Exports and Economic Development in Korea

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Chapter I
Introduction

This paper examines statistically the hypothesis that Korea experienced 'artificial' export-oriented development during the period 1961-1971.

It has been maintained by the UNCTAD (United Nations Conference on Trade and Development) that exports, especially of manufactured goods, play a key role in promoting the economic growth of developing countries.(1) In order to bridge the trade gap and to induce efficient industrialization, it has been suggested as well that, regardless of the size of the economy, industrial exports should be expanded vigorously through 'trade not aid'. Arguments similar to the UNCTAD thesis have also appeared in recent literature.(2) The first is that no other strategy is available except export expansion for maintaining a high rate of economic growth. This is an 'export or perish' sort of mercantilist's argument for export expansion. The second is that it is feasible to promote economic development through exports, since there may be substantial gains from export expansion through its favourable effects on the domestic economies. An analogy for the second proposition is that a slow rate of growth in exports is responsible for a slow rate of economic development.

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(1) UN: International Trade as the Primary Instrument for Economic Development, a resolution adopted by UN General Assembly, 1961.
UNCTAD: Proceedings of the UNCTAD, Vol. III (E/Conf. 49/141 Vol. IV) pp.42-84.
Raul Prebisch: Towards a New Trade Policy for Development, Proceedings of the UNCTAD, Vol.2, 1964, pp.3-64.
H.G. Johnson: *Economic Policy Towards Less Developed Countries*, (George Allen & Unwin Ltd., 1967) p.26.
For other references, see footnotes 9/, 21/, 28/, 29/, 95/ and Bibliography (1) and (2).

(2) There are too many to be listed. Analogies to the UNCTAD thesis offer much enlightment as to how a favourable payments position through exports may coincide with rapid economic growth, although Keynesian income theory predicts differently. See Bibliography(1) and (2).

No doubt, the UNCTAD thesis and other arguments for export expansion are not specific as to the mechanics of the correlation between exports and development or as to whether export expansion should be carried out within the framework of comparative advantages or not. There is a need for some specification regarding the structure of the export-oriented pattern of growth and the justification for and/or limitation of export expansion under certain conditions. The conditions of export-led, balancing or lagging growth should be identified.

In this discussion of the export-development hypothesis, the Korean experience raises some important issues both in theory and practice.

Since the early 1960's Korea has pursued the UNCTAD proposition. Ostensibly, economic growth and export growth were so parallel that one may be inclined to believe intuitively that rapid growth of the economy as a whole was induced by the high rate of export growth.(3) Encouraged by this simple correlation, some hold a view that Korea's recent economic development is a good example of the export-oriented growth of present-day developing countries. The Korean Government has also announced that it will continue to pursue the 'export-first' strategy to maintain rapid economic growth in the future.(4)

From this brief description of Korean experience of economic development and exports, the following questions can be raised: (a) To what extent has

(3) The Seoul Kyungje (Seoul Economic Newspaper), 28th December, 1972.
The Third Five-Year Economic Development Plan, 1972-1976, (Government of the Republic of Korea, 1971,) p.22.
Annual Presidential Address at the Blue House on 19th January, 1973.
The Seoul Kyungje, 14th January 1973.
S. Kanes-Thasan: "Stabilizing an economy—a study of the Republic of Korea" IMF Staff Papers, March 1969.
Emerson Chaplin: "Success story in South Korea," *Foreign Affairs*, Vol. 47, 1968-69, April 1969, pp.560-576.
E. Black: Speeches on "New Diplomacy in East Asia", Tokyo, 17th Sept. 1968.
Le Monde, 11 Feb. 1969.
The Times, 18 June 1969.
I. Adelman (ed.): *Practical Approaches to Development Planning; Korea's Second Five-Year Plan* (The Johns Hopkins Press, 1969) pp.257-276. See 19/ and Bibliography.

(4) Address of the President of Korea at the Conference of Korean diplomatic heads stationed abroad, April, 1969. New Year Interview with reporter, 10 th Jan. 1969. Major Indicators of the Third Five Year Plan (1972-76), 20th April, 1969. Korea Trade & Investment: the KOTRA, p.11, 1969. The Annual Report of IBRD(1973). Other references are too numerous to be cited. But especially see 19/.

Korea been affected by export-oriented development? and (b) Would it be desirable for Korea to pursue export-oriented development in the future?

One particular aspect of the Korean experience which deserves emphasis, however, is that rapid export expansion has been carried out 'artificially'.(5) Setting targets of high economic growth and investment rates which were inevitably accompanied by a large trade gap, the Korean Government introduced foreign capital amounting to around 3.5 billion dollars during the period 1961-1971, and eventually came to regard any and all exports as desirable in narrowing the growing trade gap and servicing foreign debts. As a result of this policy it appears that exports of uncompetitive goods have increasingly been encouraged beyond the current and potential comparative advantage lines. From the point of view of resource allocation and economic growth, factors of production seemed not to be efficiently used and, hence, the argument that there can be unlimited expansion of exports has to be carefully examined.

The characteristics of Korean export expansion thus require some modification of the above questions as follows: (a) To what extent has Korea been affected by export-oriented development through artificial export expansion? and (b) Would it be desirable for Korea to pursue export-oriented development through artificial export expansion in the future? The questions posed here seem to be crucial to other countries,(6) and if any developing countries follow the UNCTAD proposition as seriously as those countries do, they might also be forced to face the same problem in the future.

Before proceeding to the details of this paper's argument, the following points should be noted for ease in comprehension.

First, the analysis is carried out mainly in the context of a relatively

(5) For the definition of artificiality in export expansion, see page 25 and Chapter Ⅱ; especially Table 1-(1) and (2).

(6) J. Bhagwati: "The Theory and Practice of Commercial Policy: Departures from Unified Exchange Rates" (International Finance Section, Department of Economics, Princeton University, 1968).
I.S. Gulhati: "Economic Promotion through Import Entitlement," *Economic Weekly*, May 1965, pp. 659-864.
N. Islam: "Economic Policy in Pakistan" in Towards Balanced International Growth, 1969, pp.219-243.
J. Bhagwati and S. Chakhavarty: "Contributions to Indian Economic Analysis: a Survey," *AER*, Sept. 1969, p.66 (Part 2. Supplement, Surveys of National Economic Policy Issues and Policy Research).

small developing country, and the consideration of world-wide welfare is thus neglected.

Second, economic growth is defined as an increase in real output, and the maximization of gross domestic product is here assumed to be a legitimate policy goal.(7) Economic development is more broadly defined including the structural transformation and changes of non-economic factors. In this paper, however, economic growth and economic development are used interchangeably, and often non-economic factors are given importance. Gross domestic welfare, which takes into account the problems of pollution, income distribution, etc., is not dealt with.

Third, the assumption is also made that capital and technology are internationally mobile.(8) The dual economy involving the subsistence agricultural sector is not considered. Technical duality is also assumed away.

Fourth, throughout the paper, it is assumed that foreign demand for export goods grows at a relatively fast and steady rate and that international prices for all inputs and outputs except labour are given. World export competition among the countries which pursue the export-first policy is not considered here.

Fifth, the granting by developed countries of temporary preferences on manufactured exports of developing countries are all assumed to be exogenous variables constituting the enlargement of foreign demand which is beyond the control of developing countries. It is also assumed that the domestic markets of developing countries are usually protected by artificial barriers against outside competition, and, thus, domestic markets are utilized for inward-looking or import-substitution industrialization. In advanced countries, investment in the domestic sector is not necessarily equivalent to investment for import-substitution.

Sixth, much research work has been done recently on both the inward

(7) H. Chenery: "Patterns of Economic Growth"' AER, 1960, pp.624-625. A. Maizels: *Industrial Growth and World Trade*, (Cambridge University Press, 1968) pp.24-40.
C.A. Cooper and R.E. Massel: *Towards a General Theory of Customs Union for Developing Countries* (Rand Corporation, May 1965).
P.T. Bauer and B.S. Yamey: The Economics of Underdeveloped Countries (Cambridge University Press, 1957) p.237.

(8) This assumption alleviates the difficulty of specifying the concepts of terminal capital stock and discount rate of income, by enabling the optimal setting in advance of the magnitude of foreign and domestic savings to be an acceptable objective function.

and outward-looking development strategies of developing countries,[9] but this paper studies the case of Korea, which is relatively small, and where no empirical investigation has been conducted on the export-oriented development path and its artificiality.

Seventh, Korea is here defined as the Republic of Korea which is the official name (in the U.N.) of Korea, excluding, in a geographical sense, the northern part of Korea (North Korea). It is assumed in this paper that the possibility of territorial unification of the South and North does not exist within the period under consideration and that the communique[10] on the possible commencement of peaceful contacts between the two regions on 4th July, 1972 does not lead to the formation of a sort of economic integration in the foreseeable future.

Chapters II and III formulate a model of export-oriented development and work out a theory of 'artificial' comparative advantage. The theoretical framework dealt with in these Chapters provides a basis for the empirical investigation in Chapters IV and V. In these chapters the formula to measure the total factor productivity and the efficiency of artificiality in export expansion are also given.

Chapters IV and V formulate an export-oriented development model for Korea and evaluate statistically the extent to which Korea has developed along an artificial export-oriented path. They examine also whether resources have been wasted in the course of artificial export expansion. In evaluation, special emphasis is given to the process of export-oriented development and its artificiality, but both are treated synthetically. Chapter VI concludes with a summary and some policy suggestions. The Appendices deal with

(9) H. Myint: "International Trade and the Developing Countries," *International Economic Relations*, 1969, pp.5-35; "The Inward and Outward Looking Countries of Southeast Asia," *The Malayan Economic Review*, 1967, pp.1-13.
H.B. Chenery and L. Taylor:"Development Patterns among Countries and Over Time" RES, 1968, pp.391-416.
B. Balassa: "Development Strategies in Semi-Industrial countries," IBRD and IDA, Econmic Depeartment Working Paper, No. 34; "An Evaluation of the Strategy of Export-Induced Growth in Norway", with emphasis on the relationship between the exports of manufactured goods and industrialization" IMF, Echomic Department Working Paper, No. 24, 1968. N.H. Neff: "Export Stagnation and Autarkic Development in Brazil," *QJE*, 1967, pp. 286-301.
D.B. Keesing: "Outward-Looking Policies and Economic Development", EJ, 1967, pp.303-320. See Bibliography(2).

(10) Refer to the details of the Presidential Address at the Blue House on the 4th July, 1972.

compilation of the data in detail and provide validity tests of the artificial export-oriented development model.

Chapter II
Analysis of Artificial Export-Oriented Development

1. Controversies over 'development through exports'

The interrelationship between economic growth and export expansion is amongst the oldest themes in economic theory, but the views expressed so far have shown a wide diversity.(11) Some view export as a prerequisite for economic development. This positive view can again be differentiated into several parts according to the extent of the role which exports may play. In contrast, it has been contended that exports are a product of economic development, and only a residual out of domestic surplus. The extremists going one step further against export expansion maintain that exports may in fact play a lagging, or at most only a balancing role in economic development. In moderation of these different arguments, it has also been held that exports can speed up or slow down economic development, and that there is no simple or one-directional causal link between exports and economic development.

As such, discussion about the relationship between exports and development has not been conclusive, and it is still bound up with the whole issue of trade and protection from which it seems not yet to have been properly disentangled. Issues involved in this complication include: the principle of comparative advantage versus tariffs, or international specialization versus autarky (protection), foreign versus domestic demand (or market), export expansion versus import substitution, trade theory versus growth theory, statics versus dynamics, balanced versus unbalanced growth, agricultural production versus manufacturing (especially their demand elasticities and input-output variations), and outward versus inward-looking industrialization, along with those issues of terms of trade, international inequalities, and export instability. In addition, such economic conditions as the size of the nation, the rigidity of its economic structure, the stage of its economic development, the presence of a dual economy, the geographical situation and

(11) See Bibliography (1).

natural endowments, as well as sociopolitical factors should be included in a list of such complicating factors.(12)

Another puzzle with regard to the role of exports in economic development is concerned with the hazy concept of comparative advantage and the incompleteness of economic theory itself.(13) The present body of economic theory does not precisely deal with the problems of exports, just as J. Robinson points out that economics face a second crisis because it cannot solve the problems concerning the contents of employment, pollution, energy, differential income between the rich and poor, and the like.(14) Present international trade theory does not properly tackle the problems of the creation of export industries, the status of export management, foreign marketing, multinational corporation, foreign direct investment, joint ventures, the magnitude of foreign demand, and disaggregated export commodities. Although these factors, jointly or separately, may critically affect the role of exports in an open economy, this question of exports is still in the middle of theoretical discussion, and no clear empirical solutions have yet been provided.

In a sense, all these issues are related to investment allocation among various sectors of the economy(which differs from the choice among various projects within a sector, or the choice of techniques for a particular project), and this will depend on the strategy for development. But few investment criteria have yet been put forward satisfactorily for capital allocation between the export and domestic sectors.(15)

In this paper, an attempt has simply been made to approach the export-

(12) As an important reference, see J.M. Therberge: *Economics of Trade and Development* (Wiley, 1968).

(13) J. Robinson: "The Need for a Reconstruction of the Theory of International Trade" in *International Trade and Money* edited by M.B. Connolly and A.k. Svoboda (George Allen and Unwin, 1973), pp. 25-28. She argues that "there is no branch of economics in which a wider gap exists between orthodox doctrine and actual problems than in the theory of international trade."

(14) J. Robinson: "The Second Crisis of Economic Theory" a paper in honour of Richard T. Ely, *AER*, May, 1972, pp.1-9.

(15) H.B. Chenery: "Comparative Advantage and Development Policy," *AER*, 1961, pp. 18-51. D.W. Slater; "World Trade and Economic Growth: Trends and Prospects with Applications to Canada" in *World Trade and Trade Policy* (University of Toronto Press, 1968) p. 52. H.B. Chenery (ed.): *Studies in Development Planning* (Harvard University Press, 1971), Part II: International Trade and External Resources, pp. 89-218.

development hypothesis from the angle of an export-oriented pattern of growth, (since one of our main tasks is to examine to what extent has Korea been affected by export-oriented development). Export-lagging or balancing growth can also be analysed by this approach simultaneously. The process of export-oriented development itself seems to embody dynamic reconciliation of exports and development of the sort that Lamfalussy, Beckerman, Caves, Kindleberger and others apply in their analyses of the problem.[16]

2. Mechanics of export-oriented growth

Traditional trade theory seems to admit, though implicity, the possibility of export-oriented development in any country. According to the doctrine of comparative advantage, a country, regardless of the stage of development it is in, will gain through a higher real income if it is engaged in international trade than otherwise. In other words, traditional trade doctrine is implicitly optimistic about exports and growth, and recommends international specialization along the lines of comparative advantage. Some components of this doctrine attempt to regard exports as a determinant of growth itself, and see exports (even those of primary commodities) as a powerful engine of growth. It has been maintained in this doctrine that since the export market tends to provide possibilities for the maximization of output, it would presumably permit a rapid rate of growth.[17]

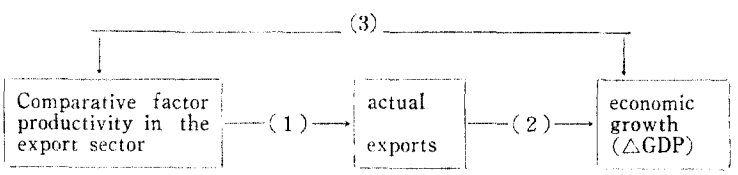
Nevertheless, traditional trade theory does not explicitly mention the whole structure of export-oriented growth. The detailed mechanics of export-oriented patterns of growth remained unexplored until 1960. Since then, some export-led models of economic growth have appeared in the literature. Among

(16) Especially see R.M. Stern: *Foreign Trade and Economic Growth in Italy*(Praeger, 1967) in Bibliography (2).

(17) As G. Haberler and others argue, the classical theory of comparative cost seems to contain the elements of change in factor availability which result in increasing production and income although these changes come gradually. The doctrine of comparative advantage is also said to recognise the simultaneous increase in production and income in both the export and domestic sectors. It has been visualized that as the export sector expands, the domestic sector is stimulated simultaneously. G. Haberler: "Comparative Advantage, Agricultural Production and International Trade" in *Economics of Trade and Development* (ed) J.D. Theberge, op. cit., pp. 168-187.
P.T. Ellsworth: The International Economy (Collier-MacMillan, 3rd Edition, 1964), pp. 59-180.
UNCTAD: Proceedings of the UNCTAD (Vol. IV, Sales No. 64.11. B. 14 Trade in Manufactures), 1964, p. 42.

export-oriented development models, such models as the vent-for-surplus, the export-base, the staple, the foreign-trade-multiplier, the Kindleberger, the Haring, the Lamfalussy, and the Beckerman models are noteworthy.[18] These models vary extensively in terms of rigour in presenting key variables and of policy implications, in describing the relationship between export growth and the growth of real income, and in showing the difference between productivity growth and export expansion, This is because these models were derived initially from the different experience of 'newly settled regions', tropical areas, and such advanced countries as Britain, the Netherlands, Belgium, and other EEC countries.[19] It is common, however, in these models that the direction of causation goes first from exports to the internal economy, and later in just the opposite direction. Common features of these models are depicted as follows:

Figure 1 **The Process of Export-oriented Growth**



(Arrows do not indicate the income flow but the direction of causation. The same will be the case throughout this paper.)

Figure 2 **The Process of Export-oriented Growth**

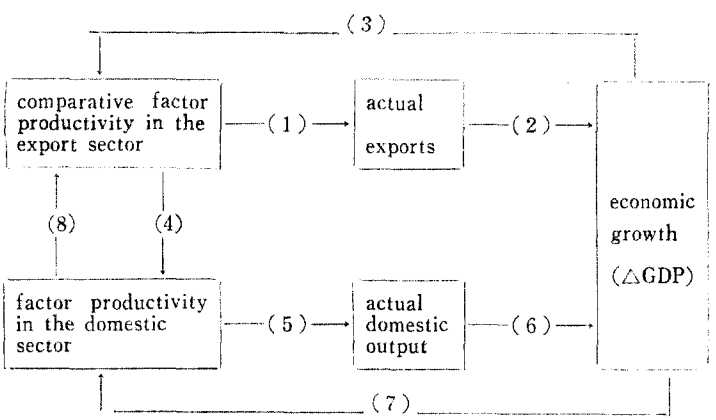


Figure 1 describes diagrammatically the process of export-oriented development, and Figure 2 expands Figure 1 to show a two-sector model.

(18) See Bibliography (2).
(19) Same as 28/.

The existing theory of export-oriented development explains the flows (1)-(8) in detail, whilst the theory of comparative advantage deals mainly with (1)-(2).

The essential process of the export-oriented development can be indicated as follows:

Route (1) Total factor productivity in the export sector affect sactual exports

In explaining route (1) in Figures 1 and 2 it is explicitly assumed in all export-led models (cf. particularly those of Lamfulussy and Beckerman) that the income and price elasticities of world demand for exportable goods are high (i.e. export elasticity optimism). It has also been emphasized that a high rate of export expansion depends on the rapid and steady growth of foreign demand over time. When future demand prospects are good in foreign markets, entrepreneurs are motivated to increase their exports vigorously and to take measures to expand the rate of productivity increase per unit of input.

But export performance may not depend on the world market factor alone, but also on the international competitiveness. It is important to identify the main factors determining the international competitiveness of exportable goods. According to the trade theory so far expounded, they are:

labour productivity, wages, unit capital costs, total costs including costs of imported goods, prices (the Ricardo-Mill theory), choice of exchange rate
factors of production or natural endowments (the Heckscher-Ohlin theory)
availability of total factors (the Kravis theory)
labour skills (the Keesing theory), technology (Johnson stresses), managerial skills, R & D, and economies of scale
product cycle and export marketing (the Hirsch theory)
home demand, similarity in the demand patterns of trading patterns(the Linder theory) or degree of industrialization
population, domestic product, preferences, and distances (the Linnemann theory)
non-economic factors such as tastes, good will, cultural relation, continuity of shipments, specification, and ownership relation

All the factors mentioned above may be combined to determine the comparative competitiveness of exportable goods in the world market. The crucial question is; which are the dominant factors, and to what extent do they determine export expansion? Comparative competitiveness appears to

be the outcome of a number of factors, some measurable, others not.

In most of the export-led growth models, however, it is assumed that export expansion depends upon price competitiveness, which again depends upon comparative factor productivity (total or single). It is imperative in those models that factor productivity in the export sector is assumed to increase faster than such other variables as wages, capital costs, etc., which are inversely correlated to price competitiveness. In the case of a small country factor productivities of competitive countries which produce the same or similar goods are all exogenously given, and, hence, factor productivity in the export sector alone can be utilized to represent comparative factor productivity for practical tests. As for a developing economy, factor productivity may well mean total factor productivity rather than single (labour or capital) factor productivity. This is because in such an economy total costs of production may play a more important role in affecting prices than wage or capital costs alone. Total costs consist of total labour costs, interest charges, the cost of imported goods (raw materials, intermediate products, and capital goods), and others.

The relationship between exports and such export-promoting factors as productivity and price competitiveness merits some symbolic explanation. At first, assume away demand factors in the two country model and suppose that export prices(assumed to be equivalent to costs) are a function of total factor productivity.

$$PRI^e = PRI^e(PRV^e) \quad \cdots\cdots (a)$$

$$PRI^f = PRI^f(PRV^f) \quad \cdots\cdots (b)$$

where PRI^e, PRI^f=export and foreign prices respectively of exportable goods.

PRV^e, PRV^f=total factor productivity in the export sector and foreign countries respectively.

Differentiating (a) and (b) with regard to time, t, and transforming them, one obtains:

$$\frac{d\,PRI^e}{dt} = \frac{d\,PRI^e}{d\,PRV^e} \cdot \frac{d\,PRV^e}{dt} \quad \cdots\cdots (c)$$

Then,

$$\frac{1}{PRI^e} \cdot \frac{d\,PRI^e}{dt} = \frac{1}{PRI^e} \cdot \frac{d\,PRI^e}{d\,PRV^e} \cdot \frac{d\,PRV^e}{dt} \quad \cdots\cdots (d)$$

$$\frac{d\,PRI^f}{dt} = \frac{d\,PRI^f}{d\,PRV^f} \cdot \frac{d\,PRV^f}{dt} \quad \cdots\cdots (e)$$

Then, $$\frac{1}{PRI^f}\cdot\frac{d\,PRI^f}{dt}=\frac{I}{PRI^f}\cdot\frac{d\,PRI^f}{d\,PRV^f}\cdot\frac{d\,PRV^f}{dt} \quad \cdots\cdots(f)$$

If a dot(•)indicates differentiation with regard to time, and if the elasticity of productivity with respect to prices, r^i, is defined as:

$$\frac{PRI^i}{PRV^i}\cdot\frac{d\,PRV^i}{d\,PRI^i}\ (i=e,f),$$

then, $$P\dot{R}I^e=\frac{PRI^e}{PRV^e}\cdot\frac{P\dot{R}V^e}{r^e} \quad \cdots\cdots(g)$$

$$P\dot{R}I^f=\frac{PRI^f}{PRV^f}\cdot\frac{P\dot{R}V^f}{r^f} \quad \cdots\cdots(h)$$

A more meaningful concept would be the reciprocal elasticity $s=\frac{1}{r}$, elasticity of prices with respect to productivity. This would lead to:

$$\begin{aligned}P\dot{R}I^e&=\frac{d\,PRI^e}{d\,PRV^e}P\dot{R}V^e\\&=\frac{PRI^e}{PRV^e}\left(\frac{PRV^e}{PRI^e}\quad\frac{d\,PRI^e}{d\,PRV^e}\right)P\dot{R}V^e\\&=\frac{PRI^e}{PRV^e}(s^e)P\dot{R}V^e \quad \cdots\cdots(i)\end{aligned}$$

$$\begin{aligned}\text{and}\quad P\dot{R}I^f&=\frac{d\,PRI^f}{d\,PRV^f}P\dot{R}V^f\\&=\frac{PRI^f}{PRV^f}\left(\frac{PRV^f}{PRI^f}\quad\frac{d\,PRI^f}{d\,PRV^f}\right)P\dot{R}V^f\\&=\frac{PRI^f}{PRV^f}(s^f)P\dot{R}V^f \quad \cdots\cdots(j)\end{aligned}$$

If the relative price, σ, between PRI^e and PRI^f is defined as $\frac{PRI^e}{PRI^f}$, then

$$\begin{aligned}\dot{\sigma}&=\frac{(PRI^f)P\dot{R}I^e-PRI^e(P\dot{R}I^f)}{(PRI^f)^2}\\&=\frac{P\dot{R}I^e}{PRI^f}-\sigma\frac{P\dot{R}I^f}{PRI^f} \quad \cdots\cdots(k)\end{aligned}$$

From here on we need to consider

$$\frac{\dot{\sigma}}{\sigma}=\frac{P\dot{R}I^e}{PRI^e}-\frac{P\dot{R}I^f}{PRI^f} \quad \cdots\cdots(l)$$

$$\text{So,}\quad \frac{\dot{\sigma}}{\sigma}=s^e\frac{P\dot{R}V^e}{PRV^e}-s^f\frac{P\dot{R}V^f}{PRV^f} \quad \cdots\cdots(m)$$

It follows that

$$\frac{\dot{\sigma}}{\sigma}>0\ \text{iff}\ s^e\frac{P\dot{R}V^e}{PRV^e}>s^f\frac{P\dot{R}V^f}{PRV^f}$$

This means that $\frac{\dot{\sigma}}{\sigma}>0$, i.e., price competitiveness tends to decline if $\frac{P\dot{R}V^e}{PRV^e}$ decreases since $s^e<0$ presumably, assuming that $s^f\frac{P\dot{R}V^f}{PRV^f}$ is given for a small country.

For the purpose of brevity in our econometric work, the following equations are employed.:[20]

$$EXP=EXP(WDE,\ PRI^f/PRI^e,\ u_1) \quad \cdots\cdots(1)$$
$$P\dot{R}I^e=P\dot{R}I^e(P\dot{R}V^e,\ u^2) \quad \cdots\cdots(2)$$

where EXP=exports

WDE=world demand for exportable goods

u=residual or error terms

(All the variables are expressed in real values throughout this paper).

In a two-sector model as in Figure 2, PRI^e may be affected by PRI^d, the domestic prices of the commodities similar to export commodities, which are also endogenously determined. As a key determinant in the change of the general level of domestic prices, MOS_{-1}, lagged money supply relative to GDP_{-1}, lagged real gross domestic output may be included. The inclusion of (MOS_{-1}/GDP_{-1}) is self-evident. Money supply affects the price level (if

(20) Lamfalussy treats the relationship between productivity, prices and export expansion in a unique way. Assuming that money wages are increasing at the same rate in all of the relevant countries, an increase in productivity in the given country results in a relatively less rapid increase in its domestic prices and, thus, in an improvement in its international competitive position. In symbol form, he expresses this relationship as follows:

$$\frac{\text{EXP}-\text{IMP}}{\text{GDP}}=\delta_1(\dot{\text{PRV}}-\delta_0)$$

where δ_0=the ratio of the rate of growth of domestic money wages ($D\dot{M}W$) to that of foreign money wages ($F\dot{M}W$) over the rate of increase in foreign labour productivity ($F\dot{P}V$), that is, $\frac{D\dot{M}W}{F\dot{M}W/F\dot{P}V}$

δ_1=balance of payments effects coefficient ($\delta_1>0$)

As in Lamfalussy's model, Beckerman maintains that rapid productivity growth ($P\dot{R}V$) relative to wage limits the upward movement of the price level ($P\dot{R}I^d$), that is, that there is a negative relation between productivity growth and increases in the general price level. He further argues that if domestic prices of exportable goods (PRI^d) becomes lower relative to those of foreign goods (PRI^f), exports(EXP) are stimulated and expanded. In symbol form:

$$P\dot{R}I^d=W\dot{A}G-P\dot{R}V$$
$$E\dot{X}P=a+b(1-PRI^d/PRI^f)\ (\beta_1>0)$$

See R.M. Stern, op. cit., pp. 56-67 in Bibliography (2).

there is no mass unemployment), but it in turn is no doubt partly affected by the general economic condition. That is, some portion of an increase in the money supply can be attributable to a total output increase. Therefore, the money supply in relation to output, not the money supply itself, is a reasonable variable to introduce. Here, the concept of the money supply is interpreted in a broad sense by including money in circulation, demand deposits, and time deposits.

Thus, instead of equation (2), we have:

$$PRI^e = PRI^e(PRV^e, PRI^d, u_2) \quad \cdots\cdots (2)$$

$$PRI^d = PRI^d(PRV^d, MOS_{-1}/GDP_{-1}, u_3) \quad \cdots\cdots (3)$$

Route (2) Exports affect economic growth

Exports thus expanded play a crucial role in promoting economic development. As to the effects exports have on economic growth, various explanations have been given.[21] Some formulate export-growth routes in rather different ways from ours. Although they differ somewhat in the channels through which exports are assumed to influence economic growth these models share some essentially common features,[22] as shown below.

Proposition (1) Exports affect imports

As in most of the export-led growth models, one of the principal functions of exports is assumed to be that of buying imports. Especially in developing countries, foreign exchange earned from exports is regarded as an intemediate good to be used for importing capital goods, intermediate products and raw materials (although additional real resources for investment are not induced by exports themselves when domestic resources are converted into foreign

(21) As recent examples, R.E. Caves lists the following as effects of exports on economic development: skilled labour and entrepreneurial skill, economies of scale in production, social overhead capital, transport facilities, shipping capital intensity, productivity, and distribution of personal income for saving. See his article, "Export-led Growth and the New Economic History," *Trade, Balance of Payments and Growth* edited by J. Bhagwati, et al (North-Holland, 1971) pp. 403-442. On the other hand, W.M. Corden shows impact effect, free trade effect, substitution effect, income distribution effect, and factor-weight effect. See his article, "The Effects of Trade on the Rate of Growth" *in Induction, Growth and Trade* edited by W.A. Eltis, M.Fg. Scott and J.N. Wolfe(Oxford, Clarendon Press) pp. 117 -143.

(22) The essential relationship between export expansion and economic growth, especially following the Lamfalussy, Beckerman, Caves, and Stern type of export-growth model, is indicated below. Especially see R.M. Stern: *Foreign Trade and Economic Growth in Italy* (Prager, 1967).

resources). Capital goods, intermediate products, and raw material imported from abroad are especially unattainable through domestic natural resources, skills, technology, and scale of production. Domestic production, being largely traditional in structure and technique, is unable to provide all the means for the transformation of developing countries.

In addition to export earnings, foreign capital inducement is also an important source of imports. Foreign capital imports may raise the growth of the gross national product if the productivity of foreign capital exceeds the interest rate that must be paid to the foreign lender.[23] In initiating economic growth in developing countries via exports, foreign capital plays this crucial role as an acupuncture, breaking the vicious circle of exports increasingly needed to offset imports.

We have, thus:

$$IMP = EXP + FKA \quad \cdots\cdots (4)$$

where IMP=imports

FKA=foreign capital inflow

The above identity (4) represents a constraint on a country's ability to acquire imports[24] and considers that imports could stem from changes on the supply side. It should be noted, however, that autonomous forces on the demand side do not always lie behind import decisions in developing countries. Hence, the demand function has also been adopted in the derivation of the export-oriented model, but, since demand and supply factors cannot be handled in the same equation,[25] two separate relationships are employed

(23) B.F. Massell: "Exports, Capital Imports and Economic Growth," *KYKLOS*, XVII, No. 4, pp. 627-634.
R.E. Caves: "Export-led Growth," Harvard Institute of Economic Research, No. 65, 1969, p. 14.

(24) A. Maizels: *Exports and Economic Growth of Developing Countries* (Cambridge University Press, 1968).

(25) Both Lamfalussy and Beckerman explicitly employ these recursive effects of exports on investment in their models. Kindleberger refers to this relationship also. Kindleberger's qualitative export-led growth model, in somewhat more detail, consists of a number of different sub-models. But these different sub-models are combined to depict the possible connections between exports and investment. In the case of full employment, Kindleberger argues that export expansion will shift resources from less productive sectors to the export sector or its ancillary industries for investment. On the other hand, if there is un- or under-employment, expanded exports will directly increase the opportunity of investment by utilizing surplus productive resources. The vent-for-surplus theories which combine staple, export base, and unlimited labour models together maintain that, when starting off with a

as follows:

$$IMP=IMP(GDP,\ u_4) \cdots\cdots (5)$$

In equation (5), GDP is assumed to be the main factor which determines import demand. This variable can again be disaggregated into domestic final use of certain products (DFU), intermediate use by producers (IUP) and the re-export of imported goods (RIG).

$$IMP=IMP(DFU,\ IUP,\ RIG,\ u_4) \cdots\cdots (5)'$$

Proposition (2) Exports affect investment

The increase in imports (especially of capital goods, intermediate products and raw materials) financed by export earnings and foreign capital inflow is a joint source of supply for an increase in investment along with domestic savings. But, investment is determined by the demand side also as Lamfalussy, Beckerman and Kindleberger strongly argued. As exports increase, the capacity to produce export goods tends to increase in the course of export-oriented growth. Pressures on the productive capacity of export industries may in turn improve investment opportunities and stimulate investment in the export sector. The increase in exports initially stimulates investment due to the accelerator effects.[26]

Increased exports may expand investment activity in the non-export sector

considerable amount of surplus resources, developing countries are able to enjoy a virtually costless means of increased investment which does not require a withdrawal of resources from domestic production, but merely a fuller employment of semi-idle productive resources (This argument is of course based on the assumption that the world wants to buy the good which the surplus productive capacity can produce). In foreign-trade-multiplier-models which are associated with an economy with unemployed or under-employed resources, exports are assumed to be comparable to investment. Therefore, an increease in exports results in a multiple increase in domestic income depending upon the size of marginal propensities to consume and import. Especially see A.G. Ford; *Gold Standard 1880-1914. Britain and Argentina*(Oxford Clarendon Press, 1962), pp. 111-113.

(26) Besides the accelerator type of determinants for investment there is a multitude of factors affecting investment behaviour, all of which cannot be incorporated into one investment function. None of the existing theories alone can adequately explain the time path of investment expenditure. The investment theories so far expounded range from the Keynesian notion of the marginal efficiency of capital to the induced investment theories such as the accelerator principle mentioned in the above interaction model, to the Schumpeterian innovation theory, and to the anticipatory-realization approach and capacity utilization models. Without elaborating on this diversity of investment theories, the present study simply attempts to explain the determinants of investment in producers' behavioural terms with regard to demand.

as well as in the export sector. The export industry's material inputs and income spent for the purchase of consumer goods may affect other domestic industries. Whether these favourable linkages are in fact made within the domestic economy is influenced by engineering differences among export commodities' production function over the input-output range. This point was particularly stressed by Caves, North and Baldwin.[27]

In the process of export-oriented development, it is assumed that export expansion may result in an associated increase in domestic savings.[28] This could occur if the propensity to save in the export sector is higher than zero and that in domestic sector. In such economies, an increase in exports would reduce the savings gap as well as the trade gap via a multiplier or by a reallocation of given full employment output. When the export sector is relatively advanced and efficient, the effects of exports on domestic savings should be taken into account. Domestic savings thus increased tend to affect investment accordingly.

The above argument produces the following identities and equations for brevity:

$$INV=SAV+(IMP-EXP) \quad \cdots\cdots(6)$$
$$INV^e=INV^e\ (\dot{EXP},\ u_5) \quad \cdots\cdots(7)$$
$$INV^d=INV^d\ (\dot{GDP}^d,\ \dot{GDP}^e,\ u_6) \quad \cdots\cdots(8)$$
$$INV=INV^e+INV^d \quad \cdots\cdots(9)$$
$$SAV=SAV(EXP,\ (GDP-EXP),\ u_7) \quad \cdots\cdots(10)$$

(27) R.E. Caves: *The Canadian Economy: Prospects and Retrospect* (Harvard, 1959) J. Levin: *The Export Economies: Their Pattern of Denelopment in Historical Perspective* (Harvard University Press, 1960); S.D. Neumark: *Foreign Trade and Economic Development in Africa.* D.C. North: The Economic Growth of the United States: 1790-1860; "Location Theory and Regional Economic Growth," *JPE*, June 1955, p. 154. R.E. Baldwin: "Patterns of Development in Newly Settled Regions," *MS*, 1956; "Export Technology and Development from Subsistence Level," *EJ*, March, 1963. G.M. Meier: *International Trade and Development* (Harper and Row, 1963) pp. 151-91.

(28) Lamfalussy particularly stresses the response of saving to an increase in the rate of growth of income generated by export expansion. By this emphasis, he explains why induced increases in imports may not hinder the balance of payments and, thus, economic development as a whole. So long as exports keep rising he believes that there are self-reinforcing tendencies for a country to maintain its rapid rate of economic growth because sufficient domestic savings are induced. Equation (10) for the exports-savings relationship is deduced from this argument. See also J.K. Lee: "Exports and the Propensity to save in L.D.C.'s," *EJ*, June 1971, pp. 341-251: Lee tested Maizel's hypothesis $(SAV_t=d+e\ (GNP_t-EXP_t)+(EXP_t)+u_t$ for 28 countries and concluded that, in all but three countries, there was likely to be an association between export and savings in primary-exporting countries.

where INV=net investment embodying advanced technology

INV^e=net investment embodying advanced technology in the export sector

INV^d=net investment embodying advanced technology in the domestic sector

SAV=domestic savings

$\dot{EXP}$, $\dot{GDP}^e$, $\dot{GDP}^d$=rate of change in exports, GDP^e and GDP^d respectively

In the course of export-oriented development, an increase in investment generated by export expansion is assumed to result in an increase in the physical expansion of productive capacity and, consequently, in an increase in production and income in the export sector(Because this study is not concerned with the problems of developed economies, it may be relevant to assume that potential output capacity is equivalent to income generated). Since domestic investment increases when exports expand, as shown earlier, production and income in the domestic sector are increased accordingly in the process of export-oriented development. An increase in the products of both the export and domestic sectors is equivalent to an increase in the gross domestic product for a country as a whole. In export-oriented growth path, the gross domestic product of the export sector is assumed to grow at a faster rate than in the domestic sector.

In formulating a production function a controversy exists over whether it is necessary to include a labour term.[29] In this study, however, the usual Cobb-Douglas type of production function is assumed. In these equation, other important factors of production such as skills, entrepreneurship, technology, and economies of scale are assumed to be embodied in capital and labour. In addition, this involves the assumption that even if substitution

(29) It is usually maintained that the labour force in developed economies may well constitute a limiting factor in accelerating economic growth so that the production function may form a labour-requirement. On the other hand, it is argued that in the case of developing economies capital may very well be the scarce factor which limits output by being the first to become fully utilized, and, hence, the Harrod-Domar model appears to be justified. This theory is, however, challenged by others which assert that an increase in capital is not to be considered a sufficient condition for an expansion of output in developing countries where other factors of production, e.g., availability of skilled labour, entrepreneurship, technological innovation, size of markets, etc. tend to be in short supply. It is again criticized for its inclusion of a fixed coefficient and, thus, its exclusion of the possibility of substitution between labour and capital as in the Cobb-Douglas and the variable elasticity of substitution production functions.

between capital and labour is possible in production, no substitution in fact occurs. Furthermore, constant capital-output ratio rules out any possibility of shifting investment from less productive to more productive areas.

We have from the above discussion:

$$GDP^e = GDP^e\ (KAS^e,\ LAB^e,\ u_8) \quad \cdots\cdots(11)$$

$$GDP^d = GDP^d\ (KAS^d,\ LAB^d,\ u_9) \quad \cdots\cdots(12)$$

$$GDP = GDP^e + GDP^d \quad \cdots\cdots(13)$$

where GDP^e=gross domestic products in the export sector

GDP^d=gross domestic products in the domestic sector

GDP=gross domestic products

KAS^e=capital stock in the export sector

$$=\sum_{t=1}^{n} INV_t$$

KAS^d=capital stock in the domestic soctor

LAB^e=labour force in the export sector

LAB^d=labour force in the domestic sector

Route (3) Production (or investment) affects productivity

Thanks to a rise in production and investment mainly in the export sector, productive capacity and total factor productivity in the export sector is assumed to improve as a whole as Lamfalussy and others did (both are assumed to grow by a certain proportion).[30] This process is realized in the long-run.

Usually the export sector is the most modernized and pioneering sector and is sensitive to changes in the world market. This is because export

(30) It is considered in Lamfalussy's model that an increase in productivity is mainly due to the working of modern machinery which is incorporated in new plants. Beckerman also contends that productivity gains are assumed to arise from high rates of capital formation because such technological change is embodied in new plants and equipment, and that productivity gains also stem from the fast growth of output due to large-scale economies. This proposition was supported by the study of Fabricant and other international comparisions which suggested that it is legitimate to assume the production-productivity relationship. These studies are concomitant with the classical and Marxian models assuming that capital accumulation permits technological progress and, hence, factor productivity.

Fabricant; "Basic facts on productivity change," (NIJER Occasional Paper 63, 1959).

佐佐波楊子：「經濟成長と國際競爭」, 『東洋經濟』, 1968, p. 968.

W.W. Lockwood: *Economic Development of Japan; Growth and Structural Change, 1868-1938* (1954), p. 309.

B. Higgins: *Economic Development*, (Constable, 1959) pp. 90 and 109.

industries are continually exposed to world competition, and if they are to survive they must be efficient and meet world quality standards. Successful export performance contributes to intensive domestic competition, and the morale-boosting effects cause domestic industries to double their efforts. As a results, there may occur a switch from a defensive to an aggressive attitude towards export and domestic industrial activities. Advanced technology abroad is usually absorbed through the export sector into the domestic industries, and in the domestic sector itself, increase in investment and production may cause productivity growth.(31)

Thus, we have:

$$\dot{PRV}^e = \dot{PRV}^e(\dot{GDP}^e \text{ or } \dot{INV}^e,\ u_{10}) \quad \cdots\cdots(14)$$

$$\dot{PRV}^d = \dot{PRV}^d(\dot{GDP}^d \text{ or } \dot{INV}^d,\ u_{11}) \quad \cdots\cdots(15)$$

where $\dot{PRV}^e$=rate of change in total factor productivity in the export sectors

$\dot{PRV}^d$=rate of change in total factor productivity in the domestic sector

$\dot{INV}^e$=rate of change in investment in the export sector

$\dot{INV}^d$=rate of change in investment in the domestic sector

Putting the above equations together, we can obtain the following statistical model:

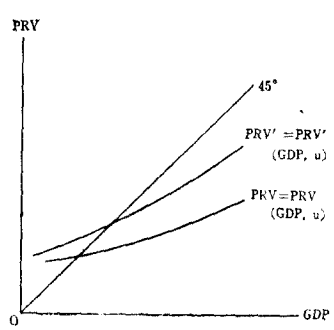
(1) Export demand function

$$EXP = EXP\ (WDE,\ PRI^f/PRI^e,\ u_1)$$

(2) Price function for the export sector

$$\dot{PRI}^e = \dot{PRI}^e\ (\dot{PRV}^e,\ \dot{PRI}^d,\ u_2)$$

(31) A functional relationship between rate of growth of production (or income) and rate of growth of productivity may, however, vary from one economy to another according to such factors as investment ratio, technical progress, and capital deepening or widening. The beside diagram shows that the slope would be flatter and the intercept lower for an economy where investment is capital widening and where the labour supply is growing fast. It would be different, however, for another economy in which the economic conditions are in strong contrast. A shift from *PRV* to *PRV'* would have a significant effect in reducing an increase in income in an economy previously moving along *PRV*.



(3) Price function for the domestic sector

$$\dot{PRI}^d = \dot{PRI}^d(\dot{PRV}^d,\ MOS_{-1}/GDP_{-1},\ u_3)$$

(4) Import supply identity

$$IMP = EXP + FKA$$

(5) Import demand function

$$IMP = IMP\ (GDP,\ u_4)$$

(6) Investment supply identity

$$INV = SAV + (IMP - EXP)$$

(7) Investment demand function for the export sector

$$INV^e = INV(\dot{EXP},\ u_5)$$

(8) Investment demand function for the domestic sector

$$INV^d = INV^d(\dot{GDP}^d,\ \dot{GDP}^e,\ u_6)$$

(9) Investment identity

$$INV = INV^e + INV^d$$

(10) Savings function

$$SAV = SAV(EXP,\ GDP - EXP,\ u_7)$$

(11) Production function for the export sector (or the export supply function)

$$GDP^e = GDP^e(KAS^e,\ LAB^e,\ u_8)$$

(12) Production function for the domestic sector (or the domestic supply function)

$$GDP^d = GDP^d\ (KAS^d,\ LAB^d,\ u_9)$$

(13) Gross domestic products identity

$$GDP = GDP^e + GDP^d$$

(14) Productivity function for the export sector

$$\dot{PRV}^e = \dot{PRV}^e(\dot{GDP}^e \text{ or } \dot{INV}^e,\ u_{10})$$

(15) Productivity function for the domestic sector

$$\dot{PRV}^d = \dot{PRV}^d(\dot{GDP}^d \text{ or } \dot{INV}^d,\ u_{11})$$

where:

EXP=exports

WDE=world demand for exportable goods

PRI=prices

PRV=total factor productivity

MOS=money supply

IMP=imports

FKA=foreign capital

GDP=gross domestic products

INV=investment

SAV=domestic savings

KAS=capital stock

LAB=labour force

u_i=residual or error terms

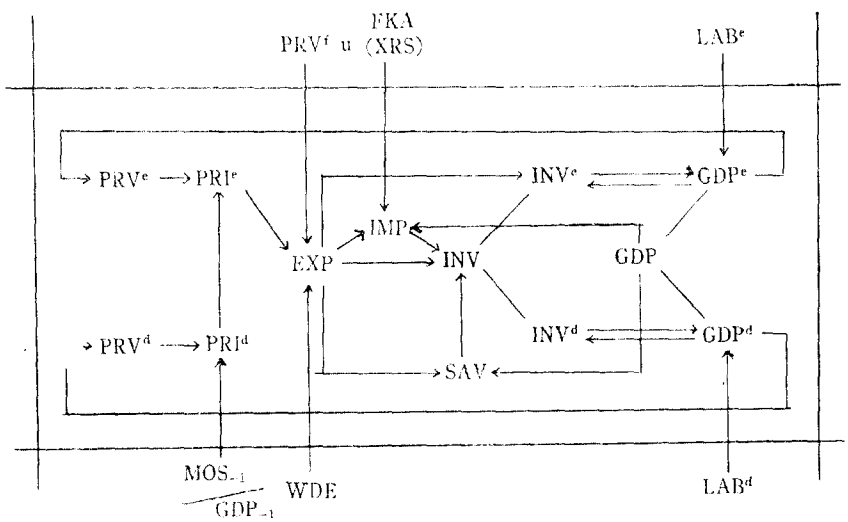
• indicates the rate of change whilst

e.d.f. reflect the export, domestic and foreign sector respectively

−1 lagged a period

The logical ordering of this model is largely recursive except INV-GDP, and one useful way of representing this structural system is by means of a

Figure 3 **The Flow Diagram of Export-oriented Growth**



flow diagram as shown above. In this flow chart, the arrows indicate the direction of the influence. Variables inside the parallelogram are endogenous and those outside are exogenous. In this chart, variables have only a one-way connection to others. Certain variables(*INV* and *GDP*) are determined by mutual interaction; that is, they receive as well as impart influences.

Equations (1), (2) and (3) in the above model explain routes (1) and (5) in Figure 2. Routes (2) and (6) in Figure 2 are concerned with equations (4)-(13), and routes (3) and (7) with equations (14) and (15). Equation (2) is related to route (8) in Figure 2 whilst equation (8) is related to route (4).

In speaking of a model for export-oriented development, it should be mentioned as explained earlier that the above equations constitute a core for an export-oriented pattern of growth, but some of them can vary in accordance with the characteristics of the economy concerned. It is thus

necessary to modify some equations and variables when the above model is applied to a certain economy. Before elaborating on the above model to fit the Korean economy, therefore, a fuller explanation of the most important modification of export-oriented development is called for. This includes artificiality in export expansion and its comparison with domestic market-oriented development.

3. Artificial elements in export expansion

(1) Internal balance and artificial factors in external balance

Historically, some export economies such as the early U.S.A., Australia, Canada, and New Zealand as well as the Netherlands, Belgium, and other European countries of the present time were able to develop into balanced and broadly productive economies by exporting primary and manufactured commodities. These economies were strongly dependent for continued growth upon the sustained expansion of their export industries, and without that expansion they could not have had such a high rate of economic growth.

Other developing export economies failed, however, to reach the stage of autonomous primary export-propelled development. Most of the present-day developing countries are classified in this category. In these 'export economies' it was observed in the 19th and early 20th centuries that economic development was not 'led' but 'lagged' by export expansion of primary products.[32] (One may call them 'old export economies' in comparison with the 'new export economies' that export manufactured goods and enjoy a relatively high rate of economic growth). Main causes of such a result were allegedly listed as the low price and income elasticities of demand for primary products in world markets, systematic forces at work tending to diminish benefits from exports due to deteriorating terms of trade,

(32) R. Nurkse: "Pattern of Trade and Development," *Wicksell Lecture* (Stockholm, 1959), "International Trade Theory and Development Policy" in *Economic Development for Latin America* (edited by) H.S. Ellis (St. Martin's Press 1961); "Some International Aspects of the Problem of Economic Development," *AER*, May 1952.

G. Myrdal: An International Economy: *Problems and Prospects* (Routledge, 1959); Rich Lands and Poor: *The Road to World Prosperity* (Harper and Row, 1957), Development and Underdevelopment; A Note on the Understanding of National and International Inequalities (Cairo, National Bank of Egypt, 1956).

R. Prebisch: "Commercial Policy in the Underdeveloped Countries," *AER*, May 1959.

H.W. Singer: "The Distribution of Gains between Investing and Borrowing Countries," *AER*, May 1950, pp. 473-85.

savings and import leakages, rigid economic structures tied up by non-economic factors, thereby creating 'fossilized' technology and an 'economic enclave', etc.(33)

Entering the late 20th century after a long and dismal journey towards import substitution, developing countries have come to recognise again the importance of export expansion, this time of manufactured goods(34). UNCTAD and other UN organizations including UNIDO initiated the argument that exports of manufactured commodities are a key both to escaping from an increasing trade gap and to facilitating the efficient industrialization of present-day developing countries. This change of development strategy has stemmed from a revision of the view that large scale import substitution is an effective means for growth. But, more important, the balance of payments of any developing country requires new sources of foreign exchange in order to avoid increasing the foreign exchange deficit and the debt servicing charges.(35)

Recently, a new trend in export expansion has been in evidence. Because of the recognition of the advantage of export-oriented development through

(33) H. Myint: "The 'Classical Theory' of International Trade and Underdeveloped Countries," *EJ*, Jan. 1958, pp. 317-337; "An Interpretation of Economic Backwardness," *OEP*, June, 1954, pp. 132-163; "The Gains from International Trade and the Backward Countries" AER, June, 1951.

P.J. Lloyd: *International Trade Problems of Small Nations* (Duke University Press, 1968).

M.C. Wallich: *Monetary Problems of an Export Economy: The Cuban Experience, 1914-1947* (Harvard University Press, 1950).

J.V. Levin: *The Export Economies: Their Pattern of Development in Historical Perspective* (Harvard University Press, 1960).

(34) See Bibliography (3).

(35) The stimulation of manufactured exports has received particular emphasis in order to meet these requirements, especially when compared to exports of primary products. This is because of the change in world production and consumption patterns, where primary materials play a declining role in a new and different international specialization, implying that light manufacturing industries should be established in a developing area. In fact, the price and income elasticities of demand for manufactured goods are higher than those for primary commodities in the world market. In addition, it has also been asserted that manufactured exports may generate industrial development since the growth contribution of investment in the industrial sector is higher than that in the primary sector, and the linkage within manufactures is closer than that in agriculture and mining. Of course, these facts must not be taken to imply that primary products have lost their position as one of the main sources of foreign exchange earnings for developing countries. It can only be said that while the volume of primary exports is undoubtedly increasing, the foreseeable rate of growth is generally considered insufficient to make a major contribution toward meeting the import requirements of developing countries. See P.G. Elkan: "How to beat backward: The Case for Customs Draw-back Unions," *EJ*, March 1965, pp. 44-62.

manufactured exports and the need to cope with the debt-servicing problem, developing countries tend to produce and export as much as possible in nearly all kinds of goods. Top priority has been given to export expansion. In particular, Korea aims at pursuing rapid industrialization by way of artificial encouragement of any and all exports. Sometimes it is claimed that, in this country, exports of more sophisticated light manufacturing goods and even heavy industrial products are increasingly important to the process of industrialization. Especially in developing countries like Korea, which has developed its economy through the mechanism of a high level of growth-investment-foreign capital inflow-balance of payments dis-equilibrium, artificiality in export expansion is called for to a greater extent.

Here artificiality in export expansion is defined as government assistance to the export sector (exporters and manufacturers) in the form of subsidies (SUB^{g-e}) and investment(INV^{g-e}) into the export sector and the formation of social overhead capital for export industries for the purpose of increasing gross(or nominal)foreign exchange earnings, when comparative disadvantage (static or dynamic) exists, and when export industries suffer from ineffective management. For the same purpose, government assistance is also given to export industries which possess both absolute and comparative advantages (see Table 1 and subsequent discussion in this paper). The need for artificiality arises when a government sets a high growth target beforehand and achieves it mostly through foreign capital inflow, the debt servicing of which should be met by an increase in export expansion. In the course of establishing the productive capacity of export industries, infant export industries, which suffer from certain weaknesses in management (such as deteriorated self-financing structure) and cannot be operational without outside assistance for an indefinite period, tend to prevail. Natural exports (when current economic distortion and insufficient specialization of world trade are assumed) possess no international competitiveness at current international prices, if no government assistance is provided, and thus cannot help achieve economic growth through exports. The increasing trade gap caused by the mechanism of a high level of growth-investment-foreign capital inflow is designed to be covered in the long run only by artificial export expansion. In the course of artificial export expansion internal balance

(savings gap) tends to be sacrificed for an external balance(trade gap), and efficiency of export expansion is frequently neglected, as discussed in the following Chapter.

(2) Artificiality in the process of export-oriented development

Figures 4 and 5 depict the direction of artificiality diagrammatically.

Figure 4　　The Direction of Artificiality

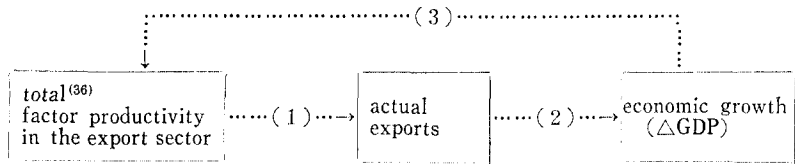
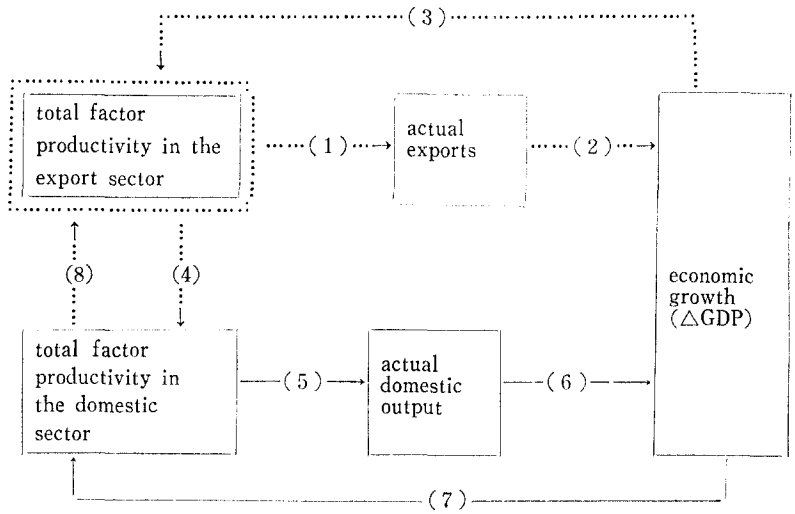


Figure 5　　The Direction of Artificiality



In figures 4 and 5, the dotted lines indicate the direction of artificiality provided by the government, whereas the others are the same as in Figures 1 and 2. In a model for a virtual circle of export-oriented development, exports are related to economic growth ($\triangle GDP$) through such variables as imports, savings, and investment (equations 4-10 represented by line 2) whilst economic growth is related to exports through productivity and prices (equations 11-15 represented by lines 3 and 7). But, in figures 4 and 5, the relationship between economic growth and productivity is ruptured at three

(36) See page 11. By factor productivity we nearly always mean labour productivity, but total factor productivity is used in this paper, since we are dealing with artificiality in export expansion ($SUB^{g-e}+INV^{g-e}+FKA$).

points: first, an increase in nominal *GDP* helped by an increase in investment does not necessarily stimulate productivity growth in the export sector, which might in turn reduce the export and domestic prices. Artificiality is needed in this respect to restore the cut-off relations between $\triangle GDP$ and productivity and between productivity and prices in the export sector(dotted lines 3 and 1 in Figures 4 and 5). The relation between exports and $\triangle GDP$ (dotted line 2) is also restored by artificiality so as to facilitate the carry-over-effect which economic rigidity or enclave tend to curtail. This is contrasted to the propositions in the export-oriented development model that the rates of growth of *GDP* and productivity, as well as productivity and prices, are functionally related. Artificiality is again necessary to link the export and domestic sectors in order to make the latter help the former (dotted line 5). In fact, route 3 is similar to route 8 whilst routes 1 and 7 are similar to 4.

Along dotted lines (1), (2) and (3) in Figure 4, artificiality in export expansion is given via the following.[37]

(a) Manipulation of export prices by providing various type of government assistance to export industries (SUB^{g-e}),
(b) Investment into, and creation and/or development of, export industries (INV^{g-e}),
(c) Other trade promotion activities, and
(d) Increase in carry-over effects.

In artificiality in export expansion, (a) is related to assisting export industries by reducing export prices as compared with foreign prices(including the suppression of wages and other cost factors in relation to productivity) whereas (b) is related to improving productive capacity of export industries

(37) In different terms of economics, artificiality is made by any one of the following:
(a) Increasing the actual subsidies beyond the optimum (static and dynamic) subsidies (by an amount equal to the optimum foreign exchange rate minus the actual foreign exchange rate, when the domestic currency is overvalued);
(b) Increasing the actual foreign exchange rate beyond the optimum (static and dynamic) foreign exchange rate;
(c) Investing capital and other economic resources into the export sector beyond the optimum (static and dynamic) level of investment.
It should be noted that the differences in the effects of methods (a) and (b) are numerous, especially in the fields of imports, foreign capital inflow, government revenue, income redistribution, inflation, administration, dumping and capital intensiveness, along with the nature of discrimination between industries and commodities.

and creating export industries by increasing capital investment. (a) is the case of constant comparative cost whilst (b) is that of changing comparative cost. (a) contains the government measures to promote PRV^e and reduce WAG hence decreasing PRI^e. (a) and (b) are accentuated by the government's special treatment of export industries through low interest loans, monopolistic pricing, tax exceptions, etc. (c) includes not only direct sales promotion but also such government intervention as reduction of government fees, conglomeration of export organizations, direct controls of export firm's establishment, and annual export requirements. Improvement of quality, marketing techniques and administrative procedures are also included. (c) is related to cases of both constant and changing comparative cost. (d) is facilitated by the elimination of economic rigidity. But, all four classes of export promotion measures aim at expanding the gross volume and value (not unit prices) of exports, and changing the pattern of exports beyond the present and dynamic comparative advantage lines. It should be clearly noted that excessive government assistance, including foreign marketing is a means of artificiality in export expansion even if it is given to export commodities which possess static and absolute comparative advantages.

In connection with method (b) it seems worthwhile to point out that artificiality in export expansion contains an increase in the factors of production and a structural transformation in the export sector (including the creation of infant export industries) through government investment into the export sector (INV^{g-e}). In order to increase exports as much as possible, both private and government investments tend to be made in the export sector more than in the domestic sector. Other factors of production are also changed, and this is especially so when foreign capital is available. Basically, artificial export expansion is the outcome of a structural change in production, and can sometimes appear only after that change. Therefore, it is necessary to take into account the rate of development envisaged within a given time horizon. In structural change due to artificial export expansion, the time horizon must not, however, be too distant, although it will obviously be difficult to predict. In the economies that adopt long-range economic development plans, the planning horizon is usally five years or so.

(3) Modification of the model

Taking into account the above elements of artificiality in export expansion and neglecting what is difficult to quantify such as infant export industries, one can modify an already established model of export-oriented development. During the process of artificial export expansion some important variables and equations eventually modified can be summarized as follows:[38]

(a) Government subsidy (SUB^{g-e}) in the export demand function,

(b) Relationship between exports and foreign capital in the import supply identity,

(38) Considering the above points, we modify initial relationships between exports and economic growth by other behavioural relationships as follows (It is noted that the following model is a tentative one and a full explanation of identification and model construction will be carried out in the forthcoming chapter with regard to the Korean model).

(1) $EXP=EXP^1+EXP^2$

(2) $EXP^1=EXP^1\ (WDE^1,\ FER^{e1},\ u_1)$

(3) $EXP^2=EXP^2\ (WDE^2,\ FER^{e2},\ u_2)$

(4) $IMP=EXP+FKA$

(5) $IMP=IMC^c+IMP^i+IMP^{ri}+IMP^s$

(6) $IMP^c=IMP^c\ (GDP,\ u_3)$

(7) $IMP^i=IMP^i(INV,\ u_4)$

(8) $IMP^{ri}=IMP^{ri}\ (GDP,\ u_5)$

(9) $IMP^s=IMP^s\ (EXP+IMP,\ u_6)$

(10) $INV=INV^{p-e}+INV^{p-d}+INV^{g-e}+INV^{g-d}+INV^s$

(11) $INV^{p-e}=INV^{p-e}(\dot{EXP},\ u_7)$

(12) $INV^{p-d}=INV^{p-d}\ (\dot{GDP}^d,\ \dot{GDP}^e,\ u_8)$

(13) $INV=SAV+(IMP-EXP)+(GOR-GEX)$

(14) $GOR=TAX+IMD+OTH$

(15) $SAV=SAV(GDP,\ u_9)$

(16) $GDP=GDP^e+GDP^d$

(17) $GDP^e=GDP^e(\Sigma(INV^{p-e}+INV^{g-e}),\ LAB^e,\ t,\ u_{10})$

(18) $GDP^d=GDP^d\ (\Sigma(INV^{p-e}+INV^{g-d}),\ LAB^d,\ t,\ u_{11})$

where 1 and 2 denote export commodities 1 and 2 respectively, and reflects rate of change

SUB^{g-e}=government subsidies to export industries

IMP^c=imports of consumer goods

IMP^i=imports of investment goods

IMP^{ri}=imports of raw materials and intermediate products

IMP^s=imports of services

INV^{p-e} and INV^{g-d}=private investment in the export and domestic sectors respectively

INV^{g-e} and INV^{g-d}=government investment in the export and domestic sectors respectively

INV^s=inventory investment

GOR=government revenue

GEX=government expenditure

TAX=taxes (direct and indirect)

IMD=import duties

OTH=other government income

Among equations in the medified model, equations (1)—(3) explain route (1) in Figures 4 and 5. Routes (2) and (6) are concerned with equations (4)—(15). Among them, routes (3) and (7) are related to equations (2)—(18).

(c) Government revenue and expenditure (GOR and GEX) in the investment supply identity as well as in their respective identities,

(d) Government investment in the export sector (INV^{g-e}) in the import, investment, and production functions,

(e) Imports of capital, intermediate products, and raw materials(IMP^{i} *and* IMP^{ri}) in the import, investment and production function,

(f) Factor productivities and prices (PRV^{e},PRV^{d},MOS_{-1}, PRI^{d} *and* PRI^{e}) in the productivity and prices functions for the export sector.

Among the variables newly included or modified, the most important ones concerning artificiality in export expansion are government subsidies to export industries in the form of price reduction (SUB^{g-e}), government investment in the export sector (INV^{g-e}), foreign capital inflow(FKA), and imports of capital goods and intermediate products from abroad (IMP^{i} *and* IMP^{ri}). Productivities, money supply, and domestic and export prices(PRV^{e}, PRV^{d}, MOS_{-1}, PRI^{d} *and* PRI^{e}) are artificially manipulated by the government, so all equations relating to these variables are omitted. As a proxy of PRV, PRI, and SUB^{g-e} an effective foreign exchange rate for exports (FER^{e}) can be adopted. Since PRI^{f} is given to developing countries and SUB^{g-e} is included in FER^{e}, the concept of an effective foreign exchange rate for exports is helpful for an explanation of artificial export-oriented development.

Especially significant is the need for the disaggregation of commodities and their effects. They differ from one category to another in their requirements for labour and machinery and in their effects on income distribution, technological change, etc. In this regard, it may be desirable, for the relationship between export promotion and economic development, to require the disaggregation of exports into meaningful categories and to attempt to trace the impact of development of each type of export upon specific sectors of the domestic economy. As for the economy which has only a few similar export goods (such as labour intensive light manufacturing products), disaggregation of export goods may not be too crucial.

Chapter III
Theory Relating to Artificial Comparative Advantage

1. Justification for departures

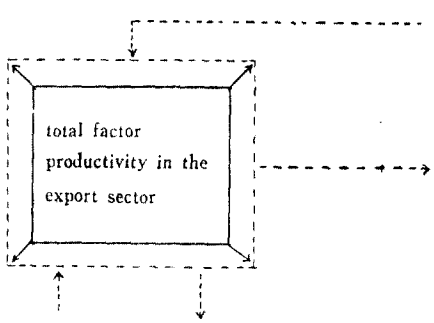
It is to be noted that the above macro-model is unable to specify how

far exports should be expanded. In such a model, no upward limit of export expansion is set, and hence it is assumed that the more exports there are, the higher the growth rate would be. That is, there are high correlations between export assistance and export expansion and between export expansion and economic growth. But, as discussed in detail later, this is not always the case, particularly when exports are expanded artificially. There are certain constraints to further export expansion. As exports pass a certain point, costs may begin to offest benefits, and new economic distortions may arise to retard efficient export-oriented growth in the long-run. It is important, therefore, to take into consideration the long-run economic efficiency of artificial export expansion when new production capacities are considered as in Korea, and it should be proved that there exist no unit correlations among unlimited (not discriminate) export assistance, unlimited export expansion, and unlimited economic growth.

Again in the above artificial export-oriented model, the role of artificiality is mostly concerned with such macro-economic variables as foreign exchange earnings, imports, and investment demand. Artificial export expansion may, however, produce other sorts of economic and non-economic benefits and costs as important side effects, Thus, one needs a fuller explanation of artificial export expansion in the form of economic theory.

How far, then, is artificiality needed in export expansion through the variation of SUB^{g-e} (including PRV^{e} and marketing) and INV^{g-e}? What are the justifiable departures of artificiality from the present theory of comparative advantage by expanding the dotted lines surrounding the box of total factor productivity in the export sector below as in Figure 6?

Figure 6 **Artificiality in the Export Sector**



First of all, artificial comparative advantage has here been defined similarly to the previous definition of artificiality in export expansion as a new comparative advantage which is artificially formed regardless of the present comparative advantage. That is, the gross volume and value of exports (despite a decrease in unit price of export goods) are expanded beyond the optimum (static) point in order to completely fill the growing trade gap created via a large amount of foreign capital inflow and to achieve a virtual circle of export-oriented development.

In the formation of such an artificial comparative advantage, there are basically four sorts of departures-artificiality (1), (2), (3) and (4) —and the theory of artificial comparative advantage hinges on these departures. Artificility (1) and (2) are in principle not based on the present comparative advantage of total factor productivity and differ from each other according to the degree of departures. Artificiality (1) assumes that comparative advantage at present is dynamic (in terms of externality, distortion, and infant industry) and incremental or potential. This argument is concerned with future comparative advantage. Artificiality (2) is not directly related, however, to the present or future comparative advantage. It is rather concerned with comparative disadvantage which has no possibility of converting into comparative advantage even in the future, if no foreign capital is available. This may be called non-incremental or non-potential comparative advantage, when capital is immobile internationally. The main difference between artificiality (1) and (2) is that in the world of the latter, international mobility of capital is assumed and, thus, comparative advantage is changed, whereas in the former capital is so rigid as to be non-transferable between countries in the manner that classical trade theorists assumed. On the other hand, artificiality (3) passes this optimum (static and dynamic) point and, thus, is called a non-justifiable departure from comparative advantage. It is to be noted that artificiality in export expansion does not exclude but positively includes the case where government assistance is given to export industries which have both absolute and comparative advantages. We may call it artificiality (4). These classifications can be summarized as follows:

Table 1-1 The Classification of Artificiality

(A) Artificial comparative advantage	
	Artificiality (1) (a) Current dynamic comparative advantage (for the cases of externality and distortion) (b) Incremental or potential dynamic comparative advantage (for the case of the infant industry)
	Artificiality (2) (a) Non-incremental or non-potential dynamic comparative advantage if no foreign capital is available.
	Artificiality (3) (a) Up to the trade balance. (b) Up to the point of no debt servicing. (c) Towards an autonomous export-oriented development path when no possibility of increase in total factor productivity exists.

To Table 1-(1), we may of course add the following:

Table 1-2 The Classification of Artificiality

(B) Comparative advantage	Artificiality (4)
(C) Absolute advantage	

(1) Artificiality (1)

(A) Justifiable departures[39]

The first justification for artificial comparative advantage is a possible departure from the static, present comparative advantage. Although it has been accepted that trade specialization can be the most efficient under certain assumptions, economic and other advantages of departure from it can also be demonstrated.[40] The explanation is to be found in (1) the externality effects of export expansion as well as the economies of scale of export industries, (2) the existence of distortions in domestic and foreign markets, and (3) the infant export industry argument. These justifications are all concerned with dynamic comparative advantage, which assumes that the present comparative advantage of factor productivity is incremental. In other words, static comparative advantage should be reinterpreted in a dynamic setting when external economies exist, when the market prices of commodities and factors of production differ from their opportunity costs, and when

(39) This section was written before our attention was drawn to Little, Scitovsky and Scott's rather comprehensive discussion on the same subject in their *Industry and Trade in Some Developing Countries: A Comparative Study* (Oxford University Press for OECD, 1970).

(40) See Bibliography (4).

factor supplies, composition of demand, and production and technology may change over time. In this situation, the growth process itself must be explicitly analysed prior to the determination of where comparative advantage lies.

Where there is distortion in the export sector in the form of production externality, a discrepancy between private and social benefits occurs. Although the output of exportable goods affects that of others favourably, the imputed value of this productivity is not appropriated to itself. Thus, private returns to the export industries fall below their social value, and exports along the comparative advantage line do not produce maximum benefits to the domestic economic growth. To correct this distortion, government intervention in the production of export goods might be justified.(41) In this case, government assistance for the production of export industries should not be at the expense of creating other new distortions via extra taxation.

The above argument can be directly applied to the case where there is distortion of domestic prices. Where a country's true comparative advantage lies with a certain commodity, production subsidies for this commodity at a rate sufficient to compensate for the domestic distortion would necessarily raise the value of output, at the international exchange ratio, above what it would be under free trade.

Another argument for government assistance to export industries can be put forward when distortions exist in the labour and capital markets. This is especially important in certain types of developing economies where there is a large volume of surplus labour.(43) In these economies, the opportunity cost of unskilled labour is zero or negative. However, the market price of labour does not fall to zero or negative, and hence there occurs a divergence between the actual wage rate and the alternative marginal product of labour in the rural sector. The same can be applied to the case where productive capacity is idle, and thus, sunken costs are very low when the economy falls into recession. In this situation, a subsidy on the use of the factors which are idle would increase economic welfare in terms of the national product. It has been very common for semi-industrialized countries developing

(41) See Bibliography (4).
(42) See Bibliography (4).
(43) See Bibliography (4).

through import-substitution to have such a sunken-cost problem in recent years.

When there is a foreign trade distortion, government intervention in the form of export subsidies will also be required. If the importing country imposes an import restriction and possesses monopsonistic power in the world market then world market prices for exports may not correspond to the marginal revenue from exports. By providing export subsidies the exporting country can equate the relative prices of exportable goods with their relative opportunity costs in international trade. There are also other valid arguments for export subsidization when the private evaluation of risks in exporting is in excess of social benefit, when the costs of opening new world markets are higher than the actual social returns, and when good export performance is regarded as a sign of economic success, resulting in more aid or foreign capital inflow.(44)

In all of these cases, export assistance may well be justified.

It is to be noted that the infant export industry case (including learning by doing) is the same as the protection of infant domestic industries in the theory of international trade. If the infant industry argument is accepted for industries in the domestic market then it would seem to apply to young export industries as well.(45) With many obstacles and risks in the world market which confront developing countries, it can hardly be expected that such countries will be able to achieve internationally competitive efficiency without a transitional stage of support. In both cases, the aim is to assure the profitability of industries which would succumb if exposed prematurely to the full effects of outside competition.

The theory of artificial formation of comparative advantage, however, goes farther than this. Government assistance to export industries will also be needed where substantial dynamic advantages, including increases in the

(44) See Bibliography (4).

(45) Although the underlying reasoning of the infant export industry argment is related to the theory of external economies, the two are logically distinguished. While the external economies argument is basically static and permanent, the infant export industry argument is clearly dynamic and temporary. The infant export industry argument is only justified when such assistance disappears after a certain period of time. See H.G. Johnson: "Optimal Trade Intervention in the Presence of Domestic Distortions" in R.E. Baldwin, et al.: *Trade, Growth and the Balance of Payments* (Rand McNally, 1965), pp. 3-34.

average savings ratio and the rate of investment, arise from export expansion. As the productivity doctrine of international trade suggests, export expansion again brings about indirect dynamic gains such as the development of technical innovation, the gaining of competitive advantage, and the receipt of the impact of 'acupuncture.' It is thus contended that governments should go beyond neutral measures of export expansion and embark on a positive policy of encouraging export expansion artificially.

(B) Comparison with domestic-oriented development

So far this paper has focussed on a one-sided agrument of export-oriented development through the formation of artificial comparative advantage. In particular, when there are distortions in the export sector and in the foreign market but not in the domestic sector it is maintained that government intervention is justified in correcting these distortions in order to increase exports beyond the present state of comparative advantage.

However, export expansion is by itself not the objective of economic policy even if exports bring about a number of benefits in the two-gap situation. In a developing economy, the objective of economic policy is usually economic growth, as shown in Figure 1 and 2 (or an increase in current income and output under given constraints, assuming that maximizing current levels of income and output is equivalent to maximizing the present value of the entire stream of output over time).(46) So it may be desirable to compare export-oriented development with domestic market-oriented industrialization from the point of view of optimal allocation of scarce resources to promote economic growth (either at any one time or over a period of time during which output can grow).

The theory of domestic market-oriented growth is that contained in the doctrine of both balanced and unbalanced growth of the economy within a national boundary which is usually protected by tariffs, quotas, and exchange restrictions. This theory emphasizes structural interdependence and considers mainly the sequence of expansion of production and factor use by sector.

(46) F. Steward and P. Streeten: "Are the Objectives of Maximum Output and Maximum Employment Compatible?" Background Paper Head II in Prospects for Employment Opportunity in the Nineteen Seventies, Cambridge Conference on Development, September 1970. cf. Various articles in Conflicts in Policy Objectives edited by N. Kaldor (Basil Blackwell Oxford, 1971).

S.K. Nath: *A Reappraisal of Welfare Economics* (Routledge and Kegan Paul, 1969).

Thus, it maintains that the investment criteria suggested by it are quite different from those derived from the classical theory of comparative advantage. It argues that due to distorted elements in developing countries, factor prices do not reflect their opportunity costs accurately, and that as infant industries acquire experience in actual production, the quality and quantity of factors of production may be altered significantly. If a group of investments are only profitable when they are undertaken together in the presence of economies of scale, the comparative advantage doctrine may be an unsuitable guide for investment allocation.

It should be stressed, however, that the theory of artificial formation of comparative advantage also contains growth elements as the essence of its arguments. The theory of artificial comparative advantage maintains that through export expansion developing countries benefit not only from an increase in foreign exchange earnings, but also from other numerous quantitative and qualitative effects detailed earlier. In particular, dynamic growth elements are linked directly with economic development by improving such factors of production as capital, labour, and technology. Both theories are concerned with economic growth elements and no distinctive differences can be seen in this regard.

The optimality criterion, as explained earlier, does not provide a clear conclusion about the relative importance of the foreign and domestic markets. What it suggests is that a tax-cum-subsidy on domestic production (not a tariff) is the optimal policy when the distortion is domestic.[47]

In contrast with the 'traditional' argument that protection is the optimal form of government intervention, this optimal criterion comes nearer to distinguishing the best form of such intervention. This criterion shows that the need for government intervention does not prejudge its form, which must be decided after comparing the relative efficiency of all the policy instruments available in the government(including their costs of administration). This criterion, however, leaves unanswered the crucial questions about which the optimal intervention is when there exists distortion in both the domestic and export sectors simultaneously.

(47) J. Bhagwati: The Theory and Practice of Commercial Policy: Departure from Unified Exchange Rates (International Finance Section, Department of Economics, Princeton University, 1968).

So far, no significant theoretical asymmetry has been found between the two theories as far as development policy is concerned. But there are 'actual' differences in importance between foreign and home markets according to different economic conditions inherent in specific economies. A major difference between the two markets can be found in their respective elasticities of demand, actual and potential, and the volume of demand for goods produced in developing countries.(48) The domestic market-oriented growth argument implies that the export is so limited that it can be ignored because the potential domestic market should be enough to meet domestic supply. On the other hand, the foreign market-oriented growth theory assumes explicitly and implicitly that price and income elasticities of external demand for exportable goods of developing countries are high over time while the domestic market is not large enough to absorb the increasing supply. Both arguments assume supply sufficiency, but the former insists on the existence of demand deficiency in the foreign market whereas the latter does so in the domestic market. Together with supply conditions at home, external demand in comparison with internal demand determines whether growth can be export-led, or vice versa. Thus, as long as the external and internal demand conditions are favourable to a developing country, both approaches fullfil the same function in promoting industrialization and improving the balance of payments. They are, therefore, not alternatives but complementary.

In connection with the demand conditions in both external and internal markets, it may be noted that the actual and potential size of the domestic market (DDE) depends largely upon such economic conditions as the size of the country(GDP-EXP), rate of growth of gross national income(dGDP), resource endowments (NRE), change in the effective foreign exchange rate

(48) There are other differences also. One is that a foreign market may possess its own advantages which the domestic market does not. Underdeveloped countries can obtain foreign exchange, through selling their goods in the foreign markets, with which they can import capital goods, intermediate products embodying advanced technology which they could not provide themselves.

These advantages cannot be obtained through production for the domestic market. On the other hand, there are practical disadvantages as well. It is difficult and expensive to get into foreign markets, and comparatively easy to sell goods in the domestic market. The marketing problem for import-substituting industries can be partially solved albeit at a cost by restricting imports. But, world markets are imperfect and exporting is a tough and competitive activity.

(FER), the state of economic development and industrialization, etc.[49] These factors determine the effects of domestic demand, exports, and import substitution in the course of export-oriented development.[50]

(2) Artificiality (2)

Up to this point, justification has been shown for the departure of artificial comparative advantage from the current comparative advantage mainly in terms of external economies, distortions and the infant nature of export industry. This theory of artificial comparative advantage is based on the comparative advantage of present factor productivity and possible productivity growth, but its main concern is the expectation of an increase in factor productivity within a relatively short period of time, thus compensating for losses incurred in the departure from the static optimum.

The creation of non-increments or non-potential comparative advantage differs from what has been discussed above. It is not concerned with the growth of productivity in the export sector, nor, at the extreme, does it anticipate the possibility of productivity growth, if no foreign capital is available. Rather it implies that even if there is no productivity rise, the volume and value of exports will expand artificially. It refers neither to the externality and distortion theories nor to the infant export industry. It aims only at increasing the gross volume and value of exports by the increment to investment of foreign capital so as to eliminate the trade gap created mainly by the introduction of foreign capital.

But, artificiality (2) is justified because it deduced benefits from the imports of foreign capital goods, intermediate products, and raw materials which embody highly advanced technology. Via artificiality (2) in export expansion, some proportion of the value added from the export industry would be national savings through trade, and domestic physical savings can be converted into investible resources. In the economies where insufficient productive capacity exists, these imported goods are the main source of

(49) See Bibliography (5).

(50) In symbolic terms, these relationships take the following form (but in our model other factors except GDP are omitted for the sake of simplicity):

$DDE = DDE(GDP - EXP, dGDP, NRE, FER, u_1)$

$WDE = WDE(GDP^w, dGDP^w, NRE^w, FER, u_2)$

where small letter, w, stands for world and,

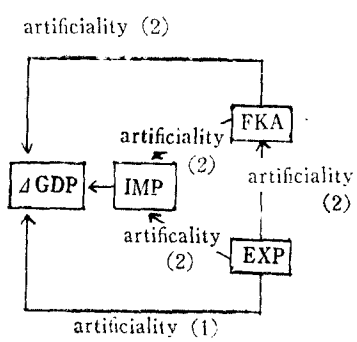
$u_i (i = 1 \text{ and } 2)$, indicates residual.

establishing a base for production. They are unattainable through domestic natural resources, skills, technology, and scale of production within the boundary of the country concerned. Domestic production, being largely traditional in structure and technique, is unable to provide all the means for the transformation of developing countries. Modern technology embodied in foreign capital goods provides the major impetus for growth.(51)

In the 20th century, imports of foreign capital goods and intermediate products embodying highly advanced technology are in the form of the inducement of foreign capital, but eventually should be financed by expanded exports. This means that foreign capital and exports play a similar role in the end, but it should be clearly noted that the difference between foreign capital and exports in this paper's model is that foreign capital is first used to establish the productive capacity and then, backed by such capacity in production, exports can be promoted to earn foreign exchange and repay the debts (artificiality 3). Where no previous productive capacity exists, the possibility of launching such an economic causation is nil.

The arrows in the simple diagram below indicates the direction of causation.

Figure 7　　**The Direction of Artificiality (1) and (2)**



This diagram shows that exports (*EXP*) support foreign capital (*FKA*), both of which principally support △*GDP* and *PRI*(mainly price stability)through imports (*IMP*). Hence, it can be argued that, even in this economy where *FKA* plays an important initial role, *EXP* is the final source of the export-oriented pattern of development. The formation of artificial comparative

(51) Closing the door to advanced countries foreclose any opportunity for rapid economic growth. Refer to the various articles in the Economics of Technological Change edited by Nathan Rosenberg (Penguin Modern Economics Readings, 1971)

advantage in this sense is the development strategy from which a country can benefit when it moves along the export-oriented development path. These benefits cannot be derived from the domestic market-oriented development strategy. The economic situation discussed above usually happens when the developing economy is designed to pursue a high rate of economic growth.

Again, on the demand side, with no government sector,

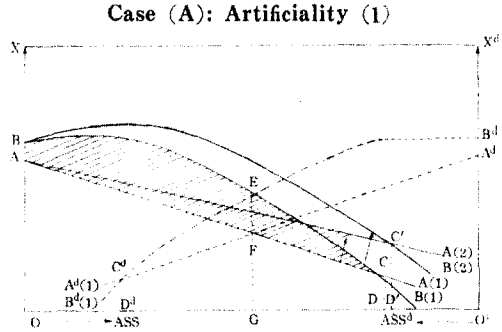
$$GDP=CON+INV+EXP-IMP.$$

In this identity, *GDP* tends to vary with such demand variables as *CON*, *INV*, *EXP* and *IMP* to retain equilibrium. In the developing economies, the supply side is also important in affecting *GDP*. If *CON* increases exceedingly in the developing economies, *SAV* should decrease accordingly and *FKA* is to be induced.(52) Again, if *INV* increases exceedingly to match the target of a high economic growth, *FKA* should be introduced. In this case, *EXP* is a final source for repaying the debt incurred from borrowing foreign capital and thus should be artificially expanded. The main features of artificiality (2) are, thus, that it assumes the international mobility of capital and technology(cf. the assumption in the theory of comparative advantage) and that it is very different from domestic market-oriented development.

For systematic comprehension of artificiality (1), (2), (3) and (4) jointly, the diagrams below exhibit what happens when exports are pushed artificially. These diagrams are based on such usual assumptions as perfect competition and rationality, for the sake of simplicity.

In Figure 8-1, *X*, vertical line, represents social foreign exchange earnings including such dynamic effects as infant industry, externality, correction of distortion, and technology. X^d is the counterpart of *X* in the domestic

Figure 8-1 **Case (A): Artificiality (1)**



(52) cf. N. Kaldor: "Conflicts in National Economic Objectives," *EJ*, Vol. 81, March 1971, pp. 1-16.

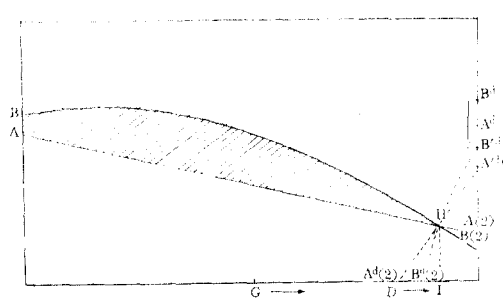
sector. *ASS* is government assistance to export activities (or total inputs), whereas ASS^d is the counterpart of *ASS* in the domestic sector. $ASS+ASS^d$ to be employed in both sectors over a given period of time is represented by the horizontal axis OO^d. From O toward O^d, successive increments of *ASS* are added to export activities, and in the opposite direction, from O^d toward O, successive increments of ASS^d are added to domestic activities in new branches of domestic production(import substitution plus other domestic production activities).

The *AA*(1) curve reflects the usual behaviour of exports when they are carried out on the current comparative advantage whilst the BB (1) curve stands for the line of dynamic comparative advantage. As increments of *ASS* are added in export activities, a downward pressure is marginally exerted on *X* along the lines of *AA* (1) and *BB*(1). The differential between *AA*(1) and *BB*(1) indicates the effects of artificiality (1) as explained in detail in pages 33-36. The optimum solution in this case is to stop export expansion at point C, the intersection of *AA* (1) and *BB* (1), and to stop *ASS* at point D. As the *AA* (1) curve becomes less steep (like *AA*(2)) and the *BB* (1) curve moves upward (like *BB* (2)), the point of intersection moves toward the right-hand side (C′) and a higher *ASS* is justified (D′).

Assume that *X* produced by export activities represented by *OA* is the same as O^dA^d in the domestic sector at the beginning of the process. In the domestic sector, domestic costs are competitive with import prices at points O^d and A^d. But new branches of domestic industries have costs higher than import prices, and X^d moves downward as ASS^d increases. In this way, X^d falls correspondingly as ASS^d increases.

If we assume again that the slopes of A^dA^d (1) and B^dB^d(1) are identical

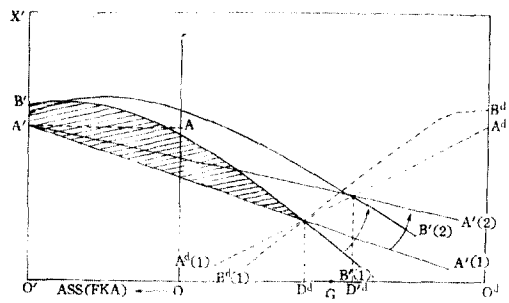
Figure 8-2　　**Case (A): Artificiality (1)**



to those of AA (1) and BB (1) respectively, the unique solution exists at points E and F in stopping export expansion, and at point G in providing ASS and ASS^d. This is the point of maximum increment of X and X^d derived from ASS and ASS^d; before or beyond that point, the increment will be less.

But in the usual cases of developing countries whose development has reached the near-saturation point of import substitution(with point A^d moving downward to point A'^d in Figure 8-2), whose sizes are small, and whose foreign exchange gaps cannot be filled by closing the savings gap, the slope of the social marginal X may be less than that of X^d, as shown in AA(2) and A'^dB (2). Thus, the optimum point to stop artificial export expansion will move to the right and the higher ASS is justified at point I.

Figure 8-3 **Case (B): Artificiality (2)**



So far, case (A) has been dealt with when domestic capital endowment is given. If foreign capital is available to export industries in the course of export-oriented development(especially in the form of direct or joint ventures by multinational firms), the situation varies. In case (B), that is, the world of artificiality (2), the origin O moves towards O' in Figure 8-3 and, thus, the total amount of ASS is increased by OO'. Point A moves toward point A' correspondingly.

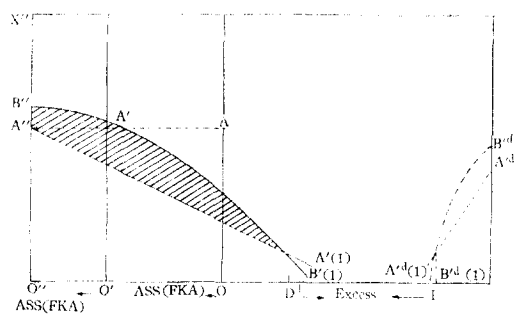
If the slope of the AA(1) curve is identical to that of $A'A'$(1) when A^dA^d (1) remain constant, the optimum point to stop artificial export expansion is D^d (the intersection of $A'A'$(1) and A^dA^d(1)), where point G moves to the left, but the length of GD^d is less than that of OO'. If the AA'(1) curve moves upward due to advanced technology embodied in the intermediate and capital goods imported, as mentioned earlier in detail, a larger amount of ASS is justified in assisting export industries (D'^d).

The feature of artificiality (2) needs a new theory of international trade.

With foreign capital, heavy and chemical industries could be established, but they are believed to be comparatively disadvantageous to developing countries. The world of artificiality (2) is one of multinational corporations. Because of increases in wages and rent, together with pollution problems, capital tends to flow from developed to developing countries to establish iron and steel, non-ferrous, electronics, heavy machine, and shipbuilding industries, thus changing the existing comparative advantage. Hence, developing countries are not short of capital but can secure a sufficient amount given the ability to repay the debt charges. Heavy and chemical industries of relatively high capital intensity are artificially set up in such a manner.

If these industries are managed well enough to produce the normal profits with which debts are repayed, then artificiality (2) is well justified. The determinant of the success or failure of heavy and chemical export industries aided by artificiality (2) is the slope of $A'A$ (1) and $B'B(1)$.

Figure 8-4　　**Case (C): Artificiality (3)**



But it should be noted that the possibility exists that the slopes of $A''A'$ (1) and $A'^dA^d(1)$ or $B''B'(1)$ and $B'^dB^d(1)$ in Figure 8-4 may not intersect. If foreign capital is introduced further when their productivies are decreasing, or at most, not increasing, then case (C) arises.(53) In case (C) foreign capital available to export industries is induced beyond the absorptive capacity of the economy and part of ASS $(FKA)+ASS^d$ is redundant like D^dI. Artificiality (3) in export expansion is usually formed in order to repay foreign debts, to fill the trade gap and to achieve artificially an autonomous

(53) Cf. S.E. Guisinger: "Negative Value Added and the Theory of Effective Protection," *QJE*, Vol. LXXXIII, August 1969, pp. 415-433.
J. Vanek: "Variable Factor Propensities and Inter-Industry Flows in the Theory of International Trade," *QJE*, February 1963, pp. 129-142.

export-oriented development path.

2. Actual measurement of artificiality

The problem, then, is how to measure the optimum point or efficiency of artificiality (1) and (2). There have been some empirical attempts at the evaluation of investment projects in the export sector in terms of society's net advantages, one of which is an evaluation of export expansion according to the total factor productivity criterion.(54)

In substance, this method is equivalent to the way of comparing benefits with sacrifices made by artificial export activities. The formula for such a comparison can be written in very general terms.(55)

$$\sum \epsilon_i = \frac{\sum q_i dSAC_i}{\sum p_i dBEN_i} \quad \cdots\cdots(1)$$

where ϵ_i = social sacrifices per unit of social benefits made by export industry i (or we may call the cost/benefit ratio);

$dBEN_i$ = the increase in various benefits made by export industry i. One may substitute different discount rates depending upon the time preference;

$dSAC_i$ = the increase in various sacrifices made for export industry i

$p_i q_i$ = accounting prices for each benefit and cost respectively.(56)

Suppose that one can draw a full list of benefits (1…h) and sacrifices (1…e). Then all benefits obtained from, and all sacrifices made on behalf

(54) See Bibliography (6).

(55) In a general equilibrium framework under the following assumptions: Zero substitution elasticity between material inputs and primary factors, constant returns to scale, same domestic cost structure for the export and domestic activities, and infinite foreign elasticities of demand for exports and supply of imports, and no transportation costs. In addition, object is assumed to maximize current output rather than the rate of growth, and, thus, time stream of benefits and costs are simply neglected. Some assumptions are relaxed as the discussion proceeds. For a general discussion of cost-benefit, see A.E. Dasgupta and D. W. Pearce: *Cost and Benefit Analysis, Theory and Practice* (Macmillan, 1972).

(56) It is possible to solve the equations (1) to (8) if p_i and q_i are given. $p_i q_i$ can be solved theoretically by the programming technique. But, in actual practice, the solution for $p_i q_i$ contained in equation (1)-(8) is hard to come by. Since the programming techniques are simplified on various accounts and the methods of computation are far from precise, it is common to use the appropriate value parameters that can be derived in practice. For example, in the absence of better information, capital can be imputed by some rate of interest equal to the real marginal costs of foreign borrowing, say 8 percent per annum' while labour is valued at its marginal productivity, say zero. Accouting prices for foreign exchange can also be obtained by deriving weighted average effective foreign exchange rates. See A.K. Sen: "General Criteria of International Project Evaluation," Evaluation of Industrial Projects, UD. ID/Ser. H/1, 1968, pp. 55-69.

of a given export industry (i) may be: for the benefits,

$$\sum p_i dBEN_i = p_{1i} dBEN_{1i} + p_{2i} dBEN_{2i} + \cdots\cdots + p_{hi} dBEN_{hi} \cdots\cdots\cdots\cdots (2)$$

and for the sacrifices,

$$\sum q_i dSAC_i = q_{1i} d\ SAC_{1i} + q_{2i} dSAC_{2i} + \cdots\cdots + q_{ei} dSACei \cdots\cdots\cdots (3)^{(57)}$$

In equation (2), the benefits, 1…h, include foreign exchange earnings, externality infant industry effects, correction of distortions, and improvement of technology which are produced by artificiality (1) and (2) in export expansion.

As for an open economy where export and import activities are very high in terms of their share in national income, equation (2) would be:

$$\sum p_i\ dBEN_i = \sum p_i\ dNFX_i + \xi$$
$$= \sum p_i\ d\ (EXP_i - \sum IIN_j r_{ji}) + \xi \cdots\cdots\cdots\cdots\cdots\cdots (1)$$

where NFX_i=net foreign exchange earned in world prices (when export assistance is given) in terms of domestic currency.

EXP_i=gross foreign exchange earned through exports at world prices in terms of domestic currency.

IIN_j=value of imported inputs per unit of output of export goods at world prices in terms of domestic currency

r_{ji}=elements of the matrix of input coefficients which are assumed to be fixed. The effects of substitution between KAP and LAB are assumed to be not strong enough to change the results obtained otherwise.

ξ=all other benefits

(57) Equation (3) expressing total sacrifices would take the following form, if shadow prices are thought of in terms of rates of substitution between labour and capital and if all other costs are neglected:

$$\sum_i^m q_i SAC_i = q_{ki}\ KAP_i + q_{li}\ LAB_i$$

where KAP=capital
LAB=labour

If q_{ki} were derived as the shadow price of capital in terms of labour, q_{li} would equal 1 and the whole expression would be simplified into:

$q'_{ki} \cdot KAP_i + LAB_i$

Similarly, with differentiated prices for various capital goods, the expression would take the form:

$/q'_{ki} \cdot KAP_i/ + LAB_i$

It can be noted, therefore, that when ξ is positive, $\Sigma\, p_i\, dBEN_i > p_i dNFX_i$, and thus, ϵ_i is smaller if one ony takes into account $p_i\, dNFX_i$.

Similarly, SAC_i is transformed into DCO_i which represents total (direct plus indirect) domestic resource costs (value added) at domestic prices required for net foreign exchange earnings which are obtained at all stages of fabrication. In an open economy of developing countries, foreign exchange is a necessary input in most income-generating activities, since an increase in income requires imported capital goods and intermediate products from advanced countries (artificiality 2). Simultaneously, export activity generates foreign exchange and requires inputs of scarce domestic resources. The requirements for scarce domestic resources differ according to different export activities, and the cost in terms of domestic resources of the marginal net foreign exchange earning varies depending upon different exports. The principle of cost minimization for a given output of exportable goods suggests that exports which have the same marginal net foreign exchange earnings but involve lower domestic costs should be encouraged.

Hence, equation (1) will be written as:

$$\Sigma\epsilon^*_i = \frac{\Sigma q_i dDCO_i \cdot r_{ji}}{\Sigma p_i d(EXP_i - \Sigma IIN_j \cdot r_{ji})} \quad \cdots\cdots (5)^{(58)}$$

where ϵ^*_i = social domestic resource cost per unit of net foreign exchange earnings by export industy i

Suppose next that domestic prices for imported inputs used in the export industry, or the inputs supplied by domestic industry, increase over their

(58) This ratio can customarily be made at the existing exchange ate. But this ratio reflects the structure of government assistance itself, so that calculations need to be made at the shadow exchange rate. We adopt $p_i q_i$ in our formula (5), assuming no distortion in the world market for a small country.

Our formula is called a total measure, involving the use of a full input-output method, and differing from direct measure, which involves the use of the semi-input-output method.

It makes no difference whether we use a total or a direct measure of the domestic resource cost of saving or earning foreign exchange if the market prices of all primary factors are equivalent to their shadow prices, and, hence, the cost of domestically produced inputs will equal their marginal cost in the world market.

But, when market prices of primary factors are different from their first-best shadow prices, which would need to be calculated from a general equilibrium model, total and direct resource cost criteria will not necessarily give the same results.

B. Balassa and D.M. Schydlowsky: Indicators of Protection and Other Incentive Measures, Harvard Institute of Economic Research, Discussion Paper No. 229, February 1972.

corresponding foreign prices. If this condition exists, then the impact of export assistance will be reduced just as the protective effect of tariffs and restrictions is reduced by the imposition of tariffs and various restrictions which raise the prices of inputs. Thus one needs to make a distinction between nominal (NEA_i) and effective export assistance (EEA_i).

$$EEA_i=\frac{q_i\ DCO_i-p_i{}^{E}NFX_i}{p_i{}^{E}NFX_i} \quad \cdots\cdots(6)\ ^{(59)}$$

where ${}^{E}NEX_i$=net foreign exchange earned when no export assistance is provided.

In this equation, non-traded inputs are taken into account.[60]
From equation (6)

$$DCO_i=p_i{}^{E}NFX_i(1+EEA_i) \quad \cdots\cdots(7)$$

Substituting (7) into (5)

$$\Sigma\epsilon_i{}^{**}=\frac{\Sigma q_i dp_i{}^{E}NFX_i(1+EEA_i)r_{ji}}{\Sigma p_i d(EXP_i-\Sigma IIN r_{ji})} \quad \cdots\cdots(8)\ ^{(61)}$$

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(59) In equation (6):

$DCO_i=TEX_i-\sum_j IIN_j r_{ji}$

$TEX_i=(1+\phi)EXP_i+\phi'\ DOM_i+\phi''$

${}^{E}NFX_i=NFX_i\times(1-s)=\frac{EXP_i}{(1-s)}-\frac{\sum_j IIN_j r_{ji}}{(1-s)}$

where TEX_i=total receipts in domestic prices per unit of export sales of export industry i.

DOM=domestic market price of domestic output

ϕ =ad valorem and specific credit(loans at preference rates, interest ceilings for bank loans, unofficial credit market), expenditure preferences (preferential railroad and electricity rates, export promotion efforts, financing of research).

ϕ' =various taxes on domestic output(direct and indirect taxes, accelerated depreciation allowances).

ϕ' =other assistance (quotas, licensing and the like)

s =the percentage of export assistance per unit of foreign exchange earned by exports.

As a way of avoiding the problems raised by negative value added at shadow prices, the denominator can be replaced by $q_i\ DCO$. As $q_i\ DCO_i$ is never negative, EEA_i can only be less than zero when $q_i\ DCO_i$ is less than $p_i\ {}^{E}NFX_i$.

(60) The treatment of non-traded inputs (electricity, gas, water, banking, insurance, domestic trade, transportation and other services) depends upon the objective of calculating the effective rate of export assistance. Since the effective rate of export assistance is used to estimate the cost of export assistance in our study, the cost of non-traded inputs to the national economy should be included with the direct cost of processing. For practical calculations, see Appendix 1.

(61) For actual measurement, equation (8) may be transformed into that which compares the costs and benefits of two different period successively as follows:

Equation (8) gives the same result as equation (5). (62)

As a last resort, the exchange-cost comparison is usally employed as a formula to evaluate the static efficiency of export expansion, substantiated by the qualitative explanation of other factors dynamizing the results of the above formulae. In other words, the calculation of exchange-cost criteria is carried out for the static efficiency of the export activities and, next, this result is supplemented qualitatively by the various favourable and unfavourable effects of artificial export expansion explained earlier in detail. The static exchange cost formula reveals the total factor productivity at a given point in time, or the static comparative advantage of export commodities concerned.

3. Implications for export-oriented development

So far theoretical justification for, and benefits of, departures from static and dynamic comparative advantages (artifificiality 1 and 2) have been discussed. In this section, the characteristics and disadvantages of artificiality (especially artificiality 3) are proposed for.

As defined earlier, artificial comparative advantage is a new concept of comparative advantage which a government forms artificially. That is, a government intervenes in the export sector through subsidies (SUB^{g-e}) and investment (INV^{g-e}) in order to increase gross foreign exchange earnings as much as possible. Thus, export industries are indiscriminately created under

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$$\Sigma\epsilon^{***}t/o = \left\{ \frac{\Sigma q_i p_i^E NFX_i(1+EEA_i)r_{ji,t}}{\Sigma p_i(EXP_i - \Sigma\ IIN.r_{ji})_t} \right\} \Big/ \left\{ \frac{\Sigma q_i p_i^E NFX_i(1+EEA_i)r_{ji,o}}{\Sigma p_i(EXP_i - \Sigma\ IIN_j r_{ji})_o} \right\}$$

Since all inputs are weighted by their base year prices, $\epsilon^{***}t/o$ measures the change in output per combined input changes between two periods, had the prices of factors of production in the base year prevailed. All inputs are supposed to represent services of individual factors which have been directed to be utilised in production. $\epsilon^{***}t/o$ is, in principle, appropriate to measure the total factor productivity of an individual, homogenous industry. For the economy as a whole or an industry at an aggregate level(e.g. export and domestic industries), different industries should be weighted by their respective prices, because the productivities of input factors are different in different industries. Constant costs are assumed even if exports are expanded from an earlier to a later period and constraints are assumed to be unchanged during that different period.

(62) It should be pointed out, however, that ranking export industries by effective export assistance or domestic resource costs of foreign exchange does not necessarily rank them in terms of comparative advantage if some rather strong assumptions concerning the theory of comparative advantage are not made. If one leaves the world of perfect competition, the concepts of comparative advantage and economic efficiency become very much blurred. See R. Findlay: "Comparative Advantage, Effective Protection and the Domestic Cost of Foreign Exchange," *JIE*, May 1971, p. 204.

the name of infant industries, etc., but over a long period of time, lack comparative advantages due to their low standards of management and self-financing.

The setting of a high export target is based on the belief that there are high correlations between government assistance and exports, and between exports and economic growth. In other words, this belief assumes implicitly that if a country exported all its output by any and all means of assistance, it would grow faster than otherwise. It also maintains that there can be no over-expansion in exports, and that the more exports there are, the better it is for economic growth and welfare, even though there is no increase in total factor productivity in the export sector.

In the case of an open economy where the amount of foreign trade activity, measured by the ratio of trade to *GDP*, is high, and where a trade gap prevails rather than a savings gap, economic growth can be defined in terms of net foreign exchange earnings. In this type of economy exports may lead to a maximization of economic growth, when economic growth is a function of development investment and the imports of capital goods and intermediate products, and is equal to exports minus maintained imports. This is only true, however, if fixed domestic savings and investment, as well as foreign capital inflow, are assumed away.

Even in this kind of economy, if artificiality (especially 3) intended to increase gross foreign exchange earnings produced by indiscriminately providing export assistance($SUB^{g-e}+INV^{g-e}$) and indiscriminately expanding exports, then the costs of such export expansion may exceed the benefits in terms of foreign exchange earnings, and ranking industries by comparative advantage (in terms of total factor productivity) does not necessarily rank them in terms of foreign exchange earnings(The investment criteria therefore differ from each other considerably).

Besides this relationship, there are other points of consideration which show that export assistance and export expansion may not be correlated. They are:

Export assistance—demand elasticities
Export assistance—supply elasticities
Export assistance—terms of trade
Export assistance—net foreign exchange earnings

Export assistance—rate of growth of exports or export performance
Export assistance—proportion of exports in manufactured production
Export assistance—fluctuation of export earnings
Export assistance—effective protection, etc.

The assumption that export expansion=economic growth is untenable also. In other words, unlimited export expansion which is carried out regardless of comparative advantage may not bring about unlimited growth. This is because an increase in national income (our definition of economic growth) is affected not only by an increase in gross foreign exchange earnings, but also by other dynamic benefits mentioned earlier, when dealing with export-oriented development. We should consider economic and non-economic constraints, and time horizon, together with the following, which can make the relationship between the two variables uncorrelated:

Export expansion—infancy
Export expansion—distortion(excess capacity, surplus labour etc.)
Export expansion—externality(backward and forward linkage effects)
Export expansion—distribution of income
Export expansion—rate of savings and investment

Then, what are the disadvantages of artificial export expansion? To begin with, in connection with (8) and (4) in Figure 2, suppose that the rate of output growth is subject to a foreign exchange constraint, and also that artificial export expansion is used to relieve this constraint, but not to offset imperfections in the export and domestic sectors or in the trade market. Thus, the export and demestic structures continue to diverge from the optimum. In the case of artificiality (especially 3), export expansion above the optimum point would induce a negative net benefit as shown below:

$$\sum_i dNEB_i = \sum_i p_i dNFX_i - \sum_j q_i dDCO_j r_{ji}$$

where NEB=the net benefits from artificiality in export expansion

This is because the social costs for production of exported goods, $\Sigma q_i d. DCO_j r_{ji}$, are higher than the net foreign exchange earned, $\Sigma pd, NFX_i$, at a given point in time. Then the formation of artificial comparative advantage entails welfare losses (An increase in GDP equal to an increase in welfare is assumed). The maximum growth attainable would be:

$$dGDP^*_t = dGDP_t + d\sum NEB_{it} < dGDP_t$$

where $dGDP^*$ = an increase in the end period output with artificial export expansion

This situation might occur since the domestic savings gap could widen due to increasing costs incurred for such export expansion, although the trade gap would tend to narrow.

An attendant increase in resource costs per unit of foreign exchange earned by artificial export expansion again gives rise to a new distortion in the domestic market, thus adding to the sacrifices already made by the domestic sector for export expansion. Since the problem of allocation is frequently a problem of increasing one type of production at the expense of another, shifts should be made in the employment of capital, labour, and technology. To the extent that domestic industries are not inefficient when compared to export industries, artificiality attracts capital from more productive uses by creating excess demand in export industry, giving rise to an inefficient allocation of resources(if the objective function is to maximize real income). A point deserving special mention in this regard is the extent to which new distortions are created when an economy departs from the optimum point of resource allocation. If these distortions are great, export-oriented development itself can be jeopardized.

Suppose that government assitance to export industries leads to an increase in the production of exportable goods, so that foreign exchange earnings increase. The foreign exchange earnings by artificial export are $\sum_i p_i d(EXP_i - \sum_i IIN_j . r_{ji})$. But whether diversion of resources to the export sector results in a net increase in foreign exchange availability would depend also on $\sum_i p_i d(ISF_i - \sum_j IIN_j r_{ji})$ where ISF_i is exchange savings made by import substitution. Thus, the net savings in foreign exchange resulting from the artificial formation of comparative advantage (NSA_i) could be expressed in:

$$\sum NSA_i = \sum p_i d(EXP_i - \sum_j IIN_j r_{ji}) + \sum p_i d(ISF_i - \sum_j IIN_j r_{ji})$$

In the absence of offsetting policies, the provision of higher returns to the export sector may attract resources which would otherwise have been allocated to the import-substitution sector, and the subsequent reduction in import substitution negates potential savings in exports. Artificial export expansion with no compensating policies would thus imply a lower rate of

growth in import substitution industries. If $\Sigma p_i d(ISF-\sum_j IIN_j r_{ji})=0$, then the foreign exchange constraint is partially relieved, and a higher rate of growth becomes attainable from the point of foreign exchange limitations after exports are artificially expanded. But, if $\Sigma p_i d(ISF-\Sigma IIN_j r_{ji})<0$, the equality will be reversed.

Since artificiality relies mainly on the import of foreign capital goods and intermadiate products, domestic production of such goods tends to be sacrificed, and therefore, not only the ratio but also the amount of net foreign exchange earnings may decline, and the capital intensity of the economy as a whole tends to increase despite its labour abundant character. In other words, heavy emphasis on attaining a quick, high rate of exports at any cost results in negligence in promoting a backward linkage with import substituting industries. Imports of raw materials and intermediate products which are intended for the export sector, but are smuggled instead into the domestic sector, may rise ahead of the economy's resources endowment, and intensify the lopsided development of the light manufacturing sector. Thus, bonded or processed re-export will tend to prevail, and the export sector may become enclave. An export-first policy like the Stakhanovite programmes of Russia in the 1930's is preoccupied with gross exports, ignoring net exports and the intangible costs of artificial export expansion.

In particular, when the linkage effects of exports to the domestic sector are weak, and the sacrifices of the domestic sector are heavy, the growth rate of exports tends to be faster than that of the domestic sector. As a result, the capacity of the domestic sector to bear the sacrifices weakens as the burdens become heavier. All this tends to require additional foreign savings to fill the growing gap.

Moreover, as the export sector drifts further away from the domestic sector, the carry-over effects may become trivial, and the disadvantageous phenomena of the old export economies tend to reappear in the new export eonomies. Because of the resultant drift of the export and domestic sectors in different directions, supply elasticity becomes lower than before in the long run. The ratio of exports to output and proportion of total manufactured exports may again differ widely among different export commodities and be biased towards a few goods.

Artificiality which attempts to export any and all commodities tend to

disregard the disequilibrium between the rates of growth of foreign demand and those of actual exports, the problems of the technology gap, R and D, and product cycle, and also representive demand in the domestic sector related to the size of the country and factor availability. In particular, the structure of domestic supply tends not to correspond to that of foreign demand for exportable goods. The demand for heavy and chemical products in the world market is increasing at a steady rate. Artificiality in export expansion may discourage the progress of such production, and the export of heavy and chemical products is thus more difficult without government assistance than that of light manufacturing goods. All these may result in a decrease in demand elasticity in the long-run. In addition, the principle of a quick and high rate of exports at any costs tends to neglect the distribution of income in the sense of welfare economics. The forced reduction of the wage earner's income (one of the main sources of rapid export expansion in developing countries) in the export sector tends to bias income distribution.

The other disadvantage arising from artificiality is the possibility of a gradual decrease in domestic savings. In the course of export-oriented development, exports tend to increase domestic savings due to the accelerator effects, and also to achieve a trade balance by increasing exports over imports. That is, both the savings and trade gaps tend to be narrowed.(63) But, when total factor productivity in the export sector is non-existent, artificiality tends to widen the two gaps. Since domestic savings are not increased in the export sector due to artificiality in export expansion, savings in the domestic sector have to be transferred to the export sector. And since marginal total factor productivity is low in the domestic as well as in the export sector at this juncture because domestic costs exceed benefits, the economy tends to rely on foreign capital even further. In other words, above the optimum point suggested earlier, total factor productivity in both sectors is not promoted, domestic savings decrease, and, consequently, more foreign savings are called for. Satisfying the external balance or the trade

(63) W.M. Corden: "The Effects of Trade on the Rate of Growth" in Trade Balance of Payments and Growth, Papers in International Economics in Honor of Charles P. Kindleberger, edited by J.H. Bhagwati, et al. (North-Holland Publishing Company, 1971), pp. 117-143, especially pp. 131-133; J.K. Lee: "Exports and the Propensity to save in L.D.C.," *EJ*,, June 1971, pp. 341-351.

gap by artificiality causes the internal balance or domestic savings gap to deteriorate further.

In the export sector which is heavily dependent on foreign countries, income increased by export expansion has a propensity to consume which is usually very high as in the export sector of the 19th century's export economics. This usually being the case, imports of consumer goods increase, reducing the volume of capital goods which would be imported and used for investment. If the increased income is directed at domestic consumer goods industries whose productive capacity is fully employed, exports tend to decrease proportionately, in turn, inducing a decrease in the import of capital goods, resulting in a decrease in investment. All these bring about a decrease in domestic autonomous savings in the export sector. In artificiality, savings in the domestic sector are artificially transferred to the export sector where autonomous savings further decrease. Additionally, certain types of consumption-oriented commodities, which are initially set up for exports but are allowed to be sold domestically, tend to increase the propensity to consume, and hence decrease domestic savings. In the above two cases, the decrease in domestic savings should be countered by foreign capital, if the target amount of investment is set high. Then, the economy is likely to become foreign capital oriented.

There are other minor disadvantages of artificial export expansion. Examples of these unfavourable effects are an inflationary impact caused by competitive demand for commodities in short supply, and an increase in the money supply created by the expansionary consequences of export finance. Increased dependnce of the economy on the outside world(heavy dependence on a few countries and commodities and increase in the ratio of exports and imports to GNP) is another. In addition, claims from overseas buyers against the quality of export good and delivery terms tend to increase, and unfavourable contracts may also be concluded in the haste of an export drive. Thus, the terms of trade tend to deteriorate, accompanied by social dumping or 'bleeding' exports. As export assistance is given to any exporter, the effort by exporters to improve scientific management tends to be de-emphasized, thus retarding the efficiency of export firms in the long run. The small size of export firms, heavy and continuous dependence on outside finance, self-development of skills and technology, etc., may not improve

either owing to habitual reliance on government assistance.(64)

All in all, artificial export expansion (especially 3) beyond the optimum point (in terms of total factor productivity) may go against cumulative export-oriented development, making the economy too export biased, under the assumption of neutral demand for exports and domestic goods. As a result of these increasing adverse effects, cumulative capital formation through efficient export-oriented development tends to be retarded, and the key variables contained in the model of export-oriented development grow independently of each other. A productivity rise may not necessarily be induced by an increase in investment and production, and productivity does not necessarily bring forth a decrease in prices.

On the other hand, it should be mentioned that, if the total factor productivity of export industries and import substitution industries grows at a rapid rate, benefits from artificiality will increase correspondingly, whereas costs will decrease. As total factor productivity in the export sector increases, even through artificiality, it may become possible to get on an efficient export-oriented development path. The feasibility of export-oriented development depends upon whether new export and domestic industries, and heavy industries in particular, can be smoothly transformed into efficient export industries. Without efficient export substitution, artificial export expansion above the optimum point might not result in export-oriented development, but rather bring forth export-balancing or export-lagging development, at best.

Chapter IV
An Artificial Export-Oriented Development Model for Korea

1. Features of the model

For the purposes of a theoretical discussion in Chapter III and Appendix 1, many aspects of the particular situation as it exists have been ignored. Hence, the essential relations among macro-variables may require some amplification before being applied to an actual economy like Korea. While keeping the basic model and flow chart described above intact, one has to

(64) C.f.W.M. Corden: "The efficiency effects of trade and protection" in Studies in International Economics, Monash Conference Papers, edited by J.A. McDougall and R.H. Snape, 1970, pp. 1-17. In this article, Corden argued that if efficiency effects are in practice important, the body of orthodox trade theory needs to be modified significantly.

modify this model in a number of ways as follows.[65]

(a) To single out the other relevant variables besides the essential ones of export-oreinted development mentioned earlier. Since the relations in the model analysed in the previous chapter are theoretical rather than empirical in construction, it may be necessary to make certain adaptations in them according to the characteristics of the Korean economy, and to introduce other variables in order to provide a better explanation of the observed variation in the specified dependent variables.

(b) To choose the relevant form of equation. If necessary, one may work with particular functional forms(e.g. linear, quadratic, exponential, etc.). The functional forms chosen should, in addition to being good approximations to reality, be such that, when the various relations are fitted together, the model is amendable to statistical analysis.

(c) To determine the unit of measurement, to weigh the observations, and to introduce lags. The coverage of each variable is required to coincide with the objective of the model, while the data for each variable should be calculated by theoretically relevant statistical methods.

The econometric model thus constructed is mainly concerned with the evaluation of Korean economic growth and exports (to test our hypothesis and thus differs from such models as the mathematical programming, input-output analysis, games theory, factor analysis, and spectral analysis), but is also a kind of policy model which seeks alternative policy means consistent with the attainment of workable goals. In this model, Chenery's two-gap approach is employed. Two gaps coincide with each other ex post but often remain different from each other ex ante. The model is in principle a recursive one, except for the relationship between investment and *GDP*, and thus different from a simultaneous one.

Another feature of this model is that it incorporates three limits to growth simultaneously: the balance of payments, the supply of capital, and the supply of labour and 'residuals'. Therefore, this model is in contrast to familiar growth models of the production function type which function in terms of domestic determinants of growth. Rather, this model starts seeking an explanation for rapid growth rates in the field of the conspicuous role played by exports and the foreign balance. What is important in this

(65) See Bibliography(7).

approach, then, is how to incorporate into the methodology of 'growth accounting' the part which corresponds to the export sector. An examination of the model reveals that the export and domestic sectors are explicitly incorporated.

Several types of hypotheses can be tested with this model leaving aside the non-quantitative aspects.(66) One type of test is to determine the quantitative significance of various phenomena, such as the role of export expansion in economic development and its relative importance as compared to the domestic market. Different applications are to develop other hypotheses as to the importance of government intervention in promoting export expansion, and to evaluate to what extent a country has been developing through export-oriented development.

For these purposes, a number of elemets of a general equilibrium system have been considered. The most important of these are the structural determinants of imports, investment, income and other factors affecting exports. Based on the essential relationships among macrovariables analysed earlier, the model chosen for this study consists of various factors containing a set of disaggregations, as follows:

(1) Exports of goods and services
(2) Imports of investment goods and raw materials, etc.
(3) Government and private investment in the export and domestic sectors
(4) Savings
(5) GDP in the export and domestic sectors
(6) Government assistance to export industries.

This model also incorporates a government revenue function. These are supplemented by a set of non-statistical accounting definitions and equilibrium conditions.

Below, each function is briefly discussed and estimated.

2. Statistical discussion and estimates

(a) The export functions

(66) But it is clearly difficult to develop general tests of the influence of artificial export growth on economic development. The amount of testing as well as theorizing that could be undertaken with regard to exports-development relationships is immense. For the difficulties of econometric work in general, see A. Shouris: "The Use of Macro-econometric Regression Models of Developing Countries for Forecasts and Policy Prescription: Some Reflections on Current Practice," *OEP*, March 1972, pp.1-35.

In theoretical discussion as well as in empirical investigation, two variables were generally adopted for explaining determinants of export volume-the level of world demand and relative prices. In the case of Korea, growth in world demand seems to be significant. Demand for Korean exports was related to the level of world demand and income elasticity of world demand for Korean goods. In defining world demand, gross world income was considered rather than world trade, economic activity in the rest of the world, and industrial output, since a considerable portion of Korean exports consisted of consumer goods during the period under consideration. Given the total size of the world market, export volume seemed to be influenced by changes in the price competitiveness of Korean exports relative to others. Relative prices were usually defined as the ratio of the export price index of Korean goods to the export price index of similar goods of Korea's chief competitors. The terms of trade, that is, the ratio of the price index of Korean exports to the price index of Korean imports, should not be very important in the Korean context, where there has been very little substitution between exported and imported commodities. Moreover, the prices of competitors are likely to be more significant in Korea's case than those of the world as whole. As a proxy for relative prices, foreign exchange rates for exports (FER^e) might be adopted for practical reasons.

Another variable in a country which developed through artificial export-oriented development was government subsidies to export industries(SUB^{g-e}). The activities were greatly intensified in the mid-sixties and have continued to be so in Korea. They ranged over a wide variety of Government activities and were especially important in affecting Korean export performance. Government subsidies strengthened the price competitiveness of Korean goods in the world market, when Government investment in the export sector (INV^{g-e}) induced an increase in the output of exportable goods. The export prices for Korean goods were determined partly by Government subsidies and partly by internal factors in the export sector. Government investment in the export sector is discussed in equations (9), (19) and (22).

At the same time, domestic policies which affected supply availabilities also seemed to have played an important role in the outcome of development. Until recently, exports have been treated as an exogenous variable in most econometric studies. But this practice needs to be modified in view

of the fact that the volume and content of exports were closely linked to domestic economic activity at large. In particular, there was a great need for the endogenous treatment of an export variable in countries where exports were highly important in relation to gross national product. Korea belongs to this group of countries maintaining a large share of exports in its gross national product. One of the supply variables was the level of output of expertable goods. This supply feature will be dealt with again when the production and investment functions in the export sector are discussed with relations to equations (19), (20) and (21).

The basic function for exports (demand function for exports) is written as follows: Total exports consist of commodity exports (EXP^c) and service exports (EXP^s).

$$EXP_t=\sum_i EXP^i_t \qquad i=c,s. \cdots\cdots(1)$$

EXP^s is treated as an exogenous variable. EXP^c is assumed to be a function of world demand (WDE), Government subsidy to exporters (SUB^{g-e}), and foreign exchange rates. SUB^{g-e} stands for artificial export activities. This paper employs $\left(\frac{FER^e}{FER}-1\right)\times EXP^c$ representing export losses due to the differential between real (FER^e) and the official foreign exchange rates (FER). Data for FER^e are shown in Appendix. Since a negative coefficient was obtained from it, $\left(\frac{FER^e}{FER}-1\right)(IMP^c-EXP^c)$ is employed on the grounds that export loss is compensated for by imports of profitable commodities. Hence, one has:

$$EXP^c_t=\alpha_0+\alpha_1\ WDE_t+\alpha_2\ SUB_t^{g-e}+ \alpha_3\left(\frac{FER^e}{FER}-1\right)(IMP^c-EXP^c)_t+u_{1t} \cdots\cdots(2)$$

The estmation of the disaggregated export function (2) revealed the following result(67):

$$EXP^c_t=\underset{(0.14)}{-11.95}+\underset{(1.25)}{0.033}\ WDE_t+\underset{(1.05)}{1.62}\ SUB_t^{g-e} -\underset{(0.83)}{0.07}\left(\frac{FER^e}{FER}-1\right)(IMP^c-EXP^c)_t \cdots\cdots(2\text{-}1)$$

(67) The estimates are shown to two significant figures, even if for most the accuracy of the two figures is in doubt.

$$SEE=4.55$$
$$\bar{R}=0.99$$
$$d.w.=2.20$$

$$\log EXP^e_t = \underset{(0.40)}{0.58} + \underset{(1.14)}{0.89}\ \log\ WDE_t + \underset{(3.22)}{0.22}\ \log\ SUB_t^{g-e} + \underset{(2.92)}{0.016} \log\left(\frac{FER^e}{FER^-}-1\right)\ (IMP^e-EXP^e)_t \quad \cdots\cdots\cdots (2\text{-}2)$$

$$SEE=0.01$$
$$\bar{R}^2=0.99$$
$$d.w.=2.66$$

The outcome of the estimation (by use of annual data in both the linear and log-linear) indicated that estimated coefficients of the equations are relatively within the range of statistical significance. Also, they showed good fit and no serial correlation was detected[68] (See Figure 12 in Appendix 2). But it was also revealed in the export function that the results for the log-linear form showed a stronger relationship than those for the linear form(This is the same as in other functions also). During the eleven years under consideration (1961-1971), world *GDP* increased at an annual rate of about 9.5 per cent. If this steady trend holds, natural export expansion will be 8 per cent per annum, since the elasticity of *WDE* was 0.89 according to log-linear estimation. Thus, the gap between the export target and natural world demand in 1976 during the Third Five-Year Plan period should be covered by artificiality in export expansion according to our estimation.

(b) The import functions[69]

To make a distinction between exogeneity and endogeneity in the variables and to clarify their different effects, total imports were divided into six

(68) For the purpose of experiment, a substantial number of tests were made to compare them with above results. Among them domestic demand was considered as an additional explanatory variable for the theoretical interest. The explanatory power of this equation was very poor, however, and, to remedy this, another variable was included domestic production. As expected, the inclusion of domestic production, especially production of export goods, did not increase the explanatory power. Other experiments were made to include labour productivity, wages, and unit labour costs with regard to exports. But, the results were poor. The failure of these were observed mainly due to the scarcity or inappropriateness of the data existing on Korea.

(69) C.f. M. FG. Scott: *A Study of United Kingdom Imports*(Cambridge University Press, 1963).

main components: Imports of consumer goods(IMP^c),

Imports of intermediate products and raw materials for the export and domestic sectors (IMP^{ri-e} and IMP^{ri-d}),

Imports of capital or investment goods in the government (IMP^{g-i}) and the private sector (IMP^{p-i}),

Imports of services (IMP^s).

These are:

$$IMP_t \equiv IMP^c_t + IMP^{ri-e}_t + IMP^{ri-d}_t + IMP^{g-i}_t + IMP^{p-i}_t + IMP^s_t \cdots\cdots (3)$$

In Korea, imports of consumer goods were highly restricted and subject to controls during the period under consideration because of a development policy favouring the growth of import substitution industries. As a result of this policy, import substitution was largely carried out in the consumer goods industry. Imports of investment goods for the Government were also determined by Government policy. Hence IMP^c and IMP^{g-i} are assumed to be exogenously determined.

Numerous factor interacted to determine IMP^{ri-c}, IMP^{ri-d} and IMP^{p-i}. A simple classification of the relevant factors yields demand factors (absorption) and domestic supply factors. The relationship between demand and imports accounted for the major part of the variation in import volume. Imports can be related to a single aggregate measure of activity or demand, such as *GDP* and *EXP*. Here, IMP^{ri-c}, IMP^{ri-d}, and IMP^{p-i} were assumed to depend on these demands, on the dynamic response of this period's imports to the previous level of imports, and on the price variable to evaluate elasticity. In Korea, the increase in imports of capital goods was largely stimulated by the low foreign exchange rate for imports. An over-valued exchange rate gave impetus to an increase in consumption of such goods, which was a result of the Government's growth-first-policy. In the function of IMP^{p-i}, the foreign exchange rate was included in place of price variables, just as in the export function. One thus has:

$$IMP^{ri-c}_t = \beta_0 + \beta_1 EXP^c_t + \beta_2 IMP^{ri-e}_{t-1} + u_{2t} \cdots\cdots (4)$$

$$IMP^{ri-d}_t = \beta^1_0 + \beta^1_1 GDP^d_t + \beta^2_2 \left(\frac{FER^e}{FER} - 1\right) IMP^{ri-d}_t u_{3t} \cdots\cdots (5)$$

The equation regarding imports of capital goods in the private sector, IMP^{p-i}, was formulated in the same way, but IMP^{p-i} was assumed to be a

function of investment activities in the export and domestic sectors (INV^{p-e} and INV^{p-d}). Thus,

$$IMP_t^{p-i}=\beta^2{}_0+\beta_1{}^2INV_t^{p-e}+\beta^2INV_t^{p-d}+\beta^2{}_2\left(\frac{FER^e}{FER}-1\right)IMP_t^{p-i}+u_{4t}\cdots\cdots(6)$$

Imports of services (IMP^s) were, finally, assumed to be a function of exports and imports since Korea lacked marine facilities and vessels. Thus,

$$IMP^s{}_t=\beta^3{}_0+\beta^3{}_1(EXP+IMP)_t+\beta^3{}_2IMP^s_{t-1}+u_{5t}\cdots\cdots(7)$$

The movement of imports might also be closely related to the availability of domestic products. Since imports reflected effective demand not met by domestic supply, the volume of imports in total and for individual products was determined not only by total demand for these products, but also by competing domesitc supply. Thus, the rate and scope of import substitution were of critical importance. Domestic product availabilities are discussed in relation to the production functions in the domestic sector, (20), (21) and (23).

In the case of Korean imports, other variables appeared to be important. Analysis of Korean economic development during the period 1961-1971 suggests that imports increased at an unprecedented rate. Largely because of the close relationship of imports to investment goods, raw materials had to be imported since the industrial sector of the economy was less developed, and raw materials for manufacturing were largely lacking. To the extent that investment was associated with the level of import of capital goods, intermediate products, etc., it was also associated with the capacity to import. This is because what is actually imported hinges on the ability of the economy to pay in foreign exchange. The capacity to import consisted of the total foreign exchange earnings of the economy from exports of goods and services, the net amount of foreign capital inflow (FKA), and gold and foreign exchange reserves (XRS). According to this paper's definition of FKA in the Appendix 1, FKA includes XRS. Hence, total net foreign capital inflow consists of both short-term and long-term foreign capital (FKA_1 and FKA_2). The difference between short and long-term foreign capital reflects the difference between endogeneity and exogeneity. The former is treated as endogenous while the latter as exogenous. Thus,

$$FKA_{1t}=IMP_t-EXP_t-FKA_{2t}\cdots\cdots(8)$$

The regression results were:

$$IMP_t^{ri-e} = \underset{(3.78)}{-5.43} + \underset{(3.39)}{0.39} EXP^e + \underset{(2.38)}{0.37}\ IMP_{t-1}^{ri-e} \cdots\cdots (4\text{-}1)$$

$$SEE = 1.30$$

$$\bar{R}^2 = 0.99$$

$$d.w. = 2.90$$

$$\log IMP_t^{ri-e} = \underset{(2.14)}{-1.24} + \underset{(2.58)}{1.28} \log EXP_t^e + \underset{(0.55)}{0.17} \log IMP_{t-1}^{ri-e} \cdots\cdots (4\text{-}2)$$

$$SEE = 0.14$$

$$\bar{R}^2 = 0.98$$

$$d.w. = 1.18$$

$$IMP_t^{ri-d} = \underset{(1.13)}{-28.85} + \underset{(3.98)}{0.11}\ GDP^d{}_t + \underset{(0.85)}{0.59} \left(\frac{FER^e}{FER} - 1\right) IMP_t^{ri-d} \cdots\cdots (5\text{-}1)$$

$$SEE = 21.45$$

$$\bar{R}^2 = 0.79$$

$$d.w. = 2.56$$

$$\log IMP_t^{ri-d} = -1.66 + 1.19 \log GDP_t^d$$

$$- 0.05 \log \left(\frac{FER^e}{FER} - 1\right) IMP_t^{ri-d} \cdots\cdots (5\text{-}2)$$

$$SEE = 0.10$$

$$\bar{R}^2 = 0.80$$

$$d.w. = 2.21$$

$$IMP_t^{p-i} = \underset{(2.55)}{-67.62} + \underset{(2.16)}{2.97}\ INV_t^{p-e} + 0.71 INV_t^{p-d}$$

$$+ \underset{(0.02)}{0.03} \left(\frac{FER^e}{FER} - 1\right) IMP_t^{p-i} \cdots\cdots (6\text{-}1)$$

$$SEE = 38.93$$

$$\bar{R}^2 = 0.90$$

$$d.w. = 1.04$$

$$\log IMP_t^{p-i} = \underset{(3.39)}{-1.59} + \underset{(2.04)}{0.48} \log INV_t^{p-e}$$

$$+ \underset{(3.26)}{1.28} \log INV_t^{p-d} + \underset{(1.08)}{0.09} \log \left(\frac{FER^e}{FER} - 1\right) IMP_t^{p-i} \cdots\cdots (6\text{-}2)$$

$$SEE = 0.10$$

$$\bar{R}^2 = 0.97$$

$$d.w. = 1.19$$

$$IMP_t^s = \underset{(0.92)}{-1.75} + \underset{(2.57)}{0.05}\ (EXP + IMP)_t + \underset{(0.84)}{0.33} IMP_{t-1}^s \cdots\cdots (7\text{-}1)$$

$$SEE = 3.76$$

$$\bar{R}^2=0.97$$
$$d.w.=2.68$$

$$\log IMP^s_t = \underset{(3.89)}{-1.52} + \underset{(3.30)}{1.06}\log(EXP+IMP)_t - 0.05\log IMP^s_{t-1} \quad \cdots\cdots\cdots (7\text{-}2)$$

$$SEE=0.15$$
$$\bar{R}^2=0.91$$
$$d.w.=2.33$$

The outcome of the above regressions was relatively satisfactory from statistical standpoint, except IMP^{ri-d} (see Figures 13-17 in Appendix 2). In Equations (4-2) and (5-2), elasticity of imports of raw materials and intermediate products with regard to EXP^c and GDP in the export and domestic sectors were 1.28 and 1.19 respectively. This means that, if EXP^c and GDP are increased 10 per cent, imports of raw materials and intermediate products for both sectors will increase 13 and 12 per cent, respectively. This result appears to suggest that there is room for the improvement of effective import substitution in this respect. With the coefficient of $\left(\frac{FER^e}{FER}-1\right)IMP^{ri-d}$ as 0.05, it seems that IMP^{ri-d} was not very responsive to a low rate of foreign exchange for imports. It shows that, although the gap between FER and domestic prices may be widened, effective import substitution industries will not be seriously jeopardized.

In equation (6-2), one sees that the ratio of imports of investment goods for private use in investment in both the private export and domestic sectors was high in Korea. The elasticities of imports of private investment goods with regard to both kinds of investment were 0.48 and 1.28, respectively, so that when investment in the private export sector increases by 20 per cent, a 9.6 per cent increase of imports of investment goods will be stimulated. Considering the low elasticity for $\left(\frac{FER^e}{FER}-1\right) IMP^{p-i}$, one can see that there appears to be little possibility for the improvement of import substitution in such heavy industries as steel, machinery, etc.

In equation (7-2) where elasticity of IMP^s with regard to $(EXP+IMP)$ was 1.06, it was discovered that, as foreign trade increased, imports of services rose accordingly. This is because Korea lacks the maritime and air transportation facilities to meet increasing exports and imports.

(c) The investment functions

In view of the need for the distinction between the export and domestic sectors, total investment was also split into several components: private investment in the export and domestic sectors (INP^{p-e} and INV^{p-d}), government investment in the export and domestic sectors (INV^{g-e} and INV^{g-d}) and inventory investment (INV^{s}). Thus,

$$INV_t \equiv INV_t^{p-e} + INV_t^{p-d} + INV_t^{g-e} + IVN_t^{g-d} + INV^{s}{}_t$$

or

$$INV^{s}{}_t \equiv INV_t - INV_t^{p-e} - INV_t^{p-d} - INV_t^{g-e} - INV_t^{g-d} \quad \cdots\cdots (9)$$

Among the above variables, INV^{g-e} and INV^{g-d} are exogenous. INV^{s} is taken as endogenous because a satisfactory explanatory relationship for this variable was found.

What are the determinants of INV^{p-e} and INV^{p-d}? In accordance with the policy orientation of this model, the fixed capital formation function was designed on the accelerator. A lagged endogenous variable was introduced in the equation in order to supplement the equation in explaining variations in investment demand caused by under-or over-utilization of capacity.

Thus, the general form of the equation is:

$$INV_t^{p-e} = \gamma_0 + \gamma_1 \triangle EXP_t^{c} + \gamma_2 INV_{t-1}^{p-e} + u_{6t} \quad \cdots\cdots (10)$$

$$INV_t^{p-d} = \gamma'_0 + \gamma'_1 \triangle GDP_t + \gamma'_2 INV_{t-1}^{p-d} + u_{7t} \quad \cdots\cdots (11)$$

In equation (10),

$$\triangle EXP^{c}{}_t = EXP^{c}{}_t - EXP^{c}{}_{t-1} \quad \cdots\cdots (12)$$

In equation (11),

$$\Delta GDP_t = GDP_t - GDP_{t-1} \quad \cdots\cdots (13)$$

In the case of Korea, the supply side of the investment function seemed to be important also. It should be noted that the level of investment depended heavily on the availability of imported capital goods. The degree of dependency was high since the industrial sector of the economy was rapidly changing and developing. Due to the lack of domestic supply and their necessity in production, demand for investment goods and intermediate raw materials was relatively inelastic. In the context of the Korean economy, the avilability of finance was likely to be important too. Since most of the

production units in Korea relied heavily on financing, Government financing in particular seemed to have played an important role in affecting the availability of investment funds..

There is:

$$INV_t = SAV_t + (IMP_t - EXP_t) + (GOR_t - GEX_t) \quad \cdots\cdots(14)$$

where SAV=private savings at 1965 prices in Korean Won
GOR=Government revenue at 1965 prices in Korean Won
GEX=Government expenditure at 1965 prices in Korean Won

This relationship is easily derived from the following identity:

$$INV_t + GEX_t + EXP_t = SAV_t + GOR_t + IMP_t$$

This identity indicates that when savings gap (INV-SAV) and trade gap (IMP-EXP) are not identical in an ex ante or desired sense, budget surplus (GOR-GEX) tends to adjust disequilibrium ex post.

The results of the regressions were as follows:

$$\underset{}{INV_t^{p-c}} = \underset{(1.74)}{6.10} + \underset{(1.95)}{0.33}\ \triangle EXP^c + \underset{(1.32)}{0.43}\ INV_{t-1}^{p-c} \quad \cdots\cdots(10-1)$$

$$SEE = 6.01$$
$$\bar{R}^2 = 0.91$$
$$d.w = 1.80$$

$$\log INV_t^{p-c} = \underset{(3.54)}{0.46} + \underset{(1.81)}{0.34}\log \triangle EXP^c_t + \underset{(1.20)}{0.33}\log INV_{t-1}^{p-c} \quad \cdots\cdots(10-2)$$

$$SEE = 0.09$$
$$\bar{R}^2 = 0.95$$
$$d.w. = 1.77$$

$$INV_t^{p-d} = \underset{(1.22)}{15.97} + \underset{(2.07)}{0.65}\ \triangle GDP_t + \underset{(1.87)}{0.46}\ INV_t^{p-d} \quad \cdots\cdots(11-1)$$

$$SEE = 20.85$$
$$\bar{R}^2 = 0.94$$
$$d.w. = 1.36$$

$$\log INV_t^{p-d} = \underset{(3.86)}{0.35} + \underset{(1.92)}{0.25}\log \triangle GDP_t + \underset{(1.14)}{0.61}\log INV_{t-1}^{p-d} \quad \cdots\cdots(11\text{-}2)$$

$$SEE = 0.08$$
$$\bar{R}^2 = 0.93$$
$$d.w. = 1.36$$

Relatively good fits were obtained, although less satisfactory than EXP^c, IMP^{ri-e} and IMP^s (see Figures 17-18 in Appendix 2). The estimated invest-

ment functions showed that estimates of all coefficients were significant at the 5 percent level. The coefficients of multiple determinants were not too low, and serial correlation in the residuals was not serious. The estimated equations (10-2) and (11-2) indicated that investment demand in the export and domestic sectors was partly determined by the change in exports and investment activities respectively, and that the accleration theory of investment was relatively applicable to the Korean case. The view that investments were positively related to production capacity was also supported statistically.(70)

The supply features in the investment functions were also considered. Intuitively, it seemed plausible that such variables as imports of investment goods, raw materials and intermediate products, credit conditions, and Government control of private investment would exert considerable influece on investment in the Korean economy. But the results of this trial were not good.(71)

(d) The savings function

Next, what are the determinants of domestic savings in (10) above? Theoretically, gross domestic private savings are assumed to be a function of *GDP* (or per capita income, disposable income, etc.), its functional distribution, rates of interest, the government's tax policy, etc. Domestic private savings in Korea seemed to be a function of *GDP*. As *GDP* increased rapidly, private savings expanded correspondingly. In the case of Korea, an increase in Government revenue (*GOR*) through tax collection (*TAX*) contributed

(70) As regards other competing hypotheses of the determinants of investment, e.g., the interest rate hypothesis and the profit hypothesis, neither hypothesis was promising. This seemed to be due to the scarcity of relevant data and their inaccuracy. The simple correlation coefficients of investment with the rates of interest and profits were found to be positive but statistically insignificant at a 95 percent level of significance.

(71) For the purpose of experiment, the supply factors in the investment function were included along with the demand factors. But it was found again that the regression coefficients of none of the variables were significant nor it possible to choose one of these variables, because none were considerably better than any of the others in all the regressions.

In order to explain capacity utilization in Korea, variables which represented the process of adjustment of actual capacity to desired capacity level were included ($\triangle EXP_{-1}/\triangle KAS^{e}_{-1}$ and $\triangle GDP_{-1}/\triangle KAS^{d}_{-1}$). The economic rationale underlying the use of these variables was that a low ratio value would tend to indicate excess capacity, where a high value would normally imply a high level of capacity utilization. Other proxy variables for capacity could be tried also. Using the capacity variables, a constant capacity/capital ratio was assume But statistical results were not good enough to be adopted in the model.

considerably to an increase in domestic savings. Thus the domestic savings function can be written:

$$SAV_t=\delta_o+\delta_1(GDP-TAX)_t+\delta_2 GOR_t+u_{8t} \quad \cdots\cdots(15)$$

These variables on savings were regressed, and the following results were obtained:

$$SAV_t=\underset{(10.68)}{-443.6}+\underset{(12.09)}{0.78}(GDP-TAX)_t-\underset{(6.80)}{0.49}GOR_t \quad \cdots\cdots(15\text{-}1)$$

$$SEE=18.50$$

$$\bar{R}^2=0.97$$

$$d.w.=0.82$$

$$\log SAV_t=\underset{(4.47)}{-21.62}+\underset{(4.40)}{9.26}\log(GDP-TAX)_t-\underset{(2.62)}{1.59}\log GOR_t$$

$$SEE=0.16$$

$$\bar{R}^2=0.93$$

$$d.w.=1.02$$

Estimates of the coefficients were found to differ from zero using the usual t-test at the 5 percent level of significance. Also, the serial correlation in the residuals was not high enough to reject the conjecture of randomness of the disturbance component in the function, which was the important assumption underlying the least squares estimation. The regression equation fitted the data quite satisfactorily, (see Figure 19 in Appendix 2)[72] The percentage of the variation was less than 3 percent.

(e) The government revenue identity

Another endogenous variable must now be discussed-*GOR* in (14) above. In Korea, Government revenue consisted of import duties (*IMD*), direct and in direct taxes (*TAX*), income from property and entrepreneurship of Government enterprise (*GIC*), and others (*OTH*):

$$GOR_t=IMD_t+TAX_t+GIC_t+OTH_t \quad \cdots\cdots(16)$$

(72) In order to find out whether exports were a significant factor leading to an increase in domestic savings, EXP was tested by including it in the savings function. It appeared likely that domestic savings would be affected by changes in the volume of exports, as the ratio of exports to GDP was increasing. But, including($EXP-SUB^{\varepsilon-e}$) instead of EXP by itself in order to single out the importance of autonomous exports themselves, it was found statistically that the coefficient of EXP was somewhat insignificant, indicating no relationship between the dependent and explanatory variables. On the basis of the regression analysis, exports were not one of the contributing factors to domestic savings in Korea. In the recursive model, the relationship between savings and exports was presented indirectly.

GIC and *OTH* were treated as exogenous variables, and *IMD*, and *TAX* as endogenous to be determined as follows:

$$IMD_t = IMD^*_t + 0.1(IMP + FIP)_t \quad \cdots\cdots(17)$$
$$TAX_t = TAX^*_t + 0.1\ GDP_t \quad \cdots\cdots(18)$$

In Equation (17), *FIP* is foreign income payment.

IMD and *TAX* are assumed to be collected at 0.1 percent of *IMP* and *FIP*, and *GDP*, respectively. *IMD* and *TAX* are strategic variables which equalize the lefthand and right hand sides of both equations.

(f) The production functions

Here *GDP*, which determines INV^{p-d} in the above (13) is discussed. Two production functions were estimated, one for export sector and the other for the domestic sector. The Cobb-Douglas type of production function with constant returns to scale, no substitution between capital and labour, and constant capital-output ratio were assumed.

The production function estimated was a relationship between real output (GDP^e and GDP^d) and inputs of utilized capital stock (KAS^e and KAS^d), man-hours worked (LAB^e and LAB^d), and a technological time trend (t). Since data for man-hours worked were not available, employment was taken as the labour input. The estimation of capital utilization was particularly difficult in Korea due partly to the shortage of information. It would be unrealistic for the present to adopt the notion of the Wharton School Index of Capacity Utilization. A technological time trend (t) was an important variable in connection with artificality (2).

This production function took the following familiar forms: neutral technical progress at rate m, for example, could be written with a single paramater

$$GDP = e^{mt} \cdot KAS^{\eta} \cdot LAB^{(1-\eta)}$$

Allowing for two sectors in log-linear form, the export and domestic sectors, one has:

$$\log GDP^e_t = mt^e + \eta_1 \log KAS^e_t + (1-\eta_1)\log LAB^e_t + \eta_2 t + u_{9t} \quad \cdots\cdots(19)$$
$$\log GDP^d_t = m't^d + \eta'_1 \log KAS^d_t + (1-\eta'_1)\log LAB^d_t + \eta'_2\ t + u_{10t} \quad \cdots\cdots(20)$$
$$\text{Here, } GDP_t = GDP^e_t + GDP^d_t \quad \cdots\cdots(21)$$

Lack of capital stock data necessitated approximating KAS by cumulating

investment over time. That is,

$$KAS^e_t=\sum_{t=1}^{t-1}(INP^{p-e}+INV^{g-e}-DEP^e)_{t-1}+(INV^{p-e}+INV^{g-e}-DEP^e)_t$$

or

$$KAS^e_t=KAS^e_{t-1}+(INV^{p-e}+INV^{p-d}-DEP^e)_t \cdots\cdots (22)$$

$$KAS^d_t=\sum_{t=1}^{t-1}(INV^{p-d}+INV^{g-d}-DEP^d)_{t-1}+(INV^{p-d}+INV^{g-d}-DEP^d)_t$$

or

$$KAS^d_t=KAS^d_{t-1}+(INV^{p-d}+INV^{g-d}-DEP^d)_t \cdots\cdots (23)$$

Allowing for private and Governmet investments and for the depreciation factor(DEP) as above, the production functions were thus reformulated:

$$\log GDP^e_t=mt^e+\eta_1\log\Big(\Big(\sum_{t=1}^{t-1}(INV^{p-e}+INV^{g-e}-DEP^e)_{t-1}+(INV^{p-e}+INV^{g-e}-DEP^e)_t\Big)\Big)+(1-\eta_1)\log LAB^e_t+\eta_2\, t+u_{9t} \cdots\cdots (19)$$

$$\log GDP^d_t=m't^d+\eta'_1\log\Big(\Big(\sum_{t=1}^{t-1}(INV^{p-d}+INV^{g-d}-DEP^d)_{t-1}+(INV^{p-d}+INV^{g-d}-DEP^d)_t\Big)\Big)+(1-\eta')\log LAB^d_t+\eta'_2\, t+u_{10t} \cdots\cdots (20)$$

As mentioned earlier, (19) is a supply function for exports, while (20) is regarded as a supply function for the domestic sector. GDP^e is in fact equivalent to net exports (NFX) added to net investment in stocks in the export secetor (INV^{s-e}):

$$GDP^e_t=NFX_t+INV^{s-e}_t$$

or

$$INV^{s-e}_t=GDP^e_t-NFX_t \cdots\cdots (24)$$

$$NFX=\phi EXP_t$$

where ϕ=net foreign exchange ratio

The regression results were as follows:

$$GDP^e_t=\underset{(0.53)}{16.45}+\underset{(0.25)}{0.24}\ KAS^e_t-\underset{(0.06)}{0.08}\ LAB^e_t+\underset{(1.95)}{15.55}t \cdots\cdots (19\text{-}1)$$

$$SEE=25.67$$

$$\bar{R}^2=0.95$$

$$d.w.=1.28$$

$$\log GDP^e_t=\underset{(2.21)}{3.86}+\underset{(0.46)}{2.19}\log KAS^e_t-\underset{(1.28)}{1.88}\log LAB^e_t+\underset{(0.29)}{0.30}t \cdots\cdots (19\text{-}2)$$

$$SEE=0.08$$
$$\bar{R}^2=0.97$$
$$d.w.=1.38$$

$$GDP^d_t=\underset{(1.02)}{336.81}+\underset{(4.49)}{0.35}\ KAS^d_t+\underset{(0.21)}{0.01}\ LAB^d_t+\underset{(0.12)}{2.87}t \quad\cdots\cdots(20\text{-}1)$$

$$SEE=21.91$$
$$\bar{R}^2=0.99$$
$$d.w.=1.34$$

$$\log GDP^d_t=\underset{(2.28)}{4.02}+\underset{(0.68)}{2.13}\log KAS^d_t-\underset{(1.66)}{0.48}\log LAB^d_t+\underset{(1.10)}{0.02}t \quad\cdots(20\text{-}2)$$

$$SEE=0.01$$
$$\bar{R}^2=0.99$$
$$d.w.=1.01$$

$$NFX_t=\underset{(15.96)}{0.62}EXP_t \quad\cdots\cdots(24\text{-}1)$$

$$SEE=30.57$$
$$\bar{R}^2=0.93$$
$$d.w.=0.55$$

The results of the statistical estimation of the production functions in the two sectors were plausible, whilst those of *NFX* were less satisfactory (see Figures 20-22 in Appendix 2). The estimate of capital coefficients was significant, no serious serial correlation was found, and the coefficients of determination, especially that of GDP^d, were near unity. It could be inferred from these statistical findings that the aggregated outputs were related to the stock of capital and technology embodied in imported capital and intermediate goods in both sectors.

It was found that according to equation (19-2), the growth elasticities of output in the export sector were 2.19, -1.88, and 0.30 with respect to fixed capital, labour, and technology, respectively. In the domestic sector, they were 2.13, -0.48, and 0.026, respectively, according to equation (20-2). Minus signs for labour in both sectors seems to be due to the inclusion of the time variables for the explanation of disembodied technology.

(g) The depreciation functions

Depreciation(DEP)was made a function of capital stock and approximated by cumulating the sum of net investment lagged a period. For both sectors,

$$DEP^e_t=\lambda_0+\lambda_1\ KAS^e_{t-1}+u_{11t} \quad\cdots\cdots(26)$$

$$DEP^d_t=\lambda_0+\lambda_1 KAS^d_{t-1}+u_{12t} \quad\cdots\cdots(27)$$

The estimated results were:

$$DEP^e_t = \underset{(2.853)}{3.41} + \underset{(13.53)}{0.06}\ KAS^e_{t-1} \quad \cdots\cdots (25\text{-}1)$$

$$SEE = 2.83$$
$$\bar{R}^2 = 0.97$$
$$d.w. = 0.73$$

$$\log DEP^e_t = \underset{(7.66)}{-0.58} + \underset{(21.12)}{0.79}\ \log KAS^e_{t-1}$$

$$SEE = 0.57$$
$$\bar{R}^2 = 0.98$$
$$d.w. = 0.75$$

The statistical result of DEP^d was relatively plausible, whilst that of DEP^e was less satisfactory (See Figures 23-24 in Appendix 2). It appeared from these estimates that the rate of depreciation in both sectors was quite high.

$$DEP^d_t = \underset{(8.46)}{-16.41} + \underset{(43.14)}{0.06}\ KAS^d_{t-1} \quad \cdots\cdots (26\text{-}1)$$

$$SEE = 2.85$$
$$\bar{R}^2 = 0.99$$
$$d.w. = 1.07$$

$$\log DEP^d_t = \underset{(13.24)}{-2.68} + \underset{(21.65)}{1.04}\ \log KAS^d_{t-1} \quad \cdots\cdots (26\text{-}2)$$

$$SEE = 0.04$$
$$\bar{R}^2 = 0.98$$
$$d.w. = 0.46$$

3. Results of the estimation

Putting the above equations and identities together, the model for artificial export-oriented development of Korea in the linear form can be presented as follows:

(1) $EXP_t = EXP^c_t + EXP^s_t$

(2) $EXP^c_t = -11.95 + 0.33\ WDE_t + 1.62\ SUB^{g-e}_t - 0.074 \left(\frac{FER^e}{FER} - 1 \right) (IMP^c - EXP^c)_t$

(3) $IMP_t = IMP^c_t + IMP^{ri-e}_t + IMP^{ri-d}_t + IMP^{g-i}_t + IMP^{p-i}_t + IMP^c_t$

(4) $IMP^{ri-e}_t = -5.43 + 0.39\ EXP^d_t + 0.37\ IMP^{ri-e}_{t-1}$

(5) $IMP^{ri-d}_t = -28.85 + 0.11\ GDP^d_t + 0.59 \left(\frac{FER^e}{FER} - 1 \right) IMP^{ri-d}_t$

(6) $IMP_t^{p-i}=-67.62+2.97\ INV_t^{p-e}+0.71\ INV_t^{p-d}+0.03\ \left(\frac{FER^e}{FER}-1\right)\ IMP_t^{p-i}$

(7) $IMP_t^s=-1.75+0.52(EXP+IMP)_t+0.33IMP_{t-1}^s$

(8) $FKA_{1t}=IMP_t-EXP_t-FKA_{2t}$

(9) $INV_t^s=INV_t-INV_t^{p-e}-INV_t^{g-e}-INV_t^{p-d}-INS_t^{g-d}$

(10) $INV_t^{p-e}=6.10+0.33\ \Delta EXP_t^c+0.43\ INV_{t-1}^{p-e}$

(11) $INV_t^{p-d}=15.57+0.65\ \Delta GDP_t+0.46\ INV_{t-1}^{p-d}$

(12) $\Delta EXP_t^c=EXP_t^c-EXP_{t-1}^c$

(13) $\Delta GDP_t=GDP_t-GDP_{t-1}$

(14) $INV_t=SAV_t+(IMP_t-EXP_t)+(GOR_t-GEX_t)$

(15) $SAV_t=-443.61+0.78(GDP-TAX)_t-0.49GOR_t$

(16) $GOR_t=IMD_t+TAX_t+GIC_t+OTH_t$

(17) $IMD_t=IMD_t^*+0.1(IMP_t+FIP_t)$

(18) $TAX_t=TAX_t^*+0.1\ GDP_t$

(19) $GDP_t^c=16.45+0.24KAS_t^c+0.08LAB_t^c+0.55t$

(20) $GDP_t^d=336.81+0.35\ KAS_t^d+0.01\ LAB_t^c+2.87t$

(21) $GDP_t=GDP_t^c+GDP_t^d$

(22) $KAS_t^e=KAS_{t-1}^e+(INV^{p-e}+INV^{g-e}-DEP^e)_t$

(23) $KAS_t^d=KAS_{t-1}^d+(INV^{p-d}+INV^{g-d}-DEP^d)_t$

(24) $INV_t^{s-e}=GDP_t^c-NFX_t$

(25) $NFX_t=0.62EXP_t$

(26) $DEP_t^e=3.41+0.06\ KAS_{t-1}^e$

(27) $DEP_t^d=-16.41+0.06\ KAS_{t-1}^d$

The complete model consists of 12 statistical equations and 15 accounting indentities and equilibrium conditions. The variables included in the system are listed below in terms of both endogenous and exogenous variables. The exogenous variables can be further subdivided into policy instruments and other data. Applying the rules of identification to this model(73) yielded the result that the 12 equations were all overidentified.

(1) Endogenous (uncontrolled) variables, 27

(73) J. Johnston: *Econometric Methods* (McGraw-Hill, 1968), pp. 240-252.

EXP, NFX, EXP^c, ΔEXP^c, FKA_1, IMP, IMP^{ri-e}, IMP^{ri-d}, IMP^{p-i}, IMP^s, INV, INV^{p-e}, INV^{p-d}, INV^s, INV^{s-e}, SAV, GOR, IMD, TAX, GDP, ΔGDP, GDP^e, GDP^d, KAS^e KAS^d, DEP^e, DEP^d.

(2) Exogenous variables, 28

EXP^s, SUB^{g-e}, FKA_2, IMP^c, IMP^{g-i}, INV^{g-e}, INV^{g-d}, GEX, GIC, OTH, FIP, IMP^*, TAX^*, LAB^e, LAB^d, $\left(\frac{FER^e}{FER}-1\right)(IMP^c-EXP^c)$, $\left(\frac{FER^e}{FER}-1\right) IMP^{ri-d}$, $\left(\frac{FER^e}{FER}-1\right) IMP^{p-i}$

(3) Exogenous (predetermined) variables, 10

WDE, IMP^{ri-e}_{t-1}, IMP^s_{t-1}, INV^{p-e}_{t-1}, INV^{p-d}_{t-1}, EXP^c_{t-1}, GDP_{t-1}, KAS^e_{t-1}, KAS^d_{t-1}, t,

But when one uses the sub-model comprising equation (1) and (3)—(27) to evaluate the role of EXP^c in determining GDP, EXP^c becomes an exogenous variable, and the solution of the system can be found within this sub-model (or block). If one adds equation (2) to this sub-model to find out the importance of artificiality in expansion(SUB^{g-e}, etc.), the exogenous character of EXP^c will be changed.

Chapter V
Applied Evaluation of the Korean Experience

1. The past role of exports (1961-1971)

The econometric model constructed above enables us to proceed to assess the past role of export expansion and to project the future evolution of the Korean economy under a certain rate of export growth.(74) We may thus obtain an indication of the rate of growth and the behaviour of the major aggregates that might have occurred if the export pattern had been different. But, since no variation of the economic structure was assumed during the period under consideration, each coefficient in the equations could only be approximately estimated.

Usually, the role of exports in economic development can be placed in three main categories: supply, demand, and externalities excluding other unquantifiable effects.(75) Externality involves a change in production,

(74) See Bibliography (8).

(75) I. Adelman and H.B. Chenery: "Economic Aid and Economic Development: The Case of Greece," *RES*, February 1966, pp. 8-9, reprinted *in Studies in Development Planning* edited by H.B. Chenery (Harvard University Press, 1971), pp. 189-218.

income, and employment. The above three effects, excluding employment, could be conveniently analysed by this model in a comprehensive form. For this purpose, a reduced form of this model was derived using all the equations except (2), and yielded the following information:

Table 2 **A Reduced Form of the Model**

	EXP^s	IMP^c	IMP^{g-i}	EXP^c	$\left(\frac{FER^e}{FER^o}-1\right)IMP^{ri-d}$	$\left(\frac{FER^e}{FER^o}-1\right)IMP^{p-i}$
FKA_1	0.947161	1.000000	1.000000	.503426	.595365	.034697
IMP	.052839	1.000000	1.000000	1.503426	.595365	.034967
IMP^{ri-e}	0	0	0	.390045	0	0
IMP^{ri-d}	0	0	0	.002964	.595365	0
IMP^{p-d}	0	0	0	1.057578	0	.034697
IMP^s	.52839	0	0	.052839	0	0
GDP^i	0	0	0	.025247	0	0
INV^{p-e}	0	0	0	.339086	0	0
INV^{p-d}	0	0	0	.070476	0	0
INV	0.944468	1.050978	1.050978	.662207	.625716	.036466
SAV	0.002590	0.049022	0.049022	0.002390	0.029186	0.001701
GOR	.005284	.100000	.100000	.161172	.059537	.003470
INV^s	0944468	1.050978	1.050978	.252646	.625716	.036466
ΔEXP^c	0	0	0	1.000000	0	0
ΔGDP	0	0	0	.108295	0	0
GDP	0	0	0	.108295	0	0
TAX	0	0	0	.010829	0	0
IMD	005284	.100000	.100000	.150343	.059537	.003470
GDP^e	0	0	0	.083047	0	0
KAS^e	0	0	0	.339086	0	0
INV^{s-e}	0.628414	0	0	05455367	0	0
NFX	.628424	0	0	.628414	0	0
KAS^d	0	0	0	.070476	0	0
DEP^e	0	0	0	0	0	0
DEP^d	0	0	0	0	0	0
EXP	1.000000	0	0	1.000000	0	0

	INV^{g-e}	INV^{g-d}	LAB^e	EXP^c_{-1}	t	LAB^d	GIC
FKA_1	.157108	.271864	.057010	0.060542	12.158780	.007074	0
IMP	.157108	.271864	.057010	0.060542	12.158780	.007074	0
IMP^{ri-e}	0	0	0	0	0	0	0
IMP^{ri-d}	.008741	.054843	.003172	0.002964	.994779	.001427	0
IMP^{p-i}	.148367	.217020	.053830	1.057578	11.184000	.005647	0
IMP^s	0	0	0	0	0	0	0
GDP^d	074457	.467153	.027018	0.025247	8.473491	.012155	0
INV^{p-e}	0	0	0	0.339086	0	0	0

INV^{p-d}	.207840	.304012	.075419	−0.070476	15.639053	.007910	0
INV	.407355	.640049	.147817	−1.196746	31.005950	.016653	.509785
SAV	.202599	.294284	.073517	−0.019321	15.228154	.007657	−0.490215
GOR	.047648	.073902	.017290	−0.116884	3.619017	.001923	1.000000
INV^{s}	−0.800485	−0.663963	.072398	−0.787184	15.366898	.008743	.509785
ΔEXP^{c}	0	0	0	1.000000	0	0	0
ΔGDP	.319372	.467153	.115890	−0.108295	24.031391	.012155	0
GDP	.319372	.467153	.115890	−0.108295	24.031391	.012155	0
TAX	.031937	.046715	.011589	−0.010829	24.033139	.001215	0
IMD	.015711	.027186	.005701	−0.106054	1.215878	.000707	0
GDP^{e}	.244915	0	.088872	−0.083047	15.557909	0	0
KAS^{e}	1.000000	0	0	−0.339086	0	0	0
INV^{s-e}	.244915	0	.088872	−0.083047	15.557900	0	0
NFX	0	0	0	0	0	0	0
KAS^{d}	.207840	1.304012	.075419	−0.070476	15.639053	.007910	0
DEP^{e}	0	0	0	0	0	0	0
DEP^{d}	0	0	0	0	0	0	0
EXP	0	0	0	0	0	0	0

	IMP^{ri-e}_{-1}	IMP^{s}_{-1}	INV^{p-e}_{-1}	INV^{p-d}_{-1}	GDP_{-1}	KAS^{e}_{-1}	KAS^{d}_{-1}
FKA_1	.371970	.337618	1.356126	.456336	−0.641481	.166703	.254297
IMP	.371970	.337618	1.356126	.456336	−0.641481	.166703	.254297
IMP^{ri-e}	.371970	0	0	0	0	0	0
IMP^{ri-d}	0	0	.003790	.025390	−0.035691	.009275	.051299
IMP^{p-i}	0	0	1.352336	.430946	−0.605791	.157428	.202997
IMP^{s}	0	.337616	0	0	0	0	0
GDP^{d}	0	0	.032284	.216268	−0.304012	.079004	.436967
INV^{p-e}	0	0	.433593	0	0	0	0
INV^{p-d}	0	0	.090118	.603690	−0.848620	.220532	.284368
INV	.390932	.354827	1.530092	.643634	−0.904770	.432232	.598691
SAV	−0.081235	−0.016550	.024705	.120038	−0.168740	.214971	.275268
GOR	.37197	.033762	.149460	.067260	−0.094549	.050558	.069126
INV^{s}	.390932	.354827	1.006581	.039944	−0.056150	.211699	.314323
ΔEXP^{c}	0	0	0	0	0	0	0
ΔGDP	0	0	.138478	.216268	−0.304012	.338876	.436967
GDP	0	0	.138478	.216268	−0.304012	.338876	.436967
TAX	0	0	.013848	.021627	−0.030401	.033888	.043697
IMD	037197	.033762	.135613	.045634	−0.064148	.1.6670	.025430
GDP^{e}	0	0	.106193	0	0	.259872	0
KAS^{e}	0	0	.433593	0	0	1.061069	0
INV^{s-e}	0	0	.106193	0	0	.259872	0
NFX	0	0	0	0	0	0	0
KAS^{d}	0	0	.090118	.603690	−0.848620	.220532	1.219750
DEP^{e}	0	0	0	0	0	.061069	0
DEP^{d}	0	0	0	0	0	0	0
EXP	0	0	0	0	0	0	0

In Table 2, one can see that the total effects on *GDP* of merchandise exports through supply, demand, externality, etc. were well reflected in the estimated coefficient of *EXP* (the total multiplier impact), 0.1083 with regard to *GDP* in the reduced form of the model. The above result indicated that a one hundred percent increase in merchandise exports induced a 10.83 per cent increase in *GDP*. This figure is comparable to 12.91 per cent obtained directly from the single stage least squares estimation of *EXP* with regard to *GDP*.

It should be emphasized that one of the behavioural equations is not binding while exports are expanding. In this case, the past effects of change in exports depends on whether the trade gap or the savings gap sets the limit to growth under certain conditions. In the trade gap situation, it is assumed that the level of imports over exports determines the level of *GDP*, while in the savings gap situation the level of investments over savings sustains the level of *GDP*.(76)

When imports are the factor which limits growth potential, and when imports are in turn limited by total exports and foreign capital, import-limited growth (GDP^{exp}) is determined by combining (1)-(13) and (19)-(27) and solving for *GDP*. On the other hand, savings-limited growth (GDP^{sav}) is determined by substituting equations (9)-(11), (14)-(18) and (26)-(27) into equations (19)-(23) and solving for *GDP* when domestic savings limit growth potential.(77) GDP^{sav} and GDP^{exp} provide two separate explanations of the role of exports. GDP^{sav} reflects the maximum *GDP* potential, whereas GDP^{exp} represents the feasible *GDP* within GDP^{sav}, which is achievable by export expansion. If $GDP^{sav}=GDP^{exp}$, that is, the equalization of internal and external balances, domestic savings potential is realized to its maximum extent and resource allocation is effectively attained. On the other hand, if $GDP^{sav} > GDP^{exp}$, realized domestic savings are below their potential due to the shortage of foreign exchange. Then, foreign capital should be induced to cover the trade gap: but the effectiveness of foreign capital is

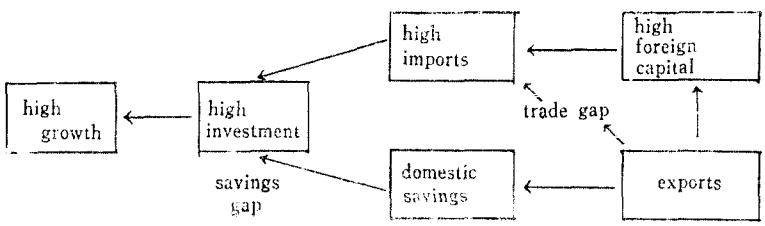
(76) I. Adelman and H.B. Chenery: "Economic Aid and Economic Development: The Case of Greece," *RES*, February 1966, pp. 8-9, reprinted *in Studies in Development Planning* edited by H.B. Chenery (Harvard University Press, 1971), pp. 189-218.

(77) I. Adelman & H.B. Chenery, op. cit., p. 91. Although our model is not based on a programming model, manipulation of the equations of our econometric model in an indirect way can provide similar quantitative results at the aggregate level.

lower than in the case of $GDP^{sav}=GDP^{exp}$. The situation of inequality between GDP^{sav} and GDP^{exp} may happen whenever the two gaps exist.

In Korea, the trade and savings gaps were always closed simultaneously throughout the period of 1961-1971; that is, no one gap prevailed over any other. This was because the Korean Government set a high growth target and attempted to achieve it by a high level of investment-high level of import-high level of foreign capital inflow because of a lack of domestic savings and exports to support the finance of imports. The logic is drawn as follows:

Figure 10 **The Direction of Causation**



Consequently, the ex post savings and trade gaps had to be equalized, and, hence, these phenomena were not concomitant with the characteristics of the other developing countries which shifted from the savings limit to the import limit stage in their development processes.(78)

However, it should be mentioned that the simultaneous fulfilment of the two gaps did not lead to the equalization of GDP^{sav} and GDP^{exp} in Korea. The main reason was that over-investment assisted by foreign capital inflow, not by export expansion based on comparative advantage, created an overcapacity in production, and natural endowments were not fully utilized.

Accoring to this model, GDP^{sav} in 1961 was 646 billion won, whereas GDP^{exp} was 588 billion won. However, the actual level of *GDP* was 607.82 billion won, about 6 percent lower than the projected GDP^{sav} for 1961. The fact that GDP^{exp} was much lower than GDP^{sav} implied that the shortage of foreign exchange was more severe than the other factors of economic growth. For 1971, GDP^{sav} was estimated by this model to be 1,642 billion won while GDP^{exp} was 1,290 billion won. The actual figure for the *GDP*

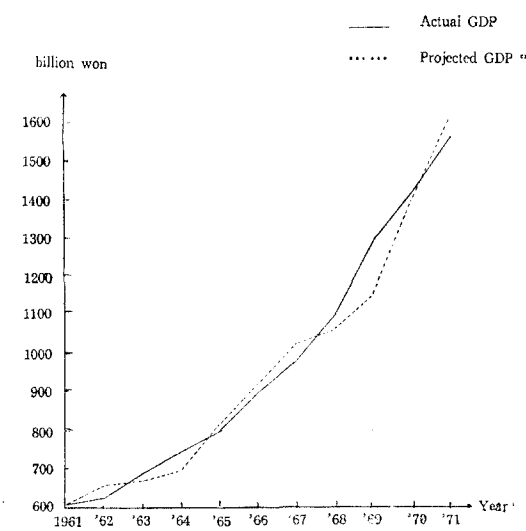
(78) Same as (77).

was 1,418 billion won which was again 14 percent lower than the GDP^{sav}. During the period 1961-1971, the relationship between the projected GDP^{exp} and the actual *GDP* revealed a high correlation as shown in Figure 11.

It was revealed in the empirical evidence that until 1971, the high rate of growth of the *GDP* was attributed to the diminution of the foreign exchange shortage through export expansion and foreign capital inflow. The savings gap was more than that the absorptive capacity of the Korean economy could absorb or contain.

Figure 11

Korea: Actual GDP and projected GDP^{exp} at constant 1965 prices



Since 1971, however, the savings gap started to be dominant. It is conceivable that the more foreign capital is induced, the more investment is available, resulting in an increase in productive capacity. The present model shows that this process was not realized in Korea. Foreign capital did not stimulate domestic savings potential to the fullest, due to high import dependence in comparison to export capacity, and negligence in the import substitution policy. In effect, export expansion might have been more desirable than foreign capital in achieving the same rate of growth of *GDP* during this period. In the cases of Israel, Taiwan, and Greece, it can be seen that, despite a shortage of resources, they enjoyed a fairly high rate of growth through export expansion and import substitution without further

inducement of foreign capital. In Korea, during the period under review, savings did not grow sufficiently enough to finance high investment, and, consequently, the savings gap was dominant, resulting in a low autonomous reinvestment ratio.(79) The actual savings gap occurred from low productivity in both the export and domestic sectors, despite the fact that the high level of investment rate was caused by an over-inflow of foreign capital and over-export expansion explained in detail in the forthcoming section.

In short, the high rate of economic growth was achieved by high investment, which was covered by foreign capital inflow and export expansion. Hence, actual GDP and GDP^{exp} projected revealed a high correlation. But there was a wide gap between GDP^{sav} and actual GDP as well as GDP^{exp}. This was because the domestic savings did not follow the actual GDP assisted by foreign capital and export expansion. In a sense, giving a high priority to the external balance induced an internal imbalance. Foreign capital which was not in conformity with domestic resources played a role in reducing domestic savings, as did the level of consumption. Exports based on comparative advantage might bring forth an increase in domestic savings rather than foreign capital, but, as will be analysed later, artificial export expansion did not contribute to the increase in the autonomous reinvestment ratio.

In relation to the role of exports in economic growth, it may well be argued that exports in terms of macro-economics played a significant role during 1961-1971. Besides these macro-economic effects, there appeared a considerable number of qualitative effects produced by export expansion. Such qualitative benefits were:

(a) Inducing highly advanced technology embodied in foreign capital goods and intermediate products which were paid for by export earnings.

(b) Providing an outlet for surplus productive capacity in some export industries.

(c) Offering the linkage effects, since, in Korea, domestic obstacles to spreading such favourable effects of exports to the economy as a

(79) See W.H. Park: An article on the Third Five-Year Economic Development Plan, Dong-A Ilbo, 20th December 1970; An article on the industrialization of Korea, The Seoul Kyungje, 2nd May, 1971.

whole were trivial. The actual scale and rapidity with which export stimuli were transmitted to other sectors were significant as contrast to the theory of export enclave.

(d) Improving labour skill, technological know-how, etc.

(e) Intensifying domestic competition and morale boosting effects.

(f) Changing the people's attitude towards work, breaking the old customs, and functioning as an acupuncture to the economy as a whole.(80)

(g) Offering self-confidence in the execution of long-term economic development plans.

(h) Strengthening national security and political stability.

(i) Affording more freedom to the decision makers, through improvements in the balance of payments condition, in choosing a better development strategy.

It should be noted, howerer, that these favourable effects are considered in macro-terms. If one takes into consideration the characteristics of artificiality in export expansion, things will be different. The next section deals with this aspect.

2. Government assistance, artificiality, and their implications for growth (1961-1971)

Exports contributed to economic development to a considerable extent, but it may be questioned whether such exports grow on their own productivity growth or whether Government intervention was one of the most important factors in expanding exports.

Examination by the export function indicated that both world demand and artificial export measures were important determinants of total Korean merchandise exports during the period of 1961-1971. The elasticity of commodity exports with regard to total world *GDP* implied in the results was 0.89 according to the long-linear estimation, whilst those of exports with regard to Government subsidies and other artificial measures were 0.22 and 0.05 respectively. Considering the foregoing results, it seems reasonable to infer that Korean exports were promoted largely due to favourable world demand conditions and Korea's artificiality in export expansion.

(80) Frequently cited by such Korean economists as Professor M.H. Choi.

In this section, the importance of government assistance, in terms of Government subsidies and investment in the export sector to an increase in export supplies and to promotion of *GDP* growth is discussed.

The role of the Government assistance in contributing to growth through export expansion is shown in the following Table 3. This Table is reproduced from the reduced form of model.

Table 3 **The Role of Government Assistance**

	SUB^{g-e}	INV^{g-e}
$\triangle GDP$	0.021	0.319

The figures reveal that the role of Government assistance to *GDP* growth was quite substantial. With an increase of 100 percent in INV^{g-e}, *GDP* increases by 31.9 percent while SUB^{g-e} increase *GDP* by 2.1 percent, according to the long-linear estimate. As shown in Appendix I, the aggregate size of export assistance increased continually. Nominal won subsidy per dollar plus Government investment in the export sector have rapidly expanded in the last few years in order to mitigate the adverse effects on exports of the won's current over-valuation and normal profit loss, and also in order to increase the supply of export goods. Thus, it is believed that high and substantial Government assistance in the form of subsidies and investment made it possible to keep exports rapidly increasing.

On the other hand, increased incentives in the form of the various kinds of Government assistance, and the excess of such assistance over a certain point (optimum or productivity point), gradually led to a number of adverse effects in the course of export-oriented development. It is, therefore, important to investigate the overall economic effects of the current assistance system including the various export subsdiy schemes.

The results derived from the estimation of effective exchange-cost criteria are shown below and they indicate the efficiency of artificiality (1) and (2), or total factor productivity of static and dynamic comparative advantage. Tables 4 and 5 summarize the estimates which were obtained by making use of the input-output tables for 1966 and 1968 in Korea.[81]

(81) Since I-O tables after 1968 are available only recently in Korea, the usefulness of this calculation is limited to the evaluation of 1966 and 1968 exports only. The variation of efficiency or factor productivity of export expansion after 1968 could not be estimated.

Tables 4 and 5 show the magnitude and structure of the effective and nominal export assistance for Korean exports and seek to examine their impact on export expansion. In particular they examine the present export assistance system in terms of the effective use of the domestic resources and productivities (static and dynamic) in the export industries. The components of each formula in the above tables are explained in Appendix 1.

In Tables 4 and 5, one can see that domestic costs for the production of all the major export items except (1),(8),(9),(14),(15),(17),(22) and (32) were above the optimum point measured by the formulae. In particular,(11) which was a major export industry rose to 1,600 won per dollar. The net foreign exchange earnings of each export good tended to decline when the export amount rose. The reasons why costs for these items were so high, and the net foreign exchange so decreased, seemed to be the inefficiency or unproductivity of these export industries. This fact simply indicated that goods that should not have been exported were pushed and exported artificially. The export items (8), (14), and (22) enjoyed far lower costs than the optimum. In 1968, social costs for the production of export goods were not much different from those in 1966, in terms of φ, φ^* and φ^{**}.

From Tables 4 and 5, one can note also that the ranking of effective export assistance was not related to that of the domestic cost of earning foreign exchange, conceived in terms of average earnings. The absence of any significant correlation between the average domestic costs of earning foreign exchange and the structure of effective export assistance tended to confirm that the differential structure of effective assistance was not designed to minimise the average costs of earning foreign exchange by granting higher assistance to lower cost exports. Although the effect of the differential structure of export incentives was to relate the rates of effective assistance to the marginal cost of earning additional foreign exchange from the individual manufactured exports, it was not possible to estimate the domestic manufacturing costs of the additional foreign exchange earning.

It is also worth noting that export industries which required less social costs than foreign exchange earned were all labour intensive and that other industries needing higher social costs than foreign exchange earned were relatively capital intensive light manufacturing industries. Thus, there was a high correlation between labour intensiveness and lower social costs. From

Table 4 Total Factor Productivities (nominal and effective)of Export Commodities:

1966 (million won)

Factors / Export commodities	1 EXP_i	2 $\sum_j IIN_j r_{ji}$	3 NFX_i
1. Rice, barley or wheat	1,723.9	113.0	1,610.9
2. Other agriculture	2,839.9	113.5	2,666.4
3. Forestry	16.3	0.8	15.5
4. Fishery	2,431.7	859.4	1,572.3
5. Coal	283.8	30.1	253.7
6. Other minerals	5,962.1	525.4	5,436.7
7. Processed foods	6,762.3	1,337.3	5,425.0
8. Beverages & tobaccos	172.3	12.1	120.2
9. Fiber spinning	7.8	0.5	7.3
10. Textile fabrics	3,940.8	2,230.7	1,710.0
11. Finished textile products	6,355.5	5,117.0	1,238.5
12. Sawmills or plywood	9,538.1	5,692.0	3,845.2
13. Wood products furniture	7,861.6	4,939.5	2,922.1
14. Paper & paper products	170.5	50.3	120.2
15. Printing and publishing	250.2	86.5	163.7
16. Leather products	80.1	19.5	60.6
17. Rubber products	178.4	32.1	146.3
18. Basic chemical	1,631.8	915.9	715.9
19. Intermediate chemicals	160.4	53.8	106.6
20. Furnished chemical products	35.5	11.1	24.4
21. Fertilizer	—	—	—
22. Petroleum & coal products	1.2	0.7	0.5
23. Cement	—	—	—
24. Ceramic, clay and stone products	491.1	135.4	355.7
25. Iron & steel	19.9	10.1	9.8
26. Steel products	2,071.1	1,012.5	1,058.6
27. Non-ferrous metal products	641.8	164.7	477.1
28. Finished products	1,052.6	422.7	629.9
29. Machinery except electrical machinary	975.7	318.7	657.5
30. Electrical machinery	1,402.5	907.8	494.7
31. Transport equipment	188.9	62.7	126.2
32. Miscellaneous manufacturing	1,769.5	1,359.4	3,410.1

	4	5	6	7	8
	r_{ji} (coefficient)	DCO_i	$\varphi=\frac{DCO_i r_{ji}}{(EXP_i-\sum_j IIN_i r_{ji})}$	s (ratio)	${}^{E}NFX_i=NFX_i(1-s)$
1.	0.66214	2,415.0	0.99267	0.09406	1,778.2
2.	0.77344	3,870.5	1.44870	0.09406	2,280.9
3.	1.03856	21.3	1.42591	0.04429	16.2
4.	0.80370	11,018.1	5.93875	0.04429	1,645.2
5.	0.85498	358.5	1.20812	0.10309	282.9
6.	0.57757	9,701.0	1.03059	0.10309	6,010.6
7.	0.59243	8,708.7	0.95102	0.25782	7,309.5
8.	0849118	127.2	0.51997	0.25782	162.0
9.	0.47009	12.6	0.80822	0.05531	7.7
10.	0.32565	6,044.2	1.09192	0.31543	2,498.1
11.	0.43607	18,316.0	6.46484	0.31543	1,809.2
12.	0.48964	15,957.0	2.03194	0.17665	4,664.0
13.	0.29070	21,839.4	2.17265	0.32065	4,301.3
14.	0.56618	169.2	0.79700	0.32065	176.9
15.	0.45306	324.2	0.89982	0.02213	167.4
16.	0.60612	103.4	1.03465	0.02213	62.0
17.	0.54973	253.0	0.95079	0.29842	208.5
18.	0.34470	3,021.5	1.45481	0.29842	1,020.4
19.	0.48166	280.7	1.26829	0.29842	151.9
20.	0.38540	72.8	0.83606	0.29842	34.0
21.	0.59463	—	—	—	—
22.	0.18424	0.54277	0.20000	0.29842	0.7
23.	0.76028	—	—	—	—
24.	0.66074	812.7	1.50857	0.09296	392.0
25.	0.35894	40.4	1.47959	0.23549	12.8
26.	0.39063	3,524.1	1.30040	0.23549	1,384.7
27.	0.47941	1,234.4	1.24041	0.23549	624.1
28.	0.45417	1,593.5	1.14891	0.23549	823.9
29.	0.56110	1,615.9	1.3790	0.23549	860.0
30.	0.44511	4,480.5	4.03133	0.23549	647.1
31.	0.50128	316.4	1.25674	0.23549	165.1
32.	0.43756	7,429.2	0.95326	0.04394	3,566.8

	9	10	11
	$EEA_i = \frac{DCO_i - {}^{E}NFX_i}{{}^{E}NFX_i}$ (ratio)	$\psi^* = \frac{{}^{E}NFX_i(1+EEA_i)r_{ji}}{(EXP_i - \sum INN_j r_{ji})}$ (ratio)	$\psi^{**} = \frac{q_i p_i {}^{E}NFX_i(1+EEA_i)r_{ji}}{p_i(EXP_i - \sum INN_j r_{ji})}$ (ratio)
1.	0.35811	0.99240	0.83667
2.	0.69692	1.44876	1.23576
3.	0.31481	1.42799	1.29099
4.	6.06181	5.93940	4.19591
5.	0.26723	1.20816	1.07885
6.	0.61398	1.03067	0.81859
7.	0.19142	1.52228	1.11181
8.	0.21481	0.51979	0.47242
9.	0.63636	0.81141	0.66356
10.	1.41952	1.15141	0.90458
11.	9.14868	6.46278	4.53638
12.	2.42131	1.43780	2.20807
13.	4.07739	2.17241	0.97814
14.	0.04082	0.29929	0.74471
15.	0.94086	0.89935	0.56806
16.	0.66774	1.03436	0.70010
17.	0.21343	0.95027	0.63158
18.	1.96109	1.45421	1.22527
19.	0.84793	1.26847	1.10086
20.	1.09195	1.14991	1.68332
21.	—	—	—
22.	0.71424	0.44218	0.18424
23.	—	—	—
24.	1.07063	1.50872	0.71232
25.	2.15625	1.47943	1.13486
26.	1.54503	1.31806	1.03446
27.	0.97789	1.24042	1.09274
28.	0.93409	1.14896	0.83666
29.	0.87895	1.37902	1.73685
30.	5.62397	4.03192	3.37080
31.	0.91641	1.25656	1.08271
32.	1.08288	0.95349	0.56303

(Note : For details of this table, see Chapter III-2 in the text and Appendix 1)

Table 5 Total Factor Productivities (Nominal and Effective) of Export Commodities: 1968

Factors / Export commodities	1 EXP_i	2 $\sum_j IIN_j r_{ji}$	3 NFX_i
1. Rice, barley or wheat	36.6	2.3	34.3
2. Other agriculture	4,687.7	282.7	4,405.0
3. Forestry	22.9	1.0	21.9
4. Fishery	1,699.5	940.0	959.5
5. Coal	446.1	47.5	398.6
6. Other minerals	8,680.8	748.8	7,932.0
7. Processed foods	13,605.1	4,554.6	9,050.5
8. Beverages & tobacco	96.9	8.9	88.0
9. Fiber spinning	23.3	1.9	21.4
10. Textile fabrics	7,104.2	3,170.9	3,170.9
11. Finished textile products	10,445.0	7,465.9	2,979.1
12. Sawmills or plywood	32,599.3	19,305.1	13,294.2
13. Wood products & furniture	19,397.1	11,112.2	6,284.9
14. Paper & paper products	130.2	38.4	91.8
15. Printing & publishing	657.5	227.2	430.3
16, Leather products	26.0	6.3	19.7
17. Rubber products	755.4	136.3	619.1
18. Basic chemicals	3,726.5	1,956.9	1,772.6
19. Intermediate chemicals	83.7	28.0	55.7
20. Finished chemical products	186.2	58.0	128.2
21. Fertilizer	299.0	101.5	197.5
22. Petroleum & coal products	45.0	26.0	19.0
23. Cement	—	—	—
24. Ceramic, clay and stone products	745.4	205.6	539.8
25. Iron & steel	216.3	110.6	105.7
26. Steel products	205.3	100.3	105.0
27. Non-ferrous metal products	460.2	118.1	342.1
28. Finished metal products	827.3	414.0	413.3
29. Machinery except electrical machinery	225.0	73.3	151.7
30. Electrical machinery	1,117.3	853.2	26.1
31. Transport equipment	444.1	147.4	296.7
32. Miscellaneous manufacturing	9,979.6	2,844.4	7,135.2

	4	5	6	7	8
	r_{ji}	DCO_i	$\varphi=\frac{DOC_i r_{ji}}{(EXP_i-\sum_j IIN_j r_{ji})}$	s	${}^{E}NFX=NFX\times(1-s)$
1.	0.662.4	51.2	0.98834	0.09406	37.9
2.	0.77344	6,303.8	1.10683	0.09406	4,862.4
3.	1.03856	30.0	1.43836	0.04429	22.9
4.	0.80370	10,005.5	8.38082	0.04429	1,004.0
5.	0.85498	563.9	1.20948	0.10309	444.4
6.	0.57757	13,830.9	1.00710	0.10309	8,843.7
7.	0.59243	47,317.3	3.09730	0.25783	12,194.5
8.	0.59118	159.6	0.89091	0.25782	118.6
9.	0.47001	37.7	0.82710	0.05531	22.7
10.	0.32565	10,114.2	1.03873	0.31543	4,632.0
11.	0.43607	26,789.9	3.92141	0.31543	4,351.8
12.	0.48964	96,072.6	3.13848	0.17665	16,146.4
13.	0.29070	28,125.8	1.30323	0.32065	9,251.3
14.	0.56618	181.4	1.11874	0.32065	139.1
15.	0.45306	891.1	0.93818	0.02213	440.0
16.	0.60612	34.0	1.04569	0.02213	20.1
17.	0.54923	1,074.2	0.95380	0.29842	882.4
18.	0.34470	6,439.8	1.25228	0.30158	2,683.4
19.	0.48166	143.2	1.27289	0.70158	79.4
20.	0.38540	278.2	0.86193	0.70158	182.7
31.	0.59463	331.8	0.99899	0.70158	281.5
22.	0.18424	47.8	0.46316	0.70158	—
23.	0.76028	—	—	—	—
24.	0.60074	1,233.0	1.50926	0.09196	595.1
25.	0.35894	433.2	1.47114	0.76451	138.1
26.	0.39063	236.3	0.87905	0.76451	137.3
27.	0.47941	885.7	1.24116	0.76451	447.5
28.	0.45417	1,258.6	1.38301	0.76451	540.6
29.	0.56110	372.1	1.37640	0.76451	198.4
30.	0.44511	4,210.2	7.09580	0.23549	345.4
31.	0.52128	743.3	1.25581	0.23549	388.1
32.	0.43956	15,544.4	0.95325	0.23549	7,462.3

	9	10	11	
	$\frac{EEA_i=DCO_i-{}^{E}NFX_i}{{}^{E}NFX_i}$	$\varphi^{*}=\frac{{}^{E}NFX(1+EEA_i)r_{ji}}{EXP_i-\sum_j IIN_j r_{ji}}$	$\varphi^{**}=\frac{q_i p_i {}^{E}NFX_i(1+EEA_i)r_{ji}}{p_i(EXP_i-\sum_j IIN_j r_{ji})}$	$\varphi^{***}=\varphi^{**}1968/\varphi^{**}1966$
1.	0.35092	0.98838	0.68528	<
2.	0.29644	1.10631	0.79098	<
3.	0.32314	1.43681	1.29668	>
4.	8.96563	8.38115	6.09815	>
5.	0.26892	1.20966	1.07965	>
6.	0.56392	1.00723	0.60415	<
7.	2.88021	3.09693	2.65702	>
8.	0.34570	0.89106	0.47261	>
9.	0.66079	0.86827	0.68110	>
10.	1.18354	1.03906	0.57017	<
11.	5.15605	3.92200	2.14637	<
12.	4.95009	3.93808	2.26685	>
13.	4.95009	3.53808	1.29886	<
14.	0.34271	1.11907	0.74485	>
15.	1.02523	0.93821	0.66798	>
16.	0.69154	1.04603	0.7010	>
17.	0.21736	0.95350	0.63235	>
18.	1.39987	1.23235	1.09651	<
19.	0.85390	1.27296	1.01050	>
20.	0.52271	0.93649	0.48130	<
21.	0.17869	0.99919	0.63799	>
22.	0.76384	0.46345	0.20553	>
23.	—	—	—	
24.	1.07192	1.50922	1.31258	>
25.	2.13232	1.47076	1.10306	<
26.	0.72105	0.87901	0.57511	<
27.	0.97922	1.24103	1.19274	>
28.	0.97922	1.24103	1.19274	>
28.	1.32815	1.38306	0.97967	<
29.	0.87550	1.30728	1.03677	<
30.	1.18582	7.09808	5.17442	>
31.	0.91523	1.25572	1.08196	<
32.	1.08705	0.95330	0.56292	<

(Note: See note of table 4)

Table 6 Other factors to be considered for export assistance

Factors / Export commodities	1 NFX_i (million won)	2 EXP_i (million won)	3 Proportion of exports to manufacturing	4 Exports to output	5 Capital to output
1. Rice, barley or wheat	1,610.9	1,723.9	2.74	0.00686	0.56694
2. Other agriculture	2,666.4	2,839.9	4.51	0.01017	0.11044
3. Forestry	15.4	16.3	0.03	0.00060	0.08720
4. Fishery	1,572.3	2,431.7	3.86	0.09918	2.48601
5. Coal	253.7	283.8	0.45	0.01841	0.58640
6. Other minerals	5,436.7	5,962.1	9.47	0.40125	1.02869
7. Processed foods	5,425.0	6,762.3	10.74	0.07074	0.45484
8. Beverages & tobacco	120.2	132.3	0.21	0.01308	0.90137
9. Fiber spinning	7.3	7.8	0.01	0.07150	0.55488
10. Textile fabrics	1,710.1	3,940.8	6.26	0.09708	0.90137
11. Finished textile products	1,238.5	6,355.3	10.09	0.14901	0.99913
12. Sawmills or plywood	3,845.2	9,538.1	15.15	0.18464	2.16100
13. Wood products & furniture	2,922.1	7,861.6	12.48	0.34984	0.67633
14. Paper & papar products	12.2	170.5	0.27	0.03590	1.19451
15. Printing & publishing	163.7	250.2	0.40	0.01614	0.84772
16. Leather products	60.6	80.1	0.13	0.01002	0.68997
17. Rubber products	146.3	178.4	0.28	0.04525	0.34490
18. Basic chemicals	715.9	1,631.8	2.59	0.17363	0.75065
19. Intermediate chemicals	106.6	160.4	0.25	0.31591	0.32868
20. Finished chemical products	24.4	35.5	0.06	0.00214	1.20169
21. Fertilizer	—	—	—	—	1.46291
22. Petroleum & coal products	0.5	1.2	0.002	0.09143	0.67584
23. Cement	—	—	—	—	0.34932
24. Ceramic, clay & stone products	335.7	491.1	0.78	0.05734	1.43041
25. Iron & steel	9.8	19.9	0.03	0.00309	1.33614
26. Steel products	1,058.6	2,071.1	3.29	1.34088	0.52628
27. Non-ferrous metal products	477.1	641.8	1.02	0.11988	0.45600
28. Finished metal products	629.9	1,052.6	1.67	0.10171	0.76474
29. Machinery except electrical machinery	657.5	975.7	1.55	0.08817	0.64043
30. Electrical machinery	494.7	1,402.5	2.23	0.10336	0.22923
31. Transport equipment	126.2	188.9	0.03	0.01604	0.56996
32. Misc. manufacturing	3,410.1	4,769.5	7.57	0.24356	0.34585

(Note: See note of table 4)

these findings, it may be inferred that, since export industries tended to become more capital intensive and needed more foreign capital, required social cost would tend to increase.

Further, Table 6 supplements the above computation. As shown in Tables 4 and 5, the subsidy system was not concomitant with the exchange-cost formula. Table 6 indicates, in addition, that export assistance (nominal and effective) was not given in conformity with the way in which it might bring about maximum benefits to economic development.

First of all, the differential performance of the individual exports was not related to the magnitude of the differential incentives whether they were nominal or effective. The relative importance of the different exports, i.e., the average ratio of individual exports to total manufactured exports, was not correlated with export assistance. Moreover, there was a very poor correlation between effective export assistance and the proportion of exports to the output of each industry.

Table 6 shows that the ranking of export industries by net foreign exchange earning was not consistent with the ranking made in terms of the most economical use of other scarce factors such as capital. There did not seem to be any significant correlation between the ranking of export industries by any of the two sets of capital/output ratios and by foreign exchange earnings.

Although it was very difficult to calculate, it seemed certain from the Korean practice of administration that export assistance did not correspond to different elasticities of demand and supply. That is, the wide discrimination in export assistance between the individual manufactured exports seemed to be uncorrelated to the difference between them in terms of elasticity of demand and supply. On dynamic ground, this paper maintains also that the cases for discriminatory export assistance were not in practice made on the basis of the infant industry argument, higher ratios of savings and investment, or other criteria relating to long-run economic growth. In Korea during the period under consideration, there was no empirical evidence that higher export assistance was provided to industries suffering from excess capacity or employing surplus labour.

The departures of export assistance from the optimum point measured by this paper's exchange-cost formula and the lack of correlation between

export assistance and other relevant variables as mentioned in Chapter III have caused many disadvantages to economic development in Korea.

First, artificial pushing of exports resulted in the protection of the currently, comparatively disadvantageous industries. As a consequence, artificiality tended to reduce efficiency within export firms. In Korea, these efficiency effects were not directly associated with export firms' motivation, but with their fragile structure. During the period of artificial export expansion, Korean export firms endeavoured to survive, refraining from managerial leisure or relaxation. Due to the lack of 'the states of the arts' and 'knowledge' in a rapidly changing environment, however, the structure of export firms was not satisfactory, in terms of heavy dependence on outside finance, relatively small size of firms, unmodernized organization, and poor management and marketing.[82] All these things were contradictory to a positive relationsphip between effort and efficiency, and brought about large substitution effects outweighing income effects. Because of the misallocation of resources in the 1960's, efficiency effects became more important than orthodox resource allocation in the 1970's. In short, there occurred a structural weakness and, thus, inefficiency of export firms, especially new ones, which tended to require more foreign capital in the form of joint ventures and multi-national corporations in order to maintain their existence. Meanwhile, the Government tried to rescue these inefficient export firms by providing more assistance, but, due to the budget constraint, it had to introduce more foreign capital to help them. As export firms became more inefficient, more government assistance was required and more foreign capital induced. Artificial export expansion whose original aim was to reduce the trade gap tended to bring about a larger balance of payments gap.

Second, in Korea, where the investment-income ratio (assisted by domestic savings) and capital per head were low, artificial export expansion induced competitive demand for capital inputs. In particular, export industries required a shift of capital away from other industries. For some export industries, the most profitable factor combination tended to require large

(82) The Bank of Korea: Reports on Export Industries in Korea, 1972. The Seoul Kyungje, 23rd October, 1973.

Korean Trade Research Center: Measures to Increase Net Foreign Exchange Earnings for Exports, Seoul National Univiersity, 1969.

amounts of complex capital. The use of this equipment in turn necessitated the employment of relatively large amounts of skilled labour and other types of capital inputs. Government assistance to export industries constituted social costs for the other sectors which were evidently in competition with export industries in absorbing scarce capital. In addition, export expansion was competitive with the domestic sector for utilizing the limited capacities of ancillary industries comprising the social overhead capital sector. Social costs or opportunity costs incurred for artificial export expansion sometimes became considerable.

Third, there appeared a clear indication in Korea that the current export incentive system penalized import substitution and import-competing industries, thus impeding the development of such industries. The delay in the development of intermediate products and capital goods industries and a decrease in the net foreign exchange rate were good examples. In 1971, net foreign exchange earned amounted to only 763.4 million dollars when gross exports totalled 1,616.0 million dollars. Notwithstanding, Korea exhausted nearly all of the net foreign exchange earnings to import food and crude oil, and to repay debt servicing (see Tale 7 below). Artificial export expansion pulled a dragging agricultural sector along with it, rather than getting the benefits of an additional push from it, thus having increased net imports of food, given its basically unfavourable natural resource endowments and low productivity in agriculture.

Table 7 Foreign Exchange Receipts and Payments (in Million U.S. Dollars)

	1968	1969	1970	1971
Net exports	495.6	645.5	716.6	763.4
Imports of food and live animals	167.5	301.7	319.4	399.5
Wheat	68.1	112.5	82.1	125.2
Rice	43.3	120.5	145.4	150.2
Barley	11.8	7.5	1.0	4.2
Imports of petroleum and its products*	72.9	107.6	132.9	187.1
Foreign debt servicing	60.4	102.7	170.5	215.7

(Source: *Economic Statistics Yearbook*,, The Bank of Korea, 1973).
Note: * indicates 'crude and partly refined for further refining excluding natural gasoline'.

In the meantime, the international prices of food (i.e., 150 dollars per ton of wheat in 1971) refused to come down, whilst the prices of crude

oil (i.e. 2.85 dollars per barrel in 1971) and other raw materials (e.g. scrap iron) were climbing. A declining net foreign exchange rate contributed to a trade deficit which was already critical.

Fourth, for some goods (e.g. swine, chemical fertilizer) where internal and external demand were competitive, permitting more export sales had an inflationary impact because of rises in the domestic prices of the products exported. Usually these export goods have low supply elasticities and are produced by small firms.

Fifth, as exports expanded artificially, Korea's dependence on international markets increased. A bias in growth in terms of relative supply or demand for goods entering international trade may in the extreme case bring about a possibility of immiserizing growth if a country's share of exports in world trade were large. (83) That is, even a small change in the supply and demand conditions of a country affects those of other countries through changes in the terms of trade or world prices directly. Such a terms-of-trade approach was not in general applicable to Korea. But, it should be stressed that a rapid increase in some manufactured exports caused a forced reduction of export prices or of export volume as in the case of textile exports. Due to specialization in a few typical products and selling in a few markets, the economy started to become vulnerable to outside conditions. As the risk of specialization spreaded over all the sectors of the economy, it became more difficult to shift resources from the export sector to the alternative sectors when external demand declined abruptly, and the instability originating in the export sector tended to seriously affect domestic production, income, and the prospect for long-term growth of the economy as a whole.

Sixth, domestic savings were not sufficiently increased due to the relatively high propensity to consume, which was in part attributed to artificiality in export expansion. Korean export commodities during the period 1961-1971 were largely labour intensive. Since it may be realistic in the case of Korea to assume that export expansion shifts income distribution towards the

(83) Immiserizing growth means in this paper that an exporting country is worse off after growth than before, because the deterioration of the terms of trade resulting from export expansion exceeds the profit from increased productivity. See J. Bhagwati: "Immiserizing growth: a geometrical note," *RES*, Vol. 25, 1958; c.f. "The Theory of Immiserizing Growth: Further Apptlications," in *International Trade and Money*, edited by M.B. Connolly and A. K. Swoboda (George Allen and Unwin, 1973), pp.45-54.

labour intensive in the production of export goods, and since the propensity to save out of profits is greater than that out of wages, the marginal propensity to save in the export sector tended to be low in the course of artificiality in export expansion. On the other hand, as exports expanded because of the introduction of foreign capital in the export sector, the factor intensity of Korean export goods gradually shifted from labour toward capital. In this case, increased income was distributed more to capital owners who were foreigners, and thus, income tended to leak out of the Korean economy. Wages in the export sector were generally low. All these contributed to the low marginal propensity to save or the relatively high marginal propensity to consume in Korea.(84) Other examples of the high propensity to consume are the fashionable deluxe life due to the influence of misuses of raw materials (e.g. mink) which were originally imported for export production, and the establishment of luxury hotels which aimed at attracting foreign tourists.

Seventh, minor examples of disadvantages include, among others:

(a) A new distortion created in financial institutions and the expansionary consequences of export finance on the money supply. Overemphasis on exports in terms of domestic money and banking, that is, the low interest policy for exports, contributed to generating false monetary demand in the name of exports. The 'prejudiced' bank fund supply tended to become worse, so much so as to put pressure on small-medium industries that played an important role in price stability. It is noteworthy that prejudiced export financing was abused to the point of smearing the fairness of banking, and the oversupply of such financing was diverted and used for purposes other than those expressly intended for export. To put it another way, small-medium domestic industries were virtually cut off from normal bank loans and had to depend on curbed market, whereas export industries enjoyed monetary leeway, which in some cases was used for property speculation tending to accelerate the price spiral as well.(85)

(b) The increase in claims from overseas buyers against export goods and delivery.

(c) The increase in the conclusion of unfavourable contracts due to the hastiness of the export drive (e.g. resulting in the increase in disadvantageous joint ventures).

(84) W.M. Corden: "Effects of Trade on the Rate of Growth," *ibid*, pp. 131-133.
(85) The editorial, the Korean Times, Seoul, August 26, 1973.

(d) The pollution problem arising from the foreign capital supported export industries.

(e) In addition, because of artificiality, imports rather than domestic production, foreign rather than domestic capital, and inefficiency rather than productivity tended to be highly regarded. The fluctuation of the index of the export and import ratio tended again to be wider, and dispersion of export industries according to the size of the firm also became irregular.

The above disadvantages were in fact accentuated by the overvalued exchange rate. Under the overvalued system, imports of foreign capital goods, intermediate products, and raw materials increased at less than cost, foreign capital was also induced at low expense. The commodities and capital thus imported were all used for constructing the economic base and infant industries. But, as a result of excessive imports, various disadvantages appeared. They were:

(a) Deterioated balance of payments as the amount of imports increased faster than that of exports.

(b) Over-inducement of foreign capital which brought about severe debt servicing problems.

(c) Creation of capital intensive industries whose size exceeded the optimum point so that the production costs started to soar and conversely hamper export expansion.

3. Artificiality in export-oriented development (1961—1971)

Korea increased her exports and simultaneously achieved a high rate of economic growth. Was her economic growth a so-called "export-oriented growth"?

Seen from the structural equations of this paper's model, Korean economic growth was not export-oriented, if one defines 'export-oriented growth' as the type of growth where:

(1) The primary impetus of economic growth stems from export markets

(2) Export production is in operation to earn the average profit margin

(3) The autonomous and cumulated growth of export and domestic industries is achieved

As indicated previously, it was found that exports played an important role in accelerating private investment into the export sector (INV^{p-e}) and,

hence, increasing gross domestic products in the export sector (*GDP*). They helped to increase imports of raw material and intermediate products, as well as of capital goods for domestic production of manufactured goods. But it should be stressed that increased exports were not due to cost reduction resulting from increased total factor productivity in the export sector. Productivity increases were not closely related to an increase in the scale of output and investment, because a manufacturing export industry whose production was rapidly expanding anyway adopted no new techniques and methods. Although the scale of production increased, the reduction in costs did not combine to increase competitive strength in international trade. Government intervention in exports in the form of both investment and subsidies instead strengthened the competitive position. The rationale for Government assistance to export industries which showed no possibility of productivity growth was the belief that exports might create various benefits as explained earlier in connection with artificialities (1) and (2). In fact, these advantages were created. But excessive artificiality was accompanied by significant sacrifices in other industries and other disadvantages also. In this sense, it may very well be asserted that Korea did not develop through export-oriented growth but by artificial export-oriented development accompanied by considerable costs and disadvantages as well during the period 1961—1971.

Chapter VI

Summary and Policy Suggestions

As a country having a large population but small cultivated land area and limited resources, Korea pursued rapid industrialization through export expansion assisted by foreign capital inflow during the 1960's, and has tried to move ahead towards export-oriented development in the 1970's for the first time during its 40-century history. This export-oriented development strategy is indicated by the simple fact that 10 billion dollars of exports have been targeted for 1981, with some amount of foreign capital exported. This goal is in contrast to the 3.5 billion dollars of foreign aid (grant) which sustained the Korean economy during the 1950's with negligible exports (around 40 million dollars annually), and another 3.5 billion

dollars of foreign capital (loan) which stimulated economic development during the 1960's. A further point to mention is that, in the Third Five-Year Economic Development Plan (1972-1976), exports of heavy and chemical industrial goods are planned to share more than 60 percent of the total export target although the heavy and chemical industries are still in the infant stage and far from import and export substitution. This export-first development policy is based on the assumption of two high correlations,

(1) Between Government assistance and export expansion
(2) Between exports and economic growth.

To what extent, then, has Korea developed through export-oriented development and will the artificial formation of comparative advantage be beneficial for future export-oriented development of Korea?

In theory, export-oriented development is the growth process in which exports are a prime impetus to growth. When world demand continues to grow at a steady rate over time, such strategic factors of development as investment, savings, productivity, etc. in the export sector tend to reinforce each other through the initiation of the export of manufactured goods, resulting in a substantial growth rate of GDP in the export sector. A GDP rise in the export sector may bring about a rise in GDP in the domestic sector through the input-output mechanism, following an increase in investment and productivity in the domestic sector. The initial force that causes rapid development is a rise in a country's exports, due to a competitive advantage in world trade. This advantage is attributable to the capability of reducing production costs below those of other competitive countries, assuming the production of an equal or better quality of exportable goods, and equal marketing. The reduction in relative prices of exportable goods is affected by a higher growth rate of real income or investment, and total factor productivity in both the export and domestic sectors which takes place when the production of export goods is expanded profitably.

However, the virtuous circle of the export-oriented development may not easily be attained without government assistance to export industries. This is because there are so many obstacles to expanding exports of manufactured as well as primary products. The difficulties involved in export expansion

cover both external and internal elements. Internal difficulties exist mainly on two accounts: the gap between investment (or GDP) and productivity in the export sector and the gap between the export and domestic sectors. In the export sector, an increase in investment or GDP may not always induce a rise in productivity, while the export sector may not be supported by the domestic sector structurally in the course of export-oriented development. Decisive government action thus has to be taken such as diverting investment into the export sector, subsidizing export industries to reduce export prices, and improving marketing and productivity. In other words, developing countries have come to acknowledge the need for the artificial formation of comparative advantage for their exportable goods in the world market. Artificial comparative advantage is defined as a new comparative advantage which is artificially formed regardless of the present comparative advantage. That is, gross volume and value (despite a decrease in unit price of export goods) are expanded beyond the optimal point(total factor productivity) suggested by the exchange-cost formula (static and dynamic, nominal and effective). The need for artificiality stems from efforts to eliminate the increasing gap created by a massive inducement of foreign capital, and to facilitate export-oriented development.

Theoretically, the formation of artificial comparative advantage is a departure from the static and dynamic concept of comparative advantage lines. The justification of departure is to be found in:

(1) The existence of various distortions in the domestic and foreign markets
(2) The economies of scale and externality effects of expansion as well as in the infant industry argument (artificiality 1)
(3) The importance of foreign capital goods and intermediate products which embody advanced technology paid for by increased exports (artificiality 2).

From the standpoint of international trade theory, the formation of artificial comparative advantage seems to be similar to protection of infant export industries as well as dynamic or incremental comparative advantages, but its concept is broader since it also contains debt servicing together with educative effects and foreign capital embodying advanced technology. There exist no limits to artificial export expansion as far as the pressure of debt servicing increases (artificiality 3), but in the process of export-oriented development, excessive measures should be restricted so as not to impair

economic efficiency measured by total factor productivity.

If government assistance to export industries exceeds optimum levels, then new distortions might occur in other sectors. Such artificial export exansion would entail welfare losses through distorted investment, savings, and would call for sacrifices by the domestic sector. Theoretically, equilibrium is required between export and domestic markets if developing countries are to derive maximum benfits from given resources devoted to rapid industrialization, and if no benefits are assumed to arise from artificiality(2).

The findings of the present study are:

(a) Together with foreign capital, exports (EXP^c) played a significant role (10.83 percent in terms of the macro-concept) in stimulating the economic growth of Korea during the period 1961-1971. In expanding exports, the role of Government assistance, through increases in such variables as Goverment subsidies to export industries (SUB^{g-e}) and Government investment into the export sector (INV^{g-e}), were significant (2.1 and 31.9 percent respectively). It can be argued that Korea developed through artificial export-oriented development during the period under review.

(b) In assessing the costs and benefits of export expansion by nominal and effective exchang-cost formulae, one may get the impression that rapid export growth has on balance greatly benefited the Korean economy. But the evidence revealed a number of anomalies in the export-first strategy which indicated that artificial export expansion, when measured by exchange-cost formulae, was inefficient. As exports expanded artificially, various new export industries were created but high social costs were encountered simultaneously. The social costs began to soar, offsetting the benefits from artificial export expansion, when exports exceeded the optimum point. New infant export and domestic industries created by foreign capital and artificial export expansion have gradually begun to drag efficient export-oriented development in recent years.

The above results suggest the following policy recommendations:

(a) It is desirable to pursue an export-oriented development strategy as long as the export market expands. But the effort should be efficient (within both export industries and firms). In order to do this, it is desirable to transform inefficient infant export industries into efficient ones, rather than to protect additional export industries by excessive investment and subsidies. More specifically, it is desirable to revise the current subsidy system as well as the present foreign exchange rate so as to make them more consistent with the export-oriented industrialization policy. As a means, it is desirable to raise the foreign exchange

rates to their equilibrium points and argument them with various kinds of Governmental subsidies and assistance.[87]

(b) Subsidies and other assistance are justified when required by strategic export industries, which have a high growth potential over time as well as other dynamic elements mentioned previously. According to these criteria, it is desirable to discriminate in the granting of export assistance to the different export commodities. Among the dynamic effects of artificial export expansion in Korea, employment of surplus labour and idle productive capacity as well as the improvement of technology are especially important. Government assistance should be provided to export industries which employ surplus labour up to the point where marginal productivity of labour equals real wages and which utilize the idle capacity of production until total demand matches it. Government assistance is particularly criticial when the economy falls into recession, as it did in the end of 1972.[88] It is also desirable to improve foreign marketing, the quality and packaging of goods and to diversify foreign markets rather than make excessive investment or grant excessive subsidies which are not closely related to the industrial policy in general.

(c) Export policy should be based on a synthesized economic policy which takes into account domestic resources and the economic structure. Since the carry-over effects of exports diminish when net foreign exchange earnings decrease, the domestic sector may also lag behind the export sector, thus gradually losing the built-up potential of Government assistance to export industries. It is again desirable to transform existing import-substitution industries into export substitution ones, rather than create new import-substitution industries under the infant industry argument. This will eventually equalize the efficiency of export and import substitution industries at their shadow prices with the margin

(87) See W.H. Park et al: "Hankuk Ui Kyungki Bunsuk Mit Yaechuk Ae Kwanhan Yunkeu" (A Study of Economic Fluctuation and Forecasting in Korea), Korea Economic Research Institute, September 1972. Articles written by W.H. Park on Korea's Economic Development and Recession, The Seoul Kyungje, on
29th March, 1971
26th July, 1971
13th September, 1971
17th September, 1971
15th May, 1972
6th June, 1972
12th August, 1972
19th December, 1972
1st August, 1973
19th December, 1973 and
The Shin-Dong-A, April, 1973, pp.120-137.

(88) Same as 87/

of artificiality (2). Agricultural development and the increasing intensity of the economic structure may play an important role in replacing artificial export expansion.

(d) It is desirable to revise the export target which seems to be too ambitious in its aim to achieve 10 billion dollars by 1981 through artificiality in export expansion. If this objective were carried out as planned, higher social costs would need to be paid. This does not mean that the target itself is unattainable, but it is maintained that the extent of artificiality is excessive. If foreign demand for Korean goods which have both a current and a dynamic comparative advantage is increasing at a rapid rate, then it may be possible that exports of such goods alone can achieve the target. But what is argued here is that, taking into account the present conditions of productivity and the productive capacity of the economy, and the fact that artificiality in export expansion is to be employed for reaching the target amount of exports, serious distortions might occur in the domestic economy. In order not to induce such domestic distortions under the present conditions of the economy, Korea could possibly borrow foreign savings from abroad. This, however, may produce more serious problems of economic independence from foreign countries because no potential for the improvement of total factor productivity exists at present in the economy as a whole to match the high export targets.

(e) To put it differently, total factor productivity in the export sector cannot easily be improved by increasing government subsidies to the export sector (SUB^{g-e}) and government investment in the export sector (INV^{g-e}), but only by changes in other variables included in the export-oriented development model. If total factor productivity does not improve, then export expansion may become inelastic to export assistance, and more export assistance will be needed, negating the original aim of terminating export assistance within a short period of time. But as long as infant export industries become efficient via an increase in total factor productivity in the export sector within a short span of time, the economy can be put on the track of export-oriented development. When the increases in investment and production improve productivity in the export sector, which may in turn reduce the prices of exportable goods and thus increase their international competitiveness, export-oriented development can be realized. In increasing total factor productivity, the ability of the Korean people in terms of technology and skill is important. To conclude, the possibility of achieving export-oriented development (and in extreme cases even converting comparative disadvantages into absolute advantage) many depend upon how fast total factor productivity in the export-sector rises (when those of foreign countries are assumed away),

and it may be a race between the rates of both productivity growth and artificiality in export expansion that determines whether or not Korean can achieve export-oriented during the period 1972—1981.

In the 1960's the most important issue was "how fast can Korea construct a productive base?" As a means of accelerated growth, artificial formation of comparative advantage was justified under the infant export industry argument, etc. But, entering the 1970's, focus needed to be shifted from a consistent macro-investment programme to efficient micro-resource allocation. The Korean Government ought to adopt an "efficiency over growth" strategy from now on and thus increase autonomous reinvestment by discarding inefficiency. As Korea has already passed the first stage of structural transformation towards industrialization, a self-reinforcing reinvestment process should be established within the framework of efficiency and austerity.(89)

In view of the Korean experience, it appears that UNCTAD proposition needs amplification in explaining the process of export-oriented development and its efficiency.

Appendices

I. Compilation of the Data

As S. Kuznets pointed out in July, 1972, when he participated in the Symposium on Economic Development and Planning held at the Korea Development Institute in Seoul, one of the most important and basic factors in the model building exercise in Korea lies in the collection of exact data.(90) For constructing an econometric model, the relevant statistical data for Korea were relatively scarce and unreliable, as compared to those for developed countries. The reasons were usually a relatively short time series, incorrect assumptions made in sample surveys, incorrect methods of reporting at the primary stage of data collection, and frequent revision of the national accounts.

(89) This argument is in contrast to the expansionists' view on Korean economic prospects. See O. Shimomura: "Some Suggestiong for Stabilization of Korean Economy," Research Report No. 8, Korea Development Institute, August, 1972.

(90) See Bibliography (8).

In Korea, although data were refined and filed in chronogical order, and methodology which affected the reliability of data was modified periodically, it was not possible for this model estimation to get all the data from published sources. Nearly half of the data were not available. In consequence, many scattered sources of information had to be manipulated on the basis of some assumptions made in the data collecting process.

(1) First, it was found most difficult to obtain the data concerning the distinction between the export and domestic sectors. The fundamental difficulty was in relation to INV^{p-e} and INV^{p-d}, and INV^{g-e} and INV^{g-d}. To build up a rough series of these data, three different methods were considered and (c) was chosen for this paper's purpose.

(a) Proportionality method……The data on *GDP* and net exports were available, from which the ratio of exports to *GDP* was derived. After total gross investment was divided by this ratio, the amount of investment for exports was obtained.

(b) Regression method……The data on GDP^e (=net exports) and GDP^d (*GDP* -net exports) were available. Hence, the coefficients of GDP^e and GDP^d could be estimated by regression for the following equation.

$$INV_t=\alpha+\beta GDP_t^e+\gamma GDP_t^d+u_t$$

(c) Sampling method……By making use of the small-sampling technique, the average capital coefficient for export industries was calculated annually by the Korea Development Bank (KDB), where three experts were engaged in investigating the supply and financial condition of export industries. Their calculations of the capital coefficient seemed to be reliable due to the massive amount of data used and their long experience. By multiplying the amount of exports by the coefficient (2.15972), INV^e could be obtained. In this model estimation, annual figures on this coefficient were required. But, since Korea's major export items didn't change much during the period of investigation, it was reasonable to employ an average capital coefficient for the period 1961~1971 rather than a coefficient of each year which could be calculated with sophistication. Interetingly enough, the coefficient derived from the sampling method was very similar to that obtained by the regression method utilized by the Economic Planning Board (EPB).

(2) Second, the data on capital coefficients and capital stock, especially in the export sector require a particular explanation. Because of discontinuity and incomparability in the series of capital, it was necessary to construct a new series which covered the period 1961-1971. Basic data for this work were obtained from Estimates of Korean Capital and Inventory Coefficients in 1968 by Professor K.C. Han. The original interindustry data were based on Input-Output tables.

for 1960, 1963, 1966 and 1968, by which INV^e and INV^d were derived.

(3) Time series for annual data for the period 1961-1971 were not sufficient to derive a reduced form because of the shortage of degrees of freedom. At least ten degrees of freedom were needed. For this, quarterly data for the period 1961-1971 were required. But, the quarterly data contained seasonal variatons, thus fiuctuating more widely. Hence, if they were to be employed for this paper's purpose, the quarterly data needed to be adjusted by the moving averages of four quarters or the overlapping semi-annual technique.

In the process of compiling quarterly data, considerable difficulties were encountered since The Bank of Korea (BOK) published unofficial quarterly data on the GNP components only in 1968. Other than the GNP components, relevant data had to be manipulated by applying the same technique (four quarters moving averages) used for the annual data, especially to distinguish between the export and domestic data. In the empirical estimation, the results using both data were found to be quite similar, and, therefore, annual data were adopted.

The main statistical sources used in this study were the *Economic Statistics Yearbook* (*ESY*) and the *National Income Statistics Yearbook* (*NISY*) published by the Bank of Korea (BOK). UN publications such as the *UN Statistics Yearbook* (*UNSY*) and *International Finance Statistics* (*IFS*) were all based on these data and virtually the same as the former. Two other regular statistical publications used were *Finance Statistics* and *Statistical Data*. Both were published annually, the first one by the Ministry of Finance (MOF), the second by the Economic Planning Board (EPB). One of the main sources for trade statistics was *Monthly Trade Statistics*, which was published by the Ministry of Commerce and Industry (MCI). Sometimes, these publications gave separate figures for trade, and trade figures, especially those of exports, were usually undervalued (see EXP below). But adjustments for coverage, and timing necessary in order to use the reliable trade statistics for the balance of payments were not published. Only recently, however, was the complete balance of payments computation for Korea revised for the years 1961-1971 by the BOK's Research and Statistics Department.

All figures were converted into the presently used Won expressed in terms of constant 1965 market prices. For these values which were only available in terms of current market prices, appropriate deflators were used

for the conversion. For experiments, the absolute figures were converted into the rate of change (△), but dismissed because of the poor results of the estimation.

The model is in essence a recursive system, except for the simultaneous relationship between INV and GDP. From a statistical viewpoint, a recursive system makes it acceptable to use ordinary least-squares to estimate structural parameters on the condition that there is no correlation among error terms of each equation in the system. All the equations were estimated in the text using (1) ordinary single-stage least-squares procedures, (2) annual data, (3) aggregate data, (4) absolute figures, and (5) linearity. It was shown from the actural estimates that the computation of the two-stage least squares estimates with quarterly and rate-of-change figures had on the whole a marked effect in reducing the regression coefficients and increasing their standard errors. The multiple regressions by these methods yielded relatively low $\bar{R}^2$ also. On the other hand, the computation by log-linear and disaggregated data improved the fit considerably. But, linearity and aggregated data were adopted for simplicity of the model and due to the difficulties of deriving a reduced form from the log-linear equations.

As usual, the t-tests of the coefficients were listed in parentheses below each coefficient. Multiple correlation coefficients adjusted, $\bar{R}^2$ and Durbin-Watson statistics, d.w., were indicated to the right of each result. In additon to statistical validity, forecasting ability was also taken into account in the process of choosing structural equations. The calculation was carried out at the Korean Computer Centre by CDC 3200.

The terminology and coverage of each variable which is identified with the objective of this model are explained in detail below.

EXP: Total exports of goods and services at constant 1965 market prices in Korean won. The original figures in current dollar terms of exports were obtained from *UNSY*, 1972 and *ESY*, 1972 together with BOK's *Monthly Statistics* (p.130). Foreign exchange earnings from exports at 1965 prices in Korean won (also from foreign capital inducement) were obtained by foreign-exchange in current dollar times the exchange rate in 1965 (272.60) times the implicit price index (All the figures shown below whose original figures

wer current dollar terms were converted to constant Korean won in the same way as above). In these figures, 1962 and 1963 figures were based on export declarations; the others on foreign exchange settlements at BOK or the Korea Exchange Bank (KXB). Reference dates were based on customs clearance. Therefore, contract, L/C or export advance bases were rejected which were employed by the Government for export maximization purposes sometimes. Merchandise exports were valued at FOB, including trade without drafts and excluding smuggling, gold coins, issued bank notes, etc. Total exports were divided into two sub-categories, EXP^c and EXP^s.

NFX: Net foreign exchange earnings at 1965 prices in Korean won.

EXP^C: Total exports of commodities at constant 1965 market prices in Korean won.

EXP^S: Total exports of services at constant 1965 market prices in Korean won. Refer to IMP for the distinction between EXP^C and EXP^S.

WDE: Index of gross world income at constant factor cost (base 1965=100). Other figures used for this experiment were both world import demand (=world export), and total GDP of the USA, Japan, West Germany and Hong Kong which were the main importers of Korean goods. Data sources were UNSY, IFS, and IMF annual reports for 1972.

SUB^{g-e} Government subsidies to export industries. See INV^{g-e} for details.

FER: Official foreign exchange rates. In detail, buying and selling rates of foreign exchange banks to customers. With the adoption of a unitary fluctuating rate system and a floor rate of 255 won per US dollar, on May 3, 1964, the selling rate to customers and buying rate from customers by foreign exchange banks were determined by BOK, taking into account the free market rates. From November 25, 1969, these rates were determined daily by foreign exchange banks.

FER^e Effective foreign exchange rates for exports. The figures for FER^e were obtained, as follows, by taking into account the changes in prices of the U.S.A. and Japan, and the volume of exports to the U.S.A. and Japan which were the main importers of Korean goods:

$$(FER^e_w)_t \times \frac{\dfrac{PRI^u_{t-1}}{PRI^d_{t-1}}}{\dfrac{PRI^u_t}{PRI^d_t}} = (FER^e_w)_{t-1} \quad \cdots\cdots (1)$$

$$(FER^e_J)_t \times \frac{\dfrac{PRI^J_{t-1}}{PRI^u_{t-1}}}{\dfrac{PRI^J_t}{PRI^u_t}} = (FER^e_J)_{t-1} \quad \cdots\cdots (2)$$

$$(FER^e)_t = \frac{(FER^e_u)_t \cdot (EXP^e_u)_t + (FER^e_J)_t \cdot (EXP^e_J)_t}{(EXP^e_u + EXP^e_J)_t} \quad \cdots\cdots (3)$$

Where u denotes the U.S.A.

J denotes Japan

PRI stands for wholesale price index which takes 1953 as a base year.

The data for these formula were:

	PRI		FER^e (won)		EXP ($1000)	
	USA	Japan	USA	Japan	USA	Japan
1961	100.0	99.9	147.82	153.49	6,821	19,387
62	100.3	98.2	161.16	162.44	11,376	23,487
63	100.0	100.0	194.85	192.29	24,287	24,841
64	100.2	100.2	261.89	258.46	35,566	38,158
65	102.2	101.0	282.72	264.59	61,695	43,974
66	105.6	103.4	318.68	296.81	95,782	66,293
67	105.8	105.3	345.16	313.32	137,431	84,723
68	109.4	106.1	360.83	336.19	235,402	99,744
69	112.1	106.4	375.26	358.04	312,175	133,326
70	116.3	108.2	391.27	371.33	395,216	234,311
71	119.9	111.3	410.11	397.38	531,822	262,002

IMP: Total imports of goods and services at 1965 prices in Korean won. The figures were originally obtained from *ESY* and *IFS*, 1972, together with BOK's *Monthly Statistics* (p.120). 1962 and 1963 figures were based on import declarations; the others were based on customs clearance. Imports were valued at CIF, including trade without drafts and excluding gold coins, bank notes, bonds, and similar securities. The distinction between consumer goods including grain, raw materials including fuel and intermediate products and capital goods is according to the following classifications:

Consumer goods : SITC 0, 1, 8, 9

Raw materials and intermediate products : SITC 2, 3, 4, 5, 6

Capital goods : SITC 7

Services : Others

The data on the imports of consumer goods, raw materials and intermediate products, capital goods, and services were separately available and were used to allow the bypass of the problem of multicollinearity.

IMP^c: Imports of consumer goods at 1965 prices in Korean won. The original figures were derived from *IFS* and *ESY*, 1972.

IMP^{ri-e}: Imports of raw materials and intermediate products for the export sector at 1965 prices in Korean won. Same source as the above.

IMP^{ri-d}: Imports of raw materials and intermediate products for the domestic sctor at constant 1965 prices in Korean won. Same sources as the above.

IMP^{p-i}: Imports of investment goods in the private sector at 1965 prices in Korean won. Same sources as the above.

IMP^{g-i}: Imports of investment goods in the Government sector at 1965 prices in Korean won. Same sources, imports of investment goods for both Government and private use were divided according to the classification of the goods in foreign exchange statistics issued by the Korean Government.

IMP^s: Imports of services including capital income at 1965 prices in Korean won. Same sources as *IMP*.

FKA_1: Net amount of short-term foreign capital inflow at 1965 prices in Korean won.

FKA_2: Net amount of long-term foreign capital inflow at 1965 prices in Korean won. The distinction between FKA_1 and FKA_2 lies in the period of repayment. FKA_2 is the foreign capital to be repaid after one year, so it excludes D/A and usance. The others are all FKA_1. In view of the identity, FKA_1 is nothing but the trade balance minus FKA_2. Thus, FKA_1 includes movement of non-monetary gold, official donation, etc., as well as D/A and usance. To speak strictly, all these items were not short-term foreign capital, but in Korea especially during the period 1961—1971, the items other than short-term foreign capital were in real sense negligible. The data were taken from *Monthly Economic Statistics* of *BOK*.

INV: Total gross investment at 1965 prices in Korean won, summing the fixed capital formation and change in inventory. The source of the data for this variable was the Mining and Manufacturing Census and Estimates of Korean Capital and Inventory Coefficients by Professor K.C. Han.

INV^{p-e}: Gross private investment in the export sector at 1965 prices in Korean won. No official statistics on this variable were available since it was defined as private investment for the production of export goods(not private investment of export establishments). The method used to calculate the figure was explained already, INV^{p-e} containing the investment for the depreciation of

fixed capital.

INV^{p-d}: Gross private investment in the export sector at 1965 prices in Korean won. In other words, this variable is defined as private investment for the production of commodities which will be used for domestic consumption and investment. The figures were derived simply from INV^{p} minus INV^{p-e}.

INV^{g-e}: Gross Government investment in the export sector at 1965 prices in Korean won. As in figures INV^{p-e} and INV^{p-d}, combined use of various information was made. INV^{g-e} includes long-term lending of foreign exchange to export industries and provision of funds for the purchase of machines and equipment for export use. The distinction between INV^{p-e} and SUB^{g-e} (Government subsidies to export industries) lies in whether Government assistance to the export sector, either INV^{g-e} or SUB^{g-e} induce the reduction of export prices of Korean goods directly. The main sources were the data prepared by the *BOK* and *EPB*. The balance sheets of other city banks were also utilized.

INV^{g-d}: Gross Government investment in the domestic sector at 1965 prices in Korean won. This figure was obtained from INV^{g} minus INV^{g-e}. INV^{g} is the total Government investment whose data were obtained from *NIY*, 1972.

INV^{s}: Investment in stock or inventory at 1965 prices in Korean won. These figures were taken from *NIY*, 1972 (p. 62) and "Research Data on GNP" kept by *BOK*.

INV^{s-e}: Net investment in stock of export goods at 1965 prices in Korean won. In Korea, it was estimated that INV^{s-e} was practically nil due to the excessive export drive.

SAV: Total domestic private savings at 1965 prices in Korean won. The estimates of *SAV* were derived from *NIY*, 1972.

GOR: Total Government revenue at 1965 prices in Korean won. This figure was taken from *NIY*, 1972 and *NSY*, 1972 (pp. 166-169).

GEX: Government expenditure at 1965 prices in Korean won. The source for this variable was the same as *GOR* (*ESY*, pp. 166-167). Government current expenditure consists of consumption expenditures for civil and defense purposes, subsidies, current transfers to households and private non-profit institutions, and current transfers to the rest of the world.

TAX: Total tax revenue at 1965 prices in Korean won. *ESY*, 1972 (pp. 166-167) was a direct data source for this figure.

IMD: Import duties at constant 1965 prices in Korean won. The figures were obtained by using *ESY*, 1972 (pp. 166-167).

*TAX**: Strategic variable of tax which equalizes the left and right hand sides of the equation.

*IMD**: Strategic variable of import duties which equalizes the left and right hand

sides of the equation.

GIC: Income from Government property and entrepreneurship, and others at 1965 prices in Korean won. Others include current transfers from the rest of the world less interest on public debt. In fact, *GIC* is the residual of *GOR* (*IMD*+*TAX*). Tax includes indirect taxes, direct taxes on corporations, direct taxes on households and private non-profit institutions. The data source was based on *ESY*, 1972.

OTH: Government revenue except *IMD*, *TAX*, and *GIC* at 1965 prices in Korean won. Same sources as the above.

FIP: Foreign income payment at 1965 prices in Korean won. Same sources as the above.

GDP: Gross domestic products at 1965 prices in Korean won. Time series for this variable were published in *NIY*, 1972 (p. 62) and *UNSY*, 1972, together with "Research Data on GNP" kept by *BOK*. We used these data without any adjustment.

GDP^e: *GDP* in the export sector at 1965 prices in Korean won. GDP^e is equivalent to exports of goods and services times net export earnings ratio plus inventory in export industries as shown in the equation in the model.

GDP^d: *GDP* in the domestic sector at 1965 prices in Korean won. Actual figure was obtained from $GDP-GDP^e$.

KAS^e: Capital stock (at the beginning of the year) in the export sector at 1965 prices in Korean won. As explained in INV^e, the capital coefficient of export industries was used for the calculation of KAS^e. The procedure was to start with the estimates of capital investment in the export sector in 1953, when in fact all the capital stocks were negligible as a result of total destruction by the Korean war. From 1953, capital series were built up for consecutive years by adding or subtracting the net investment figures of the relevant years. The main sources utilized for this purpose were the same as for the *INV* series.

KAS^d: Capital stock (at the beginning of the year) in the domestic sector at 1965 prices in Korean won. For the compilation of KAS^d, the same procedure was followed as for KAS^e. Or $KAS^d=KAS-KAS^e$ could be used.

LAB^e: Number of persons employed in the export sector. The figures were obtained by the combined use of information provided in the same source as for the *INV* series and the field survey made by *EPB*. Based on this information, the data were processed according to the same principle as applied to INV^e.

LAB^d: Number of persons employed in the domestic sector. The data and methodology used to derive the figure were the same as for LAB^e. For simplicity, the

Table 8 **The Basic Data**

	(1) *EXP* (billion won)	(2) *NFX* (billion won)	(3) EXP^c (billion won)	(4) EXP^c_{-1} (billion won)
61	38.59	37.02	10.85	9.12
62	43.31	40.82	14.54	10.85
63	46.58	40.74	23.04	14.54
64	56.00	46.07	31.61	23.04
65	76.91	62.37	46.47	31.61
66	120.68	100.80	66.46	46.47
67	170.63	140.77	88.83	66.46
68	233.63	188.96	125.06	84.83
69	305.39	233.42	174.71	125.06
70	364.18	211.22	234.14	174.71
71	514.21	268.41	312.95	234.14

	(5) ΔEXP^c (billion won)	(6) EXP^s (billion won)	(7) *WDE* (index)	(8) SUB^{g-e} (billion won)	(9) FER^e (won)
61	1.73	27.74	70.6	0.53	152.01
62	3.69	28.77	75.1	1.10	162.01
63	8.50	23.54	81.9	2.58	193.56
64	8.57	18.39	91.8	6.61	260.11
65	14.86	30.44	100.0	11.03	275.18
66	19.99	54.22	109.8	17.25	309.73
67	22.37	81.80	115.1	31.10	333.02
68	40.23	104.57	128.2	51.44	354.14
69	45.63	130.68	145.8	78.99	370.11
70	59.43	130.04	163.4	112.73	391.32
71	78.81	201.26	181.9	147.92	403.27

	(10) *FER* (won)	(11) *IMP* (billion won)	(12) IMP^c (billion won)	(13) IMP^{ri} (billion won)
61	130.00	91.30	37.84	34.79
62	130.00	120.51	41.61	51.81
63	130.00	153.48	38.22	69.99
64	256.53	114.05	22.18	62.63
65	272.60	128.45	21.16	74.31
66	272.60	208.45	26.67	103.88
67	275.00	281.32	37.45	125.56
68	281.90	410.49	66.35	154.75
69	305.20	516.23	108.12	192.57
70	317.40	570.93	118.13	182.78
71	373.30	865.75	129.37	323.27

	(14) IMP^{ri-e} (billion won)	(15) IMP^{ri-e}_{-1} (billion won)	(16) IMP^{ri-d} (billion won)	(17) IMP^{g-i} (billion won)
61	0	0	34.79	1.51
62	0	0	51.81	2.49
63	4.36	0	65.63	5.63
64	8.58	4.36	54.05	3.03
65	14.94	8.58	59.37	3.66
66	26.97	14.94	76.91	8.07
67	36.38	26.97	89.91	13.72
68	57.60	36.38	97.15	22.56
69	83.50	57.60	109.07	24.71
70	117.72	83.50	65.06	30.47
71	160.55	117.72	162.72	53.06

	(18) IMP^{p-i} (billion won)	(19) IMP^{s} (billion won)	(20) IMP^{s}_{-1} (billion won)	(21) FKA_1 (billion won)
61	72.95	6.50	5.69	3.21
62	77.99	8.12	7.09	5.69
63	132.27	12.85	11.78	7.09
64	114.41	17.62	13.23	11.78
65	118.48	52.90	21.91	13.23
66	207.98	37.02	30.20	21.91
67	241.72	49.50	25.61	30.20
68	344.12	71.90	20.10	25.61
69	451.47	97.40	30.78	20.10
70	433.94	130.44	47.50	30.78
71	438.68	142.76	50.37	47.50

	(22) FKA_2 (billion won)	(23) FKA (billion won)	(24) GDP (billion won)	(25) GDP_{-1} (billion won)
61	52.50	52.71	607.82	581.69
62	77.98	77.50	628.49	607.82
63	90.92	106.90	686.24	628.49
64	51.35	58.65	743.78	686.24
65	43.18	51.54	798.20	744.78
66	30.22	85.72	900.74	798.20
67	45.06	110.69	973.63	900.74
68	53.00	176.85	1,105.08	973.63
69	49.61	210.84	1,283.15	1,105.08
70	89.44	206.75	1,418.40	1.128.15
71	139.49	355.74	1,563.01	1,418.40

	(26) ΔGDP (billion won)	(27) ΔGDP_{-1} (billion won)	(28) GDP^{e} (billion won)	(29) GDP^{d} (billion won)
61	26.13	13.60	37.02	570.80
62	29.67	26.13	40.82	587.67
63	57.35	20.67	40.74	645.50
64	57.54	57.75	46.07	697.71
65	54.42	57.54	62.37	735.83
66	102.54	54.42	100.80	799.94
67	72.89	102.54	140.77	832.86
68	131.45	72.89	188.96	916.12
66	178.61	131.45	233.42	1,049.73
70	135.25	178.07	211.22	1.147.18
71	144.61	135.25	268.41	1,294.60

	(30) INV (billion won)	(31) INV^{e} (billion won)	(32) INV^{p-e} (billion won)	(33) INV^{p-e}_{-1} (billion won)
61	72.95	6.50	5.69	3.21
62	77.99	8.12	7.09	5.69
63	132.27	12.85	11.78	7.09
64	114.41	17.62	13.23	11.78
65	118.48	25.90	21.91	13.23
66	107.98	37.02	30.20	21.91
67	241.72	49.50	25.61	30.20
68	344.12	71.90	20.10	25.61
69	451.47	97.40	30.78	20.10
70	433.94	130.44	47.50	30.78
71	438.68	142.76	50.37	47.50

	(34) INV^{g-e} (billion won)	(35) INV^{d} (billion won)	(36) INV^{p-d} (billion won)	(37) INV^{p-d}_{-1} (billion won)
61	0.81	66.45	48.57	37.16
62	1.03	69.87	61.59	48.57
63	1.07	124.42	75.51	61.59
64	4.39	96.79	59.49	75.51
65	3.99	92.58	69.94	59.49
66	6.82	170.96	114.99	69.94
67	23.89	192.22	146.21	114.99
68	51.80	272.22	203.63	146.21
69	66.02	354.07	212.69	203.63
70	82.94	305.02	188.68	212.69
71	92.39	295.92	197.21	188.68

	(38) INV^{e-d} (billion won)	(39) INV^{s} (billion won)	(40) INV^{s-e} (billion won)	(41) KAS (billion won)
61	10.19	7.69	0	484.05
62	14.34	−6.06	0	568.10
63	17.59	31.32	0	674.05
64	16.22	21.08	0	767.38
65	21.80	0.84	0	885.02
66	39.22	16.75	0	1,075.65
67	36.38	9.63	0	1,307.04
68	50.10	18.49	0	1,633.37
69	97.67	43.71	0	2,041.13
70	83.27	33.57	0	2,441.50
71	46.05	52.66	0	2,880.18

	(42) KAS_{-1} (billion won)	(43) KAS^{e} (billion won)	(44) KAS^{e}_{-1} (billion won)	(45) KAS^{d} (billion won)
61	418.79	6.50	4.71	477.05
62	484.05	14.02	6.50	553.48
63	568.10	27.47	14.02	646.58
64	674.05	45.09	27.47	722.29
65	767.38	70.99	45.09	814.03
66	885.02	108.01	70.99	967.64
67	1,075.65	157.51	108.01	1,150.23
68	1,307.04	129.41	157.51	1,403.96
69	1,633.37	326.81	229.41	1,714.32
70	2,041.13	457.25	326.81	1,984.25
71	2,441.50	600.01	457.25	2,280.17

	(46) KAS^{d}_{-1} (billion won)	(47) SAV (billion won)	(48) GEX (billion won)	(49) GOR (billion won)
61	414.08	20.24	51.06	51.06
62	477.55	10.79	64.99	64.99
63	553.48	25.37	73.40	73.40
64	646.58	56.36	80.00	80.00
65	722.29	66.94	101.81	101.81
66	814.03	122.26	150.86	150.86
67	967.64	131.03	192.44	192.44
68	1,150.23	167.26	277.18	277.18
69	1,403.96	240.63	387.46	387.46
70	1.714.32	287.59	472.11	472.11
71	1,984.25	287.14	622.28	622.28

	(50) *TAX* (billion won)	(51) *TAX** (billion won)	(52) *IMD* (billion won)	(53) *IMD** (billion won)
61	21.41	−39,372	5.31	−3.841
62	28.66	−34.189	6.85	−5.214
63	33.11	−35.514	6.71	−8.673
64	37.72	−37.658	8.41	−2.967
65	50.12	−29.760	12.84	−7.100
66	80.35	−9.724	18.00	−2.951
67	110.20	12.837	25.41	−3.449
68	166.02	55.412	37.88	−4.225
69	257.05	128.735	52.21	−1.173
70	301.72	59.68	72.19	12.726
71	488.26	331.859	53.05	−37.677

	(54) *GIC* (billion won)	(55) *OTH* (billion won)	(56) *FIP* (billion won)	57) *LAB*[e] (1,000 peisons)
61	5.63	18.71	0.21	22
62	5.93	23.55	0.13	30
63	8.49	25.09	0.35	48
64	12.74	21.03	0.72	64
65	117.19	21.66	0.66	91
66	20.44	32.07	3.11	119
67	25.73	31.10	7.27	146
68	45.16	28.12	10.56	204
69	43.60	34.60	17.60	289
70	46.91	51.29	23.71	368
71	60.11	2.86	41.72	492

	(58) *LAB*[d] (1,000 persons)	(59) *DEP*[e] (billion won)	(60) *DEP*[d] (billion won)
61	6,521	1.27	13.00
62	7,347	1.96	16.93
63	7,898	2.47	23.84
64	8,146	5.69	31.24
65	8,431	10.01	35.72
66	8,540	10.36	47.53
67	8,768	15.13	58.67
68	9,057	20.84	78.87
69	9,058	27.32	98.86
70	9,206	31.27	109.13
71	9,319	36.01	127.27

figure was taken from LAB minus LAB^e.

DEP^e: Depreciation of capital in the export sector at 1965 prices in Korean won.

DEP^d: Depreciation of capital in the domestic sector at 1965 prices in Korean won.

The basic data for the artificial export-oriented development model are given in Table 8 above.

As to the variables included in tables 4, 5 and 6 in the text, the following explanation is given:

EXP_i represents gross foreign exchange earned through exports in domestic prices for export commodity i. In the I-O tables, EXP was calculated at f.o.b. export times 275.0 (foreign exchange rate) less commercial and transportation margins. But, since these figures were different from domestic prices of the same goods in Korea, they were adjusted again by multiplying the average ratio of export prices to domestic prices.

IIN represents the value of imported inputs per unit of output at domestic prices.

r_{ji} represents the elements of the matrix of direct and indirect input requirements, showing the inputs required by the i-th industry from the j-th industry in the production of unit of export commodity.

NFX_i represents the net foreign exchange (value added) at world prices in terms of domestic currency with export assistance provided.

s represents the percentage of export assistance per unit of foreign exchange earned by exports.

${}^{E}NFX_i$ represents net foreign exchange (value added) without export assistance.

EEA_i represents effective export assistance, calculated by

$$\frac{DCO_i - {}^{E}NFX_i}{{}^{E}NFX_i}. \quad \text{Here, } DCO_i = TEX_i - \sum IIN_i r_{ji}$$

where TEX_i represents total receipts of export sales of industry i including various export assistance. The estimation of EEA was based on the use of undeflated non-traded inputs. That is, the domestic value of the inputs from construction, gas, electricity and all other services was assumed to be equivalent to their shadow prices in foreign prices. If one uses undeflated non-traded inputs, then the rate of effective export assistance tends to increase since the value added in world prices is lower than it would be otherwise. The accounting prices of the non-traded inputs are usually lower

than the domestic market value.

φ represents the total domestic resource cost per unit of net foreign exchange earned for export commodity i. representing the static comparative advantage of each export commodity.

φ^* represents the effective foreign exchange-cost comparison taking into account effective export assistance.

φ^{**} represents the dynamic exchange-cost comparison taking into account the accounting price of *KAP*, 14.0 per cent, in its calculation. The figure 14.0, was employed from Professor K.C. Han's "The estimation of capital coefficients in Korea," 1970.

φ^{***} represents the rate of change between periods t and o of φ^{**}.

II. Validity Tests of the Model

In this section, the predictive ability of the model is evaluated. In evaluating the model's predictability, it is a common practice to reduce the structural system to a form in which every partial and total effect is summarized. As is well known, the structural equation describes the economic mechanism in terms of direct determinants, but economic analysis should be based not only upon structural, direct relationships but upon total, indirect relationships as well, indirect effects being certainly relevant. In the reduced form, each endogenous variable is expressed as a function of all the predetermined variables alone. In matrix symbols it is written as:

$$DEV=PDV\pi+RES \quad \cdots\cdots(1)$$

where DEV=the matrix of observations on the jointly dependent variables;

PDV=the matrix of observations on the predetermined variables;

π=the reduced form coefficient which is a non-linear function of all the structural coefficients;

RES=the reduced form residual which is a linear function of all the structural residuals.

This reduced form (1) is derived from

$$DEV\Gamma+PRV\xi+\mathrm{DIS}=0 \quad \cdots\cdots(2)$$

where Γ=the coefficients of the jointly dependent variables;

ξ=the coefficients of the predetermined variables;

DIS=the matrix of values of the disturbances.

Postmultiplying the structural equation (2) through by Γ^{-1}, and rearranging, the reduced form (1) can be obtained, where

$$\pi = -\xi\Gamma^{-1}$$
$$\text{and } RES = -DIS\Gamma^{-1}$$

Each reduced form coefficient measures the total marginal effect upon an endogenous variable of unitary change in a predetermined variable with all other predetermined variables held constant. In technical terms, it is the partial derivative of some endogenous variables with respect to a particular predetermined variable. That is,

$$\partial DEV/\partial PDV = \pi \quad \cdots\cdots (3)$$

The π's are called impact multipliers, because they express that part of the response of endogenous variables to changes of predetermined variables which occur in the first year. Because of lagged endogenous and exogenous variables in the system, the impact multipliers are different from the dynamic multipliers.

The predictive performance of the model through reduced form forecasts can be examined under two different sets of conditions. That is, the test within the sample period and beyond the period of sample observation. Also, the predictive tests can be classified into an ex post and an ex ante prediction test. This section will first investigate the predictive effectiveness of the model within the sample period with the total method of ex post reduced-form forecasting (besides the other two methods of ex post forecasting using the estimated econometric model which are denoted the partial or structural method and the final method). In the total method the observed values of the predetermined variables are inserted in the system for each year in order to obtain the forecast value of endogenous variables. More specifically, the ex post reduced form test with the total method consists of substituting into the estimated structural equations the observed values of predetermined variables for the future year in question, then of solving the system of equations for the current endogenous variables, and of comparing the results (i.e., the model's ex post forecast values) with the actual values of these variables.

Figure 12 EXP^c

Structural Estimation:

——— Actual $\bar{R}^2=0.9987443647$

…… Estimated

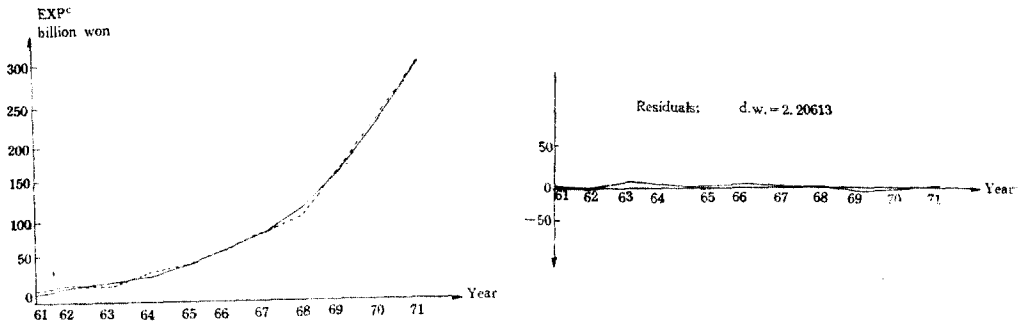


Figure 13-1 IMP^{r1-c}

Structural Estimation:

——— Actual $\bar{R}^2=0.9997015833$

…… Estimated

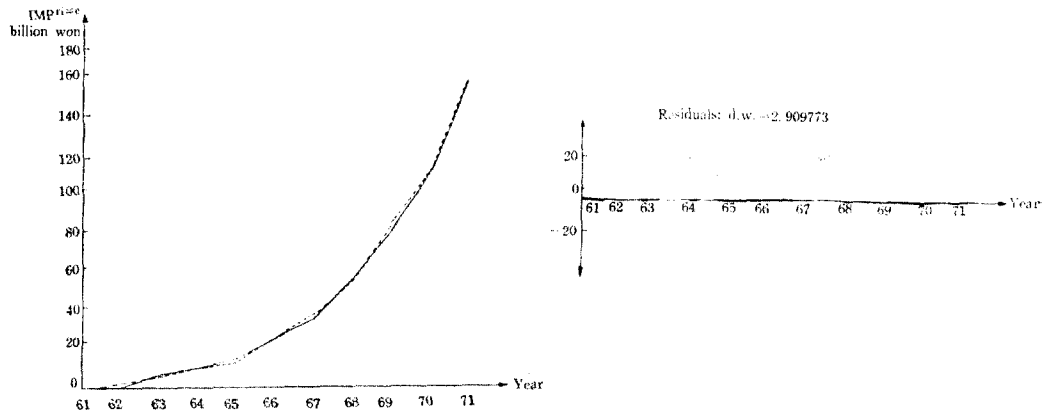


Figure 13-2　　IMP^{ri-e}

Simulation Test:

Actual　　Predicted

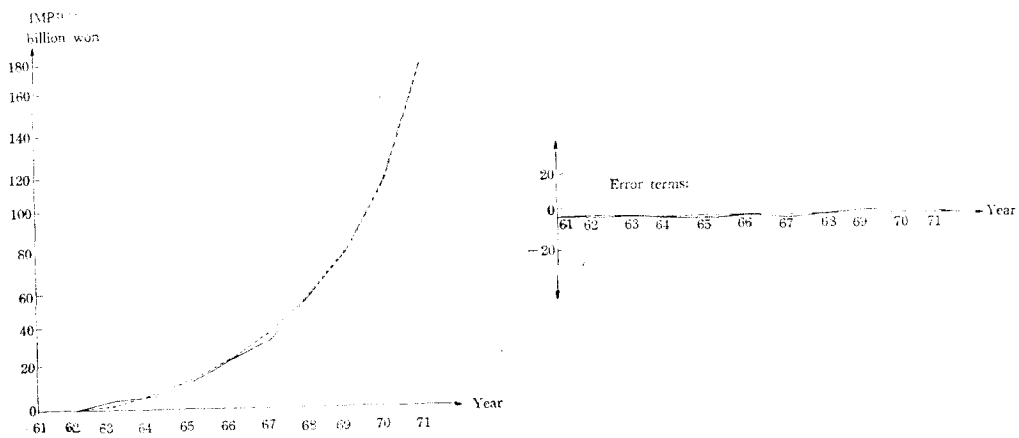


Figure 14-1　　IMP^{ri-d}

Structural Estimation:

Actual　　$\bar{R}^2=0.793314\,6546$

Estimated

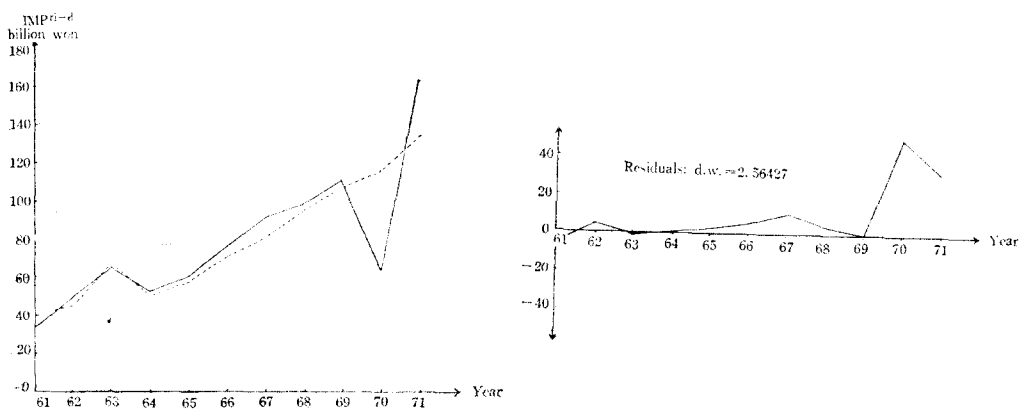


Figure 14-2 IMP^{ri-d}

Simulation Test:

——— Actual ····· Predicted

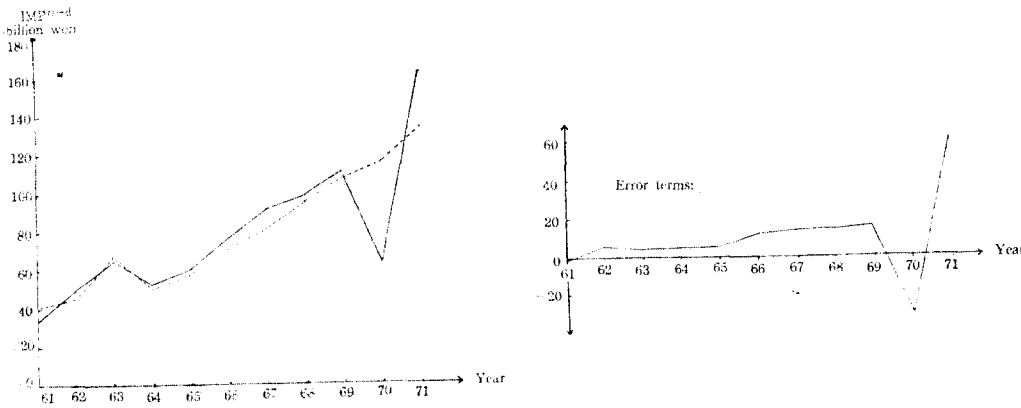


Figure 15-1 IMP^{p-i}

Structural Estimation:

——— Actual $\bar{R}^2 = 0.906661504$

····· Estimated

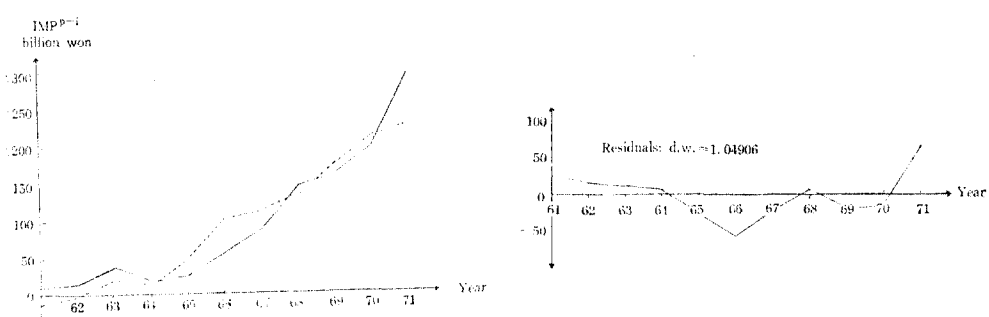


Figure 15-2　　IMP^{b-i}

Simulation test:

—— Actual　　…… Predicted

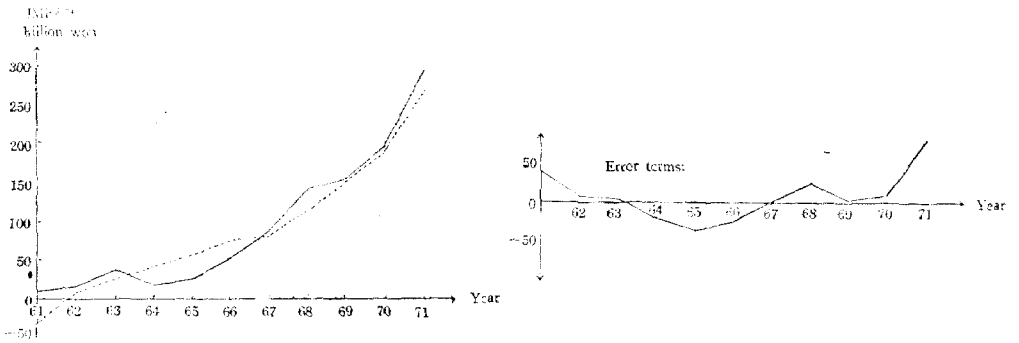


Figure 16-1　　IMP^{s}

Structural Estimation:

—— Actual　　$R^2=0.9771960409$

…… Estimated

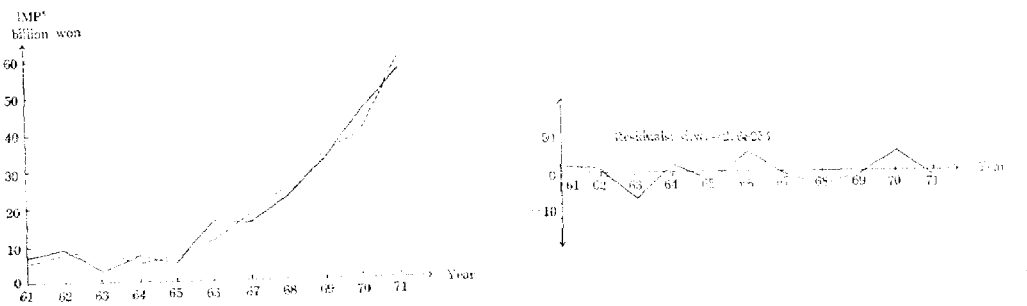


Figure 17-2 IMP^s

Simulation test:

——— Actual ····· Predicted

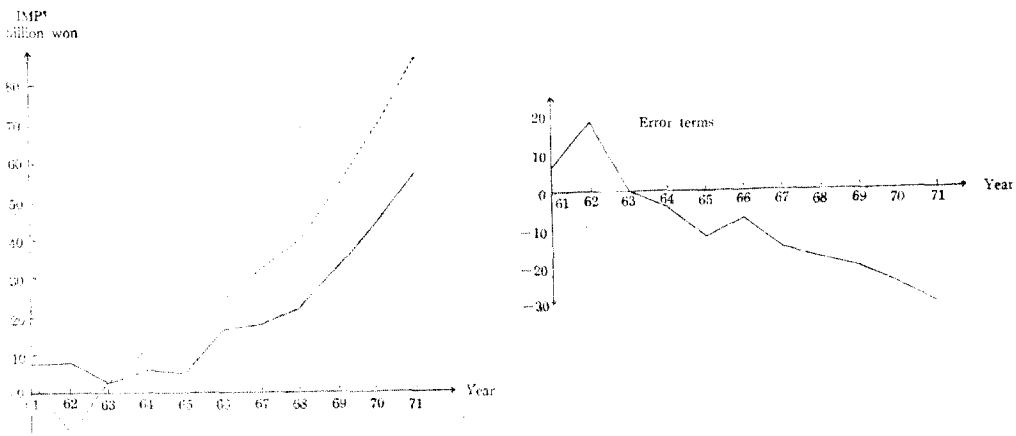


Figure 18-1 INV^{p-e}

Structural Estimation:

——— Actual $\bar{R}^2=0.9159431179$

····· Estimated

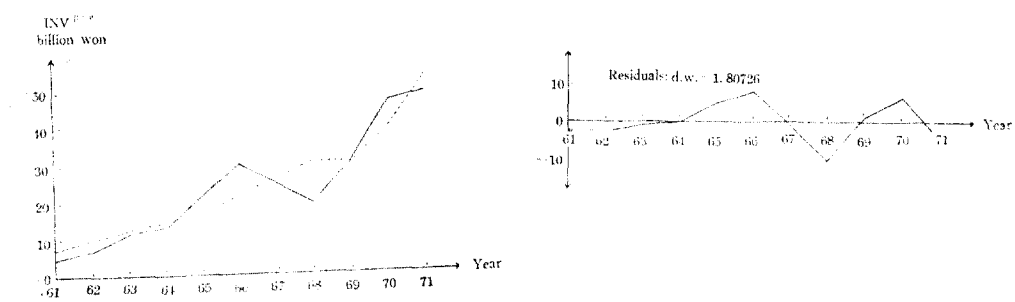


Figure 18-2　　IMP^{p-e}

Simulation test:

——— Actual　　…… Predicted

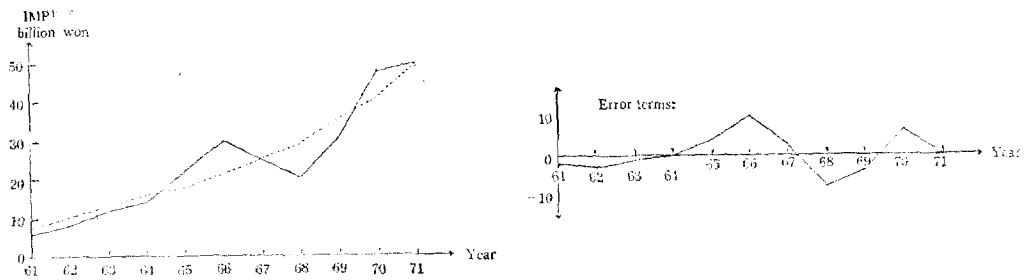


Figure 19-1　　INV^{p-d}

Structural Estimation:

——— Actual　　$\bar{R}^2=0.9484559156$

…… Estimated

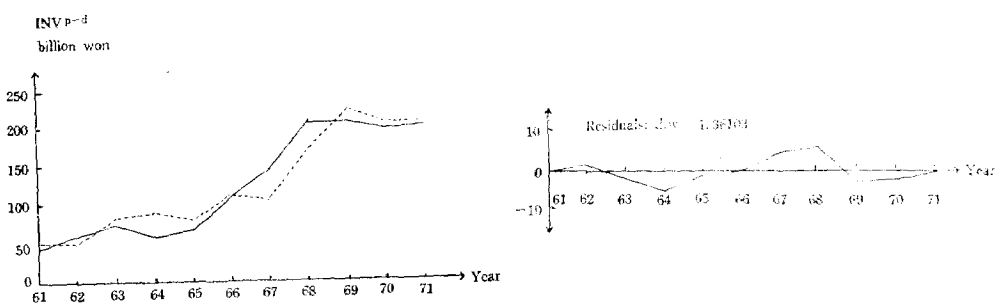


Figure 19-2 INV^{p-d}

Simulation test:

——— Actual ……Predicted

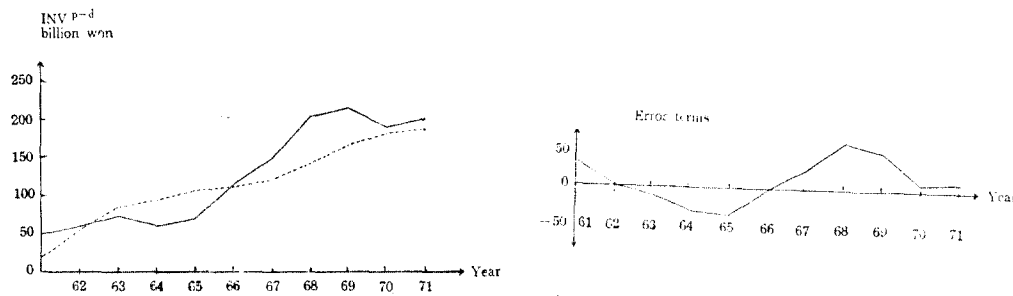


Figure 20-1 *SAV*

Structural Estimation:

——— Actual $\bar{R}^2=0.9791018799$

…… Estimated

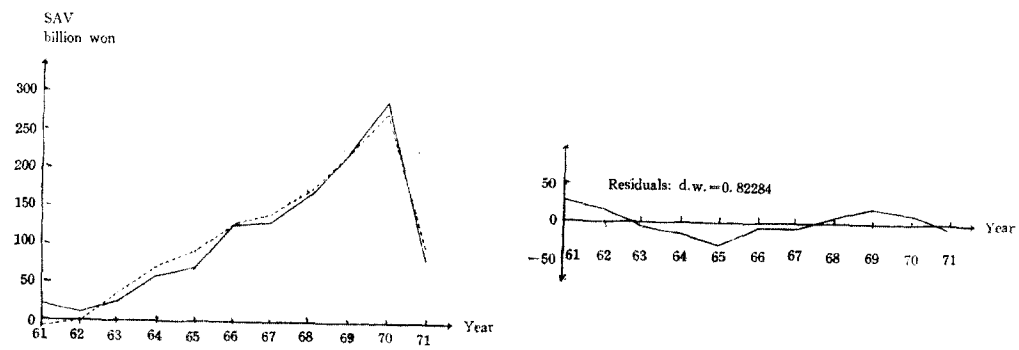


Figure 20-2　　***SAV***

Simulation test:

——— Actual　　…… Predicted

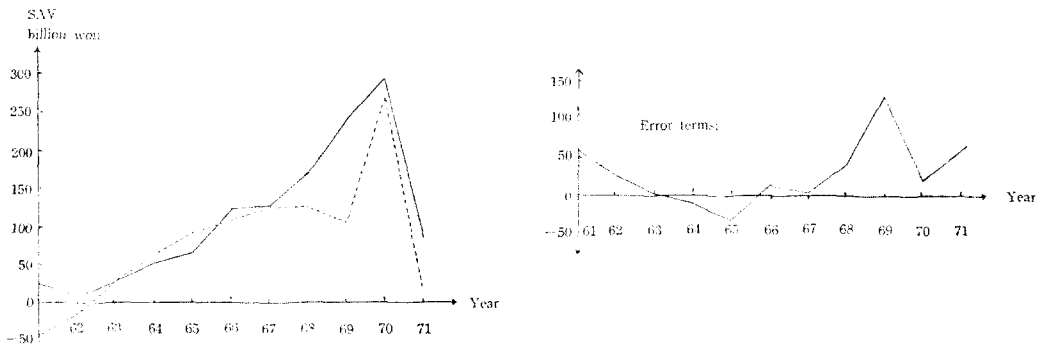


Figure 21-1　　***GDP^e***

Structural Estimation:

——— Actual　　$\bar{R}^2$=0.9560429321

…… Estimated

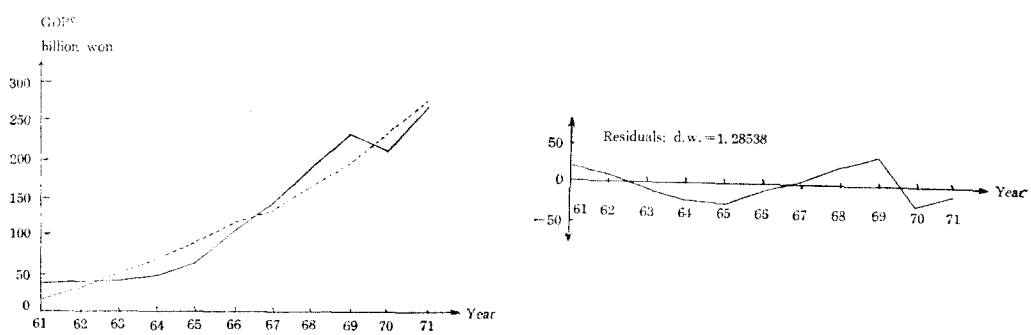


Figure 21-2 GDP^d

Simulation Test:

——— Actual ····· Predicted

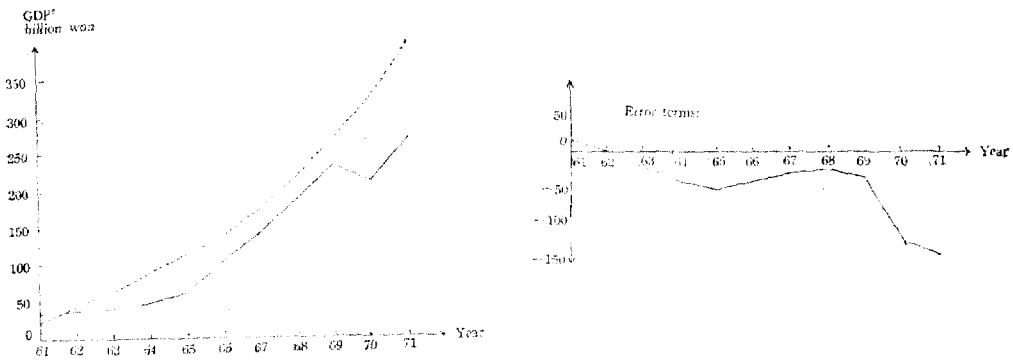


Figure 22-1 GDP^d

Structural Estimation:

——— Actual $\bar{R}^2=0.9956829744$

····· Estimated

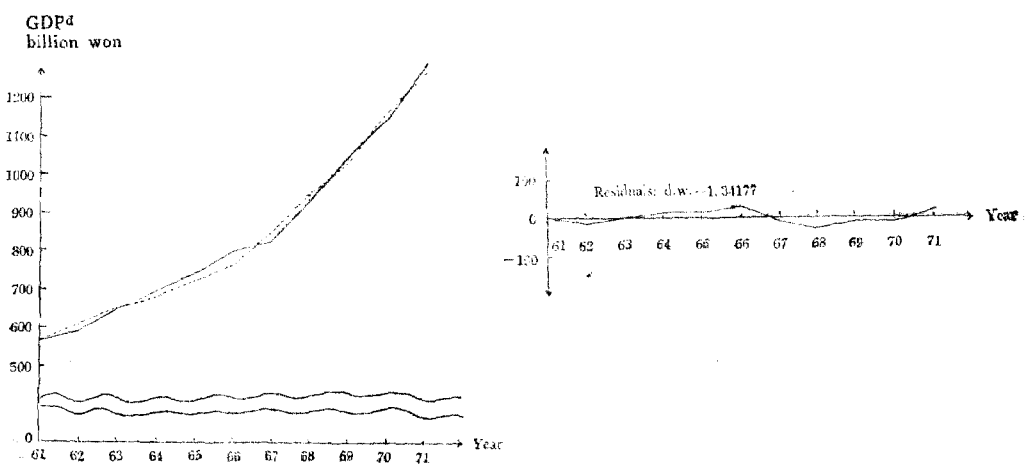


Figure 22-2　　***GDP^d***

Simulation Test:

——— Actual　　……Predicted

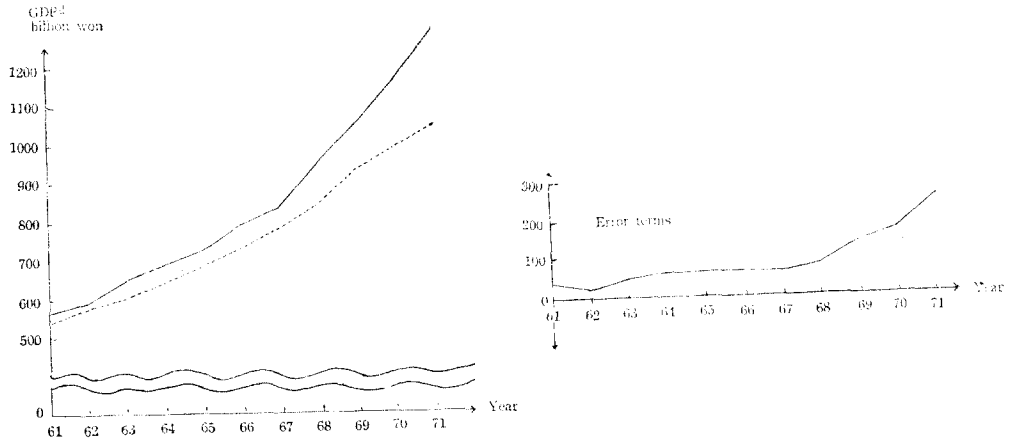


Figure 23-1　　***NFX***

Structural Estimation:

——— Actual　　$\bar{R}^2$=0.9371272556

…… Estimated

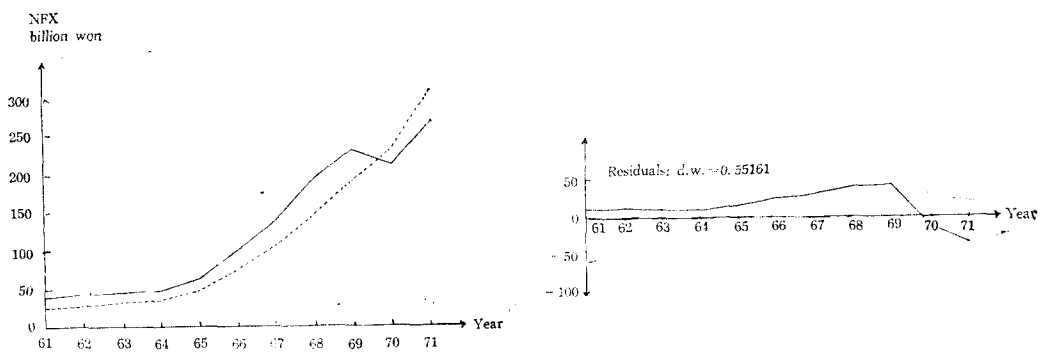


Figure 23-2 ***NFX***

Simulation test:

——— Actual ····· Predicted

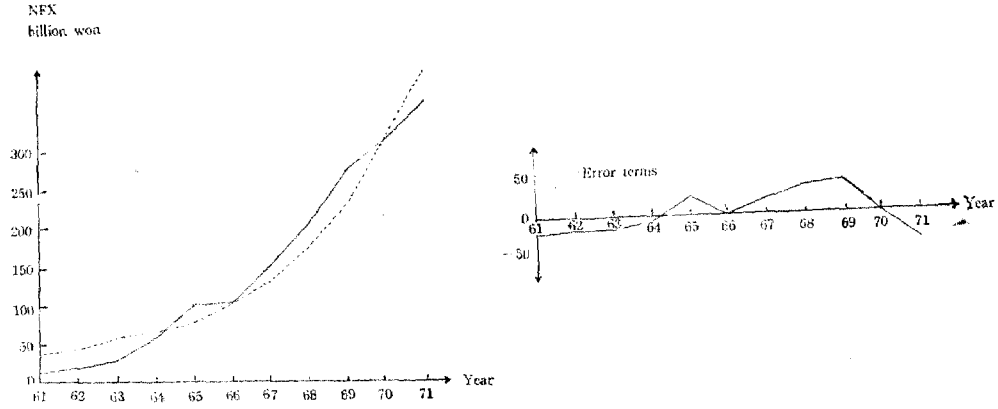


Figure 24-1 ***DEP^e***

Structural Estimation:

——— Actual $\bar{R}^2 = 0.9736223681$

····· Estimated

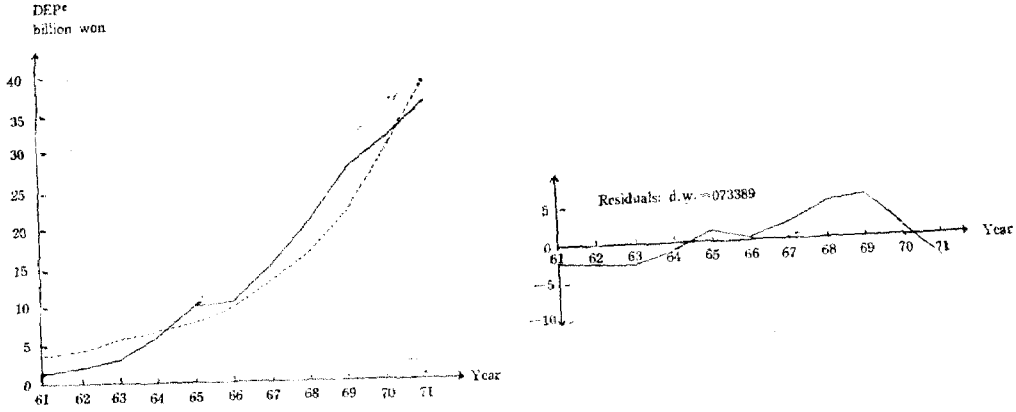


Figure 24-2

DEP^e

Simulation test:

——— Actual　　…… Predicted

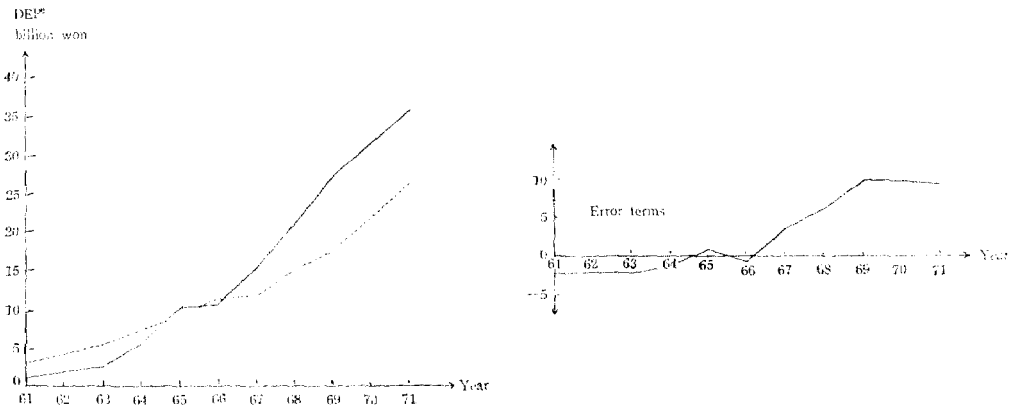


Figure 25-1

DEP^d

Structural Estimation:

——— Actual　　$\bar{R}^2=0.9973239193$

…… Estimated

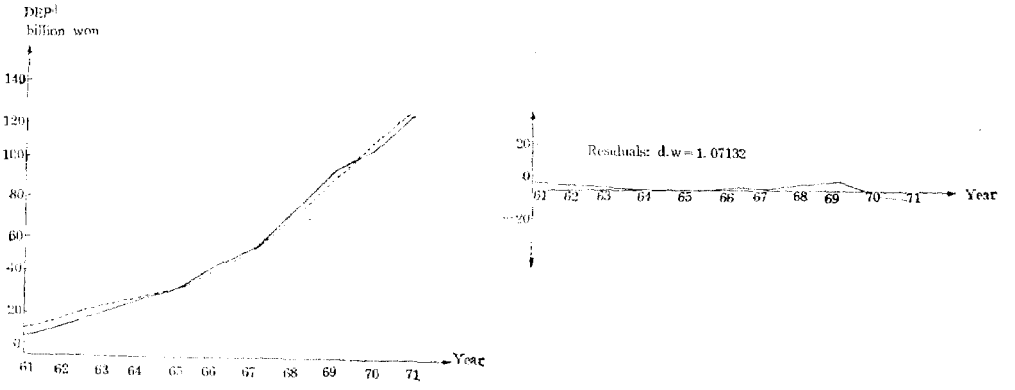
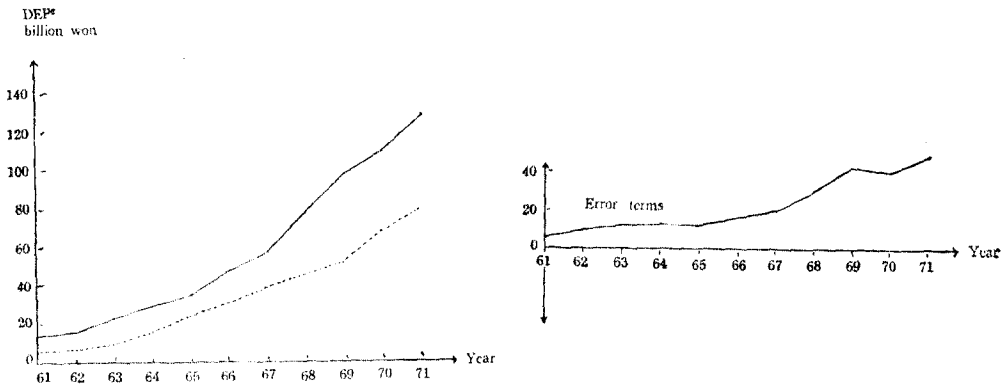


Figure 25-2 ***DEP^d***

Simulation test:

Actual ..... Predicted



Line charts of the derived values of endogenous variables are presented in Figures (12)-(25) above along with their observed values, and together with line charts of the values derived using the simulated method. Through these line charts, one can determine whether or not the model fails to simulate the working of the economy in the period 1961-1971.

All the graphs are supplemented by the relevant statistics employed for evaluating the model's capablility to reproduce the time series, from which the structural estimates applied to the forecasts period are the coefficient of determination, R^2, and the Durbin-Watson statistics, d.w.

As shown above, the results derived from this econometric model were not totally satisfactory, the broad objectives of the model construction having been only partially attained. The study may be termed successful in the sense that it could provide some quantitative information on structural characteristics of the economy. It had relatively satisfactorily specified the structural relationship among the economic variables within the system framework in quantitative terms. On the other hand, the study was not particularly successful when judged by the criterion of the predictive

power of the model. The reduced form forecasting test of the model(by the total method) revealed unsatisfactory performance in model prediction for some variables for both the sample period and beyond the sample period. The model developed in this study is thus in preliminary form, and much remains to be done in the direction of analysing the system in response to exogenous shocks and changes in conditions determining the reliability and validity of the model.

One of the main reasons why the results of this model were relatively unsatisfactory was first, concerned with the Korean economy itself. It lacked an autonomously regulated mechanism since several important variables were exogenously controlled by policy makers causing a "political cycle" as cited by Kalecki. Too many exogenous variables are not desirable in an econometric model.

The economic development of Korea during the 1960's was complex and could not be explained straightforwardly by general economic theory. In particular, socio-political and non-quantifiable economic factors played an important role as constraints on economic development, and the economic structure was likely to change in a relatively short span of time with irregular feedback effects being at work.

Again in Korea, there were no stable and long-term periods of observation. The 1950's were quite different from the 1960's in terms of the quality and rate of change of the economic structure, as indicated earlier. Only since 1961 has the Korean economy experienced quantitative expansion and qualitative change. Hence, the number of observations was limited to fewer than 11. In this regard, the small sample theory was applicable to the analysis of the Korean economy. Furthermore, during the period 1961-1971, the economy developed non-linearly as shown above. From this, there might arise a problem of conflict between the real economic phenomena and the treatment of the model as a linear equational system. Strong multicollinearity among the important variables was another difficulity when the econometric model of the Korean economy was dealt with.

Further, the model was not fully disaggregated over various sectors. Fiscal and monetary policies were not considered in detail. The role of expectations was not dealt with whilst the importance of technical progress in economic development was neglected. Consumption was again dealt with

as a residual. Thus, it is obvious that the results were only illustrative.

The lack of suitable data was another factor responsible for the somewhat unsatisfactory results. The collection and publication of statistics along the lines suitable for econometric uses were rather limited. The coverage, weight, and index problems in relation to data were also unsatisfactory, to say nothing of the assumptions made in the compilation of the data, as mentioned in Appendix 1.

Selected Bibliography

Bibliography (1) discussing on the relationship between exports and economic development

B. Balassa: "Trade Policies in Developing Cuntries," *AER*, May 1971.

R.E. Baldwin: *Economic Development and Export Growth: A Study of Northern Rhodesia, 1920-1960* (University of California Press, 1966).

R.E. Ball and P. Draker: "Export Growth and the Balance of Payments," *MS*, May 1962, pp.105-119.

P.K. Bardhan: *Economic Growth, Development and Foreign Trade* (Wiley-Interscience, 1970).

R.E. Baldwin et al: *Trade, Growth and the Balance of Payments* (Rand McNally, 1965).

K. Berrill: "International Trade and the Rate of Economic Growth," *Economic History Review*, XII, April 1960, pp. 351-359.

R. Bhagwati and J. Cheh: "LDC Exports: A Cross-Sectional Analysis", in *International Economics and Development, Essays in Honor of R. Prebisch* edited by L.E. Di Marco (Academic Press, 1972) pp.181-192.

I.Blumenthal: "Exports and Economic Growth in Postwar Japan," *QJE*, November 1972, pp.617-631.

A.K. Caincross: "International Trade and Economic Development," *Kyk*, 1960, pp.545-558.

E.J.Chambers and D.F. Gordon: "Primary Products and Economic Growth: An Empirical Measurement," *JPE*, August 1966, pp.315-332.

B. Cohen: "The Stagnation of Indian Exports, 1951-1961," *QJE*, 1364.

R.N. Coopers: "Growth and Trade: Some Hypotheses about Long-term Trends," *Journal of Economic History*, 1964.

G. Cukor: *The Role of Import Substitution and Export Development in the Industrialization of Developing Countries* (1970).

R.E. Emery: "The Relation of Exports and Economic Growth," *Kyk*, Vol. 120, (1967), 2, pp.470-486.

W.D. Freithaler: *Mexico's Foreign Trade and Economic Development* (Praeger, 1968).

M. Ghali: "Exports, Investment and Regional Growth," *Southern Economic Journal*, October 1973.

A.K. Das Guptta:(ed.) *Trade Theory and Commercial Policy* (Asia Publishing House, 1965).

N. Halevi: "Effective Devaluation and Exports: Some Issues in Empirical Analysis;with Illnstrations from Israel," *Economica*, August, 1971, pp.292-300.

G.K. Helleiner: "Manufactured Exports from Less Devloped Countries and Multinational Firms," *EJ*, No. 329, March 1973, pp.21-47.

C.W. Hulton: "Exports and Economic Growth: A Survey," *Land Economics*, May 1967. G. Haberler: *International Trade & Development* (New York, Harper & Row, 1963).

H.J. Johnson: *International Trade and Economic Growth* (Allen and Unwin, 1958).
"Sugar Protectionism and the Export Earnings of LDCs," *Ec*, February, 1966.

H. Kanamori: "Economic Growth and Exports," in *Economic Growth*, ed. L. Klein and K.Ohkawa (Irwin, 1968), p.319.

C. P. Kindleberger: "Foreign Trade and Economic Growth: Lessons from Britain and France 1850 to 1913," Economic History Review, 1961.
"Foreign Trade and Growth: Lessons from British Experience since 1913," *Lloyds Bank Review*, 1962.
Foreign Trade and National Economy (Yale University Press, 1962).

I.B. Kravis: "The Role of Exports in Nineteenth-Century United States Growth," *Economic Development and Cultural Change*, Vol. 20, No. 3, April 1972, pp.387-405.

H.B. Lary: *Imports of Manufactures from Less Developed Countries* (NBER, 1968).

N.H. Leff: "Tropical Trade and Development in the Nineteenth Century: The Brazilian Experience," *JPE*, Vol.81, No.3 Lay/June 1973, pp.678-696.

S.B. Linder: *Trade and Trade Policy for Development* (Praeger, 1966).

An Essay on Trade aud Transformation (John Wiley, 1961).

I.M.D. Little, T. Scitovsky and M. Fg. Scott: *Industry and Trade in Some Developing Gountries: A Comparative Study* (Oxford University Press for OECD, London, 1970). Separate studies contain: S.R. Lewis Jr. on Pakistan, T. King on Mexico, J.H. Power, G. Sicat & M. Hsing on The Philippine & Taiwan, J. Bergsman on Brazil, and J. N. Bhagwati & P. Desai on India.

H.B. Malmgren: *Trade for Development* (Washington Overseas Development Council, 1971) p.40.

A. Maizels: *Exports and Economic Growth of Developing Countries* (Cambridge University Press, 1968); *Industrial Growth and World Trade* (National Institute of Economic & Social Research, Cambridge University Press, 1968). "Trade and Development Problems of UDC," *National Institute Economic Review*, May 1964.

B.F. Massell: "Exports, Capital Imports and Economic Growth," *Kyk*, 1964. P.N. Mathur: "Gains in Economic Growth from International Trade," *Kyk*, 1963.

G.M. Meier: *International Trade & Development* (New York, Harper & Row, 1963).

E.J. Mishan: *Growth. The Price We Pay* (Staples Press, 1969) pp.167-176.

H. Myint: "International Trade and the Developing Countries," *International Economic Relations*, 1968, pp.15-35.

H. Neisser and F.Modigliani: *National Incomes and International Trade* (University of Illinois Press, 1953).

R. Nurkse: *International Trade Theory and Development Policy, in Economic Development for Latin America*, edited by H.S. Ellis.

S.J. Patel: "Export Prospects and Economic Growth," *Indian Economic Journal*, September 1959.

J. Pincus: *Trade, Aid and Development* (McGraw Hill, 1967).

R. Resnick: "The Decline of Rural Industry under Export Expansion: A Comparison among Burma, Philippines, and Thailand, 1870-1938," *Journal of Economic History*, Vol. 30, March 1970.

C.W. Reynolds: "Development Problems of an Export Economy: The Case of Chile and Copper," in M. Mamalakis and C.W. Reynolds, *Essays on the Chilean Economy*. (Irwin, Inc., 1965) pp.203-398.

A.J. Robinson: "Exports and Economic Development," *Quarterly Review of Economics & Business*, VI, Autumn 1966, pp.63-74.

M. Roemer: "The Dynamic Role of Exorts in Economic Development: The Fishmeal Industry in Peru, 1956-66," Ph.D. dissertation, MIT, 1968.

M. Saint Marc: "The Role of Foreign Trade in Economic Expansion," *Rev. Econ.*, July 1967(French).

I. Sachs: *Foreign Trade and Economic Development of Underdeveloped Areas* (Asia Publishing House, 1965).

A.K. Severn: "Exports and Economic Growth: Comment," *Kyk*, Vol.21 (1968), 3, pp.546-548.

M. Singh: *India's Export Trend and the Prospects for Self Sustained Growth* (Oxford Clarendon Press, 1964). Prosperity through Exports, (Calcutta Engineering Export Promotion Council, 1965).

T.N. Srinivasan: "Foreign Trade and Econmic Development," *Metroeconomica*, 1965.

B. Soedersten: *A Study of Economic Growth and International Trade* (Almgvist and Wicksell, 1964).

J.T. Thoburn: "Exports and Economic Growth in West Malaysia," *OEP*, March, 1973.

"Exports and the Malaysian Engineering Industry: A Case Study of Backward Linkage," *BOUIES*, May, 1973.

G.M.Tibout: "Exports and Regional Economic Growth," *JPE*, April 1956, pp.160-169.

B.A. De Vries: *The Export Experience of Developing Countries* (The John Hopkins Press, 1961).

J. Viner: *International Trade & Economic Development* (1952).

R.S. Weckstein(ed.): *Expansion of World Trade and the Growth of National Economies* (Harper Torchbooks, 1961).

P.D. Zook: *Economic Development and International Trade* (Southern Methodist University Press, 1959).

Bibliography (2) discussing on the process of export-oriented growth

B. Balassa: "Some Observations on Mr. Beckerman's 'Export propelled Growth Model," *EJ*, Dec. 1963, pp. 782 and subsequent reply and rebuttal *n EJ*, 1964. "An Evaluation of the Strategy of Export-Induced Growth in Norway, with emphasis on the Relationship between the Export of Manufactured Goods

and Industrialization, IMF, Economics Department, Working Paper No. 24, August 1968.

W. Beckerman & F. Dewhurst, et al: "Projecting Europe's Growth," *EJ*, Dec. 1962, pp. 912-25; *Europe's Needs and Resources* (Twentieth Century Fund, 1961).

W. Beckerman and Associates: *The British Economy in* 1975 (Cambridge University Press, 1965).

R. Buckley: "The Role of Staple Industries in Ganada's Economic Growth," *Journal of Economic History*, December, 1958.

R. Caves; and R.H. Holton: *The Canadian Economy: Prospect and Retrospect* (Harvard University Press, 1959).

R. Caves: "Export-led Growth: The Post-War Industrial Setting," *in Induction, Growth and Trade*, Essays in Honour of Sir Roy Harrod edited by W.A. Eltis, M. Fg. Scott, & J. N. Wolfe (Oxford Clarendon Press, 1970), pp. 234-254.

"Vent-for-surplus Models of Trade and Growth," *in Trade, Growth and the Balance of Payments:* Essays in honour of G. Haberler, R.E. Baldwin, et al. pp. 95-115.

"Export-led Growth and the New Economic History," *in* J.N. Bhagwati, et al, (eds.) *Trade, Balance of Payments and Growth*, Papers in International Economics in Honour of Charles P. Kindleberger (Noth-Holland Publishing Co., 1971) pp. 403-442.

W.M. Cordon: "The Effects of Trade on the Rate of Growth" *in Induction, Growth and Trade:* Essays in Honour of Sir Roy Harrod edited by W.A. Eltis, M. Fg. Scott, & J.N. Wolfe, (Oxford Clarendon Press, 1970), pp. 117-143.

A.G. Ford: *The Gold Standard 1880-1914, Britain and Argentina* (Oxford Clarendon Press, 1962) pp. 110-132.

J.E. Haring: "Export Industrialization and Economic Growth: a Dynamic Model," *Western Economic Journal*, April, 1962-63, pp. 114-126.

J.E. Haring & J.F. Humphrey: Simple Models of Trade Expansion," (abstract) *Western Economic Journal*, Spring 1964, pp. 173. N. Kaldor: "Conflict in National Economic Objectives," *EJ*, Vol. 81, March 1971, pp. 1-16.

"Dual Exchange Rates and Economic Development," *Essays on Economic Progress* (Duckworth, 1954)

C.P. Kindleberger: "Foreign Trade and Economic Growth: Lessons from Britain

and France 1850 to 1913," *Economic History Review*, 1961, pp. 289-305; "Foreign Trade and Growth: Lesson from British Experience since 1913," *Lloyed Bank Review*, No. 65, July 1962, pp. 16-28; *Economic Development* (McGraw Hill, Kogakusha, 1965), pp. 306-13; *Foreign Trade and the National Economy*, pp. 205-11.

I.B. Kravis: Trade as a Handmaiden of Growth, Similarities between the 19th and 20th Centuries, University of Pennsylvania, Discussion Paper No. 105.

A. Lamfulussy: *The UK and the Six: An Essay on Economic Growth in Western Europe*, pp. 110-20.

R. Lubitz: "Export-Led Growth in Industrial Economies," *Kyk*, Vol. XXVI, 1973, Fasc. 2, pp. 307-321.

M. Roemer: *Fishing for Growth: Export-led Development in Peru, 1950-1967* (Harvard University Press, 1973).

Adam Smith: *The Wealth of Nations*, edited by Edwin Cannon (Random House, Inc., 1937).

R.M. Stern: *Foreign Trade and Economic Growth in Italy* (Praeger, 1967).

G.P. Sicat: "A Design for Export-Oriented Industrial Development," I.E.D.R., Discussion paper 69-4, 20 June, 1967.

M.D. Thomas: "The Export Base and Development Stages Theory of Regional Economic Growth," *Land Economy*, November 1961.

UNIDO: Report on Activities and Progress of Work of UNIDO. Development of Export-Oriented Industries, ID/B/8, 7 March 1967.

M.H. Watkins: A Staple Theory of Economic Growth," *Canadian Journal of Economics & Political Science*, XXIX, May 1963, pp. 141-158.

Bibliography (3)　discussing on export promotion and import substitution

H.B. Chenery: "Pattern of Industrial Growth," *AER*, 1960, pp. 624-651.

A.O. Hirshman: "The Political Economy of Import-Substituting Industry: Latin America," *QJE*, 1968, pp. 1-3.

P.C. Mahalanobis: "The Approach of Operational Research to Planning in India," *Sankhya*, Dec. 1955, pp. 3-130; "Next Step in Planning" and "Industrialization of Underdeveloped Countries—by Means to Peace," *Sankhya*, 1960.

S. Marcos and others: "Protection and Industrialization in Latin America," "The

Growth and Decline of Import Substitution in Brazil," *Economic Bulletin for Latin America*, Vol. IX, No. 1, March 1964.

R. Prebisch: *The Economic Development of Latin America and its Principal Problems* (UN, 1956).

D.M. Schydlowsky: "From Import Substitution to Export Promotion for Semi-Grown-up Industries: A Policy Proposal," Harvard Economic Development Report, No. 54, or J.D.S. Vol. III, No. 4(July 1967).

UNCTAD: Proceedings of the UNCTAD, Vol. III, (E/Conf. 46/141 Vol. IV) pp. 42-84.

UNIDO: Industrial Development Survey: International Symposium of Industrial Development, 1967, Report of the International Symposium on International Development, 1967.

Bibliography (4) discussing on a possible departure from the static comparative advantage

J. Bhagwati: *The Theory and Practice of Commercial Policy: Departure from Unified Exchange Rates*, (International Finance Section, Department of Economics, Princeton University, 1968);

"The Theory of Comparative Advantage in the Context of Underdevelopment and Growth," *PDR*, Autumn 1962, pp. 339-353;

"The Generalized Theory of Distortions and Welfare," *in Trade, Balance of Payments and Growth*, Papers in International Economics in Honor of Charles P. Kindleberger, edited by J. Bhagwati, et. al. (North-Holland Publishing Co., 1971) pp. 69-70.

"Some Recent Trends in the Pure Theory of International Trade," *International Trade Theory in a Developing World*, edited by R. Harrod and D.C. Hague, pp. 22-30.

J. Bhagwati & V.K. Ramaswami: "Domestic Distortions, Tariffs and the Theory of Optimum Subsidy," *JPE*, Feb. 1963, pp. 44-50. Domestic Distortion Tariffs: The Theory of Optimum Subsidy: Some further Results. MIT Working Paper, No. 29, Oct. 1968.

G. Haberler: "Some Problems in the Pure Theory of International Trade," *EJ*, June 1950, pp. 223-40.

F.D. Graham: *Protective Tariffs* (Harper and Brothers, 1934).

H.G. Johnson: "Optimal Trade Intervention in the Presence of Domestic Distortions." *in* R.E. Baldwin et, al., *Trade, Growth and the*

Balance of Payments (Rand McNally, 1965) pp. 3-31.
"A new view of the infant industry argument" *in Studies in International Economics* edited by I.A. McDougall and R.H. Snape, 1970, pp. 59-82.

N. Kaldor: "Dual Exchange Rates and Economic Development," *Essays on Economic Progress* Vol. II, Chapter 19, (Duckworth 1954), pp. 178-197.

R.W. Klein: "A Dynamic Theory of Comparative Advantage," *AER*. March 1973.

S.P. Magee: "Factor Market Distortions, Production and Trade: A Survey." *OEP*, March 1973.

H. Myint: "The 'Classical Theory' of International Trade and Underdeveloped Countries," *EJ*. June 1958, pp. 317-337.

S.K. Nath: *A Re-appraisal of Welfare Economics* (Routledge and Kegan Paul, 1969) pp. 189-212.

R. Prebisch: "International Trade and Payments in an Era of Coexistence: Commercial Policy in the Undeveloped Countries," *AER*, May 1959.

V.K. Ramaswami & T.N. Srinvasan: "Optimum Subsidies and Taxes when Some Factors are Traded," *JPE*, 1968, pp. 569-582.

Bibliography (5)

discussing on the demand conditions in both external and internal markets.

B.Balassa: "Comment on H. Linnemann's Book," *Emet*, 1968.
Size and Trade Pattern: A Note. IBRD Working Paper, No. 27.

H.B. Chenery: "Patterns of Industrial Growth," *AER*, 1961, pp. 624-653; "Effects of Resources on Growth Patterns" *in Proceeding of the Gamagori Conference of the International Economic Association* edited by K. Gerrill, 1963.

D.B. Keesing: "Population and Industrial Development: Some Evidence from Trade Patterns," *AER*, 1968.

S. Kuznets: "Quantitative Apects of the Economic Growth of Nations: II, Industrial Distribution of National Product and Labour Force," *Economic Development and Cultural Change*, July, 1957, 5 Suppl. Also, Size of Nations.

W.A.Lewis: *Development Planning: The Essentials of Economic Policy* (Unwin 1966) pp. 38-43.

H. Linnemann: *An Econometric Study of the International Trade Flows* (North-

Holland, 1966).

A. Maizels: *Growth and Trade* (Cambridge University Press, 1970) pp. 41-56.

L.T. Taylor: "Development Patterns: A Simulation Study," *DES*, 1968.

J. Timbergen: *Shaping the World Economy* (The Twentieth Century Trend, 1962).

UN Centre for International Development: *A Study of Industrial Growth* (U.N., 1963).

Bibliography (6) discussing on the relative contribution of exports and import substitution to economic growth

J. Ahmad: Recent Patterns of Growth in the Indian Economy, Harvard University, Economic Development Report No. 55, April 1967.

B. Balassa & Associates: *The Structure of Protection in Developing Countries* (The Johns Hopkins University, 1971).

E. Bacha & L. Taylor: "Foreign Exchange Shadow Prices: A Critical Review of Current Theories," *QJE*, May 1971.

B. Balassa & D.M. Schydlowsky: "Effective Tariffs, Domestic Cost of Foreign Exchange, and the Equilibrium Exchange Rate," *JPE*, July 1968, p. 348-360.

M. Bruno: Development Policy and Dynamic Comparative Advantages, *in* Universities-National Bureau Committee for Economic Research: Conference on Technology and Competition in International Trade, October 1968.

A.K. Dasgupta and D.W. Pearce: *Cost-Benefit Analysis: Theory and Practice* (Macmillan 1972).

P. Eckstein: Accounting Prices as a Tool of Government Planning, Harvard University, Economic Development Report, No. 53. March 1967.

N. Islam: "Comparative Costs, Factor Proportions and Industrial Efficiency in Pakistan," *PDR*, 1967, pp. 213-246; "Tariff Protection, Comparative Costs, and In dustrialization in Pakistan," Mimeographed Research Paper, No. 57, (Karachi, Pakistan Institute of Development Economics, Jan. 1967); "Export Incentive and Efficient Subsidy in Pakistan: An Evaluation," *BOUIES*, 1969, No. 4, pp. 169-188; "Commodity Exports, Net Foreign Exchange Earnings and Investment Criteria," *PDR*, Winter 1968.

H.G. Johnson: "Tariffs and Ecocomic Development," *PDR*, Oct. 1966, pp.

3-30.

A.O. Krueger: "Some Economic Costs of Exchange Control: The Turkish Case," *JPE*, Oct. 1966, pp. 466-480.

R. Mallon: "Export Policy in Pakistan," *PDR*, 1966, pp. 306-79.

H. Myint: "Market Mechanism and Planning, The Functional Aspect" *in The Structure and Development in Asian Economics*, Proceedings of a Conference held by Japan Economic Research Centre, Sept. 1968, pp. 282-313.

G. Myrdal: *Asian Drama*, Vol. II, chs. 19 and 20; *Economic Bulletin for Asia and the Far East*; Vol XII, No. 3, Dec. 1967, p. 7.

D.M. Schydlowsky: "Short-Run Policies in Semi-Industrialized Economies," *Economic Development and Cultural Change*, April 1971, Latin American Trade Policies in the 1970's: A Prospective Appraisal," *OJE*, 1971.

"From Import Substitution to Export Promotion for Semi-Grown-up Industries: A Policy Proposal," Harvard Economic Development Report No. 54 or JDS. Vol. III. No. 4 (July 1967).

R. Soligo & J.J. Stern: "Some Comments on the Export Bonus, Export Promotion and Investment Criteria," *PDR*, 1966, pp. 38-35.

"Tariff, Protection, Import Substitution and Investment Efficiency," *PDR*, 1965, pp. 249-270.

For another approach to empirical measurement of the relative contribution of exports and import substitution to growth in income per capita, see the following articles:

M. Bruno: "Optimal Patterns of Trade and Development," *RES*, 1969, pp. 545-554, especially p. 548.

P.K. Bardhan: "Optimum Trade and Development Policy in a Dual Economy" *in Trade, Balance of Payments and Growth 1971*, *ibid*, pp. 69-90.

H.B. Chenery: "Patterns of Industrial Growth," *AER*, 1960, pp. 624-653;

The Process of Industrialization, Economic Development Report, No. 1, Sept. 1965, Project for Quantitative Research in Economic Developments, Center for International Affairs, Harvard University, Cambridge, Massachusetts. The Process of Industrialization, Economic Development Report, No. 146, December 1969.

"The Pattern of Japanese Growth, 1914 to 1954,"

S. Shishido & T. Watanabe: *Emet*, Vol. 30, No. 1, Jan. 1962, pp. 98-139.

H.B. Chenery & L.T. Taylor: "Development Patterns; Among Countries and Over Time," *RES*, 1968, pp. 391-416.

H.B. Cheinery & P. Eckstein: Development Alternatives for Latin America, Harvard Economic Development Report No. 29, September, 1967.

UN Department of Economic and Social Affairs: *A Study of Industrial Growth* (1963).

Recently, a variety of linear or non-linear programming approaches have been adopted for the same purpose. See the following:

R.S. Eckaus and P.N. Rosenstein-Rodan(ed.) Analysis of development problems, studies of the Chilean economy (North-Holland/American Elsevier, 1973); Especially chapter 6. Investment project analysis in terms of a model of optical growth, by L. Taylor, pp. 167-196.

H.B. Chenery, et al: *Studies in Development Planning* (Harvard University Press, 1971).

H.B. Chenery & K.S. Kretschmer: "Resource Allocation for Economic Development," *Emet*, 1956, pp. 365-399.

A. Nagi and J. Stahl: "The Optimum Volume of Foreign Trade and the Exchange Rate," *Emet*, 1967, pp. 143-153.

R. Repette: "Optimal Export Taxes," *QJE*, August, 1972, pp. 396-406.

UNIDO: Evaluation of Industrial Projects: Project formulation and Evaluation Series, Vol. I, Selected Studies presented at the Interregional Symposium on Industrial project evaluation held in Prague, 11 to 29, Oct. 1965, (UN, 1968).

UN: Planning the External Sector: Technique, Problems and Policies. Report on the First Interregional Seminar on Development Planning, ST/TA/SER. C/91. 1967, pp. 88-135.

Bibliography (7) discussing on the econometric model building

1. Books

F.G.Adams et al: An Econometric Analysis of International Trade (OECD, ESS, 1969).

I. Adelman and Thorbecke E. (eds.): *The Theory and Design of Economic Development* (Johns Hopkins Press, 1966).

R. Agarwala: *An Econometric Model of India, 1948-1961* (Frank Case, 1970).

T. Barna: *Structural Interdependence and Economic Development* (Macmillan, 1963).

A.H. Conrad: *Econometric Models in Developing Planning* (H.U. DAS, EDR, 21, 1966).

Central Statistical Office: *National Income Statistics, Sources and Methods* (Her Majesty's Stationery Office, 1956).

J.S. Dusenberg, G. Fromm, L.R. Klein and E. Kuk: *The Brookings Quarterly Econometric Model of the United States* (North-Holland Publishing Co., 1965).
The Brookings Model; Some Further Results (North-Holland Publishing Co., 1969).

P.J. Dhrymes, et al: Criteria for Evaluation of Econometric Models, Annals of Economic & Social Measurement, 1/3, 1972.

ECAFE: Sectoral Aspects of Long-term Economic Projections with Special Reference to Asia and the Far East (U.N. 1969).

A.S. Goldberger: *Impact Multipliers and Dynamic Projections of the Klein-Goldberger Model* (North-Holland Publishing, 1959).

S.S. Han and H.H. Liesner: Britain and the Common Market, The Effect of Entry on the Pattern of Manufacturing Production, (University of Cambridge, Occasional papers, 27, 1971).

M.K. Evans: An Econometric Model of the French Economy, A Short-Term Forecasting Model, OBCD, Economic Studies Series, March 1969.

G. Fromm and P. Taubman: *Policy Simulations with an Econometric Model* (North-Holland, 1963).

A. Ghosh: *Planning, Programming and Input-Output Models: Selected Papers on Indian Planning* (Cambridge University Press, 1968).

K. Hilton and D.E. Heathfield: *The Econometric Study of the United Kingdom* (Macmillan, 1970).

R.A. Gordon & L.R. Klein: *Readings in Business Cycle* (1965).

Government of Japan, Economic Planning Agency: *Econometric Models for Medium-term Economic Plan, 1964-1968.*

E.S. Kirsches (ed.): *A World Income & Trade Model for 1975.* (North-Holland Publishing Co., 1970).

L.R. Klein: *An Economic Model of the United Kingdom* (Blackwell, 1961).

W. Leontief: *Studies in the Structure of the American Economy, Theoretical and Empirical Explorations in the Input-Output Analysis* (Oxford

University Press, 1953).

E.E. Leamer and R.H. Stern: *Quantitative International Economics* (Allyn and Bacon, 1970).

G.J. Mishan: The Price We Pay (Staples Press, 1969). OECD: Quantitative Models as Aid to Development Assistance Policy, Report by the Expert Group on the Uses of Analytical Techniques (OECD, 1969).

P. Pavlopoulos: *A Statistical Model for the Greek Economy, 1949-59* (North-Holland, 1966).

O.E.C.D.: Productivity and Economic Planning (OECD, 1972).

H. Reichart: *Optimization Problems in Planning Theory* (Centre for Planning and Economic Research, Athens, 1971).

K. Sangha: *Productivity and Economic Growth* (Asian Publishing House, 1964).

M .Fg. Scott: *A Study of United Kingdom* (Cambridge University Press, 1963).

J. Timbergen: *On the Theory of Economic Policy* (North-Holland Publishing Co., 1952).

L.R. Westphal: *Planning Investments with Economies of Scale* (North-Holland, 1971).

2. *Articles*

I. Adelman & C.T. Morris: 'An Econometric Model of Development,' *AER*, 1968.
'Performance Criteria for Evaluating Economic Development Potential: An Operational Approach,' *QJE*, 1968.

P.K. Bardhan: "Optimum Trade and Development Policy in a Dual Economy," *in Trade, Balance of Payments and Growth*, Papers in International Economics in Honor of Charles P. Kindleberger, eds. by J.N. Bhagwati, et al. (North-Holland Publishing Co. 1971).

M. Bruno, et al.: 'Dynamic Input-Output, Trade and Development' *in* A.P. Carter and A. Brody ed. Applications of Input-Output Analysis(North-Holland, 1970).

M. Bruno: 'A Programming Model for Israel', *in* Adelman and Thorbecke (eds.), *The Theory and Design of Economic Development* (1966).

B.J. Cohen: 'Measuring the short-run impact of a country's import restriction on its exports' *QJE*, Aug. 1966.
'Relative effects of foreign capital and larger exports on

economic development,' *RESt*, May, 1968.

H.S. Cheng: 'A Collection of Elasticities & Propensities in International Trade', IMF Staff Papers, Vol. 7, April 1959.

E.F. Denison: Why Growth Rates Differ: Post-War Experience in Nine Western Countries (Washington, D.C., 1967). The Sources of Economic Growth in the United States and the Alternatives Before Us. Supplementary Paper No. 13 (New York: U.S. Committee for Economic Development, 1962).

C.F. Diaz-Alejandro: Planning the Foreign Sector in Latin America, Yale University Economic Growth Center Paper No. 154, 1970.

J.W. Eaton: Effective Devaluation as an Export Incentive in Less Developed Countries, Development Advisory Service and Project for Quantitative Research in Economic Development, Harvard University, Economic Development Report, No. 221, July 1972.

M.K. Evan: A Kew Way of Using Aggregate Economic Models; Industry Forecasts with Econometric Model, Pennsylvania University, Wharton Schol of Einance and Commerce, Discussion Paper 138, 1969.

G. Fane: Import Substitution and Export Expansion: Their Measurement and an Example of Their Application, Development Advisory Service and Project for Quantitative Research in Economic Development, Harvard University, Economic Develop ment Report No. 179, January 1971.

G. Garb: 'The Problem of Causality in Economics,' *Kyk*, 1964.

H. Giersch: 'The Trade Optimum,' *Weltwirtschaftliches Archiv*, 1965.

J. de V. Graaff: "On Optimal Tariff Structure," *RES*, No. 42, 1949-50.

J.M. Holmer: 'An Econometiric Test of Some Modern International Trade Theories: Canada 1870-160.' Purdue Universty Institute Papers, 170, 1967.

H.S. Houthakker and S.P. Magee: Income and Price Elasticities in World Trade, Harvard Institute of Economic Research, Discussion Paper Series No. 64, 1969.

L.R. Klein: 'Wnat Kind of Macroeconometric Model for Developing Economies?', in Anold Zellner, ed., *Reading in Economic Statistics and Econometrics* (Little, Brown and Company, 1968).

W. Leontief: 'Domestic Production and Foreign Trade: The American Capital Position Re-examied'. Proceedings of the American Philosophical Society, XCVII, (Septembre 1953).

J.M. McGeehan: 'Competitiveness: A Survey of Recent Literature' *EJ*, June 1968.

A.S. Manne: Multi-Sector Models for Devleopment planning: A Survey Technical Report No. 91, Institute for Mathematical Studies in the Social Sciences, Stanford University, March 1973.

J.R. Meyer: 'An input-output approach to evaluating the influence of exports on British industrial production in the late 16th century', Exporations in Entrepreneurial History, VIII, 1655.

Marc Nerlove: 'A Quarterly Econometric Model for the United Kingdom: A Review Article,' *AER*, March, 1962.

J.L. Nicholsom: 'The Measurement of Quality Changes' *EJ*, 1967.

J.B. Nugent: 'Linear Programming Models for National Planning Demonstration of a Testing Procedure', *Emet*, Nov. 1970.

B. Ohlin: "Model Construction in International Trade Theory" in *Induction, Growth and Trade*, Essays in Honour of Sir Roy Harrod edited by W.A. Eltis, M. Fg. Scott and J.N. Wolfe (Oxford Clarendon Press, 1970).

S.J. Prais: 'Econometric Research in International Trade: A Review' *Kyk*, 62.

W.J. Raduchel: A General Equilirium Model for Development Advisory Service and Project for Quantitative Research in Economic Development, Harvard University, Economic Development Report Report No. 186, February 1971.

J.D. Richardson: "On Improving the Estimate of the Export Elasticity of Substitution," *Canadian Journal of Economics*, V, No.3, August 1972.

W.F. Stolper and K.W. Boskamp: 'An Input-Output Table for East Germany with Applications to Foreign Trade,' *BOUIS*, 1961.

H.O. Stekler: 'The Sources of Forecast Errors' Stony Brook Working Papers No.87, State Universty of New York, February 1973.

B. Suits: 'Forecasting and Analysis with an Econometric Model,' *AER*, March 1962.

L. Taylor & S.L. Black: 'Practical General Equilibrium Estimation of Resource Pulls under Trade Liberation', Harvard Development Research Paper, July 1971.

Bibliography(8) discussing on the Korean economy and research data

I. Adelman and M. J. Kim: 'An Econometric Model of the Korean Economy', in Irma Adelman, ed., *A Practical Approach to Development Planning*

(John Hopkins University Press, 1969).

B. Balassa: Suggestions for Formulating Korea's 1976 Export Program (mimeo.), Seoul, 1969.

Bank of Korea: Monthly Statistical Review, Seoul, May 1972. National Income Statistics Yearbook, 1971, (Seoul, 1971).
Statisttcs for Business Cycle Forecasting, (Seoul: Sam-shin Publishing Co., 1971).
Economic Statistics Yearbooks, 1961-71, Seoul, (1961-71).
Table for Capital Estimation of Imports (mimeographed).
Statistical Data for Economic Analysis, 1971.

D.C. Cole & P.N. Lyman: 'Korean Development: The Interplay of Politics & Economics'. 1970 (HU. DAS).

C.R. Frank, K.S. Kim and L.E. Westphal: Foreign Exchange, Trade Policy, and Economic Growth in Korea, Chapter 8, 1972, (Unpublished manuscript).

D. Kendrick, and L. Taylor: "A Dynamic Nonlinear Planning Model for Korea," in I. Adelman (ed.), *Practical Approaches to Development Planning* (Baltimore: John Hopkins Press, 1969).

M. Kim and R. Norton: "A Stabilization Model for Korea," Paper Presented at the Second Far Eastern Meeting of the Econometric Society, Tokyo, June-July, 1967.

S. Kim: Foreign Capital for Economic Development; A Korean Case Study (Praeger Special Studies in International Economics and Development, 1970).

Korea Development Institute: Growth Strategy for Overall Resources Budget Plan (Seoul: March, 1972).

P.W. Kuznets: Korea's Emerging Industrial Structure, ILCORK Discussion Paper, 1971.

Office of Customs Administration: Statistical Yearbook of Foreign Trade, 1961-71, Seoul.

Office of National Tax Administration: Statistical Yearbook of National Tax, 1971, Seoul(November, 1971).

Professorial Evaluation Team: Evaluation Report of the Fourth Year of the Second Five-Year Plan (Seoul, 1971).

G. Ranis: The Role of the Industrial Sector in Korea's Transition to Economic Maturity, Economic Gowth Centre, Yale University, presented to 'Industrialization in Korea,' ILCORK Conference, August 32-29, 1971, Seoul, Korea.

R.A. Sedjo: "Combining Regression Analysis and Input-Output in Korea's Third Five-Year Plan," Unpublished paper (1972).

L. Westphal & I. Adelman: Reflections on the Political Economy of Planning; The Case of Korea, ILCORK Conference, August 22-29, 1971, Seoul, Korea.

List of Abbreviations

AER: American Economic Review
BOUIES: Bulletin of Oxford University Institute of Economics and Statistics
Ec: Economica
EJ: Economic Journal
Emet: Econometrica
JIE: Journal of International Economics
Kyk: Kyklos
OEP: Oxford Economic Papers
PDR: Pakistan Development Review
QJE: Quarterly Journal of Economics
RES: Review of Economic Studies
RES$_t$: Review of Economics & Statistics