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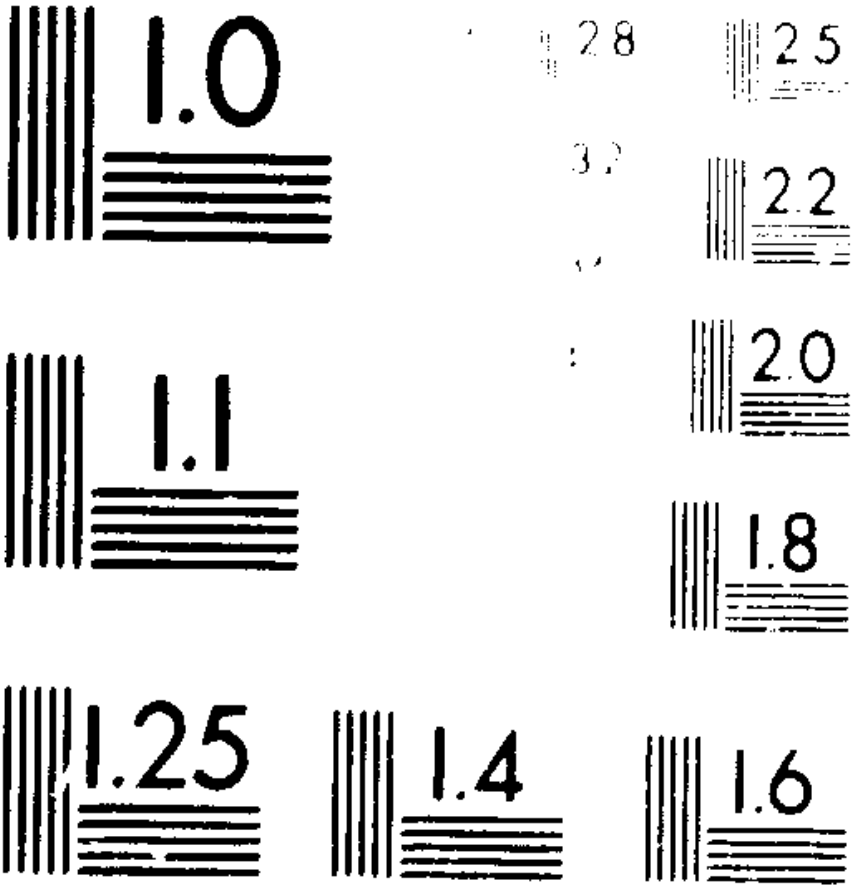

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THE BUILDING-UP OF CAPITAL GOODS INDUSTRY IN THE DEVELOPING COUNTRIES: AN INVESTMENT PLANNING APPROACH

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Preface

The build-up of a producer goods capacity has been identified historically as basic to the process of economic development. In the context of Soviet industrialization, it was seen as a means to increase the investment coefficient and the rate of growth. Recently, the creation of a machinery sector has been viewed as a necessary condition for the indigeneous generation of "appropriate" technology. The importance of capital goods exports to the Asian periphery in the economic history of Japan has also been recognized. Nevertheless, while historical examples cannot be ignored, neither can it be assumed that history will repeat itself, or that the build-up of a producer goods capacity will quickly transform poor countries into rich ones. Such a build-up, depending on how it is financed, may involve a sharp increase in foreign indebtedness or heavier taxation of the poor.

It is against this background that this study was undertaken.

The Building-up of Capital Goods Industry in the Developing Countries: An Investment Planning Approach

INTRODUCTION

There is no doubt that the prevailing situation in various developing countries predetermines the aims, sequence and pace of industrial development. But, ultimately, a key to growth is the capacity of the domestic production of capital goods industry. For it facilitates to build a sound industrial base, which in turn leads to overall growth and development in any economy. In fact, the building-up of an appropriate structure of capital stocks is one of important necessary preconditions for a balanced and sustained growth over time.

As it was intended, the main orientation of this study lies in the spirit of co-operation that may be sought among developing countries of various regions in order to prepare a feasible scheme, based on a co-ordinated investment planning approach. Hence, it is simply obvious that any scheme of this kind could hardly be materialized without an active inter-government participation of the respective countries. In any case, as a first step, it is necessary to investigate the nature of investment planning in a given country. This may be considered as the main purpose of this study.

In view of this, Section I summarizes a model for investment planning, discusses the problem of financing in a mixed economy, and indicates the implication of dynamic input-output model. Section II gives a selected but brief empirical overview of the structure of production and trade in mixed economies; and Section III describes the relevance of Chinese experience in building-up capital goods industry. Finally, the study ends with a few concluding remarks.

Section I: An Analytical Framework

1. Optimal Investment

The literature on development planning pertaining to a mixed economy is found to be vast. However, in searching for any analytical framework that may provide a rationale for building up a capital goods sector, it is found that Professor Mahalanobis[1/] happens to be the first who provided such a rationale in the Second Five Year Plan of India. He argued that the shortage of savings, which was invariably considered to be the limiting factor for accelerating the rate of material capital formation, was mirrored in the inadequacy of capital goods production. This was a sort of structuralist approach in order to create the necessary preconditions for sustained growth. It recognized the point that, for a developing country, the problem lies in building up the physical productive capacity, and that the saving for the economic system as a whole is by and large physically determined by the amount of total accummulation. This brought a sort of change in the mode of thinking in India. According to Bhagwati and Chakravarty:[2/]
"This shift from a Keynesian, "flow" analysis which emphasized the necessity to raise savings (and hence implicitly assumed that the savings could be transformed into required investment) to a "structuralist" view which emphasized the transformation constraint and the supply of capital goods to sustain growing investment (which implicitly assumed that the system would generate the savings to finance the growing supply of investment goods) was the most dramatic episode in the evolution of planning literature and debate in India".

In any event, in the first model of Mahalanobis, which, incidentally, is also known as Feldman-Mahalanobis model in the literature, the economy was divided into two sectors: investment goods and consumption goods sector. These sectors were considered to be as more or less respectively vertically integrated. The most significant feature of the model was implied in the assumption of non-shiftability of capital stock between two sectors: it was the recognition of the fact that capital stocks were specific to the producing sector. In the recent literature

on vintage models of growth, emphasizing the implications of gross investment, technological progress and productivity growth overtime, it is elaborated that investment goods are general exante and therefore, maybe used to increase the capacity of both sectors. But expost the capital stock is to be considered specific to a particular sector for which it is specilized and in which it is installed.

In addition, the structure of production was characterized by fixed capital/output and labour/output ratios. Based on these assumptions, and as to emphasize the operational aspect of the model, Professor Mahalanobis made the suggestion that a higher share of investment be allocated to investment goods sectors. This was made in view of the implication of his model that higher proportions of capital goods output allocated to further production of capital goods would always have a favourable effect on the asymptotic growth rate of the system. But the choice of this ratio also implied a choice of an alternative path of consumption. However, this choice aspect was not fully elaborated. Moreover, while obtaining the main proposition of his model, Professor Mahalanobis did not pay much attention to the role of foreign trade in the process of transformation. It seems that his efforts were oriented towards the autonomous growth of the economy, and he took it for granted that the government was in a position to have control over the level and pattern of consumption.

Following the spirit of the Feldman-Mahalanobis model, K.N. Raj and A.K. Sen[3/] formulated a disaggregated model which was oriented towards the so-called "inward-looking" strategy of planning to a developing country which has hardly much scope for increasing its exports earnings. In the structure of this model there are four sectors: the consumption goods sector; the investment goods sector producing capital goods for the consumption goods sector; the machine goods sector producing capital goods for itself, for investment goods sector and for intermediate goods (raw materials) sector; and the intermediate goods sector.

Raj and Sen compared the alternative time path of the consumption under the allocation of limited foreign exchange between importing consumption goods, importing machine tools, importing raw materials and so on. However, their solution was found to be incomplete, and a somewhat more complete solution was obtained by A.B. Atkinson.[4/] In this paper it was emphasized that a correct import strategy can only be determined by taking into consideration the objective of the planning authority.

In view of the planning horizon and in the light of the objective function of weighted utility maximization overtime, representing the preference of the planners, Atkinson distinguished between two special cases. First, the objective may be to maximize the capacity of the consumption goods sector at the end of the presupposed planning horizon. Secondly, the total discounted value of consumption over the planning period may be thought to be maximized. Next, the optimal control theory has been used to discuss the implication of the basic assumption of the Raj-Sen model. This assumption implies that export earnings are limited by the growth of the demand and that shortage of foreign exchange becomes an operative constraint on the growth of the economy. It was found that the assumption of constraint on export earnings was rather unnecessary, and it was possible to include the growth of foreign exchange earnings in the evaluation provided that these are independent of the conditions on the supply side. Such a consideration envisages the application of the model to the oil-exporting countries.

In any case, in exploring the optimal investment strategies, a noteworthy departure from such objective functions has been made, among others, by Srinivasan,[5/] Kurz,[6/] and Stolreu.[7/] They consider the social objective of minimizing the time in order to reach full employment and balanced growth. As it may be pointed out, for a developing country with an excess supply of labour, the social welfare may be thought to be maximized by approaching in minimum time an economic stage characterized by full employment and appropriate structure of

capital stock. With this objective, in what follows, an exercise in optimal control process is carried out, subject to the constraints of production structure as envisaged in an extended version of the Mahalanobis model. In this respect, the economy is divided into three sectors: investment goods, consumption goods, and export goods, and the assumption of non-shiftability of capital stocks between sectors is maintained.

The Model

Structure

(1) $Q_i(t) = b_i K_i(t)$; where $i = 1,2,3$

(2) $L_i(t) = a_i K_i(t)$

(3) $L(0) \geq \sum a_i K_i(0)$

(4) $F(t) = Q_3(t)$

$Q_1(t)$: Output of investment goods in time t

$Q_2(t)$: Output of consumption goods "

$Q_3(t)$: Output of export goods "

$K_i(t)$: Capital stock in "

b_i: is a constraint parameter, representing output-capital ratio in the ith sector;

$L_i(t)$: Labour in the ith sector in time t;

a_i: is a constant parameter representing the degree of mechanisation;

$F(t)$: Foreign exchange obtained only through export.

Assuming that foreign exchange earnings are spent only on imports of investment goods and also that there exists a balance in foreign trade, the total supply of investment goods can be represented as:

(5) $F(t) + Q_i(t) = \sum_{i=1}^{3} \dot{K}_i(t)$; where $\dot{K}_i(t) \equiv \frac{dk_i(t)}{dt}$

And, the allocation of total supply of investment goods as decided by the planner is given by:

(6) $\dot{K}_i(t) = d_i\left(F(t) + Q_1(t)\right)$; $i = 1,2,3$; where $0 \leq d_i \leq 1$, and $\sum_{i=1}^{3} d_i = 1$ represent the allocation parameter.

The equation (6) represents the capital accummulation.

Based on the above structure, the problem of minimizing the time required to obtain the terminal state by determining an intertemporally optimal pattern of investment allocation is represented as below:

$$\text{Maximize} \quad -\int_o^T dt$$

Subject to:

$$\dot{K}i(t) = di(F(t) + Qi(t)), \; i = 1,2,2 \qquad (1^1)$$

$$0 \leq di \leq 1, \; \sum_{i=1}^{3} di = 1 \qquad (2^1)$$

$$F(t) = b3K3(t) \qquad (3^1)$$

$$Q1(t) = b1K1(t) \qquad (4^1)$$

$$Ki(o) > o, \; i = 1,2,3 \qquad (5^1)$$

$$Ki(T) > Ki(o) \qquad (6^1)$$

Now, in considering the maximum principle of Pontryagin et al.,[8/] the Hamiltonian (H) is formed as:

$$H = -1 + \sum_{i}^{3} \pi i(t) di \; (b1K1(t) + b3K3(t)) \qquad (7^1)$$

where

$Ki(t)$: state variables

di: control variables

$\pi i(t)$: the imputed price of the investment in the ith sector.

Furthermore $\pi i(t)$ are assumed to be continuous functions of t and satisfy the following equations:

$$\dot{\pi} i(t) = -\frac{\partial H}{\partial Ki(t)} \quad i = 1,2,3$$

i.e.

$$\dot{\pi}1(t) = -b1 \sum_{i=1}^{3} di\pi i(t) \qquad (8^1)$$

$$\dot{\pi}2(t) = o \qquad (9^1)$$

$$\dot{\pi}3(t) = -b3 \sum_{i=1}^{3} di\pi i(t) \qquad (10^1)$$

As regards the optimal policies, they are determined by maximizing H with respect to the control variables di subject to the restriction (2^1). All the same, it can be observed that H is maximized by putting di = 1 to the sector i that happens to have the highest social demand price of capital.

Next, based on the positive prices and while considering (8^1)-(10^1), it is easy to observe that $\dot{\pi}1(t) < o$, $\dot{\pi}3(t) < o$, and $\pi 2(t) = \bar{\pi} 2$ (a constant). Moreover, one can, in the light of this information, eliminate the case $\pi 2(o) > \max(\pi 3(o), \pi 1(o))$. For in this case the optimal policy would be characterized by d2 = 1, with d1 = d3 = o for all $o \leq t \leq T$, implying K1(T) = K1(0) and K3(T) = K3(0). This contradicts the conditions (6^1), that is, that the terminal full-employment capital stock is greater than the initial capital stock in each sector.

Hence, the two cases that need to be investigated are as follows:

(i) $\pi 1(o) > \pi 3(o) > \pi 2(o)$.

Now, during the period, when $\pi 1$ remains the highest of all prices, the rule of the game is that H will be maximized only if d1 = 1. Then, as it can be derived from (8^1)-(10^1),

$$\dot{\pi}1(t) = -b1\pi 1(t) \qquad (11^1)$$

$$\dot{\pi}3(t) = -b3\pi 1(t) \qquad (12^1)$$

The solution of this pair of differential equations can be obtained as:

$$\pi 1(t) - \pi 3(t) = \left[\pi 1(o) - \pi 3(o)\right] + \pi 1(o)\left[e^{-b,t} - 1\right] \times \left[1 - \left(\frac{b3}{b1}\right)\right] \qquad (13^1)$$

Based on (13^1) and the condition: $b1 > b3$, the optimal policies compatible with the terminal condition can be easily derived to be as given below:

$$\begin{cases} d1 = 1 \text{ for } o \leq t \leq t^1 \\ d3 = 1 \text{ for } t^1 \leq t \leq t^{11} \\ d2 = 1 \text{ for } t^{11} < t \leq T \end{cases}$$

where

$$t^1 = \frac{1}{b,} \ln \left(\frac{K1(T) + K3(o)^{b3/b1}}{K1(o) + K3(o)b3/b1}\right)$$

$$t^{11} = t^1 + \frac{1}{b3} \ln \left(\frac{K3(T) + K1(T)^{b1/b3}}{K3(o) + K1(T)b1/b3}\right)$$

$$T = t^{11} + \frac{K2(T) - K2(o)}{K3(T)b3 + K1(T)b1}$$

(ii) $\pi 3(o) > \pi 1(o) > \pi 2(o)$

This case is symmetrical to (i) and therefore similar results can be derived.

To sum up these qualitative characterizations of optimal policies heuristically, it can simply be stated that it all depends on the difference of output-capital ratio between the investment goods sector and the export goods sector. When the output-capital ratio happens to be higher in investment goods sector as compared with the export goods sector, the preference may be given in the allocation of investment to the investment goods sector during the first phase of the development. However, during the second phase of development, the resources of the economy must be diverted to the export goods sector. In any event, the consumer good sector is to be developed in the final phase. On the other hand, if the output-capital ratio is higher in the export goods sector than in investment goods sector, the order of the priority is changed. It seems warranted to start with the export goods sector, followed by the investment goods sector and in the last phase to the consumer goods sector. Thus in all cases, in order that an optimum path be obtained, the consumer goods sector is to be developed in the last phase of the time horizon.

But there remains still one problem untouched. This pertains to the determination of the structure of terminal capital stocks. It is therefore necessary to indicate as to how the numerical quantities of such terminal conditions be obtained.

First, after reaching the full employment, the investment policies that would obtain balanced growth at the natural rate of growth imply that:

$$\frac{\dot{Ki}(t)}{Ki(t)} = n, \quad i = 1,2,3 \ \forall\, t \geq T \qquad (1^{11})$$

and $$\frac{K1(T)}{K2(T)} = \frac{d1(T)}{d2(T)}, \ \frac{K3(T)}{K2(T)} = \frac{d3(T)}{d2(T)} \qquad (2^{11})$$

Now using the capital accumulation equation (b), i.e.:

$$\dot{K}i(t) = di\ (F(t) + Q1(t)),\ i = 1,2,3$$

or $$\dot{K},(T) = d1(T)\ (b3K3(T) - b1K1(T))$$

or $$\frac{\dot{K},(T)}{K,(T)} = d,(T)\ (b3\ \frac{K3(T)}{K,(T)} + b,)$$

$$= d,(T)\ b, + d3\ (T)\ b3$$
$$= n \qquad (3^{11})$$

Now (3^{11}) is a single equation in two unknowns d,(T) and d3(T). It is therefore necessary to choose either d,(T) or d3(T) as known. If d3(T) is given, the pattern of investment allocation required for balanced growth can be obtained as follows:

$$d,(T) = \frac{n - d3(T)b3}{b,} \qquad (4^{11})$$

and $$d2(T) = 1 - d,(T) - d3(T) = \frac{b1 - n - d3(T)(b1-b3)}{bi} \qquad (5^{11})$$

Next, let K*i(T), i = 1,2, be the full employment capital stocks. And if the full employment is obtained at time T then

$$L(0)e^{nT} = \sum_{i=1}^{3} ai\ Ki^*(T) \qquad (6^{11})$$

The equations (4^{11})-(6^{11}) and the relation (2^{11}) solve for the appropriate full employment capital stock structure.

Foreign Aid and Borrowing

The above model can easily be extended to discuss the problem pertaining to foreign aid and borrowing. In the case of a developing country receiving a constant amount of aid each year, it is easy to see that the capital accumulation equation (6) becomes:

$$\dot{K}i(t) = di(b_1K_1 + F + A), \quad i = 1,2,3$$

where A is the constant amount of aid.

In view of this, the qualitative features of the optimal policies pertaining to the investment allocation coefficient di remains the same as in the basic model. However, the significant effect of foreign aid is that it shortens the period of time taken to reach the full employment.

Borrowing

Suppose B is the constant amount of foreign capital available for borrowing and that D(t) is the external debt at the time t. Then

$$\dot{D}(t) = B + r\,D(t)$$

where r is the rate of interest paid on the outstanding debt. The solution of this differential equation gives

$$D(t) = \left(D(o) + \frac{B}{r}\right)e^{rt} - \frac{B}{r}$$

Thus $\frac{d}{dB}(rD(t)) = e^{rt} - 1$

However the Hamiltonian for this problem becomes:

$$H = -1 + \sum \pi i\, di(b_1K_1 + b_3K_3 + B) + \beta(t)(B + rD(t))$$

Thus, an additional state variable D(t) is introduced and corresponding $\beta(t)$ represents the imputed demand price for foreign capital. And

$$\dot{\beta}(t) = -\partial H/\partial D = -\beta(t)\, r$$

In considering this optimization model, the larger the amount of capital inflow, the less time it takes to reach the end point as obtained in the basic model. But as distinct to outright aid is that with an inflow of loan capital there is a possibility of adverse effects of borrowing in the recipient country due to payment of interest. It may happen that the interest payment on borrowing becomes larger than its contribution to gross domestic products. Thus there exists a case of conflict between a time-minimization and income maximization objective.

The expression for gross domestic product is:

$$y(t) = \sum_{i=1}^{3} Qi(t) = \sum^{3} biKi(t)$$

Now, after solving the differential equation for capital accumulation, it can be shown that:

$$\frac{dy(t)}{dB} = b, \quad \frac{dK,(t)}{dB} = e^{b,t} - 1$$

for the phase in which optimal policy requires d, = 1

Similarly

$$\frac{dy(t)}{dB} = b3 \quad \frac{dK3(t)}{dB} = e^{b3t} - 1$$

for the phase in which the optimal policy is d3 = 1.

Therefore, for phase

$$d, = 1, \quad \frac{dy}{dB} \gtreqless d(rD)/dB \text{ as } b, \gtreqless r$$

$$d3 = 1 \quad " \quad " \quad " \qquad \text{as } b3 \gtreqless r$$

It is necessary that the productivity of capital in both investment goods sector and export goods sector be greater than the interest rate, so that GDP on the time-minimal path is increased more rapidly than foreign interest payments.

2. Multi-Sector Models

Based on the pioneering contributions of Leontief, Multi-sector Models have been exhaustively used for Development Planning. A survey of such models is given by A.S. Manne.[9/] However, most of these models are essentially static in their analytical framework, and have been used to examine the consistency aspect of development planning in an open Leontief model. Nevertheless, certain attempts have been made to use partially closed models. In this respect, Leontief proposed a quasi dynamic model by closing the sytem with respect to investment demand components of final demand. This is given as below:

$$(1) \quad X(t) = A\,X(t) + B\left[X(t+1) - X(t)\right] + D(t)$$

where $X(t)$ = the gross output vector
$D(t)$ = the final demand vector, excluding investment
A = current input-output matrix
B = capital coefficient matrix

As implied by (1), a forward recursive solution requires that capital coefficient metrix B be non-singular. But considering the content of B, implying the origin and destination of investment goods, it is hardly likely to maintain the assumption of non-singularity, even in the case of developed economies, let alone in developing countries. This is so because the element bij (say) of matrix B represents the amount of stock of capital goods originating from the ith sector that sector j must have on hand for each unit of its production. Therefore it is not uncommon that some rows of matrix B contain only zero elements.

The issue of forward recursive solution relates to the question of whether (1) is a meaningful representation of a dynamic economy. In other words, the singularity of B implies a decrease in the dynamic order of the system. In any case, the equation (1) can be written as:

$$\underset{n\times n}{B}\,\underset{(n\times 1)}{X(t+1)} = \underset{(n\times n)}{(I-A+B)}\,\underset{(n\times 1)}{X(t)} - \underset{(n\times 1)}{D(t)} \qquad (2)$$

After making row operation on (2), it can be transformed as:

$$\begin{matrix} m \\ n-m \end{bmatrix}\!\!\begin{matrix} \\ \end{matrix}\!\!\begin{bmatrix} T \\ 0 \end{bmatrix}_{n} X(t+1) = \begin{bmatrix} G \\ H \end{bmatrix} X(t) = \begin{bmatrix} R \\ S \end{bmatrix} D(t) \qquad (3)$$

where the matrix T has the full rank $m \leq n$.

Now a necessary and sufficient condition for obtaining a sort of recursive solution of (3) is that the matrix $\begin{bmatrix} T \\ H \end{bmatrix}$ is non-singular.

To derive the recursive solution of (3), let

$$Z(t) = T\,X(t) \qquad (4)$$

Also

$$\begin{bmatrix} T \\ H \end{bmatrix}^{-1} = n \begin{matrix} m & n-m \\ \end{matrix}\!\!\begin{bmatrix} E & F \end{bmatrix} \qquad (5)$$

and from (3)

$$H\,x(t) = S\,D(t) \qquad (6)$$

Thus

$$X(t) = E\,Z(t) + F\,S\,D(t) \qquad (7)$$

and substituting (7) in (3) and using (4) the recursive equation

$$Z(t+1) = G\,E\,Z(t) + \left[G\,F\,S - R\right] D(t) \qquad (8)$$

with

$$Z(0) = T\,X(o) \qquad (9)$$

The vector $Z(t)$ is the vector representing the total stock of capital goods required to produce the output $X(t)$. And assuming the full utilization of capacity $Z(t)$ can be regarded as the total stock in hand in the period t.

Furthermore in view of the non-singularity of $\begin{bmatrix} T \\ \hline H \end{bmatrix}$ it can be stated that current total output in all sectors is uniquely determined from the total stock of capital goods, and the current demand for non-capital goods. In addition, it seems possible, given any vector of available capital stock, to determine how to divide this capital among the various industries in such a way that each industry fully utilizes its capital resources, but net production in non-capital goods is zero. With these economic interpretations, it seems possible to deduce the dynamic equation underlying a Leontief system.

3. Financing Aspect of Development

In order to seek an analytical framework for investigating the aspect of financing investment in the process of industrialization, it was thought to explore various alternatives that have been discussed in a model proposed by Kalecki.[10/] This model is based on the schema of expanded reproduction by Marx.

The simplest version of this model abstracts from foreign trade and government sector. In other words, the economic system is considered to be closed. However, in order to identify the saving potentialities, a distinction is made between social classes: capitalist, small entrepreneurs and workers. In considering the saving potentialities, it is assumed that any such possibility lies in the capitalist class. And, in order to characterize the production structure, the economy is divided into two vertically integrated sectors producing investment and consumption goods respectively.

As regards investment, it is to be understood as gross investment. In other words, it is used for the production of investment goods for the purpose of replacement and expansion of plant and equipment. In addition, the accumulation of inventories of both categories of goods are included in the gross investment. Hence, the aggregate consumption and investmen. have been made to coincide with the output of consumption goods and investment goods sector respectively.

Next, let $Yi(t)$, $Ci(t)$, $Si(t)$, $i = 1,2$, denote the value of production, consumption and gross saving in two categories of sectors in the ith period respectively. Then

$$Yi(t) = Ci(t) + Si(t),\ i = 1,2 \qquad (1)$$

In other words, the part of the incomes received in each category is consumed and the remaining is gross savings. The consumption goods in category I is of course from the output of category II, that is

$$C1(t) = S2(i) \qquad (2)$$

In other words, S2(t) is the unconsumed parts of profit in category II, which also means that the surplus of consumption goods in category II is sold to the capitalist, small entrepreneurs and workers in category I.

From (2), it is easy to obtain

$$C1(t) + S1(t) = S2(t) + S1(t) \qquad (3)$$

or

$$I(t) = S(t) \qquad (4)$$

I.e. the aggregate gross investment, which is also equal to the gross output of category I, is equal to the aggregate gross-saving. In short, the aggregate investment finances itself.

Assuming the existence of banking institutions, it is envisaged that there are two alternative ways in which the investment can be financed. These can be accomplished either through the liquid reserves of the firms, or by borrowing, including short and long term credits. As to understand the liquidity condition, the savings which are generated by accelerated investment accumulate as deposits in the banks. In other words, the investment creates its counterpart fund in saving. Thus, in this model there are no financial limits to the amount of investment.

However, the real problem lies in the inflationary pressures that may be generated by the accelerated investment. And, in order to investigate this phenomenon, it is necessary to consider the implication of the balance that is obtained by equation (2), i.e. C1 = S2. This indicates that the problem of inflationary pressure is related to the inadequate supply of surplus consumption goods demanded by the category II in the course of accelerated investment.

In this respect, there may occur two situations. First, while the investment is accelerated, the output of the consumption goods can not be increased because the production capacities happen to be fully

utilized at the beginning of the period and no augmentation in these capacities has taken place during this period. In such a situation the increase in demand for consumption goods in category I would cause an increase in the prices of these goods. Therefore, the balance in equation (2) would be obtained at the cost of fall in the real wages. This is what is called "forced saving". In this case, it is envisaged that workers will demand for higher money wages, which may result in a price-wage spiral.

Secondly, it may be assumed that there happens to be no lack of capacity in category II. It is found to be sufficient to meet the increased demand for consumption goods from category I. In this case, the production will be stepped up to the point where the surplus S2, out of the profit in category II, will match the increased demand for consumption goods in category I at a constant price.

Next, in what follows, the extensions of this simple model, including public investment and its financing through loans or taxes, foreign trade, terms of trade, and capital inflows, and the difference between the supply elasticities of food and other consumption goods are discussed.

As regards public investment, the corresponding productive activities are included in category I. Where as the export industries are split according to the proportion of imports of investment goods and consumption goods which are obtained in exchange for exports. In other words, they are accordingly divided into two categories.

In considering the public investment, it will generate, just as the private investment, its counterpart in saving, provided being financed by loans. And the consequent increase in the production of investment goods will increase production or prices in consumption goods sector, depending upon the availability or non-availability of productive capacity respectively. As a result, a balance between C1 and S2 will be obtained.

However, the problem of danger of inflation may not arise immediately, or at all, because the entrepreneurs may for various reasons keep their investment at a low level or there may be a lag between public and private investment. In other words, the entrepreneurs may not be willing to invest in the expansion of capacity.

This being so, the public investment deserves a prime consideration in accelerating the process of development. And since its inflationary pressure when financed by loans is not greater than private investment, it becomes highly significant. Because it may avoid the undesirable nature of investment if properly selected on the basis of overall development of the economy.

In considering the range of variability in the elasticity of supply of various consumption goods, it is to be observed that in most of the developing countries the supply of food is found to be rather rigid. In other words, the production of food expands less adequately in response to the demand that is being generated for it, due to an accelerated pace of the industrialization. As to the underlying causes, they include, among others, the low output per unit of land along with low land/labour ratio and the prevalence of adverse institutional set up in agriculture.

Nevertheless, the existence of surplus labour in agriculture is generally considered as a potential for capital formation. This is, in fact, related to the main issue of extracting surplus from agriculture and using it for the purpose of industrialization in general. In any case, it is argued that, while employing the surplus labour in its industrial sector, an extra surplus of food is generated, which may mitigate the demand pressure that is caused by their employment. But such a relief may not be achieved. Because, in the first place, owing

to a very low level of average consumption of food by peasants, this extra surplus will be used by them and, in the second, the average level of consumption of industrial worker is generally found to be higher than that of a peasant.

At any rate, the likelihood of inflationary pressure due to inelastic supply of food is found to be quite significant. As a result, the real wages will fall. Moreover, the increase in food prices may generate a distribution of income favouring landlords, moneylenders and merchant classes instead of poor peasants. This increase in profit is most likely to be spent on luxuries. Consequently, there may occur underutilized capacity of production in non-food mass consumption goods, which might start lopsided feature of industrialization.

In view of this, the expansion of food production is rather necessary in order to avoid the inflationary pressure generated by an accelerated pace of industrialization. Investments , in industry, infrastructure and various long-run development projects in agriculture should be accompanied by measures conducive to the expansion of agricultural production as well. These measures range from land reform and cheap credit for peasants to improvements in the method of cultivation and availability of cheap fertilizers. In short, while augmenting the constant capital in general and fixed capital in particular, the content of variable capital in terms of wage goods needs be be brought into balance. And, in doing so, an appropriate appropriation and utilization of surplus is highly desirable.

As regards the inclusion of foreign trade in this model, the balance between the consumption in category I and the saving in category II is obtained so long as the assumption of balanced trade, i.e. value of total exports equal to the value of total imports, is maintained. But with the accelerated pace of development, it becomes a common feature to observe the emergence of imbalance in foreign trade due to increasing demand for imports. First, as the investment rises, a higher derived demand for capital goods which cannot be produced domestically is to be met by import; second, the increase in industrial production may need higher imports of intermediate goods; and, thirdly, there may also occur a need to import foods. On the other hand, the increase in exports may not keep pace with the increase in imports. In the first place, the expansion of exports may not be feasible because of the lack of capital resources, and, in the second, it may not be easy to increase its share in the foreign market without causing a deterioration in terms of trade, which is equivalent to the loss of capacity to imports.

In view of this, the import of capital funds may be necessary to relieve the inflationary pressure. But, before that it is essential to formulate a comprehensive plan of the economy under the prevailing conditions. Based on the given rate of growth of the economy and with an assumed distribution of income, such a plan may focus on the determination of the necessary composition of imports as well as the trend of the exports. In any case, denoting F as the import of capital funds, the balance equation can be written as:

$$I = S + F \qquad (i^1)$$

which shows that a smaller amount of domestic saving is required to finance a given amount of investment. It also implies that capital imports contribute to the economic surplus. However, an increased demand for imports reflect upon the underlying imbalances and bottle-neck in a given stage of the economic development. There may exist supply determined industries, such as capital goods, which may be found to be almost in non-existence and therefore the imports of such goods is to be paid by export surpluses produced by demand determined industries.

In any event, looking from the viewpoint of two gap models, which has been critically examined by Thomas E. Weisskopf,[11/] it may be argued that two independent calculations pertaining to foreign currency gap and to saving gap needs to be made. And, in order to obtain the balance, if the saving gap happens to be higher than the foreign currency gap, it may be reduced to the level of the foreign currency gap by various measures of taxation, e.g. reduction of non-essential consumption. And, if that is not possible, it would be necessary to increase the foreign currency gap to the level of saving gaps.

All the same, if the import of capital fund is utilized for purchasing capital goods abroad, the same amount of investment will be achieved by a smaller production of investment goods domestically. This implies that the pressure on the supply of consumption goods will be lessened from the demand side. On the other hand, if the imported capital funds is used for purchasing consumption goods. the pressure of demand on supply will be reduced from the supply side. In both of these cases, or in the mixture of the two, the inflationary presure generated by the accelerated investment activities will be somewhat reduced by the utilization of the imported capital funds.

Next, as to indicate the implication of taxes and government administrative expenditure, let T1 and T2 be the direct and indirect taxes

paid by investment goods and consumption goods sectors respectively. Then, maintaining a sort of balanced budget in terms of equality between government administrative expenditures and total tax revenue, $T = T1 + T2$, and having foreign trade balance, it is easy to see that:

$$C1 + T = T2 + S2 \qquad (\ )$$

$$C1 + T1 + S1 = S2 + S1 \qquad (\ )$$

$$\text{or} \qquad I = S \qquad (\ )$$

i.e. the total value of the production of investment goods, or investment is equal to the total savings. And if the additional supply of consumption goods equals the foreign trade deficit F, then

$$I = S + F \qquad (\ )$$

Notwithstanding the important roles that can be played by capital imports in financing economic development, it nevertheless does involve costs, let alone the availability of such resources. The interest paid on the imported capital funds will burden the balance of payment in the future with all the risk and uncertainties that may be envisaged. In any case, the main forms of capital imports happen to be grants, loans and direct investment. Based on the experiences of developing countries who sought capital imports from industrialized countries, the long-term loans rank first in their list of priorities in view of economic and non-economic costs involved. And its preference increases if, based on the agreement, the purchase of investment goods abroad is to be paid by the exports of specific commodities produced in the recipient country. In this way, the future balance of payment difficulties connected with amortization and interest payment on loans are eliminated to a greater extent.

In view of the various difficulties that may arise in obtaining favourable capital funds from abroad, the importance of improvement in terms of trade seem to be enhanced. For an improvement in the terms of trade may be considered equivalent to import of capital funds. Moreover, it does not involve the costs, both economic and non-economic, which are unavoidable in the case of import of capital funds. Furthermore, all

the additional foreign exchange obtained through the improvement in terms of trade could be mobilized by the government for additional purchase that deem to be essential for development.

In the end, it may be mentioned in passing that there seems to be no doubt that any increase in labour productivity, either accomplished by increasing investment/labour ratio or by any other means, would certainly mitigate the inflationary pressure. But the existence of surplus labour and its net augmentation due to population growth cannot be ignored. This being so, the increases in productivity and employment need to be considered simultaneously. And this can hardly be accomplished without having a well formulated plan.

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Section II

An empirical overview of production and trade structure

(1) In order to characterize the structure of production in each selected country of the various regions, the average annual increment in gross domestic product per unit of gross domestic investment was calculated pertaining to the periods 1965-70, 1970-75 and 1975-80 respectively. This summary statistical indicator, as it is to be understood, reflects the inverse of so-called incremental capital output ratio (ICOR). And the ICOR is used to describe the capital intensity of production as distinct from degree of mechanization which is defined in terms of capital-labour ratio. Furthermore, the growth rate is determined, on a somewhat ambiguous notion of equilibrium, by dividing the saving ratio by ICOR. In economic literature this view of growth goes with the name of Harrod-Domar type of growth model. In any case, Table II.1 gives these indicators for different countries (see Appendix II.A).

As it was observed, in certain countries the persistently high rate of gross investment with a low rate of GDP growth implied a high incremental capital output ratio. This was found to be true, particularly in the case of India. Such an implicit rise in ICOR on its timepath may be attributed to increasing inefficiency in the system, low rate of capacity utilization, cost over-run of new investment projects, backlogs of unfinished projects, gestation lags, excessive private or public investments in luxury consumer goods leading to excess capacity and high capital intensity, high capital intensity of basic industries in public sector, and skewed income distribution. All the same, it may also be noted that the rising ICOR might have also occurred due to changes in the composition of investment as a result of fragmented industrial policies. In addition, it appears also necessary to recognize the impact of various factors, working on economy-wide basis and thereby creating lack of effective demand, which in turn led to slow growth and to rising incremental capital output ratio.

In any event, it is beyond the present task to discuss the case of each country separately. It was, nevertheless, thought to select India in order to illustrate a few points. Moreoever, India was the first among developing countries which began to build-up capital goods industries and followed a somewhat inwards-looking model of planning. In addition, she claims to have most of the preconditions of growth. Yet, India failed to achieve the rate of growth that could have been expected, and lagged far behind either, removing mass poverty or improving the rate of literacy.

There is no doubt that Indian economists happen to be well known in the frontier of economics, and have always debated the issues involved in formulating the strategy of planning in India. A report of such a recent debate regarding the political economy of slow growth in India is given by Varshney.[1/] In what follows, some of the viewpoints of Indian economists in general and S. Chavavarty[2/] in particular are described.

It is hardly denied to attribute the inefficiency of resource utilization as a factor that may cause the rise in aggregate capital-output ratio. But this may not be uniformly dominating factor in each sector. If this be so, there may be some economy-wide processes, closely related to the demand factor, causing a rise in capital-output ratio of an individual sector. The core of the argument implies that, in view of considering demand as effective demand, it may affect both the product-mix as well as the rate of growth of the production.

As it happened, in India, there occurred a deceleration of public investment from the mid-sixties onwards. This fact has been noted by Varshney (p. 1513), and he describes that "the growth rate of fixed capital formation in the public sector dropped from 11.3 per cent per annum in the period 1950/51-1965/66 to less than its half, 5.3 per cent in the period 1966/67-1980/81. This was stated to be particularly critical for both quantitative and qualitative reasons: quantitative because the state is involved in "directly manufacturing basic and capital goods, owning more than 60 per cent of all productive capital in the industrial sectors, running eight of the top ten industrial units in

the country, qualitative because the state has a virtual monopoly of vital industries, like power, fuel and transport. These infrastructural inputs affect the entire industrial sector, a comprehensive supply side linkage, that, added to the role of public investment in creating demand for capital goods, makes public investment absolutely crucial to the functioning of industrial sector. Any sustained cutbacks therein would inevitably hurt the entire sector. As it turned out, the cutbacks in investment in crucial sector such as the railway were particularly severe. Its share in the net domestic capital formation in the public sector declined from 16.6 per cent per annum in the period between 1960/61-1965/66 to around 7.5 per cent in the period between 1966-67 and 1974/75, dropping further down to 4.2 per cent per annum in the period thereafter."

And, as to the emergence of the under-utilization of capacity in capital goods sector, it may be noted that, owing to the lack of necessary increase in investment for steel industry, the heavy engineering sector could not utilize their capacity fully. On the other hand, the increased investment in fertilizer and chemicals, during 1970, did not generate sufficient domestic demands, rather it was oriented more towards generating demand abroad. In other words, there occurred both deceleration in the rate of growth of public investment as well as a shift in the composition of aggregate investment. As a result, those sectors in which, in view of economies of scale, extra capacities were built for future demands, were not able to benefit.

In considering the shift in the strategy of development in agriculture, brought about by the event of the "Green Revolution", it is to be observed that, in the first place, public irrigation scheme has gone down in the list of preference, and, in the second, support price sytem was instituted in the agriculture. As a result, the income distribution became more skewed; it was found that, under the initial distribution of asset-holding, the incremental income by and large accrued to the upper dociles. Furthermore, the direct and indirect demand for energy was increased in agriculture, which added to the already increasing cost of energy-related investment.

Finally, as it is, until the purchasing power of the mass of poor people is increased by real public investments, there exists a deficiency in effective demand for consumption. Hence the increase in growth that could be obtained by the increase in the production of wage-goods is blocked.

(2)(i) In the course of the process of industrialization the derived demand for capital goods is either met by domestic production or by imports. The ratio of import of capital goods to the total aggregate gross investment is given in the set of Tables (II.2 - see Appendix II.B). In addition, the percentage of foreign exchange spent on the import of capital goods is described by the ratio of import of capital goods to the total imports in the economy.

It is obvious that the imports of capital goods expands the capacity of production in terms of the total capital stock. However, it may be observed that the full impact of investment multiplier is not obtained. In other words, had the total derived demand of capital goods been met by domestic production all the implied increase in employment and income would have taken place at home. This being so, the decrease in the import of capital goods for a given level of investment would indicate the benefit derived by the policy of import substitution. In fact, unless the production of capital goods at home increased, the sustained growth is hardly possible. This is the crux of the problem related with trade and capital accumulation in a process of import substitution.

Based on the set of tables, the following pattern of these two ratios emerges in different groups of countries:

TABLE II.2[1]: Import of Capital Goods and Accumulation

		1975		1980	
		$Mk_{/I}$ (%)	$Mk_{/M}$ (%)	$Mk_{/I}$ (%)	$Mk_{/M}$ (%)
Africa	Max.	50	31	51	33
	Min.	27	13	32	13
OPEC	Max.	75	42	42	39
	Min.	14	18	23	19
Near East	Max.	88	32	68	25
	Min.	19	14	12	14
S.E. Asia	Max.	58	34	69	38
	Min.	26	27	20	21
S.Asia	Max.	23	22	36	27
	Min.	5	5	5	13
Latin America	Max.	82	38	47	42
	Min.	6	15	17	11

(2)(ii) Table II.3 gives the import and export of capital goods at the 3-digit SITC level of disaggregation for nine selected developing countries. These countries have been selected from the set of countries for which the data were available in the UNIDO data base. Based on this statistical information, some of the underlying facts that may be described are as follows.

First, the export of various kinds of capital goods indicates the feasibility of their production domestically, whereas imports may include those capital goods which cannot be produced domestically.

Second, the structure of derived demand for import implies the import content of capital stocks in various sectors of the economy.

TABLE II.3: Imports (M) and Exports (E) of Capital Goods at 3-digit SITC, in thousand US dollars

	INDIA 1980		S.KOREA 1980		PHILIPPINES 1980		ARGENTINA 1980		BRAZIL 1980		MEXICO 1980		ALGERIA 1980		EGYPT 1980		KENYA 1980	
	M	E/M	M	E/M	M	E/M	M	E/M	M	E/M	M	E/M	M	E/M	M	E/M	M	E/M
695	20232	3.05	59967	0.54	38100	0.050	65798	0.50	58316	0.73	32755	0.10	71277	0	14267	0	13320	0.10
711	91057	0.87	451151	0.16	153798	0.001	157200	0.21	333245	1.09	180769	0.26	280757	0	43722	0	40069	.001
712	4726	1.03	35195	0.13	29783	0.063	113391	0.16	44026	4.58	59560	0.07	95784	-	70271	0	27451	.004
714	26245	0.08	156963	0.55	52476	0.020	299808	0.21	190500	1.40	81760	0.23	39019	.004	7526	-	8892	.002
715	99095	0.27	356590	0.08	42205	0	105850	0.27	529885	0.14	171174	0.003	163958	0	13131	-	8585	.002
717	67854	0.28	184187	0.17	94527	0.025	135277	0.03	194152	0.26	140093	0.01	244698	0	85634	-	42563	0
718	100905	0.26	148625	0.12	196372	0.019	321519	0.07	215479	0.82	182402	0.05	280128	0	191410	0	71046	0.025
719	575511	0.15	986380	0.12	448749	0.007	828395	0.15	1076225	0.39	632179	0.07	1091261	0	228858	0	135169	.004
722	97324	0.04	357090	0.42	118173	0.009	228275	0.07	596837	0.18	155181	0.08	361203	0	91074	0	13928	.007
723	17368	1.10	46361	1.35	33575	0.071	21965	0.51	40134	0.34	19470	0.63	67171	-	30283	0.10	4161	.050
724	39266	0.26	336348	2.80	115706	0.167	543261	0.01	129876	1.15	93997	0.14	123726	0	82369	-	47817	0
725	5946	3.68	44804	1.43	2944	0.034	81067	0.19	17222	1.72	5871	0.38	73295	-	16498	-	9376	.022
726	8447	0.07	28011	0.04	3125	-	53898	0.01	44050	0.09	15725	-	28260	-	2196	-	6568	-
729	146434	0.31	793443	0.88	126996	0.428	324084	0.07	606859	0.32	124456	0.17	208298	.001	42954	-	2829	.092
731	32672	0.94	45457	5.74	16630	-	23554	0.28	156915	0.46	196648	0.04	14368	-	14679	-	17523	-
732	75142	1.77	163377	0.73	283525	0.111	744679	0.17	205715	5.06	826409	0.08	573081	0	410977	0	223888	.001
733	1464	51.02	11752	1.72	11676	0.046	18326	0.12	15114	2.53	6006	0.13	56948	0	10182	0	7878	0.27
734	429350	0.01	356943	0.38	122755	0.002	95935	0.03	425646	0.20	48172	0.31	34023	0	1243	-	31810	0
735	16371	0.11	472029	1.30	125198	0.016	143563	0.17	38584	2.75	43953	0.04	162988	.001	25157	-	340	0.78
86	152659	0.30	369357	0.82	106940	0.260	350337	0.12	403261	0.25	141593	0.14	139305	0	47633	-	34509	.012
TOTAL	2008067	0.36	5404031	0.70	2123263	0.072	4656180	0.13	5322040	0.66	3158175	0.10	4089902	0	1390064	.002	773183	.013

Source: UNIDO Data Base.

Third, even at this level of disaggregation, it does not appear to be possible to identify competitive and non-competitive imports, without having the information regarding the domestic production of these goods. Furthermore, as it can be observed at this level of disaggregation, each category of goods have been reported as imported and exported in value terms. It can, therefore, be assumed that only at further level of disaggregation the distinction between goods that are exported and those that are imported may be made.

Fourthly, the export-import ratio may indicate the contribution of export earnings in terms of foreign exchange to the imports in respective categories of capital goods. In any case, a single transformation of this ratio provides the ratio between net exports and exports plus imports, which has quite often been used to indicate the horizontal division of labour. Hence, the ratio between exports and imports in a particular category may be considered as an important parameter to investigate the division of labour and specialization.

(2)(iii) Some of the commonly used indicators: share of value-added and employment in capital goods, and the ratio of labour productivity in capital goods to the aggregate to labour productivity in manufacture, are given in Table II.4 in order to characterize the state of capital goods industry in manufacturing sector. These have been obtained for nine selected developing countries pertaining to the period 1975 and 1978. The cut off point to 1978 was made because of the non-availability of employment data onward.

As it can be observed from this Table, during 1978 the share of value added in capital goods varied between 12 to 36 per cent whereas the range of variation in the share of employment was found to be between 12 to 29 per cent. But the level of labour productivity in capital goods was almost uniformly maintained at the average of the manufacturing sector.

TABLE II.4: Share of value-added (v) and Employment (e) in Capital Goods

	1975 %			1978 %		
	v	e	Pk/Pm	v	e	Pk/Pm
India	22.9	20.5	1.11	23.7	20.2	1.18
Korea	17.8	20.8	0.85	24.6	27.0	0.91
Philippines	12.2	15.9	0.77	12.6	15.1	0.84
Argentina	40.1	28.5	1.21	31.3	28.5	1.22
Brazil	33.3	25.6	1.30	33.2	26.9	1.19
Mexico	23.9	21.8	1.09	23.5	21.1	1.12
Algeria	11.7	13.2	0.89	12.1	12.0	1.02
Egypt	14.1	12.3	1.14	17.4	12.5	1.38
Kenya	18.5	26.0	0.60	36.1	24.1	1.50

v = Share of value-added in capital goods

e = Share of employment in capital goods

Pk = The average level of productivity in capital goods

Pm = The average level of productivity in manufacturing

Source: UNIDO Data Base.

Next an attempt was made to factorize the change in aggregate labour productivity during the period 1975-78, into two components, of which one represents the change due to inter-industry shifts in employment which the other indicates internal change due to productivity without marked shift in employment. This procedure of resolving is a very common practice in index-number approach, which can be derived as below.

Let Yi(y) be the output of the ith industry in year t, valued at same set of prices, and Li(t) be the corresponding employment. Then the labour productivity is defined as:

$$Pi(t) = \frac{Yi(t)}{Li(t)} \qquad i = 1,2, \ldots n \qquad (1)$$

From this the aggregate labour productivity is defined as:

$$\sum Pi(t)Li(t)/\sum Li(t) \qquad (2)$$

Therefore the change between period o and t can be defined as:

$$\frac{\sum Pi(t)\ Li(t)}{\sum Pi(o)\ Li(o)} \times \frac{\sum Li(o)}{\sum Li(t)} \qquad (3)$$

This in turn can be written in two multiplicative factors.

$$\left\{\frac{\sum Pi(t)\ Li(t)}{\sum Pi(t)\ Li(o)} \cdot \frac{\sum Li(o)}{\sum Li(t)}\right\} \times \left\{\frac{\sum Li(o)\ Pi(t)}{\sum Li(o)\ Pi(o)}\right\}$$

(a) (b)

where (a) indicates the change due to inter-industry shifts in employment and whereas (b) indicates the internal change in labour productivity within each industry assuming no shift in employment.

The empirical results pertaining to such an exercise are given in Table II.5. As can be observed, owing to the consideration of change only over 3 years, the results indicating a short of structural change may not be that convincing. However, this exercise was made just to make a point.

In any case, structural change obviously plays an important part in increasing productivity through high rate of gross investment. This makes the structure of production much more flexible. Moreover, there is hardly any government which does not declare its aim of bringing about an increase in the average level of general productivity in industry. Probably, it is assumed that behind productivity, with appropriate distribution of its gain, lie all the dynamic forces of accumulation, technical progress and the institutional set-up of society.

TABLE II.5: Factorization of total change in labour productivity between 1975 and 1978 (1975 = 100)

	Internal Change	Inter-industry Shift	Total Change
Brazil	90	117	105
Kenya	148	100	148
Mexico	92	121	111
Argentina	90	100	90
India	107	100	107
S.Korea	139	95	132
Philippines	76	88	67
Algeria	123	102	125
Egypt	115	100	115

Source: UNIDO Data Base.

APPENDIX II.A

TABLE II.1: GDP growth rate (g_y) and incremental capital-output ratio (ICOR) and inverse of ICOR ($\frac{\Delta Y}{I}$)

		1965-70	1970-75	1975-80
Argentina	g_y	4.35	3.53	1.33
	ICOR	5.30	6.95	20.90
	$\frac{\Delta Y}{I}$	.1887	0.1439	.0478
Bolivia	g_y	6.70	5.81	3.34
	ICOR	2.70	3.60	5.29
	$\frac{\Delta Y}{I}$	.3702	0.2775	0.1589
Brazil	g_y	7.60	10.63	6.95
	ICOR	2.93	2.65	4.62
	$\frac{\Delta Y}{I}$	0.3417	0.3768	0.2164
Chile	g_y	3.60	-.72	7.47
	ICOR	4.47	-15.47	1.36
	$\frac{\Delta Y}{I}$	0.2235	-.0647	0.7342
Colombia	g_y	5.86	6.28	5.29
	ICOR	2.44	3.24	3.77
	$\frac{\Delta Y}{I}$	0.4097	0.3086	0.2652
Dom.R.P.	g_y	7.35	9.26	5.71
	ICOR	1.79	2.28	4.07
	$\frac{\Delta Y}{I}$	0.5591	0.4386	0.2454

TABLE (continued)

		1965-70	1970-75	1975-80
Jamaica	g_y	7.58	0.66	-2.80
	ICOR	3.52	40.95	-5.20
	$\frac{\Delta y}{I}$	0.2841	.0244	-.1923
Mexico	g_y	6.91	5.78	5.74
	ICOR	3.24	4.08	4.45
	$\frac{\Delta y}{I}$	0.3081	0.2451	0.2247
Peru	g_y	4.52	4.73	1.64
	ICOR	3.25	3.40	7.94
	$\frac{\Delta y}{I}$	0.3078	0.2937	.1260
Uruguay	g_y	2.12	1.21	4.55
	ICOR	5.58	10.98	3.98
	$\frac{\Delta y}{I}$	0.1793	.0911	.2513

TABLE (continued)

AFRICA

		1965-70	1970-75	1975-80
Congo	q_y	6.06	2.60	1.80
	ICOR	5.06	8.93	8.82
	$\frac{\Delta y}{I}$	0.1975	0.1120	0.1134
Ethiopia	q_y	4.64	1.91	3.16
	ICOR	2.75	5.78	2.96
	$\frac{\Delta y}{I}$	0.3631	0.1730	.3378
Ghana	q_y	3.20	0.35	-1.83
	ICOR	4.89	35.33	-7.62
	$\frac{\Delta y}{I}$	0.2043	0.0283	-.1312
Ivory Coast	q_y	6.89	6.57	7.31
	ICOR	3.14	3.51	4.99
	$\frac{\Delta y}{I}$	0.3185	0.2852	0.2004
Kenya	q_y	8.13	4.56	5.12
	ICOR	3.16	5.50	4.57
	$\frac{\Delta y}{I}$	0.3162	0.1818	0.2188
Madagascar	q_y	4.52	0.44	1.72
	ICOR	2.93	30.61	7.02
	$\frac{\Delta y}{I}$	0.3410	0.0327	0.1425

TABLE (continued)

AFRICA (continued)

		1965-70	1970-75	1975-80
Mozambique	q_y	5.86	-1.59	-.03
	ICOR	2.00	-6.88	-348.96
	$\frac{\Delta y}{I}$	0.5000	-.1453	.0029
Zimbabwe	q_y	5.99	5.42	-1.77
	ICOR	3.64	4.87	-7.56
	$\frac{\Delta y}{I}$	0.2755	0.2055	-0.1322
Ugandia	q_y	5.21	0.81	-.05
	ICOR	2.64	12.90	-142.55
	$\frac{\Delta y}{I}$	0.3788	0.0775	-.0070
U.R.Tanzania	q_y	5.36	4.81	5.62
	ICOR	3.53	4.53	3.67
	$\frac{\Delta y}{I}$	0.2831	0.2209	0.2725
Camercon	q_y	7.50	3.33	5.32
	ICOR	2.86	5.61	2.99
	$\frac{\Delta y}{I}$	0.3493	0.1782	0.3349

TABLE (continued)

OPEC

		1965-70	1970-75	1975-80	
Algeria	g_y	8.18	4.63	7.16	
	ICOR	2.95	8.67	6.83	
	$\frac{\Delta Y}{I}$	0.3390	0.1153	0.1465	
Ecuador	g_y	5.88	8.75	6.26	
	ICOR	3.58	3.03	4.21	
	$\frac{\Delta Y}{I}$	0.2797	.3305	0.2377	
Gabon	g_y	11.22	15.05	2.59	
	ICOR	2.00	2.87	18.55	
	$\frac{\Delta Y}{I}$	0.5000	0.3484	.0539	
Indonesia	g_y	5.55	8.16	7.37	
	ICOR	1.89	2.05	3.06	
	$\frac{\Delta Y}{I}$	0.5291	0.4888	0.3266	
				(1975-79)	(1979-80)
Iran Islam Rp.	g_y	10.80	9.12	1.42	-3.46
	ICOR	1.15	2.21	16.89	-5.13
	$\frac{\Delta Y}{I}$	0.8703	0.4535	0.0592	-.1950
Iraq	g_y	4.44	5.25	13.94	-0.15
	ICOR	2.84	4.09	2.27	-232.23
	$\frac{\Delta Y}{I}$	0.3517	0.2444	0.4400	-.0043

TABLE (continued)

OPEC (continued)

		1965-70	1970-75	1975-80
Kuwait	g_y	5.68	-2.07	3.16
	ICOR	0.96	-4.35	4.88
	$\frac{\Delta y}{I}$	1.0470	-.2299	0.2050
Libyan Arab JM	g_y	19.23	-4.80	8.96
	ICOR	0.80	-3.91	3.17
	$\frac{\Delta y}{I}$	1.2570	-.2560	0.3158
Nigeria	g_y	4.99	5.47	8.12
	ICOR	1.72	3.19	3.28
	$\frac{\Delta y}{I}$	0.5809	0.3139	0.3049
Saudia Arabia	g_y	9.56	12.97	6.72
	ICOR	0.46	0.69	3.39
	$\frac{\Delta y}{I}$	2.1926	1.4508	0.2952
Venuezuela	g_y	4.15	-1.52	1.69
	ICOR	4.00	-15.80	17.54
	$\frac{\Delta y}{I}$	0.2500	-.0633	.0570

TABLE (continued)

		1965-70	1970-75	1975-80
Cyprus	g_y	6.64	-4.42	13.08
	ICOR	5.42	-6.70	2.08
	$\frac{\Delta y}{I}$	0.1845	-.1493	0.4811
Jordan	g_y	0.69	-.93	10.44
	ICOR	23.30	-26.42	3.69
	$\frac{\Delta y}{I}$	0.0429	-.0379	0.2709
Morocco	g_y	4.44	5.05	5.45
	ICOR	2.95	4.08	4.36
	$\frac{\Delta y}{I}$	0.3390	0.2448	0.2291
Syrian Arab Rp.	g_y	3.60	13.65	5.77
	ICOR	4.49	1.55	4.54
	$\frac{\Delta y}{I}$	0.2227	0.6446	0.2203
Tunisia	g_y	5.06	9.65	6.94
	ICOR	5.46	2.87	4.58
	$\frac{\Delta y}{I}$	0.1832	0.3483	0.2182
Turkey	g_y	6.34	6.16	5.50
	ICOR	2.67	3.47	3.73
	$\frac{\Delta y}{I}$	0.3745	0.2886	0.2680
Egypt	g_y	2.39	5.84	9.41
	ICOR	12.09	5.03	3.81
	$\frac{\Delta y}{I}$	0.0827	0.1988	0.2624

TABLE (continued)

		1965-70	1970-75	1975-80
India	g_y	4.86	3.0	3.66
	ICOR	4.03	6.92	6.29
	$\frac{\Delta y}{I}$	0.2481	0.1445	0.1588
Pakistan	g_y	4.73	4.10	5.87
	ICOR	3.61	4.23	2.81
	$\frac{\Delta y}{I}$	0.2770	0.2364	0.3559
Bangladesh	g_y	1.60	2.33	5.46
	ICOR	8.61	4.70	2.15
	$\frac{\Delta y}{I}$	0.1161	0.2128	0.4651
Sri Lanka	g_y	5.73	2.56	6.80
	ICOR	3.10	6.96	3.69
	$\frac{\Delta y}{I}$	0.3225	0.1437	0.2710

TABLE (continued)

		1965-70	1970-75	1975-80
Korea S.R.	g_y	10.37	9.52	7.60
	ICOR	2.32	2.99	4.04
	$\frac{\Delta y}{I}$	0.4310	0.3344	0.2475
Malaysia	g_y	6.27	7.13	8.87
	ICOR	3.37	3.21	3.12
	$\frac{\Delta y}{I}$	0.2967	0.3115	0.3205
Philippines	g_y	4.79	5.81	6.39
	ICOR	4.75	4.73	4.95
	$\frac{\Delta y}{I}$	0.2105	0.2114	0.2020
Singapore	g_y	12.85	9.52	8.72
	ICOR	2.64	4.23	4.06
	$\frac{\Delta y}{I}$	0.3788	0.2364	0.2463
Thailand	g_y	8.12	7.44	7.88
	ICOR	3.12	3.82	3.47
	$\frac{\Delta y}{I}$	0.3205	0.2618	0.2882

TABLE II.2: Import of Capital Goods and Accumulation

AFRICA	1970				1975				1980			
	I	Mk	Mk/I	Mk/M	I	Mk	Mk/I	Mk/M	I	Mk	Mk/I	Mk/M
Congo	68.25	20.3	30	16	167.98	61.8	37	13.0	285.82	105.8	37	13
Cameroon	-	81.1	-	24	-	199.6		25	-	548.6		28
Ethiopia	214.93	64.5	30	25	293.61	89.7	31	17	531.40	213.7	40	27
Ghana	313.30	122.4	36	21	584.63	207.6	36	25	1754.93	-		-
Ivory Coast	328.81	135.6	41	27	874.37	367.1	42	24	3512.60	-		-
Kenya	406.26	146.8	36	30	593.02	295.5	50	26	1502.39	773.2	51	31
Madagascar	140.10	55.8	40	30	240.76	96.7	40	23	758.55	242.8	32	27
Uganda	176.54	45.1	26	18	231.82	61.8	27	20	934.22	-		-
Tanzania	286.54	116.7	41	32	542.14	248.9	46	31	1203.58	449.6	37	33
Zambia	513.80	195.6	38	30	997.73	349.3	35	25	667.57	-		-

I = Gross investment in million US dollars
Mk = Import of capital goods in million US dollars
M = Total imports in million US dollars

Source: UNIDO Data Base.

LATIN AMERICA	1970				1975				1980			
	I	Mk	$\frac{Mk}{I}$ %	$\frac{Mk}{M}$ %	I	Mk	$\frac{Mk}{I}$ %	$\frac{Mk}{M}$ %	I	Mk	$\frac{Mk}{I}$ %	$\frac{Mk}{M}$ %
Argentina	6402.72	580.6	9	31	16468.29	905.5	6	16	27043.99	4656.2	17	42
Bolivia	177.69	62.9	35	30	590.05	250.5	42	38	1167.90	-	na	-
Brazil	10673.48	1110.1	10	35	41636.75	4668.9	11	33	77983.50	5322.0	7	20
Chile	1277.78	424.9	33	36	661.87	539.8	82	22	3914.28	1823.0	47	29
Colombia	1554.52	413.7	27	37	2383.16	617.3	26	32	8123.49	1845.6	23	34
Cuba												
Dominican Rep.		na		na	882.10	236.3	27	23	1570.30	339.7	22	19
Jamaica		na		na	745.98	269.1	36	21	417.83	152.7	37	11
Mexico	7499.72	1325.1	18	39	19131.39	3158.1	17	37	50895.85	na	19*	na
Uruguay	276.69	76.4	28	24	485.43	104.0	21	15	1847.59	535.2	29	26
Peru	915.02	237.1	26	25	3033.40	835.4	28	28	3129.13	1103.4	35	28

* World Bank, p.115.

NEAR EAST	1970				1975				1980			
	I	Mk	Mk/I	Mk/M	I	Mk	Mk/I	Mk/M	I	Mk	Mk/I	Mk/M
Cyprus	132.48	64.5	48	25	152.92	53.5	35	14	765.12	297.0	39	22.0
Jordan	61.88	34.2	55	16	275.61	243.5	88	26	1045.85	711.5	68	25
Morocco	608.64	224.1	37	28	2269.47	763.4	34	26	4041.13	943.3	23	19
Syria	234.82				1393.51	501.7	36	27	3240.03	-		-
Tunisia	292.76	86.0	29	23	1359.37	486.4	36	31	2650.57	969.4	37	25
Turkey	2668.90	382.7	14	33	8247.14	1681.2	20	32	11753.77	1425.9	12	14
Egypt	1004.81	216.7	22	16	4405.33	826.8	19	17	8020.86	1390.1	17	17

SOUTH E.ASIA	1970				1975				1980			
	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{I}$
South Korea	2307.57	615.0	27	30	5932.72	2008.3	34	27	17995.06	5404.0	30	21
Malaysia	658.57	412.5	63	33	2181.07	1259.9	58	30	6359.24	4381.9	69	38
Philippines	1584.88	448.0	28	31	4912.55	1256.2	26	31	10775.12	2123.2	20	23
Singapore	749.56	633.1	84	25	2123.68	2382.1	112	29	4804.71	7702.6	160	31
Thailand	1699.41	489.5	29	35	3902.49	1194.3	31	34	9238.18	2501.2	27	24

SOUTH ASIA	1970				1975				1980			
	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$
Bangladesh									1915.	522.5	27	26
Sri Lanka	434.95	72.5	17	11	589.99	69.3	12	5	1483.37	534.5	36	24
India	9694.84	525.7	5	21	19153.15	1036.6	5	17	37548.24	2008.1	5	13
Pakistan	1657.32	385.5	23	35	2299.99	537.5	23	22	4709.98	1413.2	30	27

OPEC	1970				1975				1980			
	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$	I	Mk	$\frac{Mk}{I}$	$\frac{Mk}{M}$
Algeria	1765.14	499.2	0.28	35	7033.59	2513.7	0.36	38	20818.9	4089.9	0.20	27
Iran	1972.30	727.3	0.37	36	14716.14	5197.8	0.35	32	11528.51	-		-
Venezuela	3435.96	794.9	0.23	36	8492.08	2978.5	0.35	42	14955.4	4918.8	0.33	31
Kuwait	347.54	240.5	0.69	35	1530.60	1148.8	0.75	37		2569.7		26
Nigeria	1408.40	421.7	0.30	32	9189.85	2668.9	0.29	33	-	na		-
Libya	708.16	176.0	0.25	16	3900.34	1268.9	0.33	23	7804.60	2673.5	0.34	24
UAE		na				na		-		3220.5		-
Iraq		na		35	4124.31	1778.4	0.43	29		na		-
Saudi Arabia	-	na		-	5284.46	1843.5	0.35	24	30013.65	12510.3	0.42	31
Qatar		na		-		218.7		-		641.1		-
Indonesia	1246.70	na		-	6197.78	1830.6	0.30	27	15175.99	3816.8	0.25	25
Gabon	99.39	33.7	0.34	28	1352.01	187.2	0.14	18	1195.56	273.0	0.23	19
Ecuador	378.9	101.2	0.27	31		484.4		34		1150.7		39

References

1. See Varshney, "Political Economy of Slow Industrial Growth in India", Economic and Political Weekly, Sept.1, 1984.

2. Chavavarty, S., "On the Question of Home Market and Prospects of Indian Growth", EPE Special Number 1979.

Section III

Building-up Capital Goods Industry: Relevance of Chinese Experience

In considering the building-up of capital goods industry, in the first place, it is recognized that, in any economy, the potential production possibility frontier over time is determined by the set of capital stocks, which has been built either by imports or by domestic production of heterogeneous set of capital goods. It is, however, to be noted that, owing to the very nature of the derived demands for the set of capital goods, which are used as means of production by various sectors of the economy, the capital goods industry acquires a social significance. Moreover, the corresponding accumulation of capital stocks entails the ownership of the means of production. Hence, in general, some sort of social control on it is called for.

In any case, China is pursuing a socialist form of industrialism having the distinct feature of public ownership and direction of means of production, along with the simultaneous development of a collective force acting against the tendencies of avarice, privilage and bureaucracy that may still be prevalent in a socialist society. As regards other developing countries, the path of industrialization may be characcerized in the framework of mixed economy with an active participation of their respective governments. All the same, in these mixed economies, it is not uncommon to find the emergence of oligopolistic market structure[1/] in capital goods industry and the prevalence of feudal or semi-feudal systems in agriculture.

In evaluating the production of capital goods industries in the developing countries, David Chunovsky and Masa Fumi Naga[2/] have noted a considerable development in this sector in Brazil, China, India and South Korea. A distinctive feature of the development of capital

goods industry in the mixed economies of Brazil, India and South Korea was that it was promoted with the help of the respective governments in a planned way. India followed, by and large, an 'inward-looking' strategy of industrialization; in view of her vast domestic market the development of capital goods industry was mainly oriented towards meeting the domestic requirements. Whereas in South Korea the strategy was by and large export-oriented, which made her dependant on external demands. The case of Brazil is rather mixed.

In fact, a general feature of the strategy of industrialization followed in most of the mixed economies, particularly in Latin America, may be characterized as import substitution industrialization (ISI). It is to be understood as a sequential process of domestic production of consumption goods - intermediate goods - and finally of capital goods. As it was, most of the developing countries could not succeed beyond the import substitution of consumer goods, mainly consumer durables. Whereas some of the semi-industrialized countries have started to produce intermediate goods, and some, for example, Argentina, Brazil and Mexico, began to build capital goods industry under the deliberate policy of government support. As to the main difficulties that were faced in making the transition from consumer to intermediate and capital goods, there happened to be the lack of finance, technology and organizational capabilities. In this respect, the aid and co-operation of Transnational Co-operation (TNC) could have facilitated the process, but such help either fell short of forthcoming or they could not be materialized.

As regards China, her strategy of industrialization may also be described as inward-looking. But, as distinct to other comparable developing countries, for example, India and Brazil, China was found to be in quite a different situation. In any case, she did develop a highly diversified capital goods industry. There occurred both capital deepening as well as industrial deepening. As a result, a significant linkage was developed between industry and agriculture, which are found to be lacking in both India and Brazil. And it is not far from sure that China, while developing a huge capital goods industry, was able to meet the basic needs of the

majority of the population. Whereas, although India and Brazil developed the necessary precondition for growth with regard to capital goods, they could not make much progress towards eliminating widespread poverty.

In any event, the salient features of the contributions of producer goods industry to the industrial development of China are described in what follows. These are more or less based, amongst others, on the analytical studies by Rawski[3/] and Maruyama.[4/]

To begin with, it may be observed that, in China, the foundation for building up capital goods industry was laid during the First FYP (1953-57). To do so, a heavy investment was made and the demand for investment goods and stocks was met by imports from the USSR and East European countries. In addition to financial aids and trade, the Soviet technicians helped in training the workers and facilitated the implementation of the investment plan in which priority was given to heavy industry.

During the plan the main emphasis was laid on import substitution in capital goods and on extensive production. It was envisaged that as the output increases, the surpluses would be generated and the realization of the surpluses into further investment would take place. This in turn would create a sort of flexibility to improve productivity of inputs and the quality of output-mix, meeting the necessary social demands.

In the course of the implementation of the investment plan, there occurred shortages of skilled and experienced industrial personnel. The problem was to integrate the newcomers into the factory system. In view of this, a programme for industrial education was instituted emphasizing the importance of teamwork. Such a programme varied from technical universities and engineering colleges to crash courses in literacy and elementary technology for common workers. There is no doubt that the system of industrial planning was found to be very complex. This was particularly the case in capital goods industry with complex and changing output-mix and technology. It was rather a difficult task to co-ordinate

this sector with others. But, despite all the difficulties, by 1957 China did evolve an operative system of planning with administrative allocation of resources.

In any event, many Chinese and would-be planners were sent for education and training in the USSR. Those specializing in planning methodology must have learnt various mathematical models of planning. But as it appears Chinese planners were considering the process of accumulation in somewhat broader perspectives, which included not only the stock of physical capital stocks, but also the augmentation of natural resources, social capital, human skills, and the technical and organizational knowledge.

Before preparing the outline of the Second FYP, during 1956, the performance of intermediate goods and capital goods industry was evaluated. Their contributions to the overall growth of the economy in the light of emerging production structure and sectoral balances were examined. As a result, certain reforms in producer goods sector were called for. First, the rate of growth of output and investment were to be slowed down in order to place greater emphasis on quality, assortment, cost, balance of supply and demand and innovation in production processes; second, decentralization of planning systems in terms of increased provincial and local authority and responsibility was to be introduced; and thirdly, increased investment in small scale production of intermediate and capital goods was to be made, with a view to meeting the requirements of industrial goods in agriculture and handicrafts.

These reforms were considered as preconditions for harmonious growth in accord with the changing social demands for intermediate and capital goods. But these reforms were set aside in the wake of the Great Leap Forward of 1958-60, resulting in a hectic rush of growth of otuput. However, despite the negative shortt-m negative impact on industry and almost a breakdown of the planning system during the Great Leap Forward, there were a few positive elements on the other hand. In the first place, an attempt was made to create rural industries in close association with

agriculture, and, on the second, the large-scale training and consultation programmes developed linkages between different kinds of enterprises.

But there occurred two significant events during 1958-60 that called for a complete re-evaluation of strategies of industrialization in China. On the one hand successive failures of harvests made the situation in an overwhelmingly agricultural economy quite precarious. On the other, there occurred a complete break between Sino-Soviet relationship, which created a significant discontinuity in the path of continuing industrial investment plans. In other words, the period of 1958-60 may be described as the period of great crisis in the experience of China. And with this ended the first phase of the development of capital goods industry, which needed several kinds of readjustment.

The post-1960 development began with various directives and reforms. Some of these were as follows:

(i) All enterprises were asked to prepare detailed information regarding capital stocks, inventories, and productive capacity;

(ii) Unauthorized construction, recruitment and sales were to be stopped;

(iii) A plan for monitoring finance, resource consumption, labour productivity, cost and quality was called for.

These were all the signs to establish firm control over industry. In fact, in post-1960 the development centre reasserted itself and was determined to create the conditions for harmonious growth with agricultural support efforts, while allowing gradual extension of regional, local and enterprise level responsibilities.

To evaluate the impact of new industrial policy on the performance in intermediate and capital goods industry, it seems essential to examine changes in the composition of output. Rapid expansion of China's petroleum and chemical fertilizer industries since 1960 characterizes the import

structural changes that recurred in view of the shift to harmonious growth policies. In addition, the list of new industries included electronics, computers, chemical fibres, plastics and wide range of aerospace, nuclear and other military linked production.

With the emergence of new industries, the established sectors got a new impetus. They showed an impressive record of both qualitative improvements as well as quantitative growth. In fact, there occurred a sort of industrial deepening in China. The spread of medium and small-scale factories to small cities and rural areas manifested the transformed industrialization from an urban to a truly national phenomena. As noted earlier, the initial impetus for expanding small scale industries came at the end of FFYP. But premature expansion during the period 1958-60 led to waste and confusion. As a result, many plants were shut down during the readjustment of 1960-62. However, as the agricultural conditions stabilized, official policy once again began to encourage local industrial development. The extent of industrial deepending that occurred as summarized by Rawski (p.68):

> "Continued investment in small- and medium-sized plants has pushed industry down to the level of China's two-thousand-odd counties, most of which are now active in one or more branches of the producer sector. In 1957, it was hoped that each province could have its own agricultural machinery plant. In 1978, there are over forty-three hundred plants that manufacture and repair farm machinery. Each province manufactures farm machinery, tractors, and power equipment. Nearly all of the two thousand-odd- counties manufacture and repair farm machinery, 80 per cent possess small cement plants, 55 per cent operate coal mines, 50 per cent manufacture chemical fertilizer, and over half engage in a whole range of producer enterprises: machinery, fertilizer, cement, iron and steel, and coal mining. Further deepening can be seen in the recent steep rise in industrial activity within China's fifty thousand rural communes, many of which now operate small-scale hydropower stations as well as workshops for repairing and manufacturing farm equipment."

It is important to observe that the industrial deepening through the expansion of small- and medium-sized producer enterprises in small cities and rural areas have added a new dimension to China's industrial economy. Small plants provide a source of industrial expansion that economizes on several scarce resources: foreign exchange, highly skilled technicians, long distance rail and truck transport, and central government financing. Rural industrialization, forged new bonds of integration and co-operation between farm and factory. They have brought industrial products, techniques, and skills to the heart of the farm economy, moving China's vast agricultural population toward the mainstream of an industrialization process.

In any case, by the end of the readjustment period, 1962-65, China was able to overcome the critical sort of situation that occurred due to damaging events of the period, 1958-60. Industrial sector was, once again dominating the overall growth of the economy, and at the same time it was meeting the appropriate derived demands for intermediate and capital goods by various sectors, including defense. This may also be described as the manifestation of the success of the harmonious growth-oriented industrial policy that was instrumental even to meet the new and unexpected change in the pattern of demand that occurred during 1958-60. There is no doubt that large-scale production of equipment for the petroleum and chemical fertilizer industries, development of production and repair network of farm machinery and many other accomplishments could not have been feasible without laying the foundation of capital goods industry during the First FYP (1952-57). Nor was it possible without creating a co-ordinated co-operative front in both industry and agriculture. Moreover, China received hardly any kind of external help during 1962-65. Hence she mobilized her internal resources, both developed and undeveloped, including latent potentials, to meet the requirements of the new situation, which was by no means an easy task to perform.

As regards the size of industrial enterprise and the development of the technological frontier with a view to skill formation, it may be

recalled that by the end of the First Five Year Plan, many large industrial projects, consisting of metallurgical, petroleum, machine building, and chemical plants were completed. In 1965, it was decided that China needed simultaneously to develop large-, medium- and small-scale enterprises. However, in the subsequent period of the Great Leap Forward, many industrial enterprises were set up, having no balance whatsoever with regard to their size. Nor was there given proper consideration to the sources of raw materials or to the level of technological requirements. It is claimed that these shortcomings were rectified during the readjustment period of 1962-65. Factories were either closed, suspended, merged or switched to other lines of products. Some of the large-scale plants were cancelled or delayed and an effort was made to bring about a proper balance between long-, medium- and small-scale plants, which were characterized either by annual products capacity or by the initial value of the fixed capital stock. In short, a co-ordinated and complementary development of the enterprises of different sizes was considered necessary for development. This implied a social division of labour, which in turn implied that modern industrial enterprises became more specialized. But in order to benefit from the extent of the division of labour and specialization, it was necessary that specialization of production on a large-scale be co-ordinated with the division of labour in medium- and small-scale enterprises. In any case, while considering specialization and the division of labour as the guiding principle for optimal determination of the size, the additional aspects regarding availability of resources, level of technology, regional distribution and social demands were also revealed by the experience of Chinese strategy of industrial policy.

In considering technological level, it was the obvious preference that heavy industries using modern technology be of large-scale size, whereas light industries were mainly classified at medium- or small-scale size, equipped with intermediate levels of technolgy. However, in some of the old and established centres of industrial enterprises, it was thought to be expedient for the purpose of innovation to follow the sequence from small to large size. The small and medium size enterprises were to shoulder a greater task of developing new varieties of technology.

Chinese engineers and workers have made many contributions. First, they produced various unique products, for example, ammonium bicarbonate fertilizer. Second, they substituted small plants for large units, and local materials of standard items in construction and manufacturing. Thirdly, they developed ingenious processes to manufacture sophisticated products with unsophisticated equipment. Expansion of small plants and equipment with new combinations of productive factors have increased industrial output and accelerated the spread of industrial products, techniques, and experience into rural as well as into urban regions.

In making modifications of foreign technologies, which is found to prevail in small- and medium-sized machinery, cement, metallurgy and fertilizer plants, it was found to be most effective when the presence of complementary factories of varying technological levels permits a division of labour in which demanding tasks are reserved for more sophisticated enterprises, leaving semi-modern units to concentrate on relatively simple operations.

In giving an example of complementarity, Rawski (p. 95) describes the experience of China's agricultural machinery industry:

> "The industry consists of a large, closely integrated network of plants ranging from national level units such as the Loyang Tractor Works, a Soviet-built enterprise employing 23,000 workers and producing an annual total of over 20,000 tractors, to small factories and workshops, some with only a few dozen workers and several machine tools, now operated by 98 per cent of 50,000-odd agricultural communes, and many of the roughly 600,000 agricultural production brigades. The degree of enterprise technological sophistication varies with a unit's position on the administrative ladder, with national level plants displaying the highest and brigade commune shop the lowest level of technical development.
>
> "Production responsibilities are distributed within this technological and administrative hierarchy on the basis of the plans designed to

match tasks with capabilities. Parts for a particular machine may come from separate units with widely varying technical capacities, as when country plants use diesel engines and ball bearings from regional or provincial units to manufacture power tillers. Alternatively, the import from higher levels may take the form of advanced machinery, as when 'modern and even semi-automated machine tools' appear even at the lowest organization levels, alongside primitive hand methods of fabrication and assembly.

"The result is a mixed technology that uses capital-intensive methods to obtain crucial tolerances or physical properties and assigns labour-intensive methods to assembly work and other peripheral tasks, even at the largest enterprises. In China, this approach has nurtured a rapidly growing equipment industry that supplies the farming sector with large quantities of tough, inexpensive and functional machines. This successful experience has arisen not from abandoning capital-intensive production techniques, but by systematic grafting of labour-intensive operations requiring conventional machine tools (often in large numbers) into a core of highly specialized and capital intensive operations. And even here, it is important to bear in mind the gradual but universal shift towards capital-using innovations, even in assembly and other operations in which mechanization has no apparent impact on product quality."

The agricultural machinery sector was by no means an isolated event. Such schemes were also used in other sectors. In any case, the accelerated pace of development of capital goods industry along with industrial deepening indicates a trend toward capital deepening in the production structure of the Chinese economy. This is manifested by increasing capital-labour ratio and growing extent of automation. And, there is small doubt that the degree of mechanization is significantly related to the rate of accumulation as well as the composition of investment.

Table III.1 gives some empirical results, which indicate the rate of accumulation and incremental increase in national income per unit of investment, beginning from the first Five Year Plan of China.

TABLE III.1: Rate of Accumulation and Efficiency of Investment

	(1) Growth rate of national income (NI)	(2) Average rate of accumulation (%)	(3) Increase in NI per 100 yuan of total investment
1st FYP (1953-57)	8.9	24.2	37
2nd FYP (1958-62)	-3.1	30.8	-11
Period of re-adjustment (1963-65)	14.5	22.7	54
3rd FYP (1966-70)	8.4	26.3	34
4th FYP (1971-75)	5.6	33.0	19
1976	-2.7	30.9	-8
1977	7.8	32.3	25
1978	12.3	36.5	38
1979	7.0	34.6	19
1980	6.9	32.4	20

Sources: Maruyama, N., "The Mechanism of China's Industrial Development", The Developing Economy, Vol.XX, Dec. 1982; China Statistical Year Book 1981.

As it was, the rate of accumulation varied between 23 per cent in the readjustment period after a high rate of 31 per cent in the Second Five Year Plan to 37 per cent in 1978. This feature of accumulation has quite often been debated by the Chinese economists and planners. And, there appears to be a common agreement that the rate of 25 per cent may as well be considered as a bench mark in the future. But in no case can this rate be increased by more than 30 per cent. In other words, this regulatory decision parameter attains lower and upper bounds of 25 and 30 per cent respectively. That such a range was considered to be necessary implies the balancing of the relation between consumption and accumulation. A due consideration was probably given to maintaining an appropriate average standard of living of the masses, given the rate of growth of the population and the level of the development of productive forces. It has also been asserted that the First FYP of China with 24 per cent of accumulation happened to be the most balanced and appropriate one.

As regards the column giving incremental income per 100 yuan of investment, it may be considered as a rough summary measure of the efficiency of investment in different planning periods. The inverse of this ratio could be called an incremental capital-output ratio, if so desired. In any event, it may be used to characterize the performances of various plans. In any case, according to the empirical results, the worst performance was made in the Second FYP, and the best results were obtained during the readjustment period 1962-65, reaching to an increment of 54 yuan in national income for a level of 100 yuan of investment.

The next Table III.2 presents some summary results regarding investment per capita and incremental change in employment per unit of investment, indicating the trends of mechanization during the period 1952-1980.

The investment per capita may be considered as a measure of investment intensity with respect to the size of the population. As it can be observed from the Table, there occurred a rising trend during the period 1952-80. It increased from 21 yuan in 1952 to 124.2 yuan in 1980. Even so,

TABLE III.2: Investment per capita and Rate of Mechanization

	1952	1957	1965	1970	1975	1977	1978	1979	1980
1. Total investment current price, billion y	12.6	21.8	34.4	61.8	83.0	83.2	109.9	113.2	122.0
2. Investment per capita: y	21.9	33.7	47.4	74.8	90.2	88.0	114.7	116.6	124.2
3. Investment per unit of labour: y	60.8	91.7	118.5	178.1	220.0	209.5	273.1	277.7	295.7
4. Average annual growth rate of labour (%)		2.8	2.4	3.7	2.1	1.6	1.2	1.8	1.7
5. Increase in labour per million y		367	228	250	106	75	50	65	59
6. " (Investment: 1970 price)		457	-	233	-	81	49	65	-
7. Index of mechanization		100	161	147	348	493	738	562	619

Sources: China Statistical Year Book 1981;
World Bank, p.170.

the level of investment per capita, as obtained in 1980, was rather low, and is hardly comparable to developed countries, let alone mentioning the content of investment, differentiated by the advances in technology. These summary results are, though, based on the investment being measured in current prices, but, owing to the insignificant growth in implicit NMP deflation, the results would hardly make any significant difference if the investments are measured in the constant prices of 1970.

As to the change in employment per unit of investment, the highest value was obtained during 1952. Its level was 367 per million yuan of investment. But after 1970, there occurred a great decline, reaching to the level of 50 in 1978. In any case, these empirical results indicate an increasing trend of mechanization in Chinese economy. According to the index of mechanization as given in the Table, it is observed that in 1980 the level of this index was more than six times as compared with the base year 1957.

Finally, Tables III.3 and III.4 describe the distribution of capital construction investment among different economic and industrial sectors respectively. According to these Tables, the highest allocation was made to industry. Except in the First FYP when it was found to be 46 per cent, it remained above 50 per cent in each given period. And among industries, the highest allocation was made to heavy industry. Once again, it amounted to 39 per cent in the First FYP, but remained above 50 per cent in all other periods. In short, the heavy industries have been given priorities throughout the period 1952-79.

Following an "inward looking" strategy of autonomous development, which, given the size of the population and compatible natural resources, appears to be the right direction to follow, China gave priority to building up a sound industrial base. But, from the very beginning, an effort was made to pursue a simultaneous and balanced growth of agriculture and industry. This again was in line with the deliberate spirit of industrialization in most of the developing countries.

Table III.3

Distribution of Capital Construction Investment among different Economic Sectors

	1st FYP	2nd FYP	1963-65	3rd FYP	4th FYP	1976-78	1979
Industry	45.5	61.4	52.1	59.2	58.2	63.6	56.4
Transportation + communications	16.4	13.8	13.3	16.4	18.9	19.6	12.8
Construction	3.9	1.4	2.2	1.9	1.7	1.8	2.3
Agriculture	7.6	11.4	18.4	11.4	10.3	11.3	11.6
Commerce, trade, etc.	3.9	2.0	2.6	2.3	3.0	3.1	4.1
Education, health services	8.1	3.9	6.0	3.0	3.3	2.3	6.7
Urban public works	2.6	2.3	3.0	1.9	2.0	4.2	6.0
Total amount (10^9 yuan)	54.991	118.667	40.374	91.473	168.03	120.388	47.96

Source: China Statistical Year Book 1981.
(Maruyama: Table XIV)

Table III.4

Distribution of Capital Construction Investment among Industrial Sectors

(%: total amount of capital construction investment: 100)

	1st FYP	2nd FYP	1963-65	3rd FYP	4th FYP	1976-78	1979
Heavy industry	38.7	54.9	48.0	54.5	52.1	57.0	50.4
Coal	5.4	7.3	6.2	5.1	5.4	6.3	6.4
Petroleum	2.2	2.1	4.1	4.2	5.3	7.5	6.2
Electric power	5.4	7.5	5.5	7.5	7.7	9.8	10.2
All energy	13.0	16.9	15.8	16.8	18.4	23.6	22.8
Metallurgy	8.5	14.3	8.4	10.8	10.3	-	7.0
Machinery	7.0	9.8	6.0	8.1	12.9	-	7.2
of which							
Agricultural machinery	0.5	1.4	1.6	1.6	1.4	1.1	n.a.
Chemicals	2.5	4.7	5.8	6.8	5.7	7.6	n.a.
of which							
Chemical fertilizer	0.9	1.8	3.3	3.6	4.1	5.1	n.a.
Building materials	1.2	2.0	1.4	1.6	1.8	n.a.	2.4
Light industry	6.8	6.5	4.1	4.7	6.1	6.7	6.0
Textile	2.9	1.7	1.3	1.5	1.9	n.a.	2.8
Total amount of capital construction in industry (10^9 yuan)	25.078	72.803	21.018	54.151	97.797	76.56	27.649

Source: China Statistical Year Book 1981
(Maruyama: Table XV)

Note: Amounts of Investment are in current prices

As regards the industrial sector, in China it was classified into light and heavy industry. This classification seems to be more or less in accord with the production activities related to means of consumption and means of production respectively. And, it was also thought to be desirable to maintain an appropriate balance between these two categories of industry. In short, the Chinese strategy was oriented towards the balanced growth and development of agriculture, light industry and heavy industry. And it was deemed essential to aim at increasing the rate of growth in these three categories so that the surplus generated in each category would not only meet the requirements of respective categories but could also be used by others, including the non-productive investment in general.

Table III.5 gives the share, growth rate and the relative contribution of agriculture, light industry and heavy industry. This Table has been compiled from different sources and reliability of statistical information may be questionable. However, the main purpose is just to indicate the relative pattern of development of these categories over the period 1952-79.

As it can be observed, the dominating share of agriculture, which was about 74 per cent before 1952, declined to 45 per cent in 1978, whereas its growth rate during 1952-78 varied between 2.1 per cent in 1977 to 14.9 per cent in 1952. The share of light and heavy industry consequently increased from 18 to 22 per cent and 8 to 33 per cent respectively. And the growth rates of light and heavy industry were found to be in the range of 7.7 to 29.0 per cent and 7.2 to 48.8 per cent respectively. After weighing the growth rate with the base year share, an approximate index of relative contribution in the total growth of these three categories combined was obtained. According to this, the percentage contribution decreased from 55 per cent in 1952 to 47 per cent in 1979, whereas the corresponding figures for light and heavy industry were 29 to 9 per cent and 19 to 29 per cent respectively.

TABLE III.5: Share, Growth and Distribution Balance

	Agriculture (%)			Light Industry (%)			Heavy Industry (%)		
YEAR	s	g	c	s	g	c	s	g	c
1952	74	14.9	(55)	18	29.0	(26)	8	48.8	(19)
1957	63	4.5	(30)	21	12.9	(28)	16	25.4	(42)
1965	56	11.1	(61)	22	8.2	(18)	22	9.7	(21)
1970	51	3.9	(25)	21	8.4	(23)	28	14.7	(52)
1975	46	4.0	(29)	21	7.7	(23)	33	10.2	(48)
1977	45	2.1	(19)	22	8.2	(35)	33	7.2	(46)
1978	44	9.0	(34)	22	10.8	(21)	34	15.6	(45)
1979	45	8.6	(47)	22	9.6	(24)	33	7.7	(29)

NOTE: s = Average annual share before the indicated year.
g = Average annual rate of growth.
c = Percentage contribution to the growth in the total of agriculture, light industries and heavy industries.

Sources: Maruyama;
China Statistical Year Book 1981;
World Bank (1981).

In short, all these empirical results indicate the increasingly dominating contribution of industry in general and heavy industry in particular, to the growth of Chinese economy.

As it may be understood, among other things, growth, industrial deepening, capital deepening and technological development have played the important roles in restructuring China's economy towards self-sustained growth. The rapid pace of accumulation and agricultural development manifest the essential contribution that has been made by intermediate and capital goods industry. After 1960, the rising requirements for food and limited supply of foreign exchange resulted in the curtailment of machinery imports and left no other alternative but to meet the demand from domestic production of capital goods.

One can hardly deny the significance of import of capital goods as a carrier of new technology. But the ability of domestic industry to absorb, imitate and modify the foreign technology, provides an impetus to extend the technological frontier. In this context, China's experience has been quite noteworthy.

Recalling the critical situation due to upsetting events of the period 1958-60, it is not far from the truth that Chinese planners were rather convinced regarding the increasing importance of agriculture sector in the process of sustained industrialization, which in turn needed industrial support. As a result, new policies of identifying agriculture as the "foundation" and industry as the "leading sector" brought about considerable success in the overall performance of the economy. In any case, Rawski (p.103) provides the following statistical information regarding the inflows of producer goods being used in agriculture:

Period	Producer Goods	Average Annual Growth Rate (%)
1957-75	Rural power consumption	32
1958-76	Small-scale cement output	19
1957-75	Chemical fertilizer output	21
1957-76	Irrigation and drainage equipment: horse power	26-27
1957-76	Tractors: horse power	18
1970-76	Power tillers: horse power	46

In order to indicate the impact of industrial imports on rural labour requirements, Rawski (p.104) describes as follows:

> "Electrification and mechanization of crop processing, irrigation, transport and other operations have eliminated the demand for millions of man-years of human labour. But increased supplies of water, nutrients, and motive power have simultaneously permitted cropping cycles to be intensified in many directions. In some regions, for example, machines capable of replacing human labour formerly devoted to irrigation, harvesting, threshing, transport, ploughing, and transplanting, during seasonal labour peaks have eliminated bottlenecks that formerly restricted the spread of multicropping. Mechanization led to unprecedented harvest results and also to increased overall labour requirements in various regions. On balance, the labour requirement created by various forms of intensification, land improvements, and water conservancy projects, all of which depend heavily on industrial supplies, have far outweighed the labour replacing effect of mechanization".

Finally, in order to examine the development of intersectoral linkages, an input-output table of China, constructed for the year 1975, was used. As is well known, in view of the analytical framework of the input-output table, the Leontief-inverse matrix provides the essential feature of intersectoral linkages.

Let $A = (aij)$, $i = 1,2 \ldots n$ $j = 1,2 \ldots n$ denotes the input-output coefficient matrix; then $(2-A)^{-1}$ is called the Leontief-inverse, having C_{ij} as an element in the ith row and jth column. These two kinds of linkages, normalized by the average of the element of Leontief-matric can be derived as follows:

(1) Backward linkage: $B_j = \frac{1}{n} \sum_{t=1}^{n} Cij / \frac{1}{n^2} \sum_{i,j} Cij$

(2) Forward linkage: $F_i = \frac{1}{n} \sum_{j=1}^{n} Cij / \frac{1}{n^2} \sum_{i,j} Cij$

The values B_j 1, $j = 1,2, \ldots n$ indicate well developed backward linkage, and similarly the value of F_i 1, $i = 1,2, \ldots n$, indicate well developed forward linkages of various sectors.

Based on the Leontief-inverse matrix for China 1975, the following empirical results for the intersectoral linkages have been obtained:

Sector	Forward Linkage		Backward Linkage	
	F	Rank	B	Rank
Agriculture	0.437	6	0.314	8
Agro-Food	0.250	8	0.525	5
Energy	0.508	3	0.479	6
Basic Products	0.876	1	0.530	4
Light Industry	0.484	4	0.563	2
Equipment	0.636	2	0.543	3
Construction	0.338	7	0.618	1
Services	0.471	5	0.427	7

As it can be observed, in 1975, all the linkages were less than unity. But it could be expected that they have increased in the post-1975 period. In any case, these linkages have been ranked in descending order.

Based on these empirical results, it is found that the rank of the equipment sector according to forward linkage was 2; it was just behind basic products sector, whereas in view of backward linkage, it obtained third position behind construction and light industry sectors. In any case, Table III.6 gives the output of major capital goods over the period 1952-80.

To sum up, in considering the experiences of China, which were of course related to a socialist construction and which may not be possibly repeated elsewhere, it is, nevertheless, possible to identify some aspects of them which could probably be worth considering in the context of mixed economies.

First, in view of the necessity of some sort of social control over investments and accumulations in any economic system, the aspect of ownership remains an open question in mixed economies.

Second, a co-ordinated approach to accumulation, viewed as a generalized process and realized in the augmention of capital goods, development of resources, human skills, and technology and organizational knowledge, appears to be the right direction to follow.

Third, it seems necessary to consider the importance of derived demand aspects of the capital goods industry.

Fourth, a balanced and interdependent development of agriculture and industry is highly desirable for a harmonious and self-sustained growth of the economy.

Fifth, the sound industrial base of Chinese economy could not have possibly been built without the development of a diversified structure of capital goods industry, whose foundation was laid in the very beginning of the industrial planning.

TABLE III.6: Output of Major Capital Goods Products in China

	Units	1952	1957	1965	1970	1975	1977	1978	1979	1980	1978/77	1979/78	1980/79
1. Power generating equipment	MW	6	198	683	2918	4965	3181	4838	6212	4193	1.52	1.28	0.67
2. Mining equipment	000 tons	1.8	52.9	40.0	96.3	196.1	184.5	242.9	264.0	163.0	1.32	1.09	0.62
3. Machine tools	000	13.7	28.0	39.6	138.9	174.9	198.7	183.2	139.6	1340	0.92	0.76	0.96
4. Motor vehicles	000	0	7.9	40.5	87.2	139.8	125.4	149.1	185.7	222.0	1.19	1.25	1.20
5. Tractors	000	0	0	9.6	31.9	78.4	99.3	113.5	125.6	98.0	1.14	1.11	0.78
6. Hand tractors	000	0	0	3.6	51.4	209.4	320.5	324.2	317.5	218.0	1.01	0.98	0.69
7. Internal comb.engines	000 hp	40	690	2790	7330	23480	27410	28180	29080	25390	1.03	1.03	0.87
8. Locomotives	units	20	167	146	573	526	293	521	573	512	1.78	1.10	0.89
9. Railway passenger wagons	units	6	454	160	576	804	538	784	856	1002	1.46	1.09	1.17
10. Railway freight wagons	000	5.8	7.3	2.9	11.8	15.7	6.4	17.0	16.0	10.6	2.66	0.94	0.66
11. Steel ships for civilian use	000 tons	2.1	108	na	na	na	634	861	809	818	1.35	0.94	1.01

Source: World Bank (Table 7.1).

Sixthly, while mobilizing and developing the internal resources of the economy, China made an effort to develop the latent resources. However, investment planning in general and the development of capital goods industry in particular was found to be a complex phenomenon. And the best practice evolved was based on identifying both weak and strong aspects of the Chinese economy in order to make progress in constructing appropriate industrial base. In short, there appears to be no substitute for experience.

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Concluding Remarks

It is to be observed that most of the developing countries, which happen to be more or less symmetrical with regard to their historically given conditions, have accumulated sufficient experiences of successes and failures in investment planning. It is also true that there has been no lack of spirit in participation of various kinds of co-operative schemes, particularly joint ventures, that were thought to be inevitably desirable. And, as regards the building-up of capital-goods industry, there are countries such as Argentina, Brazil, China, India, Korea and some others, which have accumulated sufficient experiences in producing from small tools to complex capital goods. Moreover, they are found to have developed intermediate technology, which happens to be more appropriate and suited to the prevailing situations in other developing countries. In addition, there are a group of OPEC countries which have, in particular, provided generous financial aids in terms of foreign exchange to various developing countries.

Based on all these facts, the feasibility of any co-operative scheme, with well-designed co-ordinated investment planning for the building-up of capital goods industry, leading to complementarities and, hence, mutual benefits, appears to be a genuine possibility. All the same, any such scheme could be expected to provide a more stable co-operation, promoting autonomous development of various regions.

Having made these remarks, it seems imperative to suggest that the analytical framework of input-output analysis, with inter-country linkages and thereby extending the notion of sectoral interdependence, may be used to evaluate the expected mutual benefit, including the division of labour and diversification of specialization, given the stage of development of the economy. In this context, it may be pointed out that the construction of input-output table is quite a hard task, requiring both time and expertise. This cannot be denied. But, in principle, the analytical framework of the input-output table has a heuristic appeal and could be easily understood.

Finally, in view of the sectoral interdependence, the joint venture activities of various multinational corporations originating from developing countries, such as Argentina, Brazil, India, etc., could be re-ordered according to the priorities selected in various regions. But, in the case of multinational or transnational corporations originating from industrialized countries, which happen to operate under some sort of global system, it could only be hoped that they co-operate in promoting the development of capital goods industry, which is suitable to the prevailing conditions of the Third World having regional perspectives.