estimated value in this thesis is not an estimate taking into account the realization of the target of development plans, but a rather conservative estimate based on actual performance in the

past.

Of the 14 developing countries under survey, there will be at least three countries where the average annual rate of growth in the 1960's is estimated without doubt to exceed the level of 5 per cent. These are China (Taiwan), Hong Kong, and Thailand. Those where the annual rate of growth is estimated to exceed 5 per cent in the 1970's are the Philippines, Pakistan, and Malaysia in addition to the above-mentioned three countries, the rest of countries being expected to return a rate of less than 5 per cent. This fact suggests considerable severity of self-sustaining economic growth in most developing countries in the ECAFE region. G. Myrdal has pointed out that the differences in economic development between advanced and developing countries tend to become wider; he has maintained that governments of developing countries should be required to cope with this tendency by establishing national development plans, so as to set the economy in the right direction.[1] However, the result of our projections shows that in addition to the above tendency, the differences in economic development tend to become wider even in the developing ECAFE countries. This fact stresses the necessity of co-operation in developing countries in the ECAFE region besides the establishment of national development plans.

V. SUMMARY

As stated above, this thesis intends to make projections for economic growth and intra-regional trade in the developing ECAFE region for the 1960's. In line with this object, the following has been prepared (1) a simple economic growth model, and (2) a linear programming model for the regional economic growth. According to the result of these projections, the total of gross domestic product of 14 countries in the developing ECAFE region is expected to increase at the annual rate of about 4 per cent in the 1960's. As a result, the scale of intra-regional trade will show an increase compared with the base year of 1960, and the relation of complement to the Japanese economy will strengthen. However, taking into consideration the fact that the increase of population in the region exceeds 2 per cent on an annual basis, the expansion of gross national product per capita in the region will be less than 2 per cent, and that of consumption expenditure per capita will barely exceed 1.5 per cent. This rate is smaller than the target

1 Gunnar Myrdal, *Economic Theory and Under-developed Regions*, London, G. Duckworth, 1957, p. 164.

of 3 per cent increase of gross national product indicated by the United Nations. Under these circumstances, the differences in development between the developing ECAFE region and advanced regions are anticipated to become wider, and besides, the differences of economic development in countries in the region will gradually become conspicuous. In order to cope with this tendency, the necessity to increase co-operation within the region in developing countries will become a problem to be solved in the future.