DYNAMICS OF ECONOMIC DEVELOPMENT

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CONTENTS

Preface ........................................ ix
Chapter I. The Central Problem in the
Dynamics of Development .................. 1
   The Composition of Analysis ............ 2
   The Unit of Analysis ..................... 3
   Characteristics of the Simplified
      Subeconomy ............................ 5
   Causation ................................ 10
Chapter II. Accumulation with a Single
Technique .................................... 15
   An Illustrative Economy .................. 15
   Solution for Steady Growth ............. 17
   Implications of Dynamic Development .... 24
   Pricing of Goods Under Single-Technique
      Accumulation .......................... 29
Chapter III. Wages, Consumption, and Growth
(Single Technique) ......................... 39
   Distribution of Income in a Situation of
      Dynamic Equilibrium .................. 40
   The Effect of Consumption on Growth .... 45
Chapter IV. Profits, Consumption, and Growth
(Single Technique) ......................... 49
   A Nonemployment Economy ................ 50
   A Full-Employment Economy ............. 54
   The Need to Control Consumption ......... 57
Chapter V. Choice of Techniques ............ 61
   Depiction of a Single Technique ........ 61
   Depiction of Alternative Techniques .... 65
   Choosing the Optimal Technique ......... 69
Chapter VI. Main Features of Underdeveloped
Economies .................................. 73
   Excessive Reliance on Agriculture ....... 74
   The Phenomenon of Disguised Unemployment 75
   The Demographic Factor .................. 76
   Deficiency of Capital and the Use
      of Inferior Techniques ................. 79
   Inadequate Infrastructure ............... 81
Chapter VII. Capital Formation and Economic
Development ............................... 83
Contents (continued)

Chapter VIII. Pattern of Growth: A Reconciliation .......... 89
Deliberately Unbalancing a Subeconomy ........ 89
Variables Affecting the Allocation of Resources .......... 93

Chapter IX. Inflation, Excess Capacity, and Economic Development ........ 97

Chapter X. Distribution and Development .......... 103
PREFACE

The problems of economic development, confronted by two-thirds of the world's population, pose a challenge to students and decision-makers in advanced industrialized countries. Approaching the subject of development economics from the perspective of their own economic history, they often find themselves baffled by the magnitude and complexity of economic backwardness. This book is intended to provide them with a more realistic framework for formulating attitudes toward technical assistance, foreign aid, and the distribution of income and wealth. It is designed to explain the low-inflationary impact of a steady growth investment strategy that takes care of the equity problems of developing economies. It conveys a clearer understanding of the demands raised by the Third World at international fora by explaining the reasons why theories conceived in countries that inherited the Industrial Revolution cannot be applied to newly industrializing ones.

The book starts out by explaining the basic sectors of an economy and their input-output relationships using aggregative and disaggregative approaches. The unit of analysis is a subeconomy which serves as a model using two sectors, two commodities and nondepreciating equipment. The reader learns how to work out a solution for steady growth in a theoretical framework.

In the next few chapters the book deals with the dynamic variables of economic development and their relationship with the allocation of resources. The reader is introduced to the theory of pricing and measurement of distributive shares using simple mathematical concepts based on input-output matrices. A full-employment economy is described as governed by the rate of growth of the labor force and the rate of growth of productivity based on technical progress.

The question of which choice of techniques for production is optimal for a developing economy is discussed, introducing the reader to the derivation of a suitable production function. The book ends with a
detailed discussion of the theory of income distribution and the problems of equity as they pertain to development.

I am indebted to the Osmania School of Economics in Hyderabad, India and to its chairman Professor Gantam Mathur for their initial encouragement of this work. I am equally thankful to my American colleagues and students for their free and frank discussions of the problems of development which made me realize the need for this book.

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CHAPTER I
THE CENTRAL PROBLEM IN THE DYNAMICS OF DEVELOPMENT

The best measure of economic development is the behavior of real income per man hour; the growth of that income is the objective of economic development.

Economic development, then, can be defined as the achievement of a steady rate of growth of real income per person, given the long-term growth of population and the rate of increase of technical knowledge. In a developed economy, this steady growth can be maintained without altering the structure of production. The problem of development (as distinct from the problem of growth) involves the introduction of structural changes, so as to transform the economy in the shortest possible time from one using predominantly inferior techniques to one using the most advanced techniques. The concept of steady growth remains central, however, as a basis for programming such structural changes for an economy characterized initially as underdeveloped.

Two schools of economic thought have posited requirements and conditions for evolving a steady-growth economy. One school of thought has as its leading proponents Roy Harrod, Evesy Domar, Joan Robinson, and Nicholas Kaldor, who, with their aggregative approach, have concentrated on the growth of the economy through the growth of one or two sectors. The second school of thought, led by J. von Neumann and Wassily Leontief, disaggregates the economy and works with dynamic process analysis in order to show how steady growth can be maintained.

In developing economies, there are specific goods in short supply, and these shortages deter development. In order to understand how these bottlenecks arise and the methods of overcoming them, it is important to analyze the technological structure and the techniques that ought to be selected to place the economy on a path of steady growth. Certain types of skills and equipment are in short supply or are non-existent in such economies, and this factor serves as
a bottleneck to growth. Therefore, the attainment of equilibrium depends less on money or other financial sources than on the availability of physical and manpower resources. In other words, initial constraints are not monetary in nature, but consist in certain types of skills and equipment that will be required in certain proportions to implement growth. Resources of a physical nature should be so planned that the right proportions are channeled into the sectors producing consumer goods and those producing the equipment required to produce such goods. If this can be achieved, the economy will grow with neither shortages nor surpluses, and the real wage rate will remain the same.

The Composition of an Economy

Every economy is composed of different sectors which are interdependent in terms of their input-output relationship. These sectors produce various goods and services that may serve as final goods or as inputs for the production of goods from another, complementary sector. The functioning of a sector, therefore, can be depicted as an input-output flow: the output of the sector is the resultant of various inputs cooperating with each other. Such a relationship of inputs to outputs can be described as a set of processes that characterize the economy. In such processes, output may consist of a single good or a collection of goods.

Since a process represents the techno-economic relationship between inputs and outputs resulting in the production of goods, we can define the aggregate economy as a set of processes producing a given spectrum of goods and services. Because of the input-output relationship that exists within each process, the technology as a whole represents a disaggregated view of the input requirements and output levels at any point in time. These input requirements, as well as the outputs that emerge therefrom, can be defined in terms of a single unit of labor. Thus, the process can be described as a vector of input-output coefficients defined at a level of activity appropriate to a unit of labor.
The economy, thus depicted in terms of processes will be composed of various sectors, which are physically interdependent. For simplicity's sake, we may assume here that there exists no trade relationship with other economies: the economy being described is a closed one. Therefore, the interdependence of sectors arises from the mutual input requirements of the constituent sectors. For example, in the process of producing steel, the input requirements would be iron ore, cement, power, and wage goods for steel mill workers. Similarly, for the production of power, we require steel, cement, and wage goods, along with other inputs. As the projected output of steel increases, the input requirements increase proportionally. If any of the inputs is not available in that process, then the target itself cannot be realized. The case is similar for other goods and services. This type of interdependence emerges clearly when we depict the economy in terms of processes.

The key to achieving noninflationary growth is to recognize the importance of such interdependence in allocating resources over various processes. Otherwise, the economy will develop critical shortages in specific sectors. Once such shortages develop, they tend to propagate their effects throughout the rest of the economy. For example, if there is a shortage in iron ore production, steel output is affected, and this, in turn, reduces the output of machines used in producing consumer goods. Any shortage of such machines will result, ultimately, in a lower volume of consumer goods in the economy. The greater the degree of interdependence, the sooner the shortage is propagated from one sector to another.

The Unit of Analysis

A subeconomy is defined as a set of processes self-sufficient as to its requirements except for natural resources. A subeconomy does not have commodity relationships outside itself. A subeconomy that grows at a positive rate is defined as a subeconomy that is eligible for growth. In our subsequent analysis of development, we will be using the concept of an eligible subeconomy. A larger subeconomy is capable of being broken down into smaller
A subeconomy represents a set of processes. In a closed, eligible subeconomy, the interdependence between processes must be such that it is self-sufficient for its requirements of reproducible economic inputs. In other words, it should be capable of producing all the goods it requires. Assume, for example, a subeconomy of three goods and three processes: spade, plow, and rice. Let us assume that rice is the single consumer good demanded and produced, and that spade and plow are the equipments used. If the spade-producing process can produce the plow as well as the spade, then that process is self-sufficient. In this case, the spade as an equipment is versatile. In a closed subeconomy, at least one equipment should be versatile.

Now let us take a more generalized technology, represented by one process producing a consumption good and n other processes in the equipment sector. These n processes represent n departments, of which the nth-order department represents the production of the highest-order equipment. This nth-order equipment produces the equipment of the (n-1)th order, which in turn produces (n-2)th-order equipment, and so on. Lower down the chain, the 3rd-order equipment produces the 2nd-order equipment, and the 2nd-order equipment produces the 1st-order equipment. This 1st-order equipment, in turn, produces the consumer good. This system cannot represent a closed subeconomy unless there is a process (and an equipment) producing the nth-order equipment. Thus, one of the n types of equipment must produce the nth-order equipment, in addition to producing equipment of the next lower order. If we assume that this is done by the nth-order equipment itself, then we have the nth-order machine doing two things: reproducing itself and producing the (n-1)th-order equipment.

For the purposes of meaningful analysis, however, one need not always operate with a generalized n-sector model. Practically speaking, the degree of complexity will be high for cases where n>2. Instead, we can keep the analysis at a simple level by assuming away the peripheral complexities and retaining
the essentials. To this end, in our subsequent analysis of the problem of dynamic growth, we assume, unless clearly stated otherwise, that \( n = 1 \). That is, the economy has only one equipment sector, and this equipment is used for the production of a single consumer good, besides reproducing itself. Thus, our hypothetical economy will have only two sectors, producing two goods: a composite consumer good \( (C) \) and a versatile equipment \( (Eq) \).

**Characteristics of the Simplified Subeconomy**

To facilitate an easy identification of the causative factors in dynamic growth, we will assume a subeconomy having the following characteristics:

1. **The subeconomy has two sectors and two goods.** The two sectors produce a consumer good and equipment, respectively, and these are also the goods used. Thus, the subeconomy is a closed one, and the equipment used is versatile. That is, besides producing the consumer good \( (C) \), the equipment \( (Eq) \) also produces itself.

2. **The equipment used in this model is assumed to be nondepreciating.** This assumption can be made in one of two ways. It can be assumed that the equipment is everlasting, and that its physical efficiency does not deteriorate over time. Alternatively, it can be assumed that the equipment has a finite life, but during its life it has a constant physical efficiency.

   In either case (assuming, in the latter case, that the production period is less than the life of the equipment), the equipment is as new (in terms of physical efficiency) at the end of the production period as it was at the beginning of production. Thus, it can be treated as an addition to output. That is, when the technology is depicted as a process matrix, the equipment used (and thus shown on the input side of the technology) also will be shown as output, since its efficiency is not impaired by its use as an instrument of production.

3. **There are assumed to be only two economic classes in the economy.** They are producers (entrepreneurs) and workers, whose respective sources of income are profits and wages. Thus, the total national income
generated in the economy at the end of any given production period is the aggregate of profits and wages generated during that period.

It is further assumed that the investment habit of each class—the propensity to invest, which is the ratio of investment to income, or the rate of investment—is exogenously given and not likely to change. Defining $s_p$ as that part of profits invested and $s_w$ as that part of wages invested, we have

$$s_p = \frac{I_p}{Pr}$$

and

$$s_w = \frac{I_w}{W}$$

where

$I_p$ = amount of investment by producers

$I_w$ = amount of investment by workers

$Pr$ = total profits

$W$ = total wage bill

Since (as will be shown later) this study denies the validity of the proposition that savings cause accumulation, the propensities to save (or the thriftiness condition) have no causal significance unless they are interpreted as the propensity to invest of the various classes assumed to exist in the economy. The rate of accumulation depends on investment only; savings is a null variable in the causation relevant to development. The accent on savings has been shown to be a vestige of neoclassical economics, which, unfortunately, has found a place in some of the recent post-Keynesian neoclassical (and some non-neoclassical) literature on growth. Thus, to assign to savings the status of the prime mover of development is to undo the Keynesian contribution to economic thinking.
It is more relevant to interpret savings as the reduction in real consumption, since it is this aspect which has an impact on development. Though we continue to use the symbols $s_p$ and $s_w$ for the sake of convenience, these should be interpreted as representing not propensities to save, but propensities to **invest**, on the part of entrepreneurs and workers, respectively.

The values assumed by $s_p$ and $s_w$ indicate the class propensities to invest. Therefore, $(1-s_p)$ and $(1-s_w)$ are the class propensities to consume. Defined thus, the maximum value of $s_p$ or $s_w$ is unity, in which case the class to which it pertains is investing its entire income. This implies that consumption out of income is zero. At the opposite extreme, $s_p$ or $s_w$ is equal to zero. In this case, the entire income of that class is used for consumption. This means that the class propensity to consume is equal to one. Thus, given, the propensity to invest, the propensity to consume can be calculated easily:

Let

\[ Y = \text{the national product} \]

out of which

\[ I = \text{the value of investment goods} \]

and

\[ C = \text{the value of consumption goods} \]

Now we can establish the Keynesian equation

\[ Y = I + C \]

Dividing both sides by $Y$, we have

\[ \frac{Y}{Y} = \frac{I}{Y} + \frac{C}{Y} \]

But

\[ \frac{I}{Y} = \text{propensity to invest (designated } s \text{ in this study)} \]
8

and

\[
\frac{C}{Y} = \text{propensity to consume (c)}
\]

Therefore,

\[
l = s + c
\]

or

\[
s = 1 - c
\]

or

\[
c = 1 - s
\]

To simplify the analysis, unless stated otherwise, we will make the following assumptions regarding the investment behavior of the two classes (entrepreneurs and workers) assumed to exist in this economy. The workers are assumed to consume their entire wages, which is their total income. That is, the propensity to invest of the workers is equal to zero \(s_w = 0\), and their propensity to consume is equal to one \(c_w = 1\).³ At the same time, we will assume that the entrepreneurs invest their entire profits earned in the previous period. Thus, their propensity to invest is equal to unity, and no consumption takes place out of their profits. Given these assumptions, the amount invested in the economy is equal to the amount of profits earned, while the amount consumed is equal to the total wage bill in the economy. Thus,

\[
C = C_w = W
\]

and

\[
I = Pr
\]

where

\[
C = \text{total consumption during a period}
\]

\[
C_w = \text{total C by workers in the same period}
\]

\[
W = \text{total wage bill to workers in the same period}
\]

\[
I = \text{total investment in the same period}
\]
Pr = total profits

We know that

\[ Y = C + I \]  \hspace{1cm} (1)

But, in view of the above equalities, we can also state that

\[ Y = W + Pr \]  \hspace{1cm} (2)

While equation (1) gives us the value of income by the product method, equation (2) gives the same through the income method.

4. The economy is assumed to have an unlimited supply of labor. This assumption can be made in one of two ways. We can assume a very large initial population, so that we can operate in an economy endowed with "unlimited labor." Alternatively, we can assume that the initial surplus of labor is not very large, but that the rate of growth of population (and, therefore, of the labor supply) is the same as that of the economy, so that the economy is endowed with a permanent surplus of labor in a situation where technical progress does not take place.

In either case, we have a situation in which labor is not a bottleneck to growth. In other words, the rate of accumulation is not limited by the non-availability of labor as an input. Because of the easy availability of labor, moreover, the real wage rate is constant. At a particular wage rate, that is, the supply of labor is infinitely elastic, and, therefore, there is no endogenous tendency for the real wage rate to rise. In addition, the pressure of surplus labor tends to keep the wage rate close to the subsistence level. If one assumes that labor is uniform in its skills (or, alternatively, that skill differences could be measured), then each member of the employed labor force will be paid a fixed, near-subsistence real wage rate.

5. In contrast to the neoclassical assumption, the equipments used here represent the embodiment of capital in specific forms. The efficiency of a given
piece of equipment is technologically given, as is its capacity to be combined with other factors of production. Thus, the output coefficients are to be treated as technologically given constants. This rules out the possibility of measuring the marginal productivity of a factor, since the output is the resultant of a particular combination of factors existing together. An increase in output of any good is possible in this system only when all the inputs required for its production are increased proportionately, and in proportions warranted by the given technology.

6. The economy operates under conditions of perfect competition and perfect tranquillity. Under such conditions, entrepreneurs earn the same rate of profit over the various processes used. Where the rates of profit differ, the profit-maximizing entrepreneurs are expected to shift their resources from low-profit areas to high-profit ones, so that, in the course of time, equality between the rates of profit will be established. Once such an equality is established, there is no tendency for the entrepreneurs to shift their resources from one activity to another.

The same conditions will be met if it is assumed that the economy is operating in a pure socialist setting. In this case, the planning authority will ensure that the distribution of investible resources is such that a uniform rate of profit prevails over the various processes used.

Causation

Before setting up an illustrative economy for detailed analysis, we must try to identify the causal, or active, variables in economic development. If we start with the initial assumption of nonemployment, the variables which can be classified as active are different from those which would be active if the initial assumption were that of full employment.

Under the first assumption, with nonemployment high, the real wage rate tends to be fixed at the near-subistence level, and there are no endogenous forces exerted to increase the wage rate. Nor can the wage rate be depressed below the prevailing level, because
of its proximity to subsistence. Therefore, in our analysis, wage rate enters as a variable whose value cannot be changed: it is a rigid variable.

The wage rate, thus given, now determines the rate of profit prevailing throughout the system, through the nature of the technique used. In this case, the rate of profit \( r \) is the flexible variable, since its value is adjusted to the initial real wage rate found to exist in the system. This rate of profit, in turn, determines the rate of growth, through the propensity to invest of the entrepreneurial class. The rate of growth which is the resultant (or the residue) of the system may be greater than, equal to, or less than the exogenously given rate of growth of population. Assuming that there is no technical progress taking place in the economy, in the first case, the degree of nonemployment is progressively reduced; in the second case, it remains unchanged; and in the third case, there is a progressive worsening of the situation—that is, an aggravation of the already high degree of nonemployment. Schematically, the pattern of causation can be shown as follows:

\[
\begin{align*}
\text{w} & \quad \frac{\text{r}}{\text{(sp)}} \quad \frac{\text{g}}{\text{gL}} \\
\end{align*}
\]

where

\[
\begin{align*}
w &= \text{wage rate} \\
r &= \text{rate of profit} \\
sp &= \text{propensity to invest of the entrepreneurs} \\
g &= \text{rate of growth of income} \\
gL &= \text{rate of growth of employment}
\end{align*}
\]

The direction indicated by the arrows show causation. Thus, \( w \rightarrow r \) should be interpreted as wage rate of profit.
In the reverse case, with the assumption of initial full employment, the causation relevant to the earlier situation ceases to have any validity. In this case, the assumption of full employment implies that the rate of growth of the economy is limited by the rate of growth of the labor force (which would increase the output per person). The economy's rate of growth, that is, cannot exceed the ceiling imposed by the growth of population and technical progress (increase in output per person). This can be recognized as Harrod's first identity; he calls it the natural rate of growth. In its approximate form, the natural rate of growth \( g \) is the sum of the growth rates of labor force \( g_l \) and output per person \( g_t \):

\[
g = g_l + g_t
\]

Since, under full-employment conditions, the rate of growth of the economy is limited by \( g_l \) and \( g_t \), and the value of \( g \) is invariant as long as \( g_l \) and \( g_t \) are given exogenously. Thus, \( g \) is the dependent variable of the system. The rate of growth, thus given, determines the rate of profit obtainable in this system, through the propensity to invest of the entrepreneurs. The rate of profit so determined, in turn, determines the real wage rate compatible with it, given the technology used. Given the initial conditions and constraints assumed, this wage rate turns out to be the highest possible for this technique. Schematically, the causal chain can be represented as follows:

\[
g \leftarrow g_t + g_l \xrightarrow{(s_p)} r \xrightarrow{} w
\]

where

\[
g_t = \text{rate of growth of output per person (rate of technical progress)}
\]

\[
g_l = \text{rate of growth of the labor force}
\]

\[
s_p = \text{propensity to invest of entrepreneurs}
\]
It can be seen from the above that the causation relevant to this situation is the reverse of that observed in the situation of initial nonemployment. This reversal is also true with respect to the active and residuary variables. Whereas in the first situation, it is $g$ (rate of growth) which is the determined variable, in the second case, the flexible variable is $w$ (real wage rate). The first pattern of causation is central to underdeveloped economies, while the second is relevant to a developed economy under conditions of full employment. Since it is the underdeveloped economy that concerns us here, unless stated otherwise, we will operate in a system controlled by the assumptions and causal relations of the first type.
CHAPTER II

ACCUMULATION WITH A SINGLE TECHNIQUE

An Illustrative Economy

Our illustrative economy will produce two goods: a composite consumption good (C) and an equipment to produce it (Eq). The equipment used is nondepreciating: it remains new at the end of the period in spite of having been used. The equipment is also versatile: besides producing the consumption good, it also produces itself. The lag in production for these two goods is assumed to be the same—the unit time period. There are two processes, one for the production of each good, and the engineering properties of these processes, in terms of input-output coefficients, are fixed throughout the time period. Each activity is defined in terms of unit labor. Thus, on the input side, we enter all the quantities required in terms of their utilization per person employed; on the output side, we enter outputs per person. Labor, being available in unlimited quantities, does not enter the input matrix directly, since, by the nature of its supply, it is not a bottleneck to growth. What the laborer consumes (shadow real wage), however, is a part of the input matrix, along with the equipment used by labor. This economy can be summarized as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>Wage per person</td>
</tr>
<tr>
<td></td>
<td>in terms of the consumption good</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>(1)</td>
<td>1</td>
</tr>
<tr>
<td>(2)</td>
<td>1</td>
</tr>
</tbody>
</table>

In process (1), one unit of labor, getting paid one unit of C as wage and using one unit of equipment Eq, produces $b_0$ units of C during the production period. The equipment used, being nondepreciating, is shown as output also. In process (2), one unit of labor, with the input combinations shown, produces no consumption
goods but produces equipment of the quantity $b_{j+1}$ to indicate the nondepreciating nature of the equipment.

Now, given an initial endowment in the form of some amount of $C$ and $E_G$ (labor not being a bottleneck), how should these be distributed so that the economy grows in a noninflationary manner, noninflation being defined as a situation where the standard of living of the worker (the real wage rate) does not deteriorate? Such a situation is also defined as steady growth. A steady-growth system is also one in which there are neither excesses nor shortages. Since the two processes shown above require both $C$ and $E_G$ as inputs, in fixed proportions, these must be made to grow in a steady manner. Otherwise, the steady-growth condition will be jeopardized. Thus, if our economy is to experience dynamic growth, the rates of growth of the various goods produced must be equal. This is true of any economy seeking equilibrium, following from the elementary proposition that goods produce goods.

Defining the coefficient of growth of a good ($G$) as the ratio of its output to its input,

$$G = \frac{\text{output}}{\text{input}}$$

and the rate of growth ($g$) as the ratio of the increment in its output to its input,

$$g = \frac{\text{increase in output}}{\text{input}}$$

then

$$g = \frac{\text{output} - \text{input}}{\text{input}}$$

$$= \frac{\text{output}}{\text{input}} - 1$$

$$= G - 1$$

or

$$G = 1 + g$$
Solution for Steady Growth

Let the ratio in which the initial resources are divided between the two processes be \( m \) and \( n \), with \( m \) the proportion of resources going into process (1) and \( n \) the proportion into process (2), such that the distribution is in the ratio of \( m:n \) and, hence, \( m + n = 1 \). Such a ratio, indicating the distribution of resources, is known as the process intensities. Following such a division, the economy can be shown as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>( \frac{m}{n} )</td>
<td>( \frac{m}{n} )</td>
</tr>
<tr>
<td>( m+n )</td>
<td>( m+n )</td>
</tr>
</tbody>
</table>

While \( m+n \) represents the inputs used, \( b_{0m} \) and \( m+n(b_{1}+1) \) represent the outputs produced of \( C \) and \( Eq \), respectively. Using \( g_C \) and \( g_{Eq} \) to denote the rates of growth \( C \) and \( Eq \), respectively, and \( g \) to denote the overall rate of growth of the economy, we have as the condition for steady growth the following equality:

\[
g = g_C = g_{Eq}
\]

or

\[
l + g = 1 + g_C = 1 + g_{Eq}
\]

or

\[
G = G_C = G_{Eq}
\]

But, according to our definition of coefficient of growth, we have

\[
G_C = \frac{b_{0m}}{m+n}
\]
and
\[ G_{Eq} = \frac{m+n(b_1+1)}{m+n} \]

Therefore,
\[ \frac{b_0^m}{m+n} = \frac{m+n(b_1+1)}{m+n} \]

and each of these is equal to \( G \) under conditions of steady growth. But
\[ \frac{b_0^m}{m+n} = \frac{m+n(b_1+1)}{m+n} \]
is the same as
\[ b_0^m = m+n(b_1+1) \]

Therefore,
\[ m(b_0-1) = n(b_1+1) \]
or
\[ \frac{m}{n} = \frac{b_1+1}{b_0-1} \]

Now, let us calculate the value of \( G \):

\[ G = \frac{b_0^m}{m+n} = \frac{b_0^m}{n} \cdot \frac{n}{m+n} = \frac{b_0 \cdot m}{n} \cdot \frac{m+n}{n} \]

\[ = \frac{b_0 \cdot \frac{b_1+1}{b_0-1}}{b_0-1} + 1 \]
\[
\begin{align*}
\frac{b_0}{b_0 - 1} & = \frac{b_0(b_1 + 1)}{b_0 - 1} \\
& = \frac{b_0(b_1 + 1)}{b_1 + b_0 - b_0} \\
& = \frac{b_0(b_1 + 1)}{b_1 + b_0} 
\end{align*}
\]

Finally, we can solve for \( g \):

\[
g = G - 1 = \frac{b_0(b_1 + 1)}{b_1 + b_0} - 1
\]

\[
= \frac{b_0b_1 + b_0 - b_1 - b_0}{b_1 + b_0}
\]

\[
= \frac{b_1(b_0 - 1)}{b_1 + b_0}
\]

Instead of assuming that \( w = 1 \), let us assume that it is \( w \) (where \( w \), the real wage rate, is known to us). Then, the technology matrix can be written as:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C )</td>
<td>( b_0 )</td>
</tr>
<tr>
<td>( w )</td>
<td>( 1 )</td>
</tr>
<tr>
<td>( 0 )</td>
<td>( \frac{b_0}{b_1 + 1} )</td>
</tr>
</tbody>
</table>
20

We know that

\[ \frac{b_0m}{w(m+n)} = \frac{m+n(b_1+1)}{m+n} \]

or

\[ \frac{b_0m}{w} = m+n(b_1+1) \]

or

\[ b_0m - mw = n(b_1+1)w \]

or

\[ m(b_0 - w) = n(b_1+1)w \]

or

\[ \frac{m}{w} = \frac{b_1+1}{b_0-w} \cdot w \]

It can be seen from the above that for steady growth (a state where all goods are growing at the same rate), the allocation of resources depends on the technology, on the one hand, and the real wage rate,
on the other (assuming that the wage earners represent the only consuming class). If the wage rate increases, then the above equation tells us that the ratio $m/n$ increases. That is, allocations will shift toward the consumer-goods process in order to meet the real wage rate per person employed.

It is also clear from the above that, given the technology depicted in the form of an input-output matrix, steady growth can be realized only when the allocation is made in a rational manner. A random distribution of resources, therefore, is most likely to produce unbalanced growth. We know that $m:n$ is in the ratio of $b_1+1:b_0-1$. Let us allocate the resources in this ratio and see whether the economy can realize dynamic equilibrium.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>$b_1+1$</td>
<td>$b_1+1$</td>
</tr>
<tr>
<td>$b_0-1$</td>
<td>$b_0-1$</td>
</tr>
<tr>
<td>$b_0b_1$</td>
<td>$b_0b_1$</td>
</tr>
</tbody>
</table>

Thus,

$$G_C = \frac{b_0(b_1+1)}{b_0b_1}$$
and

\[ G_{Eq} = \frac{(b_1+1) + (b_0-1)(b_1+1)}{b_0 + b_1} \]

\[ = \frac{b_0(b_1+1)}{b_0+1} \]

Therefore, \( G_c = G_{Eq} \), and our condition for steady growth is satisfied.

Now let us take an illustration to see how the process intensities can be calculated, given the technology (in the form of an input-output matrix) and the real wage rate, representing the per capita consumption of the workers.

Let the economy be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( L )</td>
<td>( C )</td>
</tr>
<tr>
<td>1 1 1</td>
<td>4 1</td>
</tr>
<tr>
<td>1 1 1</td>
<td>0 3+1</td>
</tr>
</tbody>
</table>

Let the process intensities be represented by the ratio \( m:n \), where \( m = \) the production of investment going into the first process, and \( n = \) the proportion going into the second process. Therefore, \( m + n = 1 \).

After the allocation, the matrix can be written as:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( L )</td>
<td>( C )</td>
</tr>
<tr>
<td>( m )</td>
<td>( m )</td>
</tr>
<tr>
<td>( n )</td>
<td>( n )</td>
</tr>
<tr>
<td>( m+n )</td>
<td>( m+n )</td>
</tr>
</tbody>
</table>
Since, under conditions of steady growth, the coefficients of growth should be equal, the ratio of output to input will be equal for all goods. Therefore,

\[ \frac{4m}{m+n} = \frac{m+4n}{m+n} \]

or

\[ 4m = m+4n \]

or

\[ \frac{m}{n} = \frac{4}{3} \]

That is, \( m:n :: 4:3 \)

Now distribute the resources in the ratio of 4:3.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

The coefficient of growth of \( C \) is

\[ G_C = \frac{16}{7} = 2.285 \text{ (approx.)} \]

Therefore, the rate of growth is

\[ g_C = (2.285 - 1) \times 100 = 128.5\% \]

Similarly, the coefficient of growth of \( \text{Eq} \) is

\[ G_{\text{Eq}} = \frac{16}{7} = 2.285 \text{ (approx.)} \]
and

$$g_{Eq} = (2.285 - 1) \cdot 100 = 128.5\%$$

Thus, with 4.3 as the process intensities, given the technology depicted in the matrix, the condition for steady growth—that the coefficients of growth be equal—is satisfied. Any ratio other than 4:3 would violate this condition.

Implications of Dynamic Development

What are the dynamic gains which an economy realizes if it is on the equilibrium, steady-growth path? The condition that the goods must grow at the same rate ensures that the process of growth is devoid of any shortages or excesses. This is because commodities produce commodities. In a two-commodity model, as outlined above, if the goods figuring in the matrix grow at different rates, this will result in shortages in one sector and surpluses in the other. This type of unsteady state can be illustrated by allotting arbitrary process intensities which are not in the ratio required by the equilibrium condition.

Let the economy be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>$C$</td>
<td>$Eq$</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

For steady growth, the process intensities should be 2:3, at which distribution the rate of growth would be 60 percent. But now, let the actual process intensities be 3:2. In this case, the economy will develop symptoms of unsteady growth, as shown on the following page.
In this case, the two rates of growth are different. In the next period, there are 12 units of C and 7 units of Eq. Since one worker requires one unit of Eq as input, there is a requirement of 7 workers in the next period, requiring 7 units of C was wages. But as 12 units of C are produced, at the real wage rate of one unit of C, 5 units of C remain unutilized. This continues period after period, so that, over time, the economy accumulates C surpluses and, as a result, the value of C falls.

In the above two-good example, when the rates of growth are different, what is the rate at which the economy as a whole grows? For technological reasons, the production of any good in this system depends on the availability of both goods in a fixed ratio. Thus, if C is to be produced, C and Eq must be obtained in the ratio of 1:1, and so also for the production of Eq. For this reason, the rate of growth of 140% for the C good is not feasible. For this rate to be sustained, its inputs also must grow at that rate; but Eq, which is an input, is growing at only 40%. With its input growing at 40%, C can grow only at 40% (given the real wage rate as unity), and the accumulating surplus of C will have a zero price attached to it.

Thus, in a subeconomy, if all goods are basic, and if they are growing at different rates, then the
lowest of the growth rates is the operative one and determines the overall growth rate of the economy.\textsuperscript{12} In the above illustration, the economy's rate of growth (g) will be equal to the lower of the two rates, or 40%.

In an unbalanced growth state, the production of goods will not be in harmony with technological requirements. As a result, bottlenecks and surpluses will develop, leading to a reduction in the rate of growth. Further, unbalanced growth involves wastage, as scarce resources are being used for the creation of economically unnecessary surpluses. Finally, unbalanced growth results in real inflation, defined as a decrease in the standard of living of the workers. This decrease is caused by shortages in the sectors producing essential consumption goods, as a result of the unbalanced allocation of resources over various processes.

The above example illustrates the danger of distributing resources randomly, leading to actual process intensities that deviate from the optimal distribution. At the same time, it demonstrates the need to calculate the optimal intensities, for only in this way can we ensure that the economy will grow at its technologically determined maximum rate of growth. In an unbalanced situation, the rate of growth of the economy can be increased simply by rectifying the degree of misallocation of resources—that is, by closing the gap between the actual and optimal process intensities. Note that, in this case, an economy can increase its rate of growth without reference to the traditional exhortation to increase the ratio of savings to income, which, in the neoclassical system, is cited as the prime precondition of growth.

Thus, it can be seen that, in an economy where there is no choice-of-technique problem to be solved first, the realization of steady-growth equilibrium ensures the most efficient utilization of scarce (real) resources. Alternatively, a system plagued by shortages and wastage (induced by unbalanced growth) will suffer from a lower rate of growth, simply because of its less efficient use of resources. Given the technology, then, a system can generate its highest rate of growth only when the process intensities are such as to keep the economy on the steady-growth equilibrium path.
This same conclusion can be proved in a different way. Let the equilibrium intensities be \( m:n \), given the technology and the real wage rate. Let the observed ratio be different from the equilibrium ratio. This inequality can be a ratio either higher or lower than the equilibrium ratio.

Let us consider first the case in which the observed ratio assumes different values, all of which are lower than the equilibrium ratio; alternatively, the observed ratio may be lower than the optimum one, but the former continuously changing its value so as to approach the latter. If, in the ratio \( m:n \), \( m \) represents the proportion allocated to the \( C \) sector, then an observed ratio of less than \( m:n \) implies that the \( C \) sector is not receiving resources in adequate quantities, while the \( \text{Eq} \) sector is receiving excess allocation. As a result, the rate of growth observed in the \( C \) sector (designated as \( g_C \)) will be less than the rate of growth in the \( \text{Eq} \) sector (designated as \( g_{\text{Eq}} \)). The inequality of the type \( g_{\text{Eq}} > g_C \) persists as long as the posited imbalance between the process intensities persists. The rate of growth of the economy is governed by the lower of the two growth rates, or \( g_C \).

In the reverse case, if the observed process intensities represent a series of ratios higher than the optimal one, then \( g_C > g_{\text{Eq}} \), and the economy is again bound to the lower rate of growth—in this case, \( g_{\text{Eq}} \). In either case, the economy's actual rate of growth is less than what is feasible technologically, and this shortfall can be traced directly to the deviation between the optimum and observed process intensities.

Now let us take the case of the following sub-economy and consider various process intensities and the resultant rates of growth:

\[
\begin{array}{ccc|cc}
\text{Input} & \text{Output} \\
L & C & \text{Eq} & C & \text{Eq} \\
1 & 1 & 1 & 3 & 1 \\
1 & 1 & 1 & 0 & 2+1
\end{array}
\]
Let us assume that there are 100 units of C and 100 units of E51 and that these, together with 100 laborers, have to be allocated to the two processes. We know that m:n is 3:2; that is, if the allocation is in the ratio of 60:40, we will realize steady growth for this economy. But let us assume that the actual ratio is initially less than 3:2, then approaches the optimum ratio, and, finally, surpasses it. The resulting pattern will be as follows:

<table>
<thead>
<tr>
<th>Allocation (Actual)</th>
<th>g_C</th>
<th>g_Eq</th>
<th>g (Economy As a Whole)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35:65 (7:13)</td>
<td>5%</td>
<td>130%</td>
<td>5%</td>
</tr>
<tr>
<td>40:40 (2:3)</td>
<td>20%</td>
<td>120%</td>
<td>20%</td>
</tr>
<tr>
<td>45:55 (9:11)</td>
<td>35%</td>
<td>110%</td>
<td>35%</td>
</tr>
<tr>
<td>50:50 (1:1)</td>
<td>50%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>55:45 (11:9)</td>
<td>65%</td>
<td>90%</td>
<td>65%</td>
</tr>
<tr>
<td>60:40 (3:2)</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>65:35 (13:7)</td>
<td>95%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>70:30 (7:3)</td>
<td>110%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>75:25 (3:1)</td>
<td>125%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>80:20 (4:1)</td>
<td>140%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>85:15 (17:3)</td>
<td>155%</td>
<td>30%</td>
<td>30%</td>
</tr>
</tbody>
</table>

As can be seen from the table, an increase in the ratio, implying a shift of resources to the C sector, results in an increment in the rate of growth of the C good and a decrease in the rate of growth of equipment. When the value attributed to the observed process intensities is very much smaller than the optimal ratio, the output of C grows very slowly. This acts as a bottleneck, keeping the rate of growth of the economy as a whole at a low level. As the observed ratio increases, the pressure of scarcity of the C good lessens, leading to an improvement in the overall rate of growth. The smaller the deviation between the observed and equilibrium process intensities, the more the pressure of the bottleneck is relieved. In the ideal case of no bottleneck, where both goods grow at the same rate, the rate of growth of the economy is the highest. That is when g_C = g_Eq = g = 80%, this value turns out to be the highest overall growth rate. To realize this value, with this technology, the process intensities must be in the ratio of 60:40 (3:2)—the same as the value discovered for the equilibrium solution.
As the observed ratio continues to increase, deviating once again from the equilibrium ratio, equipment becomes a scarce commodity. Here, again, the rate of growth of the economy declines as a result. Thus, in either type of misallocation, the rate of growth is less than what is technologically feasible because of scarcities and surpluses. The optimal growth path, characterized by the absence of shortages and surpluses, not only results in the highest possible growth rate; such growth, being steady, is noninflationary in nature.

Pricing of Goods Under Single-Technique Accumulation

We now turn our attention to the problem of measuring the value of goods which enter into the technology. For this purpose, we must overcome the "money illusion." Measurement of value in terms of money is not only an inefficient exercise, but also one fraught with uncertainties, since the value of money itself depends on the value of the goods we seek to measure.

We can eliminate the "moneyness" in value by expressing the value of two goods as a ratio: even when there is a change in the value of money, there is no change in the ratio. In effect, we are measuring the value of each good in terms of the other. Thus, in our two-good economy, we can measure the value of equipment in terms of units of C goods, or the value of C goods in terms of equipment.

Among the assumptions made in this study are perfect competition, homogeneity of labor, an unlimited supply of labor, and perfect mobility of factors. Together, these assumptions result not only in a real wage rate that is uniform and constant, but also in a rate of profit that is the same for all processes. In a situation of perfect competition, the profit-maximizing entrepreneurs will not permit any differentials in the profit rates to persist beyond a short period. Such differentials will induce transfer of resources from a low-profit process to a high-profit one, and this movement will continue until it is no longer worthwhile to shift—that is, until the rate of profit for all processes is the same.

This is the familiar position of equilibrium, at which resource allocation is stabilized. Thus, equality
between the rates of profit realized in all sectors of the economy becomes the second condition for steady growth. The prices of various goods must be such that the set of relative prices results in an equal rate of profit for each. If the actual price ratio deviates from the one required by the equilibrium condition, then the resulting allocation of resources will be unstable, and the initial prices cannot remain as they are. The observed price ratio will be under pressure (of resource shifts) until it equals the equilibrium price ratio, at which point the price ratio becomes inert. Thus, goods can be valued properly only when equilibrium conditions prevail in the economy.

Now, let us calculate the relative prices for our two-good model. Designating the prices of the C good and equipment as \( P_1 \) and \( P_2 \), respectively, we can express the ratio between them as

\[
\frac{P_1}{P_2}
\]

This can be rewritten as

\[
1 : \frac{P_2}{P_1}
\]

to give us the price of equipment in terms of the C good. Now, let

\[
P = \frac{P_2}{P_1}
\]

and the relative prices can be expressed as

\[
1 : P
\]

The coefficient of profit (R) is defined as the ratio of the value of output to the value of input in a particular process. That is,

\[
R_1 = \frac{\text{value of output in process (1)}}{\text{value of input in process (1)}}
\]

The rate of profit (r) is defined as the ratio of the increment in output to the value of input in an process, so that

\[
r_1 = \frac{\text{value of output in process (1)}}{\text{value of input in process (1)}} - \text{value of input in process (1)}
\]
Thus,

\[ r_1 = \frac{\text{value of output in process (1)}}{\text{value of input in process (1)}} - 1 \]

or

\[ r_1 = R_1 - 1 \]

or \[ R_1 = 1 + r_1 \]

The coefficient of profit is equal to the rate of profit plus unity.

Under conditions of steady growth, as we know,

\[ r_1 = r_2 \]

Therefore,

\[ 1 + r_1 = 1 + r_2 \]

or

\[ R_1 = R_2 \]

Let us return now to the basic matrix introduced at the beginning of this chapter:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>(1) 1</td>
<td>1</td>
</tr>
<tr>
<td>(2) 1</td>
<td>1</td>
</tr>
</tbody>
</table>

Let the relative prices that will equalize the rates of profit be 1:P. In process (1), the inputs are one unit of \( C \) and one unit of equipment. In value terms, this is:

\( (1 \cdot 1) + (1 \cdot P) = 1 + P \)

The value of output in process (1) is
The value of output in process (1) is 
\[(b_0 \cdot 1) + (1 \cdot P) = b_0 + P\]
Therefore, 
\[R_1 = \frac{b_0 + P}{1 + P}\]

Similarly, for process (2), the value of input is 
\[(1 \cdot 1) + (1 \cdot P) = 1 + P\]
and the value of output is 
\[(0 \cdot 1) + (b_1 + 1)P = (b_1 + 1)P\]
Therefore, 
\[R_2 = \frac{(b_1 + 1)P}{1 + P}\]

For the system to be in equilibrium, we must have 
\[R_1 = R_2\]

Therefore, 
\[\frac{b_0 + P}{1 + P} = \frac{(b_1 + 1)P}{1 + P}\]

or 
\[P = \frac{b_0}{b_1}\]

Thus, the relative prices must be in the ratio of 
\[1:b_0/b_1\]

We know that 
\[R_1 = \frac{b_0 + P}{1 + P}\]
and

\[ R_1 = \frac{b_0 + b_1}{b_0 + \frac{b_0}{b_1}} \]

Substituting \( \frac{b_0}{b_1} \) for \( P \), we find that

\[ R_1 = \frac{b_0 b_1 + b_0}{b_1 + b_0} \]

\[ = \frac{b_0 (b_1 + 1)}{b_1 + b_0} \]

and

\[ R_2 = \frac{(b_1 + 1) b_0}{1 + \frac{b_0}{b_1}} \]

\[ = \frac{b_0 (b_1 + 1)}{b_1 + b_0} \]

Therefore,

\[ \frac{R_1}{R_2} = 1 \]

Thus, at \( P = \frac{b_0}{b_1} \), the condition that the rates of profit must be equal is satisfied. Here, the price of equipment in terms of C goods is found to depend on the ratio of its productivity (output per person) in the C sector to its productivity (output per person) in the equipment sector.
In the solution for steady growth, we found that

\[ G \text{ (coefficient of growth)} = \frac{b_0 (b_1 + 1)}{b_1 + b_0} \]

Thus, it can be seen that

\[ G = R_1 = R_2 \]

or, more generally,

\[ G = R \]

or

\[ 1 + g = 1 + r \]

Now take the economy represented by the following technology:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

If the relative prices are in the ratio of 1:P, then

\[ R_1 = \frac{(4 \cdot 1) + (1 \cdot P)}{(1 \cdot 1) + (1 \cdot P)} = \frac{4 + P}{1 + P} \]

and

\[ R_2 = \frac{(0 \cdot 1) + (2 \cdot P)}{(1 \cdot 1) + (1 \cdot P)} = \frac{2P}{1 + P} \]

Since

\[ R_1 = R_2 \]
we have
\[
\frac{4+P}{1+P} = \frac{2P}{1+P}
\]
or
\[
P = 4
\]
Substituting, we find that
\[
R_1 = \frac{4+P}{1+P} = \frac{4+4}{1+4} = \frac{8}{5} = 1.6
\]
and
\[
R_2 = \frac{2P}{1+P} = \frac{8}{5} = 1.6
\]
The rate of profit in process (1) is
\[
r_1 = (R_1 - 1)100 = (1.6 - 1)100 = 60\%
\]
and the rate of profit in process (2) is
\[
r_2 = (R_2 - 1)100 = 60\%
\]
Thus,
\[
r_1 = r_2 = 60\%
\]
which is the rate of profit for the economy in equilibrium.

Now, if we allocate the resources in the ratio of 2:3 (process intensities), the resultant rate of growth (g) is 60%, and the coefficient of growth (G) is 1.6. Here, again, the rate of growth and the rate of profit are equal.

Is it coincidental that these rates are working out to be equal to each other, or is there some logic behind this relationship? Let \( sp \) represent the propensity of the entrepreneurs to invest out of their profits; \( Pr \), the level of profits; \( K \), the value of
of capital; \( I \), the level of investment; and \( Y \), the level of output. The prefix \( \delta \) represents an increment. Then, under steady growth,

\[
g = g_K = \frac{\delta K}{K}
\]

But the increase in the stock of capital (\( \delta K \)) is attributable directly to net investment (\( I \)) and, in fact, is equal to it:

\[
K = I
\]

Therefore,

\[
g = g_K = \frac{\delta K}{K} = \frac{I}{K}
\]

But the source of \( I \) is profits (\( Pr \)), and the amount of \( I \) depends on the propensity to invest out of profits (\( sp \)). Therefore, \( I \) is equal to the product of profits and propensity to invest:

\[
I = Pr \cdot sp
\]

Therefore,

\[
g = g_K = \frac{\delta K}{K} = \frac{I}{K} = sp \cdot \frac{Pr}{K}
\]

But

\[
\frac{Pr}{K} = r
\]

Therefore,

\[
g = g_K = \frac{\delta K}{K} = \frac{I}{K} = sp \cdot \frac{Pr}{K} = sp \cdot r
\]

Thus, the relationship between \( g \) and \( r \) (and, indirectly, between \( G \) and \( R \)) can be represented as

\[
g = sp \cdot r
\]
In our previous analysis, we have used the classical savings assumption of $s_p=1$; that is, the entrepreneurs invest the whole of their profits. Under this assumption, $g$ and $r$ are equal.\textsuperscript{14}

In a Golden Age economy, as postulated by Joan Robinson, the existence of full-employment conditions means that the rate of growth of the economy ($g$) is governed by the rate of growth of the labor force ($g_l$) and technical progress ($g_t$). Thus, $g_l$ and $g_t$ together determine the value of $g$, which enters the system as a rigid variable. That is, $g$ is determined exogenously, and its value cannot be changed unless the values of its determinants are altered. In this case, the given $g$ will determine the value of $r$ (which, in turn, determines the real wage rate), through $s_p$. Given $g$, therefore, the higher the $s_p$, the lower will be $r$ (and the higher will be the wage rate). A situation in which $s_p=1$ (meaning that $r$ is lowest and the wage rate highest) is described as the optimum Golden Age.\textsuperscript{15}

In our model economy, all the relevant parameters are constant, as in the Golden Age system, but with a difference. Whereas the Robinsonian system assumes full employment, the steady-growth system makes the contrary assumption of nonemployment.
CHAPTER III
WAGES, CONSUMPTION, AND GROWTH (SINGLE TECHNIQUE)

We have assumed that our economy has two classes of people, workers and entrepreneurs, whose incomes consist of wages and profits, respectively. In addition, we have assumed that the propensity to invest of workers is zero and that of entrepreneurs is unity, which means that the propensity to consume of workers is unity and that of entrepreneurs is zero. This implies that aggregate consumption in the economy is equal to workers' aggregate consumption, since consumption out of profits is assumed to be zero. Thus, designating $C$ as total consumption and $C_w$ and $C_p$ as consumption by workers and entrepreneurs, respectively, the absence of any other class in the economy ensures that

$$C = C_w + C_p$$

But, by our assumption, $C_p = 0$. Therefore,

$$C = C_w$$

Since the propensity to consume of the workers is unity, the total wage bill ($W$) is consumed. Thus,

$$C = C_w = W$$

If we should relax the assumption that $s_p = 1$ (that is, if we assume that $0 < s_p < 1$), then $C_p > 0$, and this would have an effect on total consumption. In this case, as well as in the case of an increase in the wage rate (leading to an increase in consumption per worker), the ratio in which goods are produced would be altered. For the economy to remain in non-inflationary equilibrium, that is, an increase in the production of $C$ goods would be required to match the increase in demand for them.

In this chapter, we continue to adhere to our original assumption that $s_p = 1$, thus ruling out, for the time being, any increase in demand from the entrepreneurs. Instead, we will focus on the effect of an increase in wages (and consequent increase in consumption, since all wages are assumed to be consumed) on
the rate of growth of the economy. First, however, let us calculate the distributive shares for an economy in dynamic equilibrium.

Distribution of Income in a Situation of Dynamic Equilibrium

Let us set up the type of economy outlined in the last chapter and see how the distribution of income between the two economic classes is determined, so that, after distribution, the total output is exhausted. In this type of economy, characterized by unlimited supplies of labor, the real wage rate is the rigid variable and the rate of growth, the determined variable. The wage rate, being an autonomous variable, influences the distribution of income.

As an example, consider the following economy:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

We know the process intensities to be 2:1. Assume that, in the initial situation, there are 60 units of C and 60 units of Eq, providing employment for 60 workers (since each worker requires one unit of C and one unit of Eq, according to the wage rate and technology depicted above). Allocating the resources in the ratio of 40:20 (which is the same as 2:1), the economy looks like this:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

The rate of growth is 33 1/3 percent.
For the steady-growth solution, we know that prices must be in the ratio of 1:2. The total input used in the economy is \(60C + 60Eq\), and the total output produced is \(80C + 80Eq\). The difference between the two is the surplus:

\[
\text{value of surplus} = \text{value of output} - \text{value of input} = [(80\cdot1)+(80\cdot2)] - [(60\cdot1)+(60\cdot2)]
\]

\[= 240-180 = 60 \text{ units of } C\]

But the value of the surplus is equal to profits. Therefore, total profits \(Pr\) = 60 units of \(C\). Since \(Sp = 1\), this is also equal to the total investment \(I\), or

\[Pr = I = 60\]

The total wage bill in the economy is the total amount of \(C\) goods used, which is also equal to 60. Since total consumption is equal to total wages (according to the assumptions made), we have

\[W = C = 60\]

Since

\[Y = C+I = 60+60 = 120 \text{ units of } C\]

it follows that

\[Y = W+Pr = 60+60 = 120 \text{ units of } C\]

Therefore, the share of wages in income is

\[\frac{W}{Y} = \frac{60}{120} = \frac{1}{2}\]

The distribution of income, therefore, is

\[W:Pr :: 1:1\]
Let us consider another illustration, using the following economy:

<table>
<thead>
<tr>
<th>L</th>
<th>C</th>
<th>Eq</th>
<th>C</th>
<th>Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2+1</td>
</tr>
</tbody>
</table>

In the solution for steady growth, the allocation ratio is 1:1. If there are 100 units of C and 100 units of Eq at the beginning of the production period, then these, along with 100 workers, must be allocated in the ratio of 50:50. The economy, after allocation, looks like this:

<table>
<thead>
<tr>
<th>L</th>
<th>C</th>
<th>Eq</th>
<th>C</th>
<th>Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>200</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>150</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

Here, the rate of growth is 100 percent. The prices are in the ratio of 1:2, so that

\[ P = I = \frac{((200 \cdot 1)+(200 \cdot 2))-((100 \cdot 1)+(100 \cdot 2))}{600 - 300} = 300 \text{ units of C} \]

and

\[ W = C = 100 \cdot 1 = 100 \]

Therefore,

\[ Y = C + I = 100 + 300 = 400 \]

or

\[ Y = W + Pr = 100 + 300 = 400 \]
Thus, we find that

\[ \frac{W}{Y} = \frac{100}{400} = \frac{1}{4} \]

and

\[ \frac{Pr}{Y} = \frac{300}{400} = \frac{3}{4} \]

and the distribution of income is

\[ W:Pr :: 1:3 \]

Now, let us take another illustration, in which the technical data are the same, but the real wage rate is different. In this economy, let the real wage rate be 2, instead of 1:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( L )</td>
<td>( C )</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Here, the process intensities are 3:1. Assuming that 100 workers are to be distributed, the distribution will be in the ratio of 75:25.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( L )</td>
<td>( C )</td>
</tr>
<tr>
<td>75</td>
<td>150</td>
</tr>
<tr>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

The price ratio is still 1:2. Therefore,

\[ Pr = I = [(300 \cdot 1) + (150 \cdot 2)] - [(200 \cdot 1) + 100 \cdot 2)] \]

\[ = 600 - 400 = 200 \]
and
\[ W = C = 200 \]
Thus,
\[ Y = W + Pr = 200 + 200 = 400 \]
Here, the share of wages in income is
\[ \frac{W}{Y} = \frac{200}{400} = \frac{1}{2} \]
and the share of profits in income is
\[ \frac{Pr}{Y} = \frac{200}{400} = \frac{1}{2} \]
In this case, then, the distribution of income is
\[ W:Pr :: 1:1 \]
From the above, it can be seen that when the wage rate changes, there is a corresponding change in the distribution of income. The results obtained so far can be summarized as follows:

<table>
<thead>
<tr>
<th>Output of C</th>
<th>Wage Rate</th>
<th>Distribution of Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>( b_o )</td>
<td>( w )</td>
<td>( W/Y )</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1/2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1/4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2/4</td>
</tr>
</tbody>
</table>

In fact, in a two-good model, the share of wages in income \( (W/Y) \) turns out to be equal to \( w/b_o \) (where \( w = \) wage rate). Thus, in the first case, \( w = 1 \) and \( b_o = 2 \), \( W/Y = w/b_o = 1/2 \). Similarly, \( Pr/Y \), which is equal to \( 1 - w/b_o \), is equal to \( 1/2 \). In the second case, \( w = 1 \) and \( b_o = 4 \), \( W/Y = w/b_o = 1/4 \), and \( Pr/Y = 3/4 \). In the third case, \( b_o = 4 \), but \( w = 2 \), \( W/Y = w/b_o = 2/4 \). These illustrations not only show us how to calculate the distribution, but also indicate how total output is exhausted.\(^{16}\)
The Effect of Consumption on Growth

We turn now to the effect of increased consumption on the rate of growth of the economy. We will consider this problem in the context of a single technique and under the assumption of two economic classes, workers and entrepreneurs. This means that any increased demand for consumption goods must derive from a desire for a higher standard of consumption on the part of either (or both) of these economic classes. We will retain, in this chapter, the assumption that $s_w = 0$ and $s_p = 1$. Thus, the only source of consumption demand is wages, and an increase in demand occurs whenever there is an increase in wages (whatever the reason for the latter increase). Thus, we will be studying the effect of increased wages on the rate of accumulation in the economy.

For this purpose, one should consider an economy having different wages at different times. But such an intertemporal approach is fraught with complexities. Instead, we will analyze the problem at a much simpler level by considering two economies that are technically identical but have different wage rates. By comparing these two economies, we hope to see the effect of increased consumption (because of higher wages) on the rate of growth.

Let A represent a subeconomy with a low real wage rate per person employed and B, a subeconomy technologically identical to A, but with a higher real wage rate. These two subeconomies can be represented as follows:

### Subeconomy A

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>$1$</td>
<td>$1$</td>
</tr>
<tr>
<td>$1$</td>
<td>$1$</td>
</tr>
</tbody>
</table>

### Subeconomy B

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>$1$</td>
<td>$1$</td>
</tr>
<tr>
<td>$1$</td>
<td>$1$</td>
</tr>
</tbody>
</table>

Let $A$ represent a subeconomy with a low real wage rate per person employed and $B$, a subeconomy technologically identical to $A$, but with a higher real wage rate. These two subeconomies can be represented as follows:
In Subeconomy A, the real wage rate is one unit of $C$; in B, the real wage rate is two units of $C$. All other entries (which are of a technical nature) are identical.

Let us solve these two subeconomies for steady growth. For Subeconomy A, the process intensities are 2:3. Allocating resources in this ratio, we have:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Here, the rate of growth is 60 percent. The rate of profit is also 60 percent, since $s_p$ is assumed to be equal to unity. The distribution of income is $W/Y = 1/4$ and $Pr/Y = 3/4$.

Now, consider Subeconomy B. For steady growth, the process intensities must be in the ratio of 2:1. Allocating resources in this ratio, we have:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>


The rate of growth here is 33 1/3 percent. Since $s_p = 1$, the rate of profit is also 33 1/3 percent. The share of wages in income is 2/4 and that of profits is also 2/4.

The rate of accumulation in Subeconomy B is less than the rate of accumulation in Subeconomy A. This is because in B, the wage rate is higher; as a result, the proportion of income devoted to consumption is also higher. The higher demand for consumption (caused by higher wages) must be satisfied if the economy is to realize noninflationary growth. As a result, a larger proportion of resources flows into the $C$-producing sector. This can be seen by comparing the allocation ratios for A and B. In B, the proportion of resources going to the $C$ sector is three times as high as in A. Thus, in a high-wage economy, a smaller proportion of resources is available for the equipment sector (investment), and this results in a lower rate of accumulation.

In effect, then, an increase in consumption (in this case, arising out of higher wages) acts as a levy on the rate of growth. This is because income is transferred to a class whose propensity to consume is high. In fact, in our analysis, the workers' propensity to consume is assumed to be equal to unity: when the wage rate increases, consumption per worker increases to the same extent. As the distribution becomes more favorable to workers, the entrepreneurs (whose propensity to invest is high) receive a smaller proportion of the total national income. Since total investment ($I$) depends on their share of income, there will be a decrease in $I$.

Conversely, a high rate of accumulation is possible only if the pressures to increase consumption beyond functional subsistence are resisted successfully. A decrease in nonessential consumption, therefore, is a major precondition for a higher rate of growth. The traditional growth economist is apt to confuse this with savings. The accent ought to be not on savings or its mobilization, but on direct control of consumption. This is especially true when we leave the ideal world of our model (wherein the population is arbitrarily divided into two classes) and step into the real world, where one is apt to find a
a parasitic class of consumers, whose consumption is out of line with the prescription of austerity implied by the analysis so far.
CHAPTER IV

PROFITS, CONSUMPTION, AND GROWTH (SINGLE TECHNIQUE)

Having seen the effect on the rate of accumulation of higher consumption out of wages, we turn now to examine the consequences of higher consumption out of profits.

Up until now, we have assumed that the propensity to invest of the entrepreneurs is unity, while that of the workers is zero. While retaining the latter assumption with regard to the workers, we now relax the assumption regarding consumption out of profits. We now assume that \( s_p \) is not equal to one, but, rather, \( 0 < s_p < 1 \). Under this new assumption, the entrepreneurs invest only a part of their profits (the proportion being determined by the value of \( s_p \)). Their consumption is no longer zero, but some proportion of their profits. Thus, if \( s_p = \frac{1}{2} \), then one-half of profits is invested and the rest consumed. If \( s_p = \frac{1}{4} \), only one-fourth of profits is invested, while consumption out of profits is three-fourths (\( s_p + c_p = 1 \)). In the extreme case of \( s_p = 0 \), no investment would be made out of profits: the entire profits would be consumed. In this case, with no accumulation at all, the economy would be in a state of stagnation. We will not use this extreme case, but will take a more realistic case where \( s_p \) is less than unity, but greater than zero (\( 0 < s_p < 1 \)).

We will analyze the problem of entrepreneurial consumption in two distinct situations. In the first case, the assumption of nonemployment, with unlimited supplies of labor, is retained. This situation closely resembles the conditions prevalent in some of the underdeveloped countries, particularly India. In the second case, the assumption of nonemployment is dropped, and the economy is assumed to be operating under conditions of full employment. The distinction between these two types of situations is very important because, as we saw in Chapter I, the pattern of causation relevant to one is not valid for the other.

In a nonemployment situation, the wage rate is fixed near the subsistence level because, at that wage rate, the economy can get any amount of labor. This wage rate, in turn, determines the rate of profit consistent with it, through the technique used. Finally,
this rate of profit determines the rate of growth, through the propensity to invest of the entrepreneurs.

Under conditions of full employment, by contrast, it is the rate of growth which is inflexible, and this rate, through $s_p$, determines the rate of profit. The rate of profit, in turn, determines the real wage rate compatible with it. Thus, whereas under conditions of nonemployment, it is the rate of growth which is the flexible variable, under conditions of full employment, it is the wage rate which is flexible.

A Nonemployment Economy

We will examine the effects of entrepreneurial consumption first under the assumption of nonemployment. Let our illustrative economy be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Since labor is assumed to be available in unlimited quantities, the real wage rate is constant and is equal to unity, as shown in the input-output matrix. Let $s_p = 1$. If we assume that there are 100 units of C and 100 units of Eq as the initial endowments, then these, together with 100 laborers, should be allocated in the ratio of 50:50 (process intensities of 1:1) to achieve steady growth:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

The rate of growth is 100%. The distribution of income between workers (wages) and entrepreneurs (profits) is in the ratio of 1:3.
Now, let us relax the assumption that $s_p = 1$. Consider an economy identical to the first in technology and real wage rate, but with a propensity to invest by the entrepreneurs of, say, one-half ($s_p = \frac{1}{2}$). In this economy, aggregate consumption will be higher because, here, entrepreneurs as well as workers are consuming. Therefore, the process intensities of 1:1, appropriate where $s_p > 1$, will not produce an amount of $C$ goods sufficient to satisfy the total demand. If this ratio is retained, the aggregate demand will not be satisfied, and the economy will experience inflation.

In order to discover the equilibrium process intensities, let us assume them to be in the ratio of $m:n$. Allocating resources in this ratio, we have:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>$m$</td>
<td>$m$</td>
</tr>
<tr>
<td>$n$</td>
<td>$n$</td>
</tr>
<tr>
<td>$m+n$</td>
<td>$m+n$</td>
</tr>
</tbody>
</table>

The total amount of $C$ goods produced in this economy is $4m$. This must be used to satisfy the demands of both entrepreneurs and workers.

Now, let us calculate the amount of consumption by entrepreneurs. First, we must know what their total profits are. We know that the relative prices are 1:2, at which ratio the rate of profit would be 100%. With this price ratio,

$$\text{profits} = \text{value of output} - \text{value of input}$$

$$= [(4m \cdot 1) + (m+3n)2] - [(m+n)1 + (m+n)2]$$

$$= (4m + 2m + 6n) - (m + n + 2m + 2n)$$

$$= 6(m + n) - 3(m + n) = 3(m + n)$$

If $s_p = \frac{1}{2}$, then $c_p = \frac{1}{2}$. Therefore, total consumption by the entrepreneurs is

$$c_p = \frac{3(m+n)}{2}$$
To find the amount of $C$ goods available to the workers, we subtract this amount from the total output of $C$:

$$C_w = 4m - \frac{3(m+n)}{2}$$

$$= \frac{8m - 3m - 3n}{2} = \frac{5m - 3n}{2}$$

The ratio of $C$ to $Eq$ as inputs is technologically given at 1:1, and this ratio must be maintained. That is, the number of units of $C$ goods available to pay the workers must be equal to the number of units of equipment. Therefore,

$$\frac{5m - 3n}{2} = m + 3n$$

or

$$5m - 3n = 2m + 6n$$

or

$$3m = 9n$$

or

$$m = \frac{9}{3} = \frac{3}{1}$$

and the ratio is

$$m:n :: 3:1$$

Thus, the allocation ratio has tilted from 1:1 to 3:1. The resources must be allocated in the ratio of 75:25, as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L$</td>
<td>$C$</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
With a price ratio of 1:2,

\[ \text{Pr} = [(300 \cdot 1) + (150 \cdot 2)] - [(100 \cdot 1) + (100 \cdot 2)] = 600 - 300 = 300 \]

If entrepreneurs use one-half of their profits for consumption, then

\[ \frac{\text{C}_p}{2} = \frac{\text{Pr}}{2} = \frac{300}{2} = 150 \]

and

\[ \text{C}_w = 300 - 150 = 150 \]

Therefore,

\[ \text{G}_C = \frac{150}{100} = 1.5 \]

and

\[ g_C = (\text{G}_C - 1)100 = 50\% \]

At the same time,

\[ \text{G}_{Eq} = \frac{150}{100} = 1.5 \]

and

\[ g_{Eq} = (\text{G}_{Eq} - 1)100 = 50\% \]

Therefore, the rate of growth of the economy is 50%. The same rate of growth can be derived in a different way. We know that, for this technology, the rate of profit (r) is 100%. If \( \frac{s_p}{r} = 1 \), then

\[ g = s_p r = 1 \cdot 100\% = 100\% \]

If, given the same technology, \( \frac{s_p}{r} = \frac{1}{2} \), then

\[ g = s_p r = \frac{1}{2} \cdot 100\% = 50\% \]
It is clear from this example that an increase in the propensity to consume on the part of the entrepreneurs results in a decline in the rate of growth of the economy. This is true of any nonwage consumption, as long as the wage rate is held constant. This is the reason why, in underdeveloped countries, there is an urgent need for policies aimed at reducing consumption by the nonwage-earning classes. Such policies involve redefining the roles of the monetary and fiscal instruments of control, so that their primary purpose will be to discourage expenditure, both on nonessential consumption goods and on investment in the production of such goods.

A Full-Employment Economy

Now, consider the case of a full-employment economy. Here, the rate of growth of the economy is governed by two factors: the rate of growth of the labor force \(g_1\) and the rate of growth of output per person, or the rate of technical progress \(g_t\). We have established, in Chapter I, the following chain of causation:

\[
\begin{align*}
g_1 & \rightarrow g & (s_p) & \rightarrow r & (\text{technique}) & \rightarrow w
\end{align*}
\]

Here, the real wage rate \((w)\) is the residue of the system.

In this case, what happens if the propensity to consume of the entrepreneurs \((c_p)\) increases? This is the same as saying that the propensity to invest of the entrepreneurs \((s_p)\) has decreased. Since a change in \(s_p\) is not expected to influence the value of \(g_1\) or \(g_t\), the value of \(g\) remains constant. Since \(g = s_p r\), when \(g\) is constant and \(s_p\) falls, \(r\) increases. But a higher rate of profit in the economy, given a single technique, is compatible with a lower real rate. Thus, the consequence of a lower \(s_p\) is a fall in the real wage rate \((w)\).

The same result can be seen in a different way. The rate of growth, which is fixed, determines the ratio in which output is divided between consumption goods and equipment. When the entrepreneurs increase their consumption, there are fewer units of consumption goods available to the workers. As a result, the
standard of living of the workers (that is, the real wage rate) falls.

Is there a limit to this process? Can the entrepreneurs increase their propensity to consume indefinitely? They cannot, because every increase in entrepreneurial consumption is accompanied by a corresponding fall in the standard of living of the workers. The workers will tolerate this erosion only up to a point, after which they will start resisting. The point at which the workers resist a further fall in real wages has been described by Joan Robinson as the inflation barrier wage rate. The level of the inflation barrier wage rate depends on what the workers consider to be the minimum and, thus, is not necessarily the same as the subsistence wage rate.

Because of the adverse effect of entrepreneurial consumption on the real wage rate, such consumption has been described as a tax on the workers. In the following examples, we work out the effects of entrepreneurial consumption on wages.

Assuming full employment, let the technique be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>w</td>
</tr>
<tr>
<td>0</td>
<td>2w</td>
</tr>
<tr>
<td>2</td>
<td>2w</td>
</tr>
</tbody>
</table>

In this economy, let $s_1$ be 40% and $s_t$ be 40%, so that the full-employment rate of growth ($\bar{g}$) is 80%. If $s_p = 1$, then the rate of profit ($r$) is also 80%. What is the real wage rate compatible with a rate of profit of 80%?

We know that the ratio of prices is 2:3. Thus,

$$r = \frac{\text{value of output} - \text{value of input}}{\text{value of input}}$$

$$= \frac{[(3 \cdot 2) + (4 \cdot 3)] - [(2w \cdot 2) + (2 \cdot 3)]}{(2w \cdot 2) + (2 \cdot 3)}$$
\[
= \frac{(6 + 12) - (4w + 6)}{4w + 6}
= \frac{12 - 4w}{4w + 6}
\]

But we know that \( r = 80\% \). Therefore,
\[
\frac{12 - 4w}{4w + 6} = 0.8
\]
or
\[
3.2w + 4.8 = 12 - 4w
\]
or
\[
7.2w = 7.2
\]
Therefore,
\[
w = 1
\]
The wage rate compatible with a rate of profit of 80\%, for this technology, is equal to one unit of the consumption good.

Now, consider another economy, with identical technique, in which \( s_p = \frac{1}{2} \). If \( g = 80\% \), then \( r = 160\% \). This higher rate of profit is sustainable only if the wage rate falls. What is the new wage rate compatible with this \( r \)?

With the same price ratio of 2:3, we know that
\[
r = \frac{[(3 \cdot 2) + (4 \cdot 3)] - [(2w \cdot 2) + (2 \cdot 3)]}{(2w \cdot 2) + (2 \cdot 3)}
= \frac{12 - 4w}{4w + 6}
\]

In this case, however, \( r = 160\% \), so that
\[
\frac{12 - 4w}{4w + 6} = 1.6
\]
or

\[ 6.4w + 9.6 = 12 - 4w \]

or

\[ 10.4w = 2.4 \]

Therefore,

\[ w = 0.23 \text{ (approx.)} \]

In this case, with \( \frac{s_p}{w} = \frac{1}{4} \), \( w \) is only 0.23 (approximately) of a unit of the consumption good.

If the inflation barrier wage is higher than 0.23, the workers will not tolerate such a fall in wages. They will resist, demanding higher wages. In this case, we have a confrontation between the will of the entrepreneurs to increase their consumption and that of the workers to protect their standard of living. As a result, one of two things will happen: either the economy will depart from the full-employment equilibrium, because the entrepreneurs' higher consumption reduces the rate of accumulation, or the economy will become highly inflationary. These two outcomes are equally undesirable.

The Need to Control Consumption

We have considered the effects on growth of an increase in consumption by either of the two classes in our simplified model. In the previous chapter, we let wage consumption increase and found that, as a result, the rate of accumulation decreases. In this chapter, we have posited an increase in consumption out of profits. In a nonemployment economy—the relevant model for underdeveloped economies—the result, again, is a decrease in the rate of growth. In a full-employment system, the result is a decrease in the real wage rate.

In an underdeveloped (nonemployment) economy, then, any increase in consumption, whatever the source, has the direct effect of reducing the rate of accumulation. Therefore, controls on consumption are of prime importance.
for a rapid rate of growth. Any development plan that ignores this is likely to produce a rate of growth far below the optimum.

A cut in consumption, however, should not be confused with savings. Though, in the Keynesian system, savings is defined as that part of income which is not consumed \( S = Y - C \), in actual practice, the accent tends to be on money savings. Those economists who argue that an increase in savings is a prerequisite for development, therefore, are likely to set planners on the wrong path of mobilizing increased money savings. Money savings may not represent a cut in consumption, for two reasons. First, savings may be forthcoming only after people's consumption requirements have been satisfied. Second, even if additional money savings are forthcoming, this may not result in a fall in consumption, since the instruments of savings (notably, the instruments of borrowing) can be monetized easily through the banking system or by other means. It is for these reasons that an increase in monetary savings does not necessarily signify a reduction in the aggregate level of consumption.

The accent on savings as a prime mover of economic development stems from another confusion as well. In the Keynesian system, \( S = I \). Thus, the economists who talk of savings are thinking, in fact, of investment. But, by their nature, these variables signify two entirely different things. A mere act of savings does not automatically promote the rate of growth, since the latter depends on the rate of investment. A reduction in the level of consumption simply releases resources and makes them available for investment. These resources must actually be invested in order to realize a higher rate of accumulation. Thus, the two relevant factors are (1) a cut in consumption and (2) an increase in investment. The first is commonly confused with savings. In the process of such a transformation, the real significance of the need for austerity is lost.

Once we understand the role of consumption, we can appreciate the importance of the need to control it. This is particularly true in the real world, which is far more complex than our simplified two-class model. In underdeveloped countries, there is a great deal of
consumption by various classes whose origins may be found in the inherited socioeconomic order. A semi-feudal system is characterized by one or more classes enjoying hereditary wealth. The higher-income groups in such a system tend to indulge in high levels of status-oriented consumption.

Thus, the need for a rational consumption policy can hardly be overstressed. Such a policy should include a national wage policy, specification of the types of goods to be produced, and control over the distribution of profits.
CHAPTER V

CHOICE OF TECHNIQUES

Until now, we have investigated the conditions affecting accumulation in the context of a given technique. Now, we will consider the situation in which more than one technique is available. Given a choice of techniques, which one is the optimum?

If an economy is already committed to a particular technique and has planned all its investments on that basis, then, at that point, no choice of techniques is possible. In this ex post situation—assumed in previous chapters—the choice does not exist. If investible resources have not yet been committed to a particular form, or technique, however, then the economy is in a position to choose among alternative forms. In this ex ante situation, there is indeed a choice of techniques.

Thus, the choice of techniques is always an ex ante concept. In the post-Keynesian system, moreover, it must be exercised in the context either of a particular real wage rate or a particular rate of profit. In underdeveloped economies, the former is more appropriate. Under the assumption of nonemployment, the real wage is fixed at a near-subsistence level, since, at this wage, it is possible for the economy to obtain as much labor as it requires. Therefore, we will judge the optimality of a technique with reference to a particular real wage rate.

First, we list all the processes known to us at any given time. Then, we group the processes into various subeconomies. Then, we solve each of these for the rate of profit and the rate of growth, at a particular real wage rate. Finally, we choose the subeconomy yielding the highest rate of profit as the optimum one. Thus, the criterion adopted here is that, for a given wage rate, the rate of surplus should be maximized.

Depiction of a Single Technique

Let us begin by considering a single technique. Its technological structure is assumed to be as follows:
The equilibrium process intensities are in the ratio of 1:1. Allocating resources in this ratio, we have

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
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<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Here, the rate of growth \((g)\) is 100%. If we assume that \(sp^e = 1\), then the rate of profit \((r)\) is also 100%. The price ratio is 1:2, which means that the value of one unit of consumption good is equal to two units of equipment; on this basis, we now calculate the rate of profit. Taking the first process, we have

\[
\begin{align*}
r_1 &= \frac{[(4 \cdot 1) + (1 \cdot 2)] - [(1 \cdot 1) + (1 \cdot 2)]}{(1 \cdot 1) + (1 \cdot 2)} \\
&= \frac{6 - 3}{3} \cdot 100 = \frac{3}{3} \cdot 100 = 100% 
\end{align*}
\]

Similarly,

\[
\begin{align*}
r_2 &= \frac{[(0 \cdot 1) + (3 \cdot 2)] - [(1 \cdot 1) + (1 \cdot 2)]}{(1 \cdot 1) + (1 \cdot 2)} \\
&= \frac{6 - 3}{3} \cdot 100 = \frac{3}{3} \cdot 100 = 100% 
\end{align*}
\]

and the rate of profit for the economy as a whole is

\[
\begin{align*}
r &= \frac{[(4 \cdot 1) + (4 \cdot 2)] - [(2 \cdot 1) + (2 \cdot 2)]}{(2 \cdot 1) + (2 \cdot 2)} \\
&= \frac{6 - 3}{3} \cdot 100 = \frac{3}{3} \cdot 100 = 100% 
\end{align*}
\]
\[ \frac{12 - 6}{6} \cdot 100 = \frac{6}{6} \cdot 100 = 100\% \]

Not, let us concentrate on the process producing consumption goods in this technology matrix:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Here, each laborer is paid one unit of consumption good as his wage. He uses one unit of equipment as his capital and produces 4 units of consumption goods. (The unit of equipment shown in the output is the one used as input, which is assumed to be nondepreciating.) Thus, output per laborer \((O/L)\) in the consumption-good sector is equal to 4 units of \(C\). The amount of fixed capital used by a laborer in the consumption-good-producing process is one unit of equipment \((Eq)\), which has a value of 2 units of \(C\). Thus, for the technology matrix given above, we have the following data:

1. the output per laborer of consumption goods:
   \(O/L = 4 \text{ units of } C\)
2. the value of equipment \((Eq)\) per laborer:
   \(Eq/L = 2 \text{ units of } C\)
3. the value of wages per laborer (the wage rate):
   \(W/L = w = 1 \text{ unit of } C\)
4. the rate of profit:
   \(r = 100\%\)
5. the ratio of output to equipment:
   \(O/Eq = 4/2 = 2\)
These data can be depicted in the form of a graph. On the vertical axis, we measure the output per laborer of consumption goods (O/L—in this case, 4 units of $C$. On the horizontal axis, we measure the value of equipment per laborer (Eq/L) used to produce those goods—in this case, 2 units of $C$. This particular combination, or technique, is represented by point A. Now, how can we represent wages? On the output side (vertical axis), one unit of $C$ must go to pay the worker ($W/L = w = 1$). This is represented by the distance $OW$ (or $BC$). On the input side (horizontal axis), one unit of $C$ must be added to represent wages per worker (line $W'W$).
If we look at the ratio between $AB$ and $OB$, we can see that the slope of line $OA$ is

$$\frac{AB}{OB} = \frac{0/L}{Eq/L} = \frac{4}{2} = 2$$

Now, look at the line $W'A$. The slope of this line is

$$\frac{AC}{OB} = \frac{AB - BC}{WC + W'W} = \frac{0/L - W/L}{Eq/L + W/L} = \frac{4 - 1}{2 + 1} = \frac{3}{3} = 1$$

But

$$\frac{O/L - W/L}{Eq/L + W/L} = \frac{0 - W}{Eq + W} = \frac{\text{net output of consumption goods}}{\text{total inputs}}$$

Since

$$\frac{\text{net output}}{\text{total inputs}} \cdot 100 = r$$

we can see that

$$r = 1 \cdot 100 = 100\%$$

Depiction of Alternative Techniques

We have seen how a technique can be represented by a point on a two-dimensional plane. If we have more than one technique, then each of them can be represented by a corresponding point representing a particular combination of $O/L$ and $Eq/L$. If a large number of subeconomies are depicted in the form of points, the results is a scatter diagram:
The next step is to fit a curve to this scattering of points. What type of curve will suit our purpose? To discover this, we must first be familiar with the concepts of superiority and inferiority of techniques.

Consider two points, A and B, on the scattered diagram, with B lying vertically below A.

At point A, $\frac{O}{L} = \frac{AM}{OM}$ and $\frac{Eq}{L} = \frac{OM}{OM}$. At point B, $\frac{O}{L} = \frac{BM}{OM}$ and $\frac{Eq}{L} = \frac{OM}{OM}$. Using the same amount of capital per laborer, that is, technique A produces a higher output per laborer than technique B. Therefore, A is said to be superior to B, or conversely, B is inferior to A. Since B produces a lower $\frac{O}{L}$ than A at the same $\frac{Eq}{L}$, $\frac{O}{Eq}$ is bound to be higher for A than for B. For each unit of $\frac{Eq}{L}$, that is, A produces a higher output than B. This can be verified by observing that the slope of OA is higher than that of OB.

Now consider two points, C and D, of the scatter. They have the same $\frac{O}{L}$, but $\frac{Eq}{L}$ is higher for D than for C. Though technique D produces the same output per person as C, it requires a higher level of $\frac{Eq}{L}$.
Thus, whether one technique is superior or not can be decided on the basis of two attributes. If either $O/L$ or $O/Eq$ is higher for $A$ than for $B$, while the other remains the same for both, then $A$ is superior to $B$ (and $B$ is inferior to $A$). If both $O/L$ and $O/Eq$ are higher for $A$, of course, $A$ is also superior. However, if either $O/L$ or $O/Eq$ is higher for $A$, while the other is higher for $B$, then neither technique is superior to the other. In this case, $A$ and $B$ are said to be mutually nonsuperior techniques.

If there are two techniques, and if one of them is superior to the other, then the technique which is inferior is naturally eliminated. The problem of choice does not arise. The problem of choice of techniques is thus reduced to the problem of choosing between two or more mutually nonsuperior techniques.
From the scattered diagram of all available techniques, we now eliminate all inferior techniques. They happen to be all those that fall below the outermost points. For any given $\text{Eq}/L$, that is, we eliminate all but the highest $O/L$. We now join all the mutually nonsuperior techniques (which lie on the periphery of the scatter). The resulting curve is known as a production function.

Any other fit would not pass through all the techniques that are mutually nonsuperior. Thus, for example, if one were to fit a straight line (using the method of least squares), it would ignore some superior techniques.
If we have a large number of techniques, then we can derive a smoothly curving production function. Here, there are five techniques (A, B, C, D, and E) shown on the production function.

Note that as one moves from A toward E, \( \frac{O}{L} \) is increasing. At the same time, \( \frac{O}{Eq} \) is decreasing. (Compare the slope of OE with that of OA.) In other words, to produce a given output, technique A uses relatively little equipment and relatively more labor. This technique is labor intensive. Technique E uses much more equipment and less labor. This technique is highly mechanized, or capital intensive. Techniques B, C, and D fall between these two extremes.

Choosing the Optimal Technique

Given the techniques arranged in the form of a production function, which one do we choose? Remember that this production function is drawn on the basis of a constant real wage rate and that the choice is to be
made in the context of a given wage rate. Since the optimal technique is the one that will generate the highest rate of profit for a given initial real wage rate, we want to choose that technique which will yield the highest rate of profit.

We know that the slope of the line joining the wage point W' with the point representing a particular technique gives us the rate of profit (r) for that technique. If we draw a line from W' to each point representing a technique, therefore, the line with the highest slope will give us the solution.

In this case, we can see that the line with the highest slope is W'C, and, therefore, C is the technique that will yield the highest rate of profit. In general, it can be seen that the optimal technique will be found at the point where a line drawn from W' is tangential to the production function. Of all lines that can be drawn from W' to intersect the production function, the one with the highest slope is the tangent. If the slope of this line is maximized, then the rate of profit is maximized, and the optimal technique has been found.

Having chosen technique C, we can see that O/L is represented by the distance CM. Of this, MN (=OW)
represents $W/L$, and $CN$ represents $Pr/L$. Therefore, the distribution of income is in the ratio of $Pr/W = CN/MN$.

Now, let us summarize the points involved in the problem of choice of techniques. First, the production function is drawn with respect to a given real wage. Since we are concerned with a situation of nonemployment, the assumption of a constant real wage is valid here. Thus, all the points on the production function (indeed, in the whole scatter diagram) are determined on the basis of a fixed real wage. When the real wage rate changes, the position of the technique may or may not remain the same. Whether and in what direction the technique shifts depends on how the price of equipment used in that technique reacts to a change in the wage rate.

The production function is convex from above. This means that the slope of the production function decreases as one moves up. The convexity is a result of the diminishing marginal productivity of mechanization. This means that as between two mutually non-superior techniques, the one with a higher degree of mechanization ($Eq/L$) has a higher output per laborer ($O/L$), but the increase in $Eq/L$ is greater than that in $O/L$. In other words, $O/L$ increases with $Eq/L$, but the increase in the former is less than proportionate to the increase in the latter. Thus, the ratio of output to capital ($O/Eq$) decreases as the degree of mechanization increases.

The condition that output per capital should fall is essential if the techniques on the production function are to be mutually non-superior. Consider two techniques, $A$ and $B$, of which $A$ is more mechanized than $B$. Suppose also that $O/L$ is increasing as fast as, or faster than, $Eq/L$. In this case, the production function would be linear or concave from above. But this means that, with $O/L$ higher for $A$, $O/Eq$ is either the same for both or higher for $A$. Therefore, $A$ is superior to $B$, and $B$ cannot be on the production function.

Further, the production function drawn from the engineering data must have a summit point. This is because the ex ante function is drawn on the basis of existing data relating to different techniques at any given point in time, and there is a maximum degree of
mechanization known to us at any time. Thus, the function must have a summit point (also described as the Summit Technique). 24

The causation relevant to the production function described here is relevant to a situation of initial nonemployment. The given real wage rate determines the rate of profit, 25 and it is the maximization of profit which is the criterion for selection of the optimum technique. It should also be noted that the profit-maximizing technique turns out to be neither the least mechanized (A) nor the most mechanized technique (E), but falls somewhere in between these limits. 26 Given the convex curvature of the production function, the lower the initial wage rate, the less mechanized, or more labor intensive, will be the optimum technique.
CHAPTER VI

MAIN FEATURES OF UNDERDEVELOPED ECONOMIES

Economic development is not the result simply of applying theories or models or calculating growth paths, but is an integral part of the dynamic process of society's growth as a whole. There is no aspect of human behavior or social or economic organization that does not have a direct impact on this process of development. Since it implies an increase in the material well-being of all members of society, it requires an involvement on the part of all of them. It is in this sense that the concept of economic growth differs from that of development. While the former postulates an expansion of the existing economic structure, the latter requires structural changes in the economy on the path of expansion. Therefore, it is the latter which is of relevance to developing economies.

The word "underdeveloped" or "developing" is a relative term. United Nations experts define underdevelopment as the state in which "per capital real income is low when compared to the per capital real incomes of the United States of America, Canada, Australia, and Western Europe." Generally, underdeveloped economies have vast unutilized and underutilized resources, both natural and human, which, when tapped, are capable of supporting the population at a higher standard of living. Economies that are in the process of doing this are "developing."

When one looks for the causes of backwardness, one finds that the causes and effects are so interlinked that it is sometimes difficult to separate them. The so-called "characteristics" of underdevelopment, in fact, are interrelated themselves, since they are mutually caused by circular flows and causal forces that are inextricably linked to each other. While broad characteristics may be similar, moreover, each country has its own particular problems.

The more general features of underdeveloped countries include: (1) excessive reliance on agriculture and primary production; (2) pressure of population on land, creating disguised unemployment; (3) rapid growth of population, generating nonemployment; (4) acute deficiency of capital and low capital stock per person
employed manifested in the adoption of inferior techniques of production; (5) lack of economic infrastructure, in the form of heavy and basic industries; (6) social attitudes, entrepreneurial skills, and economic behaviors that are not oriented toward material progress; and (7) social and technological dualism. We will discuss each of the first five, "economic" characteristics in turn, with special reference to the causative factors involved.

Excessive Reliance on Agriculture

The predominance of agriculture in underdeveloped economies has two aspects. It is the single largest source of national output, and it is the single largest source of subsistence for the population of these countries. While agriculture accounts for one-third to one-half of the total output of such an economy, nearly two-thirds the population derives its support from agriculture.30

In an underdeveloped economy, there is no sizable industrial base. Thus, the availability of alternative avenues of economic activity is severely restricted. At the same time, the agricultural sector is organized mainly on a subsistence basis, so that its capacity to generate an adequate surplus is limited. This, in turn, leads to a "saturation" of population in the agricultural sector.

In most underdeveloped economies, industrialization started late and was initiated with the help of imported techniques. As a result, the industrial sector is not only small in size but also highly mechanized, in terms of capital per person employed. This is particularly true in those countries that were colonies in the past. Because it is so capital intensive, the industrial sector is even less capable of generating employment sufficient to relieve the agricultural sector of its excess population.

While excessive reliance on agriculture is a symptom of underdevelopment, it is also a cause. Increasing pressure of population on land results in fragmentation of holdings and inferior techniques. A suboptimal holding depresses productivity per unit of capital, resulting in a low rate of surplus, in real
terms. This, in turn, impedes the progress of industrialization. The population stagnates on the land leading to further fragmentation. The inadequacy of credit facilities available to the farmers, especially small and marginal ones, aggravates the trend. Economic activity remains concentrated in the primary sector. Industries are of relatively minor importance and, in many cases, are engaged in the production of nonessential consumer goods. Again, the population is deprived of gainful industrial occupation, further increasing pressure on the land.

One important feature of agriculture is its ability to increase output without a huge injection of capital into the sector. By a rational policy aimed at reforming agrarian practices, such as the use of improved seeds, use of fertilizers (both natural and chemical), greater efficiency in water use, consolidation of uneconomical holdings and ceilings on large ones, and improved marketing and credit facilities, output can be increased with a less than proportionate increase in social costs.

Because food comprises a dominant proportion of consumption in developing countries, the trade balance changes substantially with changes in the level of domestic food production. Moreover, any shortfall in food production will result in a rise in the price of food, and when food dominates household budgets, this results in real inflation and severe hardship. For all these reasons, the agricultural sector cannot be neglected in any planned effort for development.

The Phenomenon of Disguised Unemployment

As the size of the family grows relative to the size of its land holding, there emerges the phenomenon of disguised unemployment. The small size of the holding does not warrant the services of all the members of the household. In other words, a part of the family is rendered surplus if economic use of land is to be made. It appears as if all members of the family are employed, but, in an economic sense, there is a redundancy.
What are the economic effects of disguised unemployment? Those persons who are not effectively contributing to production represent an unproductive class. But these same persons consume at least their minimum requirements of food. Since they do not contribute to its production, they become, economically speaking, a class of parasite consumers. This feature could be converted from a liability into an asset through rational planning of physical and human resources. This large reserve army of labor could be rendered productive by using it for capital formation, using a low degree of mechanization. Some prominent models of development have been based on the premise that less developed countries have large supplies of labor.

The Demographic Factor

Most underdeveloped countries are burdened with a high birth rate (usually around 40 per 1,000), depending on sociocultural forces. The death rate, because of poor living conditions, inadequate nutrition, and lack of medical facilities, is equally high. When the death rate begins to fall, the equilibrium between birth and death rates is disturbed, and there is a population explosion. The burgeoning population then acts as a drag on the economy.

In order to achieve an increase in income per capita, an economy must somehow break the "population barrier." This is the main thrust of the "critical minimum effort" thesis, which emphasizes that the size of the initial investment must be so high that the resultant rate of growth of income is higher than the rate of growth of population. This is also Walt Rostow's concept of "take-off." But the theory of the "critical minimum effort," which defines the effort required to develop an aggregate investment/income ratio, avoids the problems arising out of disaggregation of the economy. Therefore, it does not concern itself with the vital problem of choice of techniques. Unless one assumes that the economy produces only one good, using only one process, the solution offered by the "critical minimum effort" thesis may not be valid.
In the initial stages of development, a growing population is a liability rather than an asset. This is so because a large part of the investible effort is devoted to satisfying the requirements of the growing population, leaving very little for net capital formation. The problem is aggravated where income distribution is skewed. If the population is distributed unevenly over various income classes within the economy, then the real burden of population increase is not distributed evenly.34

The magnitude of population, expressed in absolute numbers, cannot serve as an index of underdevelopment. Even the ratio between population and land is inadequate as an indicator of development. There is no rule by which a country with a high land/person ratio should be more advanced than one with a low ratio. Both Canada and Libya have very high land/person ratios, even though they differ widely in the degree of development attained by each. Similarly, India and Japan have low land/person ratios, but the latter country is far more developed than the former.

Since the traditional measures of population fail to reflect the degree of development, it has been proposed that we adopt a more modern concept: the degree of nonemployment.35 Unemployment refers to a situation in which a person, previously employed, is involuntarily idle; nonemployment refers to a situation in which a person has never been employed in sectors using optimum techniques of production. Unemployment, then, is the result of economic instability; nonemployment is the result of economic underdevelopment or stagnation.

Using this concept, the degree of overpopulation can be defined as the ratio of the nonemployed to the total population. The higher this ratio is, the larger is the number of nonemployed persons relative to the total population, and the greater is the degree of underdevelopment. Thus, if the ratio is 0.5, it means that half the population remains outside the organized sector; the problem of development planning is to bring them into that sector. As the pace of development accelerates, the ratio starts falling steeply.

This ratio indicates that overpopulation does not depend upon the physical size of the population. Suppose that two countries have total populations of 400
million and 100 million, respectively. If, in the former country, 300 million are employed in the organized sector, while, in the latter country, 20 million are so employed, then the degree of overpopulation is 25 percent in the former and 80 percent in the latter. Thus, it is argued, this measure of overpopulation is a far more meaningful concept than are the traditional measures.

When initial investment effort begins in underdeveloped economies, the death rate begins to fall. The birth rate, however, is subject to a ratchet effect, because of social and psychological factors. Therefore, the population continues to multiply rapidly. This effect, sometimes described as the Low Income Trap, tends to neutralize the initial efforts at development. Family planning programs show results in the labor market only after a time lag, the lag depending on the average age of entry into the labor market. Therefore, the population barrier can be crossed only by accelerating the rate of growth of the economy.

For this purpose, the formulation of a national plan is a precondition. If physical resources are available, then the size of the plan can be enlarged, so that the resultant rate of growth of income and output is higher than the rate of growth of population. Only then can there be a sustained increase in income per capita. Thus, the emphasis must be shifted to a massive investment program if the population problem is to be solved.

Investment, in turn, must not be made in a random fashion, but must follow an optimal long-term strategy. The composition of investment is as important as total investment. A rational investment plan must discriminate between what goods ought to be produced and what ought not, and what techniques should and should not be used for their production. The strategy chosen must be such that it does not use bottleneck goods on a large scale, and, at the same time, increases the output of such bottleneck or infrastructure goods.

In an underdeveloped economy, where the degree of nonemployment is high, the strategy selected must aim at using labor intensively. Thus, while heavy investment goods should be produced at a growing rate, consumption goods must be expanded using capital-conserving
techniques. Labor is not a bottleneck to such a scheme. With all this effort at a rational investment policy, it should be borne in mind that a growing population entails a considerable burden on development, to the extent that outlays are diverted toward providing food and essential consumer goods to an increasing number of people. This means that the proportion of investment resources left for providing roads, power, and equipment is inevitably reduced.

Another demographic characteristic is the distribution of population by age. In developing economies, the percentage of population in the productive age group (defined as 15 to 59) is lower than the percentage for the same age group in developed economies. This not only places a bigger burden on the productive members of the economy, but constrains the total productive power of the economy. Further, in the absence of planned development, the low rate of economic growth inhibits population mobility. The rural areas are characterized by underemployment, leading to underutilization of human resources and, hence, social and economic waste.

As a supplement to the main effort at inducing sustained development, a population policy is essential. In the long term, such a policy will induce a decline in the birth rate. Meanwhile, during the period of time required for social change to evolve or compulsory measures of family planning to take effect, the surplus labor can be deployed in a planned development effort. In such labor-surplus economies, it is possible to take advantage of the low wage rate to use this surplus productively, at the same time creating the required infrastructure that will help in improving the real wage rate.

Deficiency of Capital and the Use of Inferior Techniques

The key to economic development is the rate of capital accumulation. The availability of capital per capita is one of the most important indicators of development. Those economies which have experienced a low secular rate of capital accumulation in the past are characterized by the use of inferior techniques in the traditional sectors—agriculture and cottage-based
industries. It is important to differentiate here between inferior techniques and those that are less mechanized. The degree of mechanization refers to the relative inputs of labor and capital. If a technique is inferior, it means that, using the same basic capital/labor ratio, some other technique would produce a higher output. Thus, a technique with a lesser degree of mechanization is not necessarily an inferior one.

In the absence of planned efforts, the use of inferior techniques is perpetuated by the difficulty of adopting new techniques when the rate of accumulation is so low. In the agricultural sector, the use of inferior techniques results in a declining rate of productivity per unit of capital employed, so that the rate of accumulation is further depressed. At the same time, the growing rural population exerts increasing pressure on the land, thus preventing small and marginal farmers from improving their techniques.

If inferior techniques predominate in the primary sector, then the key to rapid development lies in introducing superior techniques into this sector. The technique adopted should yield a larger output, both per unit of labor and per unit of capital, than the existing technique. For example, in a low-wage economy, the introduction of improved plows, better seeds, assured water supply, and other extension services in the agricultural sector will yield a larger output, relative to inputs, than will the indiscriminate use of tractors.

As noted previously, there is a sharp dualism of techniques in an underdeveloped, especially a post-colonial, economy. Unlike agriculture, the small industrial sector tends to be highly mechanized. In a low-wage economy, the use of highly mechanized techniques results in a distribution of income that is biased in favor of profit earners. This leads to a distortion in the demand for goods, which pulls in the direction of nonessential consumer goods for the rich. The result is a "Glass Curtain Economy," in which the rich can indulge their demand for conspicuous consumption, while the poor can observe but do not have the means to imitate. The nature of this industrial sector does not enable it to expand at a rate sufficient to absorb the excess population of the agricultural sector.
Inadequate Infrastructure

Underdeveloped economies suffer from a shortage of infrastructure goods that are the output of heavy industries, including steel, cement, coal, oil, chemicals, transport, and technology—all of which require large-scale investment. For a capital-scarce economy, infrastructure industries constitute a bottleneck to growth which must be confronted and overcome if the economy is to move forward on the growth path.

The sector of heavy, or basic, industries performs two functions. Given a supply of wage goods exogenously, it is capable of reproducing itself. At the same time, this sector can be used to produce capital equipment required for the output of consumer goods. Steel, for example, can be used to produce more steel, as well as to produce textile machinery and automobiles.

Only when the economy is able to sustain a fairly high rate of growth should it use highly mechanized techniques of production in the consumer-goods sector. On the path to this stage of development, it would be better for the economy to concentrate on capital-conserving techniques. In the absence of such a strategy, the economy may find itself in one of two situations: (a) Resources available for the production of capital goods are diverted to the production of consumer goods. This may promote social justice, but not growth. Investment in infrastructure industries does not lead to capital accumulation, and this raises the opportunity cost of diverting resources to the consumption sector. (b) The consumption-goods sector uses highly mechanized techniques for producing consumer nonessentials. The market structure, influenced by the initial skewness in the distribution of income places a high premium on the production of such goods. In this case, we have neither social justice nor growth, because of the continuous drain on the infrastructure industries. Persons having high disposable incomes are able, through their spending power, to deprive the economy of essential basic requirements. The luxury-good industries make handsome profits, further encouraging investment in that sector, and leading to a decline in the growth of bottleneck goods. Thus, the initial maldistribution of income and wealth is
perpetuated. This, in turn, will starve the market of consumer essentials, subjecting the economy to real inflation.

The selection of an optimum strategy is of great significance to a developing country with a labor surplus. The government must assume the responsibility not only of selecting the correct strategy of development but also of implementing it. More particularly, monetary and fiscal policies must be evolved to implement such a strategy effectively. A "conservative" monetary policy, for example, may have an adverse influence on the choice of an investment pattern. A conservative monetary policy is an end in itself for neoclassical economists, and strategy follows from it. In a developing economy, however, it is essential that policies follow from the strategy adopted, and not vice versa. Unfortunately, in most underdeveloped countries, this requirement is overlooked by policymakers, thus leading to an imbalance in the pattern of investment.
CHAPTER VII

CAPITAL FORMATION AND ECONOMIC DEVELOPMENT

Capital formation is the kingpin of growth; its inadequacy keeps backward economies tied to low levels of income per capita. If we compare the developed countries with the underdeveloped ones, we can see that the former attained the status they enjoy today by maintaining a high rate of capital accumulation in their early stages of development. Their present high standard of living is a direct result of their past effort at accumulation.

Two factors are of significance in accelerating the rate of capital formation. First, infrastructure industries must be established for the production of capital equipment. When the economy has attained full employment and is ready to switch to a higher order of mechanization, such as replacing plows with tractors, then the infrastructure, in the form of steel, power, technology, and skills, must be available to help the economy effect a quick changeover. During the period of transition toward this target, the economy must equip itself with the requisite industrial base.

Second, capital accumulation entails providing the economy with the right types of machinery and equipment to serve as inputs for the processes producing those goods and services which the economy decides to have at a particular level of development. This implies that there should be an accumulation of various types of equipment, and their inputs, in the proportions required by the strategy which the economy adopts. If the strategy to be used is labor intensive, then the accumulation of heavy equipment for producing consumer goods would not be appropriate, and would not form part of capital accumulation.

A number of economists reduce the problem of development to one of increasing savings in the economy. For them, development consists merely in converting a "low savings" economy into a "high savings" one. Thus, the entire problem is reduced to one of mobilizing additional savings, rather than inducing structural changes. Even if we are prepared to grant that savings can be mobilized, there is no guarantee that all of these savings will be invested. That will depend
on the overall propensity to invest. Again, if investment does take place, there is no assurance that it will be channeled into development-oriented production. Keynesian economists advocate an increasing rate of investment, on the assumption that this will result automatically in economic growth. Such an argument assumes that investment governs savings, not vice versa. Nonetheless, it is as much an oversimplification as the argument that savings alone leads to growth. It says only that investment in one homogeneous equipment may result in accumulation for growth. The moment we introduce heterogeneous equipment, not all of which may be equally optimal for the economy, then accumulation becomes conditioned by the choice of techniques and may not lead to a high rate of growth, despite a high investment/income ratio.

Neither the emphasis on aggregate savings nor on aggregate investment gives a proper insight into the problem of capital accumulation. For an underdeveloped economy, it is the choice of the strategy of growth which, in the last analysis, governs capital accumulation. From this perspective, capital accumulation is really the process of increasing the supply of appropriate types of equipment. It is not so much the quantity of capital as its composition, or the distribution of investment over various processes, that results in growth. The programming of investment is vital if capital accumulation is to be directed along the right lines for growth maximization. The "big push" theory and the theory of "critical minimum effort" do not give adequate recognition to the complex relationship that exists between investment and the standard of living in underdeveloped countries.

In an economy characterized by uneven distribution of income, production is diverted to satisfy the demand that emanates from the upper income groups. Profit-oriented entrepreneurs will concentrate on satisfying the demand for conspicuous consumption, so that while investment is growing, it does not generate growth. When the vast majority of the population is below subsistence, investment loses its relevance if luxury goods are produced instead of wage goods. Thus, a reasonable degree of disaggregation has to be introduced into the economy before aggregative models can work.
Aggregative models have a tendency to gloss over the real issues of development. To discover the best method of accumulating capital, first the economy must be disaggregated into various sectors. Next, a selection must be made of the special types of equipment required, so that accumulation may proceed on the right lines. Toward this end, the length of time required by the economy to achieve the transition should be borne in mind. Disaggregation not only can help to determine priorities, but also can help in identifying the bottleneck goods, so that their production will not stand in the way of development. The analysis of accumulation becomes meaningful in the context of investment allocation, rather than total investment.

There is considerable divergence of opinion among economists as to whether the pattern of investment should result in balanced or unbalanced growth. Balanced growth has been advocated on the grounds that investment in isolated sectors does not lead to sustained growth, because of the incapacity of the market to absorb the additional output. The prevalence of low standards of living limits purchasing power and, thereby, the size of the market. Let us assume that this balance is disturbed by an isolated large investment, such as a bicycle factory. Additional output and incomes are generated, but the capacity of these newly created incomes to absorb the bicycle output is far below what would finally clear the market for bicycles. The new entrepreneur realizes that he is incurring a loss because of the restricted market for his product, and he cannot sustain the initial investment. Therefore, argues Nurkse, the solution lies in expanding the size of the market. To achieve this, a battery of investments is needed, in order to generalize the increase in incomes. Nurkse advocates a complementarity of demand induced by diverse investments, so that the economy as a whole experiences balanced growth, and this growth helps to clear the market of the various goods produced.

If the economy is characterized by extremes in the distribution of income, however, the new investment may generate a demand for luxury goods to the detriment of demand for consumer essentials and capital equipment. In such a case, the profit-motivated entrepreneurs may strive to satisfy the market demand for
these goods, which are growth-inhibiting in nature. The main drawback of the Nurksian model, therefore, is that it is not conducive to the production of those goods that are in conformity with socially determined choice.

A. O. Hirschman disagrees with the balanced-growth thesis, on the grounds that it is a strategy that an underdeveloped economy cannot afford. The opportunity cost of across-the-board investment, in terms of bottleneck resources, is too high. Investments scattered over a wide variety of projects simultaneously will require vast resources of capital and entrepreneurship. These are precisely the resources that are in short supply and that need to be conserved, if the maximum impact of the economy is to be achieved.

According to this view, the task of development policy should be to create disequilibria, so that further investment decisions will be induced. Investment concentrated in a few sectors, that is, will generate pressures on other sectors to come forward with investment projects. Thus, the initial investment will create linkage effects. When one industry produces output that is used as an input by some other industry, this is termed a forward linkage effect. When an existing industry creates a demand for the output of some other industry, this is called a backward linkage effect. Thus, a growth industry can augment demand on both sides. If investment projects have high linkage effects, or coefficients, the pressures created by the initial imbalance will induce further investments in related sectors.

The rationale of investment decision is related to the goal of development. Under the New International Order, it would seem appropriate to fix the goal as that of raising real income per capita. Galenson and Leibenstein have proposed a social welfare index that would be a function of the per capita output potential at some future point in time. But output potential has to be measured in value terms and is not a definite indicator of rising per capita income. Further, it requires increasing capital per worker, which may not be the most useful strategy to adopt. In a labor-surplus economy, the indicator of economic development would not be capital intensity per worker.
The marginal reinvestment quotient assumes that investment is generating a surplus over wage costs on the basis of higher capital intensity. In this case, the capital/labor ratio has to be maximized, which may not be the optimum strategy for development with surplus labor.
Should the pattern of growth be balanced or unbalanced? Development economists generally treat this issue as a dichotomy: the choice of one excludes the other. This is not necessarily so, however. In fact, there is no fundamental incompatibility between the two types of growth.44

Consider the two subeconomies, A and B, each producing various goods. Of these goods, some are common to both, while others are not. Let corn, plows, and cloth be produced in A, while corn, plows, and shoes are produced in B. Within each subeconomy, the goods are growing at the same rate; the two subeconomies, however, are growing at different rates. If we aggregate the two subeconomies, we find that the total economy is producing corn, plows, cloth, and shoes, using inputs corresponding to these outputs. But since the subeconomies are growing at different rates, in aggregation the goods appear to be growing at different rates, thereby creating the impression that growth is unbalanced.

The compatibility between balanced and unbalanced growth can be seen also when we examine an economy that has made a choice of the goods it wishes to encourage and those it wishes to discourage. Let us assume, again, that there are two subeconomies, one producing priority goods and the other, nonpriority goods. Investment is channeled in such a way that the bottlenecks to growth of the first subeconomy are removed, so that its rate of growth will be higher than the rate of growth of the second. The objective of such an investment policy is to make priority goods grow faster than nonpriority ones. Although there is an imbalance between priority and nonpriority goods, it is possible that, within each of these subeconomies, goods are growing at the same rate. Thus, the pattern of growth—balanced or unbalanced—depends on one's perspective.

Deliberately Unbalancing A Subeconomy

In yet another type of situation, it is possible for a subeconomy to undergo an initial phase of unbalanced growth as a means of carrying it, later, to
a stage of balanced development. Such a situation arises when the inputs in the process of production are not organized for balanced growth in equilibrium proportions. In this case, growth has to be unbalanced to ensure optimal utilization of inputs. The following example will clarify the point:

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
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<tbody>
<tr>
<td>L</td>
<td>C</td>
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<tr>
<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
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</tbody>
</table>

Let us assume that this economy has 100 units of C and 100 units of Eq at the commencement of the period of development. We know that the required proportions of inputs are in the ratio of 1:1. Therefore, there must be 100 sets of C and Eq, each set having one unit of C and one unit of Eq. Thus, 100 laborers can be organized for production.

Solving this technology for steady growth, we derive process intensities of 1:1, so that labor is divided in the ratio of 50:50 between the two processes. The result is shown below:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
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<tr>
<td>100</td>
<td>100</td>
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</tbody>
</table>

The rate of growth is 100 percent, which is the highest rate that can be realized for this economy, given the initial conditions.

However, the labor distribution of 50:50 is not the only ratio possible. And inputs can be distributed in any proportion, so long as they add up to our assumption of 100 units of C and 100 units of Eq at the commencement of the process. The reason for selecting the ratio of 50:50 is, obviously, that any other combination
would result in a suboptimal rate of growth. Again, in this situation, the alleged incompatibility between balanced and unbalanced growth does not exist, since there are no alternatives, in the real sense of the term.

Nonetheless, it is possible to approach steady growth through a deliberate policy of making some goods grow faster than others in a subeconomy. Assuming the same technology as in the previous example, we know that inputs can be organized only in the ratio of 1:1. Suppose, however, that the requisite inputs are not available in those proportions. Let us assume that the availability ratio is actually 1:0.7. If 100 units of \( C \) are available, then only 70 units of \( E_p \) will be available at the commencement of the process. In this case, the bottleneck good is equipment, because its supply is relatively less.

There are two ways of overcoming this bottleneck. One is to ignore the bottleneck nature of this good and to organize the subeconomy for steady growth. If we allocate resources in the ratio of 35:35, we then have:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td>( L )</td>
<td>( C )</td>
</tr>
<tr>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

While the rate of growth is 100 percent, only 70 units of \( C \), out of the 100 initially available, are used. In the next period, production has grown in balanced proportions to 140 each of \( C \) and \( E_p \), but the 30 units of \( C \) remain unused and will never be used. Therefore, the condition of full-capacity utilization of resources for achieving steady growth remains unfulfilled.

The other possibility is to allocate resources in a biased manner, favoring the bottleneck good—in this case, equipment. The supply of equipment can be made to grow faster, resulting in unbalanced growth. This imbalance is maintained until the inputs are restored.
to equilibrium proportions. This means that we must allocate resources in such a way that the equipment sector grows faster, so that, at the end of the stipulated period, both goods will be available in equilibrium proportions.

To derive such an adjustment model, let the actual allocations be in the ratio of \( a:b \). The technology can now be represented as follows:

\[
\begin{array}{c|c|c|c|c|c}
\text{Input} & \text{Output} \\
\hline
L & C & Eq & C & Eq \\
\hline
\frac{a}{b} & \frac{a}{b} & \frac{a}{b} & \frac{4a}{0} & \frac{a}{3b} \\
\frac{a+b}{a+b} & \frac{a+b}{a+b} & \frac{4a}{a+3b} \\
\hline
\end{array}
\]

We have assumed that the bottleneck good is equipment, with an input of 70 units. Therefore, if we want balanced growth in the next period, output in this period should be such that

\[4a + 30 = a + 3b\]

We know that

\[a + b = 70\]

or

\[b = 70 - a\]

Solving for \( a \), we find that \( a = 30 \) and, hence, \( b = 40 \). If we allocate resources in this ratio, then the supply of equipment will grow faster than the supply of \( C \). The result of this deliberate imbalance will be:

\[
\begin{array}{c|c|c|c|c|c}
\text{Input} & \text{Output} \\
\hline
L & C & Eq & C & Eq \\
\hline
30 & 30 & 30 & 120 & 30 \\
40 & 40 & 40 & 0 & 120 \\
70 & 70 & 70 & 120 & 150 \\
\hline
\end{array}
\]
If we take the unused surplus of 30 units of $C$ from the previous period and add them to the 120 units of $C$ produced in this period, we have 150 units of $C$ available for use in the next period. Thus, the bottleneck disappears in the next period, and both $C$ and $Eg$ are available in balanced proportions. (Note that the quantity of resources available in the next period, as a result of this strategy, is 150 units each of $C$ and $Eg$, as opposed to 140 units in the steady-growth strategy.)

Variables Affecting the Allocation of Resources

While allocation of investment resources in the key variable for the attainment of balanced growth, this allocation is itself conditioned by the behavior of other active variables. Some of the more important ones are:

1. The propensity to consume of entrepreneurs and, hence, their propensity to invest. If there is a situation of nonemployment, a high propensity to consume of entrepreneurs will result in a low rate of accumulation. The same is true of all types of unproductive expenditure, whether incurred by private-sector personnel or by the public sector. Such activities cut into the size of the real investible surplus available for accumulation. Therefore, as the propensity to consume, either of the rentier class or of entrepreneurs, increases, it cuts into accumulation.

In an economy characterized by disparities of income and consumption, there is a tendency to indulge in conspicuous consumption. Often, the private sector in business and industry caters to this demand for luxury goods; often, it creates such demand wilfully. Given a market for luxury goods, the resulting high rates of profit encourage investment to flow into that sector. When society refuses to follow a rational consumption policy, and when it cannot be coerced into doing so, the trend is hard to reverse. Yet reversal is necessary, if real growth is to be ensured, and if disparities in living standards are to be prevented from increasing.

The traditional use of fiscal tools has failed to curb such trends in many developing economies. The
problem is that direct taxes on income do not control the allocation of disposable income, once the taxes are paid. Even in a highly developed economy like that of the United States, steeply progressive direct taxes during 1973-74 led to lower investment, consequent recession, and a worsening of the real income of taxpayers. The burden of lower accumulation falls on the unemployed. In other words, taxes meant to have an impact on the rich have a way of percolating, through price increases of essential goods, to that section of the population which cannot pass it down further.

2. The level of the real wage rate. A rational consumption policy depends on an appropriate wage policy. Unfortunately, in many developing economies, this is not understood. Wage policies are formulated without adequate attention to a national consumption policy.

In a developing economy, a demand for higher wages by the organized sections of the labor force shifts the burden of such wage increases onto the unemployed and the unorganized sectors, such as farm labor and self-employed persons. The lower rate of accumulation that results from higher wages serves to prolong the time before such workers can be absorbed into the organized sector. In a period of transition, during which the economy is on the path of development and austerity in consumption is planned, that austerity must apply equally to the entrepreneur, the politician, the bureaucrat, the factory worker, and the farm laborer. This does not mean that workers are to be denied the fruits of their labor or the gains of development. As profits from industries increase, it should become possible for labor to receive a share in ownership, by distributing higher wages or bonus payments in the form of equity capital. Such a system is not new and has operated with great success in the highly advanced capitalist economy of the United States.

3. The rate of technical progress. Caution must be exercised in evaluating the effects of technical progress on the rate of accumulation. Such an evaluation can be made only in the context of a disaggregated system. All technical progress does not represent real progress. Often the alleged progress represents regression, when viewed in terms of accumulation. This is particularly true when choice has been exercised
with regard to the goods to be produced and the techniques to be adopted. Such a choice is closely dependent upon the strategy selected for development and whether that strategy is a growth-optimizing one or not.

If an underdeveloped economy has opted for a strategy involving the rapid progress of capital-goods production, then the technique will be capital intensive for the heavy investment sector, while essential consumer goods may rely on labor-intensive techniques. However, the private sector in underdeveloped economies has to be watched closely because, very often, technical progress may be generated in the luxury-goods sector, such as automobiles, synthetic fabrics, or cosmetics. Such technical progress creates a double distortion in its effect on distribution and on opportunity cost. Nor is the state sector absolved of such misuse of technical progress. In some underdeveloped countries, one can find public-sector industries using sophisticated techniques to produce refrigerators or color television sets.

Suppose, on the other hand, that technical progress has occurred in the agricultural sector, in the form of an improved, high-yielding variety of seeds. This will make the rate of growth of food output rise, in which case the economy as a whole may opt for a higher rate of accumulation. Such technical progress would be oriented to the overall strategy of development.
CHAPTER IX

INFLATION, EXCESS CAPACITY, AND ECONOMIC DEVELOPMENT

There appears to be no agreement among economists about the effects of inflation on economic development. While some have held that a moderate dose of inflation is not harmful in its effects, others feel that it has a deleterious effect on the rate of growth. Economists differ on the basic causes of inflation, as well as on remedies.

Monetarists contend that inflation is caused by an excess supply of money. They condemn deficit financing and advocate a monetary policy that will align the money supply to economic growth. Keynesians are concerned with curbing aggregate demand by means of an incomes policy. They argue in favor of a deferred payment system to contain excess demand. A third school of thought holds that misallocation of resources is responsible for inflationary disequilibrium. In a developing economy, the physical resources available to planners sets a limit to the size of the development effort at any given point in time. According to this view, therefore, financial resources are secondary to physical ones.46

It is essential to distinguish here between a micro and a macro situation. In the former, a single entrepreneur organizes production, or a firm or industry plans production. For such organizations, physical resources do not constitute a bottleneck. The constraints they face are primarily financial rather than physical. In a macro situation, on the other hand, the entire economy has to be organized for production. At this level, the bottlenecks to growth are real resources and not financial ones. Taxation, borrowing, and deficit spending are all available for initiating new projects, and financial resources can always be made to match the exploitation of physical resources in any planned effort for development.

In a developing economy, real inflation constitutes a decline in the real standard of living of the majority of people, who are unable to draw on savings to retain their original living standards, already very low by international standards. When consumer essentials or wage goods are out of reach for the mass
of the people, inflation becomes a deterrent to growth. Such a situation stems more often from assigning a low priority to the production of wage goods than from deficit spending.

Projects that have a long gestation lag are those that tend to generate inflationary forces. Some of these projects, such as hydroelectric dams, steel plants, railways, and other infrastructure requirements, are socially necessary. Also in the public sector, however, are projects that are wasteful in terms of essential production, such as top-heavy administration, prestigious government buildings, sophisticated townships, nuclear arms, and other defense equipment. In this category should be included luxury consumption goods, which the economy cannot afford in its initial stages of "take-off." To offset the inflationary pressures generated by long-gestation infrastructure projects, there must be an adequate quantum of investment in the production of consumer essentials, to mop up the excess demand generated by rising incomes. Inflation, then, can be avoided by allocating financial resources in such a manner that any excess demand is matched by increasing supplies.

This can be demonstrated by using the process matrix and applying it to a simplified economy of the type used earlier. Let the technology be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
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<tbody>
<tr>
<td>L</td>
<td>C</td>
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<tr>
<td></td>
<td>1</td>
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<td>1</td>
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</table>

The process intensities are 1:1. If we assume initial endowments of 100 units of C and 100 units of Eq, then the noninflationary allocation will be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
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</tbody>
</table>

150 50
0 100
150 150
The rate of growth is 50 percent. At the prevailing wage rate of unity, 150 units of $C$ are required to maintain 150 laborers, who produce 150 units of $Eq$. Therefore, the standard of living of the worker is maintained, and growth is noninflationary.

Suppose now that the allocation ratio is 2:3, or 40:60. The matrix would be as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>$C$</th>
<th>$Eq$</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>160</td>
<td></td>
</tr>
</tbody>
</table>

In the next period, 160 units of $Eq$ will be available, which, with the given technology, can employ 160 workers. At the prevailing wage rate, the economy will require 160 units of $C$; however, it has produced only 120 units. As a result, the real wage will fall, leading to a situation of real inflation. If the wage rate is to be maintained at unity, the economy can employ only 120 workers to produce 120 units of $Eq$. In this case, 40 units of $Eq$ will remain unutilized, leading to excess capacity.

The only other alternative is to permit the standard of living of the workers to fall only partially, thus combining inflation with excess capacity. Such a policy can result in inflation with recession, a phenomenon that has become familiar in advanced economies as well as developing ones.

A steady-growth model of development assumes the neutrality of money. This is so because prices, under perfect competition, are set in such a way that the rate of surplus will be equal in all sectors. What is essential for steady growth is that each commodity must grow at the same rate. Then, with the growth of output, the additional stock of money is absorbed, even as the demand for money increases with additional demand for new output. The monetarists depict a situation of moving equilibrium, in which the rate of change in the money supply alone is important. In a developing economy, however, this relationship is not predictable.
Under planned investment, the anticipated rate of inflation is not clear. Even the allocation pattern of new money fails to explain how deficit financing influences consumption more through the increased velocity of circulation of new money than through government expenditure at the macro level. Another important constraint in a developing economy is the effect of lags in the impact of monetary policy. Changes in the money supply have to be timed in such a way as to bring about predetermined changes in effective demand. The dual objectives of stabilization and growth create contrary lags in monetary policy and have to be bolstered with direct controls and/or fiscal policy.

In its eagerness to industrialize as rapidly as possible, a developing economy is likely to create excess plant capacity, which may well serve as a drag on the economy when inflationary trends emerge. Under cost-push conditions, industrialists in both private and public sectors resort to leaving a part of their installed plant unutilized. Such a policy further aggravates inflation, increases unemployment, and adversely affects economic growth. Governments of developing economies also tend to encourage small-scale industries on socioeconomic grounds. Since economies of scale are not open to the small-scale sector, higher investment here has an inflationary impact and further retards growth. Many developing economies face the problem of a parallel economy based on smuggling, black markets, and unaccounted money. Under such conditions, the fruits of development are not directed toward economic opportunity and social justice. While overall national output may increase, its distribution does not lead to egalitarian development.

Given the desired rate of capital formation, and given a low rate of voluntary savings and inadequate tax revenues, it often becomes imperative for an underdeveloped country to mobilize forced savings through inflation. In concrete terms, if infrastructure projects in the public sector, such as irrigation, hydro-electricity, roads, and railways, cannot be financed in any other way, then, even if inflation imposes hardships, it may well be worth the price. However, the threat involved in what seems a simple and harmless
process is that deficit financing will become the line of least resistance and tempt the government to spend its money extravagantly, neglecting the more difficult and irksome methods of mobilizing resources. After initiating inflation, moreover, governments often find themselves compelled to neutralize its effects through compensatory payments, price controls, or rationing of essential commodities. Therefore, inflation undertaken for capital formation becomes self-defeating as the standard of living falls.

Apart from inelasticity of supplies and a low rate of productivity, developing economies also suffer from resource immobility. This means that resources cannot be shifted easily from one use to another. It is easier to alter the allocation of new resources than to shift those already employed. Further, in such countries, the propensity to consume is high. The vast majority of the population, subsisting at submarginal levels, wants to increase spending with every increase in income. When consumers find that the value of their incomes is continually eroded by inflation, they are even more eager to convert their money balances into goods. This type of inflation psychology is certainly detrimental to economic growth.

Another adverse effect of deficit-induced inflation is that it diverts production from exports to the sheltered domestic market. Because of rising costs, exports become less competitive in foreign markets. At the same time, there is the greater inducement of high prices for the same goods in the home market. Deficit financing must be watched, therefore, for the structural imbalances it is likely to create. It is possible to reduce these adverse effects on the external payments position by licensing imports and controlling imports for inventory accumulation. The success of this policy will depend on the degree of distortion to which the balance of payments has been subjected by inflation. Restoration of the monetary equilibrium per se will not rectify the structural imbalances. The entire economic system will have to be readjusted to planning with physical resources rather than monetary ones.

While some fluctuations in the price level may be inevitable during the process of development, inflation
should not create distortions in the economy. The relationship between inflation and growth cannot be defined easily. It will depend on a number of factors, including the degree of inflation, the natural resources available in the country, the stage of their exploitation, and the political and social structure.
CHAPTER X

DISTRIBUTION AND DEVELOPMENT

One economic issue that consistently baffles theorists and policymakers alike is the distribution of the Gross National Product. In the past, governments have risen or fallen over the issue of inequalities of income and wealth. The struggle over income shares manifests itself in contemporary economic situations, perhaps even more strongly than in the past.

Inequality is the result of cumulative causation, involving history, social and institutional forces, and the thrust of development. One can almost predict a trend in inequality, depending on the phase of development and the stage of capitalist experience. In the last two decades, the major task of underdeveloped countries has been the planning of economic growth at such a pace as to banish, or at least reduce, the crushing burden of poverty. During the second development decade, however, many developing countries have attained rising rates of growth unaccompanied by a more equitable distribution of the gains from growth. The persistence of poverty despite economic progress has led economists to challenge the compatibility of growth with better distribution. Clearly, the growth of GNP is not identical with the growth of national welfare. Nonetheless, it cannot be established on empirical grounds that growth and social justice are mutually contradictory.

The earliest theory of distribution originated with the classical school of economics; its leading exponent was David Ricardo. He wrote during a time when the early effects of the Industrial Revolution were being felt. Industrialization was accompanied by a growth in population and a consequent growth of poverty. It saw the establishment of the factory system, capitalism, rising prices, and demand for cheap labor. In such an atmosphere, Ricardo devoted his attention to the redistribution of income and wealth, which he believed to be the gravest economic problem confronting the people of Great Britain in his day. With his focus on distribution, he changed the emphasis of economic analysis from production to distribution.
Ricardo divided society into three classes: landlords, wage earners, and capitalist employers. His theory of distribution is bound inseparably to the factor of land and its margin of cultivation. He evolved the differential principle, according to which production costs differ either because of a difference in the grade of land or because of differences in the doses of capital and labor applied to a given plot of land. The exchange value of output is influenced by the cost of production incurred under the least favorable conditions. Thus, the price of corn will cover the cost of production on the least fertile land that must be cultivated to satisfy the demand for corn.

With respect to the share of wages in income, Ricardo adhered to the doctrine of a subsistence wage, which would enable laborers to subsist "without increase or diminution" in their numbers. Profits, then, were simply a residue of the system. Since rents were constantly increasing, with the cultivation of more and more land, profits could not grow except at the expense of wages. According to Ricardo, "profits depend on high or low wages, wages on the price of necessaries, and the price of necessaries chiefly on the price of food." As population grows and the demand for food increases, the price of food rises. Therefore, money wages rise, and profits tend to fall. Since accumulation depends on profits, growth also depends on profits. With profits tending to fall over the long run, Ricardo's analysis led to a "stationary state" situation. History has shown this analysis to be of doubtful validity, inasmuch as wages have not tended to remain at subsistence level, nor have profits approached zero.

Karl Marx's contribution to this aspect of economic thought was based on the classical labor theory of value, from which he derived his theories of surplus value and exploitation. His writings on the distribution aspect of economic theory centered on two factors: wages and profits. This emphasis stems directly from his interpretation of history as a struggle between two social classes for the material means of life.

In Marx's analysis, labor, as a commodity, has a special quality found in no other commodity: the
ability to determine the value of all other commodities. Marx held that the value of a commodity is determined by the socially necessary labor time concealed in it. In this way, labor creates a value which is greater than its own value—that surplus value which is the source of capitalist profit. His theory of exploitation led, like Ricardo's theory, to a falling rate of profit, but for very different reasons. The capitalist system of distribution would generate its own destruction, to be replaced by a new, classless social and economic order.

This aspect of Marx's theory poses a challenge to capitalism to overcome its weaknesses and, therefore, commands significant support in the underdeveloped economies of today. With communism and capitalism competing for the support of these countries, the promises of the Marxian doctrine are appealing. Capitalism must prove to the Third World that it can and has set up a system of distribution that promotes growth with social justice.

The neoclassical economists also subscribed to the view that, as accumulation progresses, the marginal productivity of capital declines, and this results in a falling rate of profit. According to this school, the share of each factor in production is determined by its marginal productivity, and the total product is equal to the sum of all the factor quantities multiplied by the marginal productivity of each factor, providing that production takes place under constant returns to scale. But the marginal-productivity doctrine is based on several assumptions, including perfect competition, mobility and homogeneity of factor units, factor substitutability, and variable factor proportions, that may not always prevail in a dynamic society.

J. R. Hicks introduced some refinements to this theory. He pointed out that the entrepreneur would select the "least cost combination," on the basis that the marginal productivity of factors should be proportional to their prices. If labor and capital were the only factors of production, this condition would be:

\[
\frac{\text{marginal productivity of labor}}{\text{price of labor}} = \frac{\text{marginal productivity of capital}}{\text{price of capital}}
\]
The locus of points representing various combinations of labor and capital which might be used to produce a given output is called an isoquant, or equal product curve. Its slope reflects the diminishing marginal significance of the increasing factor in terms of the decreasing one.

This analysis implies an assumption of malleable capital. Such an assumption may reflect reality in the case of primitive agricultural production, where fixed capital plays a negligible role. Under conditions of modern technology, however, capital goods change their form. Such change takes time, skill, and real resources. Thus, the assumption of malleability does not hold good.

Paul Samuelson supports this neoclassical approach by using a fixed coefficient of production for each type of output. He assumes constant returns to scale and perfect competition. He then builds a model in which there are a number of steady states at equilibrium levels, given the rate of profit and the real wage rate. If, for a given output, the wage rate is high and the rate of profit is low, the process can afford a higher level of capital intensity. In other words, Samuelson assumes that capital is malleable, enabling free substitution in the production function between labor and capital. In point of fact, he avoids the problem of any measure for capital by using a single capital good technology.

The Harrod-Domar theory relates a country's rate of growth to its savings/income ratio and its marginal capital/output ratio. This theory applies to an advanced economy rather than a developing one, as it seeks to determine how much national income must grow to induce investment sufficient to maintain a predetermined rate of growth. An underdeveloped country is more concerned with initiating a higher growth rate, rather than maintaining a high initial rate of growth. Even so, the theory provides a structure for purely dynamic equilibrium which involves spontaneous growth. The variables of the model are not independent, but mutually determining. Therefore, no government intervention is needed to sustain growth.

With respect to distribution, the theory adheres to the general thinking of the post-Keynesian analysis. It concentrates on steady growth, in the belief that steady growth is necessary for equitable distribution.
Under full-employment conditions, in an economy experiencing steady growth, the wage rate \( (w) \) will be determined by the rate of growth \( (g) \).

The disadvantage of this theory is that it tends to be a one-sector analysis, placing emphasis solely on increasing capital through technological development. Harrod makes the assumption that the savings ratio is constant. While this may be true of developed nations, such is not the case for developing ones. The distribution of income has an important bearing on the savings ratio of underdeveloped economies. Further, Harrod concludes that, even if steady growth is attained, there will not be a tendency toward long-term stability, leading to what is called the "knife-edge." To be on the knife-edge, the required savings ratio must equal actual savings. If this condition does not hold, there is the danger of falling off the equilibrium edge.

Joan Robinson has evolved a theory of distribution for a steady-growth state with a constant rate of profit and a rising wage rate.\(^53\) In her Golden Age model for economic growth, she believes that, at the Golden Age level, the economy will attain maximum consumption per worker. It is possible for an economy to pass through several optimum Golden Ages, each one at a higher level of production than the preceding one. In her model, the determinants of long-run growth are: technology, savings of entrepreneurs, competition, variable wages, and investment policy. The assumptions of this model are: entrepreneurs do not consume, wage earners do not save, and profit expectations are constant.

If wage earners do not save, any growth in capital stock must depend on investment by entrepreneurs. The "animal spirits" of entrepreneurs, which make them greedy for profits, prevent them from allowing the profit rate to fall. To maintain this constant rate of profit in a Golden Age economy, it is necessary to maintain a steady increase in investment by entrepreneurs and an equally steady increase in the rate of wages to allow for increased consumption. Such a theory operates not only for economies under perfect competition but also for planned economies. In a free enterprise system, the thriftiness of entrepreneurs would be a significant factor, whereas in a planned
economy the thriftiness of the government would be an important determinant. In both cases, the economy would achieve full-capacity, noninflationary growth under full-employment conditions.

This distribution model, however, does not show how an economy can move from a lower level of development to a higher one. A growth model describes various dynamic relationships between investment, consumption, employment, and technical progress. A development model must be concerned with strategies that are instrumental in carrying an economy forward on the path of growth, such that the resultant growth will be steady, full-capacity, noninflationary growth.

One such development model has been designed by Professor P. C. Mahalanobis, based on the Harrod-Domar growth equation. In a four-sector model, he first takes into account the two main sectors of an economy: the consumer-goods sector and the capital-goods sector. The production of consumer goods is subdivided into three sectors: goods produced in factories, goods produced by small industry and households, and services to consumers such as health, housing, and education. Mahalanobis then builds an econometric model to prove that a developing economy needs to concentrate on the production of heavy capital goods. While heavy industry certainly widens and deepens the capital base of an economy, the model does not shed any light on the distribution of profits and wages. Consequently, it is difficult to discern the source of investment to sustain a capital-goods sector employing capital-intensive techniques of production. Nor does the model tell us if wages will be held above the "inflation barrier," and, if so, what methods are envisaged to combat unemployment in the process of growth. While there is technical interdependence of the four sectors in the model, growth in a developing economy is not entirely a function of technology. There are institutional factors influencing economic behavior which make it necessary to consider demand functions.

The problems of factor pricing and distribution in an underdeveloped economy can be approached more usefully through a realistic analysis of modern technology. If the assumption of malleable capital is dropped, we can assume a self-reproducing, durable
capital goods sector. Consider the simple example of a developing economy under perfect competition with an unlimited supply of labor, using two goods and two processes. Assume that the technology is as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
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<tbody>
<tr>
<td>L</td>
<td>C</td>
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<tr>
<td>C</td>
<td>Eq</td>
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<td>1</td>
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The steady-growth solution would be given by a resource allocation ratio of 1:1, as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
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<tbody>
<tr>
<td>L</td>
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<td>2</td>
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<tr>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Let \( p \) equal the price of \( \text{Eq} \) in terms of \( C \). If the rate of profit \( (r) \) is the same for both processes, then

\[
\frac{[(3-1)+(1\cdot p)]-[(1-1)+(1\cdot p)]}{(1-1)+(1\cdot p)} = \frac{[(0-1)+(2\cdot p)]-[(1-1)+(1\cdot p)]}{(1-1)+(1\cdot p)}
\]

or

\[(3+p)-(1+p) = (0+2p)-(1+p)\]

or

\[2 = p - 1\]

or

\[p = 3\]

Thus, the price of \( \text{Eq} \) is 3 units of \( C \).
Using this price ratio, we can derive the value of profits $(Pr)$:

$$Pr = output - input$$

$$= [(3\cdot1)+(3\cdot3)] - [(2\cdot1)+(2\cdot3)]$$

$$= (3+9) - (2+6)$$

$$= 12 - 8 = 4$$

If we assume that entrepreneurs do not consume and wage earners do not invest, then

$$Pr = I = 4$$

We know that the wage bill $(W)$ is 2 units of $C$. Therefore,

$$Y = C + I$$

$$= W + Pr$$

$$= 2 + 4 = 6$$

The distribution of income is

$$\frac{W}{Y} = \frac{2}{6} = \frac{1}{3}$$

and

$$\frac{Pr}{Y} = \frac{4}{6} = \frac{2}{3}$$

Since the theory of value is closely associated with the theory of distribution, it is necessary to analyze the behavior of relative values in response to a change in the real wage rate or the rate of profit, assuming a given technology. Whenever the wage rate changes, capital has to be revalued, since its value depends upon the relative strength of two opposing elements: the rate of profit and the wage rate. If the technology is such as to bring about a lower rate
of profit to offset exactly an increase in the wage rate, then the value of capital remains unaffected.

From the point of view of welfare, income received and income consumed are more important than factor incomes. Consumption expenditure is a vital indicator for measuring welfare. The problem of inequality does not lend itself to rigid mathematical computations, such as the Lorenz curve and Gini concentration ratios derived therefrom. Income disparities are not only quantitative but qualitative. In the highest income decile in developing economies, the composition of the consumption basket is quite different from that of the lowest 20 percent of the population. Company executives in such countries have a lifestyle that is a million light-years away from that of the landless agricultural laborer.

According to a study conducted by the World Bank's Development Research Center, about one-half of the underdeveloped countries show high inequality, and one-third of them exhibit moderate inequality.\(^5\) The magnitude of absolute poverty is indicated in the study by the fact that one-third of the population of developing countries has a per capita income of $50 to $75 per annum. In point of fact, much of the poverty in such countries is caused as much by a skewed distribution of national income as by a low income per capita. The overall cost to the economy is not only that inequality detracts from social justice, but also that modern technology and equipment are being diverted away from infrastructure and essential commodities to the items of conspicuous consumption for a small minority. In such economies, policies of industrial licensing or import substitution are geared to a social climate that is heavily biased toward the rich. If planning for economic growth degenerates into a desultory affair, then inequality will remain built into the economic system.

Thus, distribution theory lies at the heart of development. Fiscal policy touches only the periphery of the problem. Confiscatory taxation, by itself, will not remove the evils of the socioeconomic structure. Growth and distribution need to be tackled simultaneously.
Chapter I


3. This can be recognized as the classical savings assumption. It can also be found in the works of Kaldor, Kalecki, Robinson, and Neumann.


6. Nonemployment is defined as the status of a person who has never been in employment; it is associated with inferior techniques. This is in contrast to the concept of unemployment, where a person is temporarily without a job. See Joan Robinson, *Exercises in Economic Analysis* (New York: Macmillan Publishing Company, Inc., 1970), p. 101.


Chapter II

11. These can be recognized as the properties of the Neumann System. See J. A. Kregel, *Rate of Profit, Distribution and Growth*, Chapter II, Section 1.


13. This is true only in the simplified case of a two-good model. In more general models, it depends not only on the productivities, but also on the real wage rates.


Chapter III

16. The hypothesis \( \frac{W}{Y} \) is equal to \( \frac{w}{b_0} \) has limited validity under Neutral Wicksell technologies only.

17. Complexities increase when time is introduced into the analysis. See Joan Robinson, *Essays in the Theory of Economic Growth*, on logical and historical time. In addition, the problem of revaluation of capital consequent upon changes in the wage rate will be encountered. This becomes much more complex if we introduce the problem of choice of technique.


Chapter IV


Chapter V


This is in contrast to the neoclassical Cobb-Douglas production function, where there is no summit point.

This is in contrast to Joan Robinson's production function, where the given rate of profit determines the real wage rate.

This is the most important conclusion of A. K. Sen.

Chapter VI


Harvey Leibenstein, *Economic Backwardness and Economic Growth*. 


38. Gautam Mathur, *Disparity Tax in a Composite Economy*.


Chapter VII


43. Galenson and Leibenstein, "Investment Criteria, Productivity and Economic Development."

Chapter VIII


Chapter IX


47. See M. F. Jussawalla, *Economics of Development*, Chapter XIV.
Chapter X


51 J. A. Kregel, *Rate of Profit, Distribution and Growth*.

52 Roy F. Harrod, *Towards a Dynamic Economics*.

53 Joan Robinson, *The Accumulation of Capital*.


INDEX

Agriculture, 73-75, 79, 80, 95


Balance of payments, 101

Bottlenecks, 2, 9, 15, 16, 26, 28, 78, 81, 85, 86, 89, 91-93, 97

Capital (K), 36, 73, 86, 106, 110

Capital formation, 83-88, 100

Capital intensive techniques, 69, 74, 81, 86, 95, 106, 108

Capitalism, 103, 104, 105

Causation, 10-13, 49, 54, 72, 73, 103

Classes, economic, 5, 6, 7, 39, 40, 45, 47, 57, 59, 76, 93, 104, 111

Competition, perfect, 10, 29, 99, 105-107


Consumption, nonessential, 47, 54, 80-82, 84, 85, 93, 95, 111

Consumption, control of, 47, 54, 57-59, 94, 95

Consumption by producers, (CP), 39, 49, 51, 54

Consumption by workers (CW), 39, 49, 50, 54

Critical minimum effort, 76, 84

Deficit spending, 97, 99-101

Developed economy, 1, 13, 73, 83, 94, 99, 100, 106, 107

Distribution of income, 40-44, 46, 47, 50, 76, 80, 81, 84, 85, 95, 100, 108-111

Domar, Evesy, 1, 106, 108

Dualism, 74, 80

Dynamic growth, 5, 16, 24, 39-40

Economic development, definition of, 1, 73

Entrepreneurs (producers), 5, 7, 8, 10, 29, 39, 45, 47, 49, 51-53, 54, 57, 84-86, 93, 94, 97, 107

Equipment, (EQ), 4-5, 9, 15-17, 19, 21-25, 27-28, 31, 34, 40,

Equipment, non-depreciating, 5, 15-16, 63

Equipment, versatile, 3-5, 15

Excess capacity, 97

Fiscal policy, 54, 81, 94, 101, 111

Full employment, 10, 12-13, 37, 49, 54-56, 107-108

Galenson, Walter, 86

Glass Curtain Economy, 80

Golden Age Economy, 37, 107

Growth balanced, 85, 86, 89-90

Growth, coefficient of (G), 16-19, 34-36

Growth in the consumption-good sector (GC), 17, 21-23, 25, 53

Growth in the equipment sector (GEQ), 17, 18, 22, 23, 53

Growth, noninflationary, 3, 16, 29, 39, 47, 98, 108

Growth, rate of (G), 10-13, 17-23, 26, 28, 34-37, 40, 42, 45-47, 49-50,

53-57, 62, 78, 83-84, 89-91, 97, 99, 103, 106-107

Growth unbalanced, 24-26, 85-86, 89-91

Harrod, Roy, 1, 12, 106-107

Hicks, J. R., 105

Hirschman, A. O., 86

Income per capita, real, 73, 76, 78, 83, 86, 111

India, 49

Industry, 74-75, 80, 83

Inferiority of Techniques, 65-68

Inflation, real, 26, 50, 57, 75, 81, 97-101

Inflation barrier wage rates, 55, 57, 108

Infrastructure, 73, 78-79, 81-82, 83, 97-98, 100, 111


Investment (I), 5-9, 29-30, 36, 42, 43, 47, 57-58, 83-86, 93, 106-108, 110, 111
Isoquants, 106

Keldor, Nicholas, 1

Keynesian Economics, 6-7, 58, 84, 97, 106


Labor intensive techniques, 69-71, 78, 83, 93

Labor supply, rate of growth of (GL), 11-12, 37, 54-56

Labor supply, unlimited, 9, 15, 16, 29, 40, 49, 50, 61, 76, 78, 79, 86, 87

Labor theory of value, 104-105

Leibenstein, Harvey, 86,

Leontief, Wassily, 1

Linkage effects, 86

Mahalanobis, P. C., 108

Marginal productivity, 105-106

Marx, Karl, 104-105

Mechanization, 69-70, 74, 75, 79-81, 83

Monetary policy, 54, 81,

Mutually nonsuperior techniques, 66, 67, 71

National income (Y), 5, 7, 8, 9, 36, 41-44, 46, 47, 58, 104, 106, 110

Neoclassic economics, 6, 9, 26, 81, 105-106

Neumann, J. Von, 1

Non-employment, 11-12, 13, 37, 49-50, 57, 61, 72, 73, 77, 78, 93

Nurkse, Ragnar, 85, 86


Planning, 10, 57, 75, 79, 80, 81, 103, 108

Population growth, 11, 12, 73, 76-79, 103-104

Population planning, 78, 79

Poverty, 103-104, 111


Process intensities, 15, 20-24, 26-28, 36, 40-44, 50-51, 61, 90, 98

Producers (entrepreneurs), 6, 8, 10, 29, 39, 45, 49, 50-53, 55, 57, 84-85, 93, 94, 97, 107

Production function, 67-69, 106

Profit, rate of (R), 6-8, 10, 30-33, 35-37, 46, 47, 49, 50, 53-57, 61, 62, 65, 70, 71, 104, 106-107, 109-111

Technology, rate of growth, 11, 12, 37, 54-56, 92-93, 107-108

Unemployment, 73, 75, 77, 94, 99, 100, 108

Wage rate, real (W), 1, 9, 11, 12, 13, 16, 19, 20, 26, 37, 39, 41, 44, 49, 50, 54-56, 61, 63, 77, 91, 92, 97, 98, 110-111